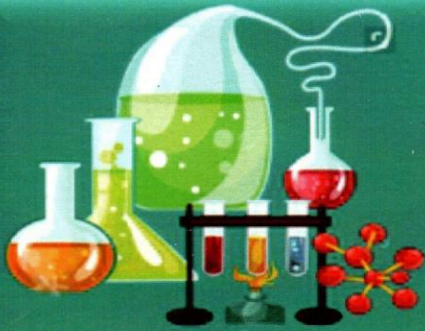# USE OF ICT IN SCIENCE AT SECONDARY SCHOOL LEVEL
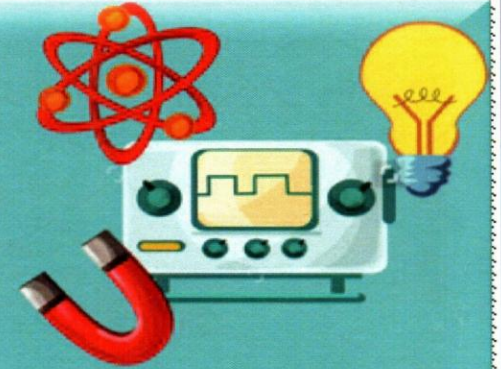
(PAC - 16.36)

Chemistry   Biology   Physics

Programme Co-ordinator
RASHMI SINGHAI

विद्यया ऽ मृतमश्नुते

एन सी ई आर टी
NCERT

Regional Institute of Education
(National Council of Educational Research and Training)
Shyamla Hills, Bhopal- 462013
2017-18

क्षेत्रीय शिक्षा संस्थान

शिक्षार्थ आइए   सेवार्थ जाइए

LEFT TO RIGHT cSBs

1.DR. KAILASH BASPANDEY 2.AMIR KHAN 3.KAUSHLENDRA SINGH 4.DR. N.C. OJHA 5.PROF. N. PRADHAN (PRINCIPAL)

UNIVERSE OF CHEMISTRY

SCHOOL LEVEL

(PAC - 16.36)

REPORT

Programme Co-ordinator

RASHMI SINGHAI

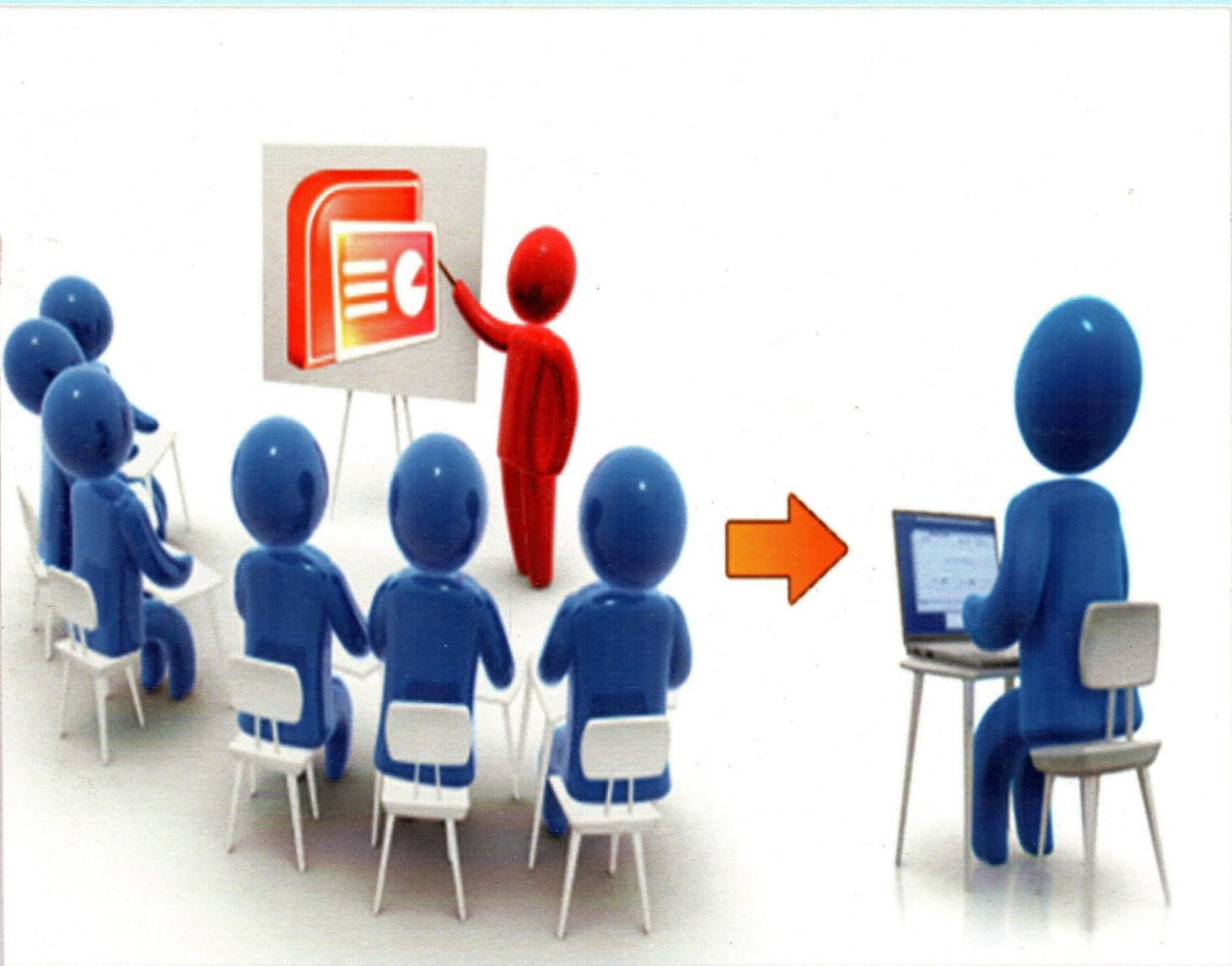## Regional Institute of Education
(National Council of Educational Research and Training)
Shyamla Hills, Bhopal- 462013

2017-2018

USE OF ICT IN SCIENCE AT SECONDARY SCHOOL LEVEL

(PAC - 16.36)

Regional Institute of Education

APPROACH PAPER

The National Curriculum Framework (NCF), 2005 recommends that children's life at school must be linked to their life outside the school. This principle marks a departure from the legacy of bookish learning which continues to shape our system and causes a gap between the school, home and community. The syllabi and textbooks developed on the basis of NCF signify an attempt to implement this basic idea. They also attempt to discourage rote learning and the maintenance of sharp boundaries between different subject areas. We hope these measures will take us significantly further in the direction of a child-centered system of education outlined in the National Policy on Education (1986). The success of this effort depends on the steps that school principals and teachers will take to encourage children to reflect on their own learning and to pursue imaginative activities and questions. We must recognize that, given space, time and freedom, children generate new knowledge by engaging with the information passed on to them by adults.

In-service training programs are an integral component of the academic activities of Regional Institute of Education, Bhopal. It is our abiding duty to serve the needs of state under our jurisdiction with the fruits of our experimentations in educational innovations and best practices.

E-content is becoming popular because of it's flexibility of time, place and pace of learning. E-content includes all kinds of content created and delivered through various electronic media. E-content is available in many subjects and almost all levels of education. It can be used by wide variety learners with diverse needs, different backgrounds, and previous experience and skill levels. It can be shared and transmitted easily and promptly among unlimited number of users around the world. Teachers, students and others get benefited by the use of well designed and

developed e-content. It is advantageous to the educational organizations to make their program accessible to their teachers and students on campus, home and other community learning or resource centres. It has a significant implications for open and distance learning institutions.

The purpose of e-content development is to create an information rich society. Every one in the society is empowered to create, receive, share and utilize information for their progress. Very well designed, developed and validated e-content will provide access to high quality meaningful digital content and serve as an effective virtual teacher.

Using the art of technology in the studio functional at Regional Institute of Education Bhopal, participants will be trained in the developing of e- content ICT integration of the content with the help of various Free and Open Source Software will also be dealt with.

Ojectives:

(1) To formulate strategies to make teachers aware to integrate the use of the ICT in the class room teaching learning so that the student can understand the concept easily

(2) To facilitate efficient ways of learning techniques to use ICT.

(3) To enable maximum number of examples using ICT so that students can relate science to the real life experiences.

(4) To integrate the use of mobile technology in the classroom teaching-learning.

Methodology:

(1) five days workshop for the development of material

(2) Five days training programme on the developed material for secondary school teachers .

(3) Getting feedback and Report preparation

Acknowledgement

I would like to express our sincere gratitude to Prof. N. Pradhan, Principal, Regional Institute of Education, Bhopal for giving us the opportunity and necessary support to carry out the research.

I would like to express our sincere thanks to Prof. I.B.Chugtai , Dean of Instructions, and Prof. V.K.Kakaria , Head, DESM, Regional Institute of Education, Bhopal, for continuous support and encouragement.

I would like to express my sincere thanks to the resource persons for their continuous support to make the training programme a success.

My sincere thanks to the participants for their cooperation and active participation in the training.

I am also grateful to Prof. L. K. Tiwary, Head, Department of Extension Education, Regional Institute of Education, Bhopal for providing administrative support.

(Rashmi Singhai)
(Co-ordinator)

REPORT

Online tools and resources have made it easier for teachers to instruct students, and for students' to collaborate with those teachers and with other students and parents. E-learning success is dependent on effective and efficient delivery of teaching and learning contents electronically. New technological innovations have greatly facilitated e-learning and have made it conducive to those who can afford. Developed countries have significantly benefited from these innovations whereas developing economies are still battling with the many challenges that have hindered e-learning success.

The advent of Web 2.0 and Free Open Source Software (FOSS) would have been seen as the breakthrough for the developing economies to embrace e-learning. The quandary of huge budgets in institutions of learning could be avoided if they utilize Free Open Source Software (FOSS) and the web 2.0 technologies for e-learning. These "Web 2.0" teaching tools aren't magical, but they may seem to defy definition at times since they save time, help you to stay organized, and often take up little space on a computer. Some of these applications are Web-based, which means that they can be accessed from any computer. The eXe project developed a freely available Open Source authoring application to assist teachers and academics in the publishing of web content without the need to become proficient in HTML or XML markup. Resources authored in eXe can be exported in IMS Content Package, SCORM 1.2, or IMS Common Cartridge formats or as simple self-contained web pages.

This is a small endeavour in using web 2.0 and FOSS tools to develop e –content material in science at secondary level.

Need and Justification

ICT, the most valuable tool of present day education system. ICT techniques   provide audio-visual cues that help in memorizing the key concepts at ease and furnishes a better ability to understand and relate to theoretical aspects of science. Students are thus free to share scientific ideas and observations among themselves which will help them to improve their academic performance. ICT

based virtual lab modules aims to be used to develop quality of science education and enhance teaching-learning process. It will also enhance the quality of lecture delivery in classroom and make learning effective, interactive and enjoyable. NCF 2005 and other documents have insisted on infusion of ICT in teaching learning process at all levels of school education. Now a days in the post global era this facilitates the effectiveness of the class room teaching.

Teacher of different subjects, teaching at secondary level were invited from neighbouring KVS and NVS schools as resource persons to develop a E-Content in Science at Secondary level Using FOSS and web 2.0 tools Under the able guidance of prof. N.Pradhan, Principal, RIE Bhopal, the project co coordinator of this Programme Dr. Rashmi Singhai briefed the resource persons about the aim and implication of the project and all necessary physical and technological support was extended

This Programme was organized in different spells:

FIRST PHASE (Sept. 11-15, 2017)

Five days workshop was organized and the entire Programme was briefed out by the coordinator Dr. Rashmi Singhai .

The following resource person were associated with the workshop .

1. Prof. P. Kulshererstha   Professor (Botany), RIE Bhopal
2. Dr. R. Prajapati-   Assistant Professor (Chemistry), RIE Bhopal
3. Ms.Ragni Bhatt-   PGT, Biology, NVS
4. Mr.Manish Mishra-   PGT, Physics, NVS
5. Mr.Naresh Yadav-   PGT, Computer Science, NVS
6. Ms. Kanitmati-   KV. No.2 , Bhopal
7. Ms. Jagrati Sharma   (PGT Chem), KV. No.2 , Bhopal
8. Mr. K. Singh   (PGT Chem), KV. No.1 , Bhopal
9. Mr. S.K.Jain   (PGT Chem), Govt H.S.S.School, sagar
10. Mr. L.S.Chouhan   Assistant Professor (Physics), RIE Bhopal
11. Mr. Muneedra Chouhan DMS, Bhopal
12. Mr, Shayam   DMS, Bhopal
13. Mr. Amir Khan   ITM University, Gwalior
14. Dr.N.C.Ojha   Assistant Professor (Education), RIE Bhopal

The first phase of the programme was started with the workshop of five days from September 11-15, 2017. In the Workshop 'IX' and 'X' science textbook (NCERT) were thoroughly studied to select chapter each from Biology, Chemistry and Physics. The resource persons were from Kendriya Vidyalaya, Jawahar Navodaya Vidyalaya, and other CBSE affiliated schools along with subject experts from RIE, Bhopal. An outline format was framed to develop the modules giving liberty to the teachers for variation as per their requirement. Each module has feature of Video/simulation along with various exercises for practice like MCQ, True or False, Drop Down Activity, multiple select questions etc. This package was specially developed for the students of class IX and X. The main objective is to provide them access even offline to facilitate the availability for urban and rural area students. This attempt also fulfills the objective of inclusive education where each child can access it as per their need and thus every one's learning can be enriched.

The second phase of the programme (October 3-7, 2017) was training on the developed module. Participants from the western region were invited. Seventeen participants attended the training. The classes were as per timetable. Hands on Experience was the main attraction of the training where the participants enjoyed learning the use of various Free and open source software's. Feedback was also taken by the participants. At the fifth day valedictory was conducted where the participants expressed their views, they all had the similar request for the duration of the training to be 10 days instead of 5 days. Valedictory was concluded by the blessings was the principal Prof. N. Pradhan and vote of thanks by one of the resource person.

प्रथम दिवस का दैनिक प्रतिवेदन

राष्ट्रीय माध्यमिक शिक्षा अभियान म.प्र. भोपाल के आदेश के कम में माध्यमिक स्तर पर विज्ञान विषय में ICT के उपयोग पर 05 दिवसीय आवासीय प्रशिक्षण दिनांक 03.10.17 से 07.10.17 तक का प्रारंभ आज दिनांक 03.10.17 को क्षेत्रीय शिक्षा संस्थान भोपाल में हुआ। इस प्रशिक्षण में म.प्र., महाराष्ट्र के शिक्षक उपस्थित हुये।

इस प्रशिक्षण कार्यकम के संयोजक संस्था के प्राचार्य प्रो. नित्यानंद प्रधानजी एवं कोर्डिनेटर श्रीमती रश्मि सिंघई हैं।

प्रथम दिवस का प्रतिवेदन निम्नानुसार है–

1. प्रातः 9.30 बजे से 11.00 बजे तक का सत्र पंजीयन एवं उद्घाटन का रहा, जिसमें विभिन्न राज्यों से उपस्थित हुयें शिक्षक प्रशिक्षणार्थियों का पंजीयन हुआ एवं उन्हें प्रशिक्षण किट प्रदान किये गये।

   प्रशिक्षण कार्यकम का उद्घाटन संस्था के प्राचार्य प्रो. नित्यानंद प्रधानजी के द्वारा किया गया। अपने उदघाटन भाषण में उन्होंने समस्त शिक्षक प्रशिक्षणार्थियों का स्वागत किया एवं संबोधन में प्रशिक्षण के महत्व पर प्रकाश डाला।

   उद्घाटन सत्र में ही दूसरे वक्ता के रुप में प्रो. काकरियाजी, विभागाध्यक्ष विज्ञान एवं गणित विभाग ने सर्वप्रथम सभी शिक्षक प्रशिक्षणार्थियों का परिचय प्राप्त किया। उन्होंने अपने प्रेरक उद्बोधन में बताया कि ICT का उपयोग किस तरह से शिक्षण कार्य में किया जा सकता हैं।

   डॉ. सारिका साजू, प्रभारी विभागाध्यक्ष विस्तार विभाग ने अपने उद्बोधन में ICT एवं शिक्षक के प्रति चिन्ता जाहिर करते हुये बताया कि कहीं ICT शिक्षक का स्थान न ले लें।

   कार्यकम का संचालन कोर्डिनेटर श्रीमती रश्मि सिंघई ने किया।

2. प्रातः 11.30 बजे चायकाल के बाद प्रथम कालखंड में श्रीमती जाग्रति शर्मा ने Blended learning में ICT के समावेश पर चर्चा की। उन्होंने Blended learning के माध्यम से कक्षा कक्ष में छात्रों की रुचि को कैसे बनाये रखा जा सकता है, इस पर भी प्रकाश डाला। इसके साथ ही अपने 90 मिनिट के व्याख्यान में Face to Face class room Method को कम्प्यूटर आधारित गतिविधियों द्वारा कैसे जोड़ा जा सकता है।

3. भोजनावकाश के बाद दोपहर 2.00 बजे से 3.30 बजे तक संस्था के प्राचार्य प्रो. नित्यानंद प्रधानजी के द्वारा रचनावाद पर गहन चर्चा की गई। रचनावाद के मॉडलों पर प्रकाश डाला। उन्होंने बताया कि ज्ञान का हस्तांतरण नहीं होता।

4. दोपहर 3.45. से 5.15 बजे तक अंतिम कालखंड श्री एन.सी. ओझाजी ने लिया, जिसमें उन्होंने बड़े विस्तार से ICT के विकास पर गहन चर्चा की। उन्होंने TPACK पर प्रकाश डाला। साथ ही सभी शिक्षक प्रशिक्षणार्थियों का विषय के आधार पर समूह विभाजन किया। साथ ही विषय विश्लेषण तैयार करने को कहा।

5. इस प्रकार प्रथम दिवस के प्रतिवेदन के अंत में हम सभी शिक्षक प्रशिक्षणार्थियों का यह निवेदन है कि प्रशिक्षण कसे पूर्ण रुप से प्रायोगिक बनाया जावें, ताकि सभी को प्रायोगिक ज्ञान प्राप्त हो।

अंत में मैं संस्था के प्राचार्य प्रो. नित्यानंद प्रधानजी, कोर्डिनेटर श्रीमती रश्मि सिंघई, समस्त रिसोर्स पर्सनस को साधुवाद ज्ञापित करना चाहता हूं।

आई.टी.सी. प्रशिक्षण द्वितीय दिवस का दैनिक प्रतिवेदन

राष्ट्रीय माध्यमिक शिक्षा अभियान म.प्र. भोपाल के आदेश के क्रम में माध्यमिक स्तर पर विज्ञान विषय में ICT के उपयोग पर 05 दिवसीय आवासीय प्रशिक्षण के संयोजक संस्था के प्राचार्य प्रो. नित्यानंद प्रधानजी, प्रशिक्षण समन्वयक श्रीमती रश्मि सिंघई, रिसोर्स पर्सन, विभिन्न प्रदेशों से आये हुये समस्त प्रशिक्षणार्थियों का स्वागत करता हूँ।

द्वितीय दिवस का प्रतिवेदन निम्नानुसार है–

1. प्रथम कालखंड प्रातः 9.30 बजे से 11.00 बजे के दौरान सर्वप्रथम श्री डी.एन. सुरेश सर ने प्रथम दिवस का दैनिक प्रतिवेदन प्रस्तुत किया। इसके पश्चात् श्रीमती के. कांथीमती मैडम ने **सीखने की शैली** पर चर्चा की। इन्होने कहा कि प्रत्येक शिक्षक अपने आप में **यूनिक** होता है, साथ ही **छात्र भी।**

   उन्होने प्रशिक्षणार्थियों को तीन समूहों में विभाजित करके मनोरंजक गतिविधि करायी। उन्होंने VAKT मॉडल के बारे में बताया और रसायन गतिविधि के दौरान श्रीमती वंदना तिवारी ने पी.एच. मान के अंतर्गत एक सूत्र **अनीला क्षालानी** दिया।

2. द्वितीय कालखंड प्रातः 11.30 बजे चायकाल के बाद श्री आमिर खान सर ने ICT का उपयोग कम्प्यूटर द्वारा कैसे किया जाय इस पर चर्चा की। इसमें उन्होंने वीडियों डाउनलोडिंग, शेयरिंग, YTD और गुगल ड्राइव की जानकारी दी। इसके अलावा विभिन्न प्रकार के एप्लीकेशन को डाउनलोड करके ICT में उपयोग करना सिखाया और विभिन्न प्रशिक्षणार्थियों को प्रेजेन्टेशन तैयार करने में आने वाली समस्याओं का निराकरण किया।

3. भोजनावकाश के बाद तृतीय कालखंड में दोपहर 2.00 बजे से 3.30 बजे तक श्रीमती जाग्रति शर्मा ने ICT समावेशित शिक्षा के बारे में चर्चा करते हुये बताया कि समावेशित शिक्षा वह शिक्षा है जिसमें शिक्षण कक्ष में सभी प्रकार के छात्रों को समान शिक्षा प्राप्त करने का अधिकार है। उन्होंनें IEP और JAWS के बारे में बताया।

4. द्वितीय दिवस का समापन दोपहर 5.15 बजे डॉ. एन.सी. ओझा सर के साथ हुआ। उन्होने e-content के विकास के बारे में ppt , विडियोज के माध्यम से सटीक जानकारी प्रदान की। उन्होने किस प्रकार e-content का विकास ADDIE Modal के साथ किया जाता है, इसके बारे में विस्तृत जानकारी दी।

अंत में मैं कहना चाहता हूँ कि द्वितीय दिवस का प्रशिक्षण कार्यक्रम हम प्रशिक्षणार्थियों के लिये सार्थक रहा। इसके लिये मैं भगवत सिंह खंगार जंतुविज्ञान समूह की ओर से संस्था के प्राचार्य प्रो. नित्यानंद प्रधानजी, प्रशिक्षण समन्वयक श्रीमती रश्मि सिंघई एवं समस्त रिसोर्स पर्सन को धन्यवाद ज्ञापित करता हूँ।

आशा करता हूँ कि शेष दिनों में भी प्रशिक्षण का स्वरुप ऐसा ही बना रहेगा।

धन्यवाद।

तृतीय दिवस का दैनिक प्रतिवेदन

राष्ट्रीय माध्यमिक शिक्षा अभियान म.प्र. भोपाल द्वारा आयोजित माध्यमिक स्तर पर विज्ञान विषय में ICT के उपयोग पर 05 दिवसीय आवासीय प्रशिक्षण में मैं प्रशिक्षण समन्वयक श्रीमती रश्मि सिंघई, रिसोर्स पर्सन, विभिन्न प्रदेशों से आये हुये समस्त प्रशिक्षणार्थियों का स्वागत करता हूँ।

तृतीय दिवस का प्रतिवेदन निम्नानुसार है–

1. प्रथम कालखंड प्रातः 9.30 बजे से ब्रिजेन्द्र गौतम के आनंदम एवं श्रीमती वंदना तिवारी के सरवती वंदना से प्रारंभ हुआ। तत्पश्चात् भगवत सिंह खंगार जंतुविज्ञान समूह की ओर से द्वितीय दिवस के दैनिक प्रतिवेदन का वाचन किया गया। इसके पश्चात श्रीमती के. कांथीमती मैडम ने **NLP** पर चर्चा की, जिसमें उन्होने सकारात्मक सोच पर बल दिया। इन्होने कहा कि प्रत्येक शिक्षक की सोच सकारात्मक होनी चाहिये। उन्होने मनोवैज्ञानिक सोच को बल देने के लिये एक गतिविधि करवाई, जिसमे उन्होने पेड़ का चित्र सभी प्रशिक्षणार्थियों से बनवाकर उसका मनोवैज्ञानिक विश्लेशण किया।

2. द्वितीय कालखंड प्रातः 11.30 बजे चायकाल के बाद श्रीमती जाग्रति भार्मा ने आवर्तसारणी पर विस्तृत चर्चाकर केमबोला गतिविधि के माध्यम से विद्यार्थियों में विषय के प्रति रुचि जाग्रत करने व सकारात्मक सहभागिता करने का तरीका सिखलाया। विजेताओं को उन्होने पुरस्कृत किया। इस कालखंड के अंत में श्रीमती कांतीमथी ने श्रीमती जाग्रति शर्मा के जन्मदिन की जानकारी दी एवं सभी लोगो ने उन्हें जन्मदिन की शुभकामनायें दी।

3. आज भोजनावकाश में संस्था के प्राचार्य प्रो. नित्यानंद प्रधान एवं संस्था के फेकल्टी सदस्य भी उपस्थित थे, जिसका अनुभव सुखद रहा। इसके बाद तृतीय कालखंड में दोपहर 2.00 बजे से 3.30 बजे तक श्री के. सिंह ने कार्बनिक रसायन को कैसे आसान तरीके से ICT के माध्यम से कक्षा में पढ़ाया जाय, जिससे छात्र आसानी से रसायन की जटिलता को समझ सकें। उन्होने **Chemsketch** साफ्टवेयर का उपयोग कर जटिल रासायनिक सूत्रों एवं समीकरणों को कैसे आसानी से लिखा जा सकें, इस पर सटीक जानकारी प्रदान की। इस कालखंड के अंत में बहुप्रतीक्षित फोटो सेशन हुआ, जिसका हम सभी प्रातः 10.00 बजे से इंतजार कर रहे थे।

4. तृतीय दिवस का समापन दोपहर 5.15 बजे संस्था के प्ब्ज लैब में प्रायोगिक कार्य करते हुये हुआ। इस लैब में श्री आमिर खान ने **Blog** का उपयोग करना सिखाया एवं श्रीमती रश्मि सिंघई ने **e-content** के स्किप्ट के संबंध में चर्चा की।

आज का दिन हम सभी प्रशिक्षणार्थियों के लिये सार्थक रहा, क्योंकि आज हमें समझ में आया कि ICT के माध्यम से शिक्षण को आसान एवं सरल कैसे बनाया जा सकता है एवं इसमे विभिन्न प्रकार के **Tool** का प्रयोग कैसे किया जा सकता है। इसके लिये सभी प्रशिक्षाणार्थियें की ओर से संस्था के प्राचार्य, प्रशिक्षण समन्वयक एवं समस्त रिसोर्स पर्सन को धन्यवाद ज्ञापित करता हूँ।

धन्यवाद।

डॉ. ललित मेहता

अध्यापक

शा.भास्. उत्कृष्ट उ.मा.वि. रतलाम म.प्र.

चतुर्थ दिवस का प्रतिवेदन   दि० 06.10.17

माध्यमिक स्तर पर विज्ञान विषय में ICT के उपयोग पर
05 दिवसीय आवासीय प्रशिक्षण में उपस्थित समस्त लोगो का
हार्दिक अभिनंदन।

चतुर्थ दिवस का प्रतिवेदन आप सब लोगो के समक्ष प्रस्तुत
है -

① प्रातः 9.30 से 11.00 एवं 11.00 से 1.00 बजे लगातार दो कालखंडो में
आज ICT लैब में सभी प्रशिक्षणार्थियों का समूह ICT का
विज्ञान विषय में कैसे उपयोग में लाया जा सकता है, इसका
प्रायोगिक कार्य भी आमिर खान के निर्देशन में संपन्न हुआ।
इन कालखंडों में ICT की कई बारीकियों से भी आमिर खान
ने हम सबको अवगत कराया। साथ ही उन्होंने Blog के बारे
में विस्तृत जानकारी दी एवं Blog कैसे कार्य करता है यह भी
समझाया।

② लंच के उपरांत दोपहर 2.00 बजे से 3.30 एवं 3.45 से 5.15 बजे
तक भारती राजोरी अडू ने "Developing Digital Content on
Biology- Educational PPT" पर ICT लैब में ही विस्तृत जानकारी
दी। उन्होंने पॉवर पाइंट प्रेजेंटेशन का उपयोग जीवविज्ञान विषय में
कैसे किया जाता है, पर प्रायोगिक रूप से सटीक जानकारी दी।
उन्होंने सभी प्रशिक्षणार्थियों से PPT का निर्माण हेतु अन्य
बारीकियों से अवगत कराया। सभी प्रशिक्षणार्थियों ने उनके दिशा
निर्देशानुसार PPT का निर्माण किया।

इस प्रकार आज का संपूर्ण सत्र ICT Lab में प्रायोगिक
कार्यों के साथ संपन्न हुआ। ICT लैब में बार-2 निर्युत अवरोध
होने से प्रायोगिक कार्य में बाधा उत्पन्न हुई। अतः प्रशासनिक
अधिकारियों से निवेदन है कि Lab में जनरेटर की सुविधा होनी
चाहिये।
        अंत में मैं बेदना त्रिपाठी स्वाध्याय अडू की ओर से आप का
धन्यवाद ज्ञापित करती हूँ।

Contents

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Constructivism and Classroom Teaching

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The term constructivism refers to the idea that individuals, through their interaction with the environment construct their own knowledge and meaning (Fosnot 1996; Steffe and Gale, 1995). This metaphor of construction comes from the idea that humans are builders, shapers, and designers, who throughout history have created artifacts from pots to skyscrapers. All these tangible products were and are still being built through the process of selecting the materials, arranging or mixing the materials together, resulting in a whole that is greater than some of its parts (Spivey, 1997). However, as humans we also create mental products or meanings as well as creating things. The emphasis of the constructivist theory is on the process, rather than the product of learning. A constructivist approach would have the student determine how much they have learned as well as the process by which they have come to know. Such a theory of knowledge and learning has significant implication for teaching. It changes the dynamics of the traditional classroom by empowering the learner as the focus and architect of the learning process while redefining the role of the instructor to be a guide and helper, rather than the source and conduit of knowledge. Constructivism has become an educational theory of choice for many within modern educational institutions. Gaining insight into its core pedagogical principles and how these principles determine/influence the major aspects of classroom instruction, e.g. role of the teacher, instructional strategy, evaluation, is important on the part of the teachers and the teacher-educators who really want to participate in this movement.

Assumptions of Constructivist Learning Theory

The constructivist learning theory is based on the following four major assumptions

- Knowledge depends on past constructions. We know the world through our mental framework and we transform and interpret new information through this framework.
- Constructions come through systems of assimilation and accommodation into our existing mental framework.
- Learning is an organic process of invention, not mechanical.
- Meaningful learning occurs through reflection and scaffolding of new knowledge upon existing framework of knowledge.

Characteristic of constructivist learning

- Goals and objectives are derived either by the learner or in negation with the teacher or system
- Teacher plays the role of facilitator, guide monitor and coach
- Learner plays a central role in mediating and controlling learning
- Knowledge construction and not reproduction is emphasized

- Knowledge construction takes place in individual contexts and through social negotiation, collaboration and experiences
- Learners' previous knowledge, beliefs and attitudes are considered in the knowledge construction process
- Learning environments are created where activities, opportunities, tools are provided to encourage meta-cognition, self-analysis, self-regulation, self-reflection and self-awareness
- Content, skills, tasks and learning situation are relevant, realistic, authentic and represent the natural complexities of the 'real world'
- Primary sources of data are used to ensure authenticity and real-world complexity
- Problem-solving, critical and creative thinking skills and deep understanding are emphasized
- Wrong answers provide the opportunity for insight into students previous knowledge construction
- Learners are encouraged to explore the new knowledge independently and to manage the pursuit of their goal
- Learners are provided with the opportunity for apprenticeship learning in which there is an increasing complexity of tasks, skills, and knowledge construction
- Conceptual interrelatedness and interdisciplinary learning are emphasized which reflex knowledge complexity
- Collaborative and cooperative learning are focused in order to expose the learner to alternative viewpoints and encourage social interaction
- Scaffolding facilitate to enable students perform just beyond the limits of their ability
- Assessment is interwoven with teaching

Constructivist Pedagogy

Instruction that is based on constructivist principles is extremely demanding of the teacher. Constructivist pedagogy is the link between theory and practice. Many theorists and practitioner (Brooks and Brooks, 1993; Driscol, 1994; Jonassen, 1991) have generated constructivist pedagogies with an array of results. While these pedagogies share a set of core design principles, the peripheral principles tend to vary greatly. The general theoretical and practical constructivist principles indicates that eight factors are essential in constructivist pedagogy (Brooks and Brooks, 1993; Larochelle, Bednarz and Garrison, 1998; Steffe& Gale, 1995).

Learning should take place in authentic and real-world environments

Experience, both socially oriented and object oriented, is a primary catalyst of knowledge construction. Experience provides the activity upon which the mind operates. In addition, knowledge construction is enhanced when the experience is authentic.

(i) Learning should involve social negotiation and mediation

While only social constructivism emphasizes social interaction as a basis for knowledge construction, cognitive and radical constructivism do assign social interaction a role. Social interaction provides for the development of socially relevant skills and knowledge. In some cases, e.g. greetings, gender relations, dress, knowledge can only be attained through social contact. As an individual gains experience in a social situation, this experience may verify his

knowledge structure or it may contradict those structures. If there is contradiction or confusion, then the individual must accommodate this contradiction in order to maintain an accurate or social model of reality. Language is the medium through which knowledge and understanding are constructed in social situations (Spivey, 1997).

(iii) Content and Skills should be made relevant to the learner

Constructivism emphasizes the concept that knowledge serves an adaptive function. The knowledge attained, i.e. content and skills, in order to enhance one's adaptation and functioning, must be relevant to the individuals need, understanding, and goal. This relevancy is likely to increase the individuals' motivation. Ultimately, experience with relevant tasks will provide the individual with the mental process and social experiences necessary for enhanced functioning within one's practical environment.

(iv) Content and skills should understand within framework of the learner's prior knowledge

All learning begins with an individual's prior knowledge, regardless of constructivist affiliation. Understanding a student's behaviour requires an understanding of the student's mental structure, i.e. an understanding of the student's understanding. When a student replies that the answer to $54 - 38$ is 24, the teacher must not think it immediately to be wrong, but rather try to understand the student's understanding of subtraction that has led to this answer. In this case, the student appears to be using the following rule of subtraction: "Subtract the smallest from the largest". Understanding the student's rule usage makes it much easier for the teacher to demonstrate the non-viability of the student's understanding. The teacher in this case, for example, may ask the student to count out 54 blocks, then take away 38 blocks from that pile, and finally count the remaining 16. Only by attempting to understand a student's prior knowledge will the teacher be able to create effective experiences, resulting in maximal learning.

(v) Students should be assessed formatively, serving to inform future learning experiences.

Constructivism asserts that the acquisition of knowledge and understanding is an ongoing process that is heavily influenced by a student's prior knowledge. Knowledge and understanding are not directly visible, but can be inferred from one's action. Thus, to take into account an individual's current level of understanding in this ongoing teaching-learning process, a teacher must continually assess the individual's knowledge. This formative assessment is necessary to create the subsequent series of experiences and activities for the students.

(vi) Students should be encouraged to become self-regulatory, self-mediated, and self-aware

The underlying tenet of constructivism is that learners are active in their construction of knowledge and meaning. This activity involves mental manipulation and self-organization of experiences; and requires that students regulate their own cognitive functions, mediate new meaning from existing knowledge, and form an awareness of current knowledge structures. Within a cognitive constructivist perspective, self regulation, self-mediation, and self-awareness would be subsumed under the construct of metacognition. Metacognition is considered an essential aspect of learning and consists of (i) knowledge of cognition, and (ii)

regulation of cognition (Brown &Palincsar, 1987). Vygotsky (1978) believed that students construct mental signs or psychological tools to represent concepts and relationships, and that these tools are used to mediate cognition. Similarly, Piaget (1977) theorized that students mentally reflect on the use and nature of objects and then construct new knowledge by generalizing new relationships.

(vii)Teachers serve primarily as guides and facilitators of learning, not instructors

The role of the teacher, in constructivist perspective, is to motivate, provide examples, discuss, facilitate, support, and challenge, but not to transmit knowledge. In the cognitive constructivist perspective, the role of the teacher is to create experiences in which the students will participate that will lead to processing and acquisition of knowledge. On the other hand, social and radical constructivism argue that the only role of the teacher is to guide students to an awareness of their experiences and socially agreed-upon meanings. They advocate that there is no factual knowledge to transmit.

(viii) Teachers should provide for and encourage multiple perspectives and representations of content

The relationship of multiple perspectives and multiple representations is one of cause and effect. Experiencing multiple perspectives of a particular event provides the student with the raw materials necessary to develop multiple representations. These multiple representations provide students with the ability to develop more complex schemas relevant to the experience. In a nut-shell, multiple perspectives provide the students with a greater opportunity to develop a more viable model of their experiences and social interactions.

Constructing Knowledge in the Classroom

Research on instructional advancement of the last 30 years, particularly in the areas of cognitive processing, teacher effects, and teaching of cognitive strategies, revealed that the constructivist view affects all the important aspects of the teaching-learning process, including classroom environment. A constructivist classroom is no longer a place where the teacher pours knowledge into passive students, who wait like empty vessels to be filled. Students are actively involved in the learning process and given the opportunity to construct knowledge based on their own background. In specific terms, a constructivist classroom bears the following characteristics (Brooks & Brooks, 1993) :

Students' autonomy and initiative are accepted and encouraged
By respecting students' ideas and encouraging independent thinking, teachers help students attain their own intellectual identify. Students who frame questions and issues and then go about analyzing and answering them, take responsibility for their own learning and become problem solvers.

The teacher asks open-ended questions and allows wait time for responses.
Reflective thought takes time and is often built on others' ideas and comments. The ways teachers ask questions and the ways students respond will structure the success of student inquiry.

Higher-level thinking is encouraged.

The constructivist teacher challenges students to reach beyond the simple factual response. He encourages students to connect and summarize concepts by analyzing, predicting, justifying, and defending their ideas.

Students are engaged in dialogue with the teacher and with each other.
Social discourse helps students changes or reinforce their ideas. If they have the chance to present what they think and hear others' ideas, students can build a personal knowledge base that they understand. Only when they feel comfortable enough to express their ideas will meaningful classroom dialogue occur.

Students are engaged in experiences that challenge hypotheses and encourage discussion.
When allowed to make prediction, students often generate varying hypotheses about natural phenomena. The constructivist teacher provides ample opportunities for students to test their hypotheses, especially through group discussion of concrete experiences.

The class uses raw data, primary sources, manipulatives, physical, and interactive materials.
The constructivist approach involves students in real-world possibilities, then helps them generate the abstractions that bind phenomena together.

The 5 E's Model of Constructive Learning

The 5 E model of constructive learning envisages all the principles of constructivism.

1. *Engage*– Students encounter the material, define their questions, lay the groundwork for their tasks, make connections from new to known, and identify relevance.
2. *Explore* – Students directly involved with material, inquiry drives the process, teamwork is used to share and build knowledge base.
3. *Explain* – Learners explain the discoveries, processes, and concepts that have been learned through written, verbal or creative projects.
4. *Elaborate*– Learners expand their knowledge, connect it to similar concepts, apply it to other situations can lead to new inquiry.
5. *Evaluate*– It is an on-going process by both instructor and learner to check for understanding. Rubrics, checklists, teacher interviews, portfolios, are used to evaluate and modify further instructional needs.

Conclusion

The constructivist view of the world as having reality only as it is understood by the learner signals a dramatic departure from theories which view the world as objective truth to be explained and accepted. This change represents a fundamental shift in the understanding of the learning relationship. It gives new status to the learner as the active constructor within the learning activity instead of being the passive respondent to externally determined world of education. Constructivism challenges learners to move beyond fact learning to more transportable cognitive understanding. It defines teaching to be an exciting process of joining in the intellectual discovery of others. The constructivist teacher becomes a partner who is given the opportunity to see familiar educational vistas through new eyes and in a real sense becomes a fellow learner with the students he serves. Becoming a constructivist teacher may prove a difficult transformation since most instructors are prepared for teaching in the traditional manner.

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INTEGRATION OF ICT IN BLENDED LEARNING

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KV No.2 BHOPAL

INTRODUCTION:

A blended learning approach combines face to face classroom methods with computer-mediated activities to form an integrated instructional approach. The goal of a blended approach is to combine the best aspects of both face to face and online instruction.

NEED AND OBJECTIVE OF BLENDED LEARNING-

Children have multiple intelligence ."The theory of multiple intelligences was developed in 1983 by Dr. Howard Gardner, professor of education at Harvard University.It suggests that the traditional notion of intelligence, based on I.Q. testing, is far too limited. Instead, Dr. Gardner proposes eight different intelligences in children.

Teachers are guide and facilitator. As same technique cannot be applied in a heterogeneous class, it becomes very challenging job for a teacher to acquaint with varied techniques, to prepare for innovation in the traditional method of teaching as science involves more of mathematical, logical, spatial and visual intelligence and there are children who need help to strengthen these or opportunities to use other intelligence to understand and explore the subject. Blended learning is the best way to help the children to strengthen their intelligence and also it provides a platform to explore on their own and develop concepts.

GOVERNMENT'S INITIATIVE-

HRD Ministry, for launching its Massive Open Online Courses (MOOC) platform 'Swayam' .

SWAYAM is a programme initiated by Government of India and designed to achieve the three cardinal principles of Education Policy viz., access, equity and quality.

The courses hosted on SWAYAM will be in 4 quadrants – (1) video lecture, (2) specially prepared reading material that can be downloaded/printed (3) self-assessment tests through tests and quizzes and (4) an online discussion forum for clearing the doubts.

ROLE OF ICT IN BLENDED LEARNING

ICT can develop innovative, creative and engaging learning environments

Focus on the purposeful use of technology to

Develop key skills

Incorporate assessment for learning
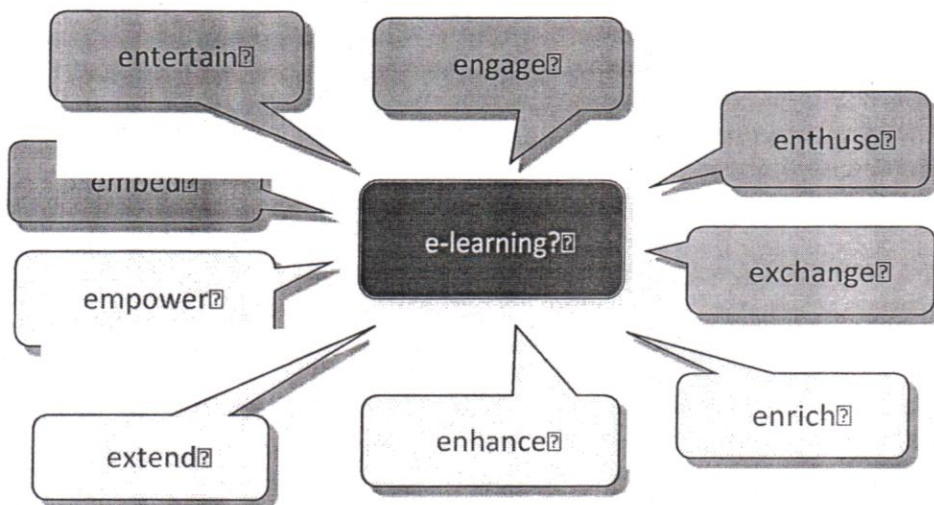
ROLE OF A TEACHER-

- Designs a multimodal framework enabling deployment of a vast variety of modalities, tailored appropriately for use in blended learning environment. The integration of technology in the classroom involves a *planned, highly structured and purposeful* use of technology with students with the aim of engaging students and helping them develop new thinking skills.

How does this helps ?

- Allows students more control of their own learning
- Allows lecturers to guide more, teach less
- Allows student to build up knowledge, and become part of the teaching process
- Can provide some really engaging learning experiences
- Teachers can provide "scaffolding" and safety nets
- "At risk" students can be identified more quickly
- Collaborating can be very well supported

ICT TOOLS-

- Use of PPT, Videos, mobile apps, simulations etc

- Interactive learning

    - HOT POTATOES
    - Web 2 technology
    - Interactive Science Simulations (PhET)
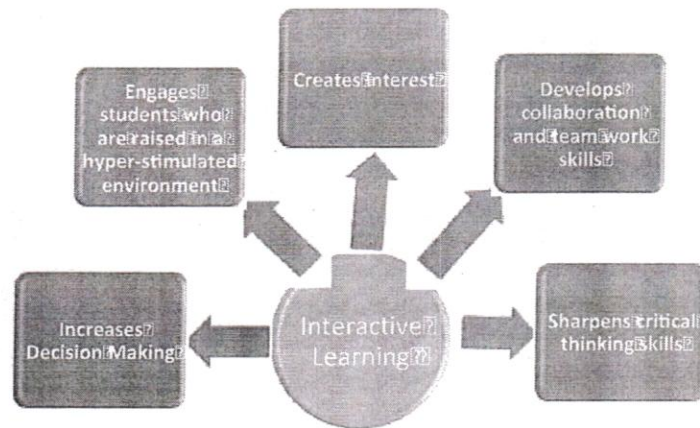
- Use of soft wares – FOSS

SUMMARY-

Using Technology	Technology Integration
Technology usage is random, arbitrary & often an afterthought	Technology usage is planned & purposeful
Technology is rare or sporadically used in the classroom	Technology is a routine part of the classroom environment
Technology is used purely for the sake of using technology	Technology is used to support curricular goals & learning objectives
Technology is used to instruct students on content	Technology is used to engage students with content
Technology is mostly being used by the instructor(s)	Technology is mostly being used by the student(s)
Focus on simply using technologies	Focus on using technologies to create and develop new thinking processes
More instructional time is spent learning how to use the technology	More instructional time is spent using the technology to learn
Technology is used to complete lower-order thinking tasks	Technology is used to encourage higher-order thinking skills
Technology is used solely by individuals working alone	Technology is used to facilitate collaboration in & out of the classroom
Technology is used to facilitate activities that are feasible or easier without technology	Technology is used to facilitate activities that would otherwise be difficult or impossible
Technology is used to deliver information	Technology is used to construct & build knowledge
Technology is peripheral to the learning activity	Technology is essential to the learning activity

Options for Blended Learning

- TedED ~ http://ed.ted.com/

- Blend Space ~ www.blendspace.com

- Virtual Learning Environments e.g. Moodle, Schoology & Edmodo

REFERENCES:

- https://iitbombayx.in/courses/IITBombay
- https://swayam.gov.in
- https://link.springer.com
- https://images.google.com
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DEVELOPMENT OF E-CONTENT

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Wide varieties of digital materials which are of educational significance are available online. Some of the quality materials which are available free of cost or with minimum restrictions can be used, re-used and modified by teachers and students for their teaching and learning. As textbooks are too expansive, the students are switching from textbooks to digital course materials. These materials provide both teachers and students a greater interactivity and social collaboration. One of the materials which can be designed and developed used, re-used and distributed is e-content.

E-content is becoming popular because of it's flexibility of time, place and pace of learning. E-content includes all kinds of content created and delivered through various electronic media. E-content is available in many subjects and almost all levels of education. It can be used by wide variety learners with diverse needs, different backgrounds, and previous experience and skill levels. It can be shared and transmitted easily and promptly among unlimited number of users around the world. Teachers, students and others get benefited by the use of well designed and developed e-content. It is advantageous to the educational organizations to make their program accessible to their teachers and students on campus, home and other community learning or resource centers. It has a significant implications for open and distance learning institutions.

It encompasses eTexts and digital learning resources. These could be digital textbooks, workbooks, articles, videos, or multimedia. Switching from traditional textbooks to digital course materials is a growing trend in higher education. Advantages for students and faculty include greater interactivity, customizability, and opportunities for social collaboration.

Electronic content (e-content) which is also known as digital content refers to the content or information delivered over network based electronic devices or that is made available using computer network such as internet. According to Oxford dictionary 'e-content is the digital text and images designed to display on web pages'. According to Saxena Anurag (2011) 'E-content is basically a package that satisfies the conditions like minimization of distance, cost effectiveness, user friendliness and adaptability to local conditions'.

Well developed e-content can be delivered many times to different learners. Individual course components i.e. units, lessons and media elements such as graphics and animations can be re-used in different contexts.

The purpose of e-content development is to create an information rich society. Every one in the society is empowered to create, receive, share and utilize information for their progress. Very well designed, developed and validated e-content will provide access to high quality meaningful digital content and serve as an effective virtual teacher.

E-content design, development and approach will depend upon the nature of the content and the learners. It will also depend on the quality and complexity the learning you wish to create. Various instructional design models are available according to our requirements. Most of the

models involve the process of analyzing the learner needs and goals of the instructional material development, development of a delivery system and content, pilot study of the material developed, implementation, evaluating, refining the materials etc. In designing and development of E-content we have to adopt one of the instructional design models based on our requirements. Before understanding the designing and development of e-content it is essential to understand the meaning of instructional design.

According to Wikipedia '**instructional design** is the practice of creating instructional experiences which make the acquisition of knowledge and skill more efficient, effective and appealing. The process broadly consists of determining the current status of learner understanding, defining the end goal of the instructional material and creating some 'intervention' to assist the transition. This systematic approach provides a step by step process for the analysis of the learners' needs, the design and development of the material'. Most common and popular model used for creating instructional materials is the **ADDIE** model. This abbreviation stands for the five phases involved in the model. They are **analyze, design, develop, implement and evaluate**. This model is initially developed by Florida State University to explain the processes involved in the formulation of an instructional systems development (ISD) program for military inter-service training. ISD was meant for training individuals to do a particular job. This can also be applied to any inter-service curriculum development activity. Originally the model contained several steps under its five original phases (analyze, design, develop, implement and evaluate). Over the years the steps were revised and finally the model itself became more dynamic and interactive.

Analysis: It is the first phase of this model meant for examining the suitability of the e-content to be developed. It is related to analyzing the learning needs, context, learner, task and content. Analyzing the learning needs is identifying the needs from the perspective of different learners, teachers, subject experts, practitioner, policy makers etc. Needs are to be clearly stated.

- **Contextual analysis** is collecting data related to the context of learning such as learning environment. Whether the e-content developed is for the individual or group, formal or informal, facilitated or self-learning etc.
- **Learner analysis** is collecting data related to learners academic levels and attributes such as skills, motivation, visual literacy, language competency, learning styles etc. That is nothing but preparing the learner profile. It helps to know about the learner.
- **Task analysis** is stating the purposes of developing the e-content. Deciding whether that is developed for educating, training, creating awareness, developing skills etc.
- **Content analysis** is nothing but preparing a content outline. Good content comprehension is required before designing and developing content. It includes verifying the content with respect to cognitive appropriateness, factual accuracy, completeness etc. It also includes classifying the content into facts, concepts, principles, processes and procedures.

Design: It is concerned with defining the learning objectives, structuring the content logically, specifying the instructional and evaluation strategies, and preparing for visual and technical design.

- **Learning objectives** are to be defined in clear, realistic and measurable terms. Learning objectives are the statements that describe what the learner will be able to do at the end of the course or program. Learning objectives should specify performance and communicate their purposes. Prepare a detailed content outline in which content is thoroughly analyzed and logically organized. Content is to be structured logically following simple to complex, known to unknown, concrete to abstract, general to specific etc.

- **Instructional strategies** are to be stated clearly. Depending on the learning style and nature of the content we have to decide the appropriate instructional strategy. Appropriate **media mix** that is combination of audio, video, graphics, animation; simulation etc is to be decided.

- **Learner evaluation strategies** such as practice, computer marked or tutor marked assessments, pretest, post-test, remedial tests etc are to be specified. We have to decide about the formative and summative assessments. Before developing the content for the selected course review the proposed learning objectives. Make sure that content, assessment tests and exercises match the objectives stated. Provide the information and knowledge required to meet the learning objectives.

Development: It is related to the creation of story board. **Story board** is nothing but scripting the entire course content. The term 'story board' is taken from film production. In a movie it indicates the visual representation of the various scenes. In e-content development the story board describes step by step script of the final outcome of the e-content i.e. story board is created to provide a blue print of the course with each and every detail along with the content notes. The story board is created based on the objectives and instructional strategies. Here the developers create and assemble the content assets and learning objects. **Programming and integration** of all media elements into a cohesive multimedia package are the part of this phase.

Implement: In the implementation phase, materials are distributed to learners. A comprehensive implementation strategy document is developed. This document should cover the course curriculum, learning outcomes, method of delivery in terms of hard ware and soft ware requirements and testing procedures. Ensure that the web site is functional if the material is on the web site.

Evaluation: The evaluation phase consists of two parts i.e. Formative and summative evaluation. Formative evaluation is present in each stage of the ADDIE process. Summative evaluation determines the adequacy of the distributed materials in achieving the course objectives. Material is to be revised at all the stages based on the feedback received.

Learner's Characteristics and needs

Educational audio and video materials are invariably addressed to specific learner groups of conventional or ODL systems. It is, therefore, of utmost importance that audio/video scriptwriters have as much information as possible about their target audiences. In ODL systems where learners are placed at a distance and are scattered and almost invisible, it is all the more important to have such vital information about them, viz. their age, sex, maturity level, attitudes, beliefs and aspirations, socio-economic background, lifestyles, (urban/rural),

existing knowledge, skills, language proficiency, vocabulary, likes, dislikes, preferences and information needs. It is also important to know about the context or conditions in which the audio/video programmes will be listened/viewed by these audiences.

Access to and knowledge of this kind of learner profile is very useful for educational audio and video scriptwriters. It gives them greater insight into learners' needs and helps in tackling their communication problems. Such detailed information about the target audiences is also useful in formulating precise learning objectives and identifying appropriate content and presentation formats for different programmes. Similarly, need assessment studies help in ascertaining the actual needs of the target audiences and identifying suitable programme topics, themes and content areas. Audio and video scriptwriters can certainly develop relevant need-based scripts and programmes if they are familiar with the needs, interests and characteristics of their specific learner groups.

Instructional objectives and programme briefs.

Another necessary condition for a scriptwriter to be able to write a meaningful and effective audio or video script is concerned with 'what' and 'why' of a programme or what is generally known as 'programme objectives'. Therefore, the crucial questions that a scriptwriter must ask himself/herself right in the beginning are:

- Why am I writing this script? Or, in other words, what are the instructional objectives I am required to achieve through this programme script?
- What is the precise content to be presented? Does the content really lend itself to audio or video treatment?
- What do I want to happen to my audiences through this particular programme or a series of programmes (in terms of gaining knowledge, information or acquiring certain skills, or influencing their attitudes, habits, behaviors, etc.)?

When analyzed and researched further, these questions get expanded into what we call a 'programme brief' or 'an academic note' or a 'programme outline'. A programme brief is a written, typed or printed statement of intent. It represents a 'road map' that traces the scripting path from the beginning to the end. It serves as a basic document that provides all related content – information, ideas, sources and suggestions – for a proposed audio or video programme at one place. Researchers are scriptwriters can freely draw upon such materials to design their scripts. A programme brief should usually include the following information:

- Series title
- Programme title (working title only)
- Target audience (their characteristics, needs, and entry behavior)
- Programme length or duration
- Programme objectives (stated in behavioural terms)
- Brief content outline (preferably in distinct sequences matched with one or more programme objectives)
- Expected learning outcomes (as reflected from objectives, but more concrete and performance-oriented)
- Suggested treatment and production hints (for each sequence)

Usually, detailed programme briefs are designed jointly by a team consisting of subject experts, instructional designers, researchers, scriptwriters, and media producers. Programme briefs serve as basic reference material for scriptwriters, researchers, producers and evaluators. Programme briefs facilitate the scriptwriters and producers to the given mandate and help them remain on track while developing audio and video scripts and producing final programmes.

Script as the core of the programme

The script is the foundation of any programme whether for stage, radio, film, television or videotape. It is crated and evolved step by step into a carefully designed blueprint that provides detailed instructions for actors/participants, technicians and producers who finally transform the script into a worthwhile listening experience or a viewable programme. In the ultimate analysis, the script is the 'core' of any educational audio or video programme. In other words, we can say that it is the quality of the script that determines the quality of the programme.

At this point, we may return to the basic questions raised earlier. How are educational audio and radio scripts planned and developed? What is the scripting process like? What are the steps involve in the scriptwriting process?

Undoubtedly, planning and writing educational audio/video scripts is a demanding task. It requires intelligence, imagination, creativity, knowledge of a subject, a deep insight into the nature, attributes and constraints of the medium, its language, grammar and techniques and above all the ability and willingness to work in a team.

The felicity of the language and the skill to convert simple ideas into powerful aural (audio) experiences and/or to transform abstract ideas and concepts into visual illustrations and appropriate analogies, are other important traits of scriptwriters of educational audio and video programmes.

Developing scripts for radio/audio programmes

Writing for radio differs from other forms of writing such as 'writing for print' or 'television'. The reasons are given as follows:

- In radio/audio writing, words are required to be spoken and heard (not required to be read).
- Unlike a television of film viewer, the radio listener only hears the speaker (but does not see him/her).
- The potential listeners, especially those targeted in open schooling and distance learning systems, comprise of all ages and conditions and have vast variations in their levels of understanding, achievement and intelligence. In this case, therefore, the audio/video writer must use the simplest possible language and avoid long, usual and bombastic words and sentences. In other words, ew may say that the educational radio/audio writer must learn to:

    - Write for the ear, not the eye,
    - Write for speaking, not for reading,

- Write in a simple language, using short sentences so that he/she is understood correctly, and not misunderstood.

General guidelines for radio/audio scriptwriting

Writing for educational audio/radio programmes appears to be a rather simple activity. It is, however, not so in actual practice. It is a demanding task that requires a lot of creativity and imagination. Whereas the ways to writing may vary form writer to writer, the process of script development entails a few essential steps, which all writers follow consciously or unconsciously. The general guidelines that we present below will provide you a better insight into the scriptwriting process for radio/audio.

Carry out programme research

Once you have acquainted yourself fully with a particular 'programme brief' or have thoroughly understood the scriptwriter's mandate in terms of general objectives, content, target audience and programme length, your first task is to carry out a through research on the given topic/ content by consulting books journals, experts and other knowledgeable people or subject specialists. You must keep your target audience and programme objectives in focus while selecting appropriate content and authentic information. You must also ensure that your facts are correct and up-to-date. You must double check every bit of information before you put in your script. Always look for some information that may enrich and provide interest to your storyline. Select only the most relevant content, resources and ideas, which match your programme objectives.

Select key ideas

The next step is concerned with the selection of content for the programme. Here, you have focus on the basic content and reduce in to a few key ideas. Put these key ideas in a logical sequence and this will help you define the main focus or the central theme of your program. You will also be able to decide on the weightage and emphases you need to give to different programme objectives.

Make a plan

At this point, you are ready to concretize you presentation strategy. You may choose a special format or combination of formats to put your content in certain style, pace and sequential continuity. You are ready with a detailed story structure or script outline, which is essential designing a draft script.

Write your draft script

While putting your draft script on paper, the most essential rule to follow is to always keep individual listener in focus. That means you must address your writing to one person, not thousands and millions of distance learners. Radio, of course, is a mass medium, yet your was end up in the mind of one person, i.e. the individual listener. Radio writing is, therefore, an intimate, one-to-one talk. It is just 'you' and 'me'. By that reason, you must consciously construct your sentences in 'active voice'.

Think of a good beginning and a good end

Give adequate attention to the beginning of your programme. The first sentence or the open of the programme. The first sentence or the open of the programme must be interesting and should hold the listeners attention. Thereafter, you may follow it with other key points and ideas linking them together in a sequence that you already decided above. Join each sequence by signposts of aural indicators, which will help draw the listener's attention and move from one point to the other.

After you have dealt with all key points in your script, spend some time on finding a good of your programme. In educational radio, it is a good idea to return to the introductory remark end the programme reinforcing the same point. There can be several other interesting way round off our pgoramme. For example, you may choose to leave your listeners with a spy theme, a punch line, a particular action or task. The programme must close on a positive me and in natural way – not in an abrupt, sudden or unnatural fashion. Openings and closing although most difficult to visualize and write certainly make radio programmes a memorable experience for the listeners.

Check and rewrite

Write the draft script in your hand, it is now time to shape the final script. It is the good idea I discuss the draft script with some of your colleagues or media experts to get their reaction suggestions and incorporate the same in the revised version of the script. Now, read you're to yourself and ask the following type of questions:

- Is the script interesting? (If not, change it.)
- Is it easy to understand? (If not, replace difficult words and expressions with simple and straight ones.)
- Is it accurate and authentic in information and content? Is it free from controversies that may invite criticism or an objection later? (If not, update it.)
- Are there too many facts and details? (If yes, reduce and simplify.)
- Is it logically sequenced? (If not, alter the sequences accordingly.)
- Does the content match with the given objectives? (If not, modify the content.)
- Does it have enough 'signposts' for joining different key points? (If not, add more.)
- Does it begin and end with a punch or memorable sentence? (If not, add think more and modify.)
- Is the language conversational so as to engage the listener in a one-to-one interaction? (Remember that it will be
- Are the sentences and phrases short and simple to understand and speak? (Modify to remove tongue twisters and bombastic words and phrases.)

As you answer the above kind of questions to yourself, you must try to revise, refine and rewrite your script into the final form. One golden rule to test eh quality of your script is to read it out aloud to yourself – speaking reach sentence one, twice, thrice, exactly in the same way you would like it to be heard. In this way, you can modify, rearrange, refine and polish your language and ideas on the basis of your own feedback and judgment. You may add some more attention-catchers in your script, if you find the need to do so at this stage,

The final script, as described above, is ready for recording at this stage. The radio producer will arrange all studio facilities and production resources, crew and artists to produce and record the programme for broadcast or playback.

The educational audio script, in its final form, must indicate all relevant instruction in CAPITAL LETTERS so that these are not mistaken for a 'dialogue to be spoken'. Instruction on the script can also be underlined, as these are not to be spoken by actors or performers. Such instructions must be noted and followed both by the artists and the production crew.

Developing scripts for TV/video programmes

Writing for television or video is a kind of visual scripting. It is just not an activity or coordinating words with pictures in sequential continuity. It requires intelligence, creativity, drawing capability, knowledge of the medium, its nature, language, grammars and techniques.

Television or video is primarily a visual medium. That means it is the visuals or pictures that come first, and are the main carriers of messages. Words do have their place but only in support of the visuals. Many a time, pictures need no words; they speak for themselves and make powerful statements. A TV/video scriptwriter has, therefore, to learn to think in terms of visuals, visual ideas and visual illustrations for ideas.

In television, a writer has to communicate in an entirely new language: in which the writer uses the video camera as his/her and all the different kinds of shots, movement devices, techniques, effects, transitions, dialogues, sounds, noises and even silences as his/her language. Writing for TV/video is thus quite different from other forms of writing particularly 'writing or print' or 'writing for radio'.

Writing as such is a solitary activity. However, writing for television or video is largely a co-operative effort; a team mode approach. It may be seen as a sort of a continuous dialogue or a constant interaction among the scriptwriter, the researcher, the subject specialist, the producer and other members of the production team. This dialogue or interaction generally begins with a 'programme idea' or a 'programme topic' or a 'theme' around which a video script is proposed to be evolved and continuous up to the end when there is no time left and the programme script has got to be finally produced. While the scriptwriter is the principal architect of the script other team members contribute in many different ways to its instructional effectiveness, authenticity, visual quality, technical perfection and overall embellishment. To put it differently, we can say that video or television scripts are evolved step by step. Creatively, imagination and cooperative effort are the key words in the video scripting process.
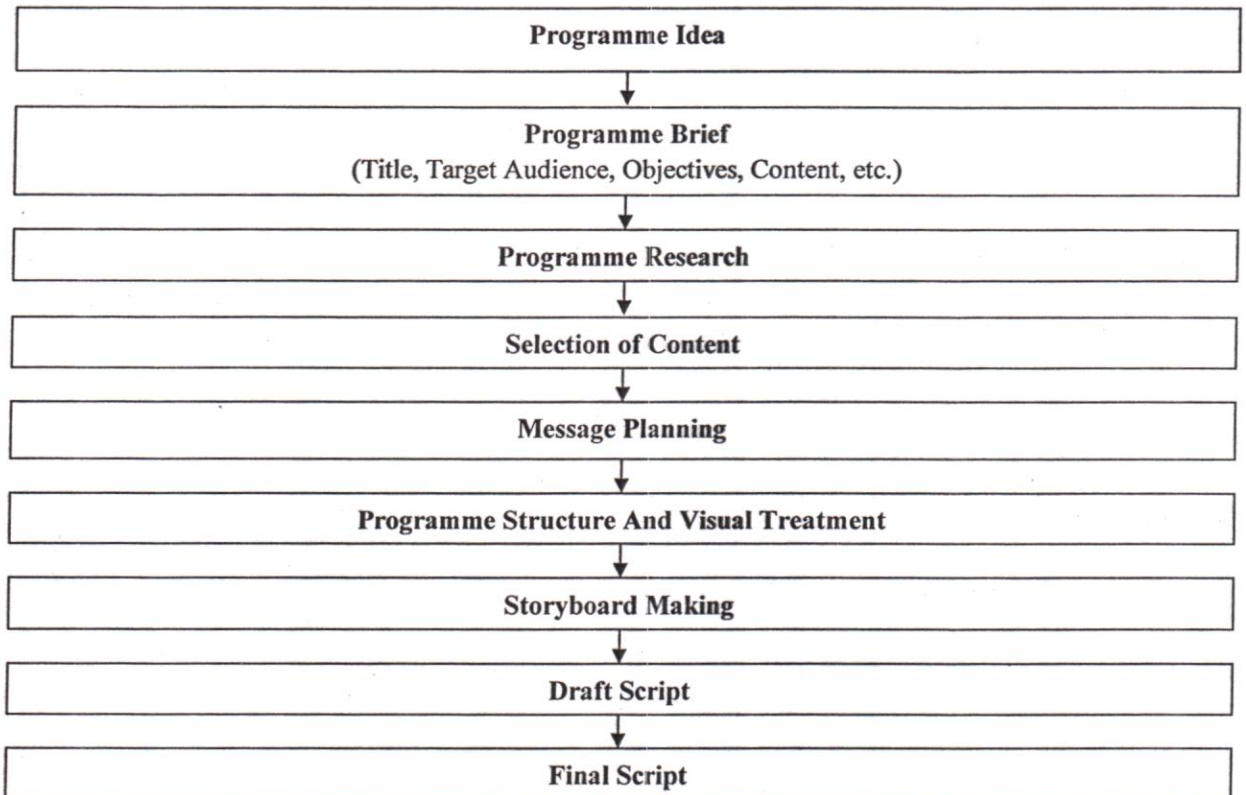
Process of TV/video scriptwriting

It is rather difficult to describe what the video scriptwriting process like. Experiences vary from writer to writer and from script to script, and it is very hard to generalize. However, television./video scriptwriting may be seen as consisting of a series of steps or stages or processes which together and often overlap. But the basic pattern of the scripting and programming processes remain almost the same. All TV/video scriptwriters, whether

consciously or unconsciously, go through these stages or steps in one way or the other. The sequence and timing of these steps may vary and even overlap in most of the cases.

Major steps of TV/video scriptwriting process

A descriptive presentation of the steps involved in the video scriptwriting process suggested below may be helpful to you. Certainly it is a loose, flexible and arbitrary arrangement. Yet this process framework will give you sufficient insight into the creative activity of TV/video scriptwriting.

Programme Idea

↓

Programme Brief
(Title, Target Audience, Objectives, Content, etc.)

↓

Programme Research

↓

Selection of Content

↓

Message Planning

↓

Programme Structure And Visual Treatment

↓

Storyboard Making

↓

Draft Script

↓

Final Script

Programme ideas

Ideas are basic to any kind of writing, not just television writing. Indeed, all educational TV/video scripts originate with an idea. Once an idea or a theme has been identified, it needs to be analyzed for its possible expansion into a worthwhile visual presentation. If the idea is found to be entertaining, educative and appropriate for the intended audience and suitable for television presentation, it meets the criteria for being 'production worthy'.

Programme brief

Once an idea or a theme or a topic is adjudged as 'production worthy' for TV/video production, it can be further analyzed and expended into a 'programme brief' or an 'academic note'. As already discussed, a programme brief is the first written statement-which forms the basis of an educational video script. It provides a road map to the scriptwriter.

Programme research

A well-designed programme brief delineates the parameters of the proposed video script and enables the scriptwriter to begin the process of programme research. Programme research is the most essential pre-requisite for developing a video script. It is at this initial stage that the scriptwriter must plan and carry out thorough research both on the topic as well as the target audience. He/she should look for suitable visual materials and other interesting and related information on the topic. Not only should she/he consult books, journals, census reports, yearbooks and encyclopedias hut should also talk to experts and knowledgeable people in that particular field.

At this stage, it is important for the scriptwriter to get to know the target audience well - their background, maturity level, interests, likes, dislikes preferences etc. Such knowledge about the audience enables the scriptwriter to collect, select and organizle1 relevant programme materials and information in a manner most interesting for the viewers. It is not uncommon for writers and researchers interact with small groups of their target audience and know their first-hand experiences and interests on the topic. Some writers do not attach much importance to programme research and tend to skip this step, often claiming, that they already know a lot about the topic and the audience. It is, however, a grave misconception and must be guarded against.

Selection of content

During programme research, the writer is often able to coma across a large mass of material and information (both written and verbal) besides pictorial evidence on the programme topic. At this stage, therefore, he/she must go through this mass of materials and select the most relevant material, visual resources and information which match the programme objectives, are relevant to audience needs and interests and are sufficient to cover the given content and fill programme time most appropriately.

To put it conversely, the scriptwriter must eliminate what is not relevant to programme objectives or is not likely to click with the viewers or may go over-their heads, or may even unnecessarily lengthen the programme and increase its information size.

Message planning

Message planning is the most decisive and creative stage of video script development. Here, the scriptwriter explores interesting ways of dishing out his/her programme to the audience. Many options and considerations come into sharp focus and the writer has to design a strategy taking appropriate decisions on each of the following aspects:

- Identifying key teaching concepts or ideas to be highlighted.
- Selecting a suitable format or a combination of formats for presenting the programme.
- Adopting a particular programme style and approach.
- Exploring media possibilities; use of visual examples and analogies, graphics, photographs, reality bites, stock shots, animation, experiments, demonstrations and other resources, both visual and aural.

- Choosing a definite storyline for message presentation: using human characters in the story - men, women, children, presenter, anchor, puppets, cartoon figures, animals, birds etc.

While deciding on the above aspects, as suggested earlier the writer must always keep in view: (i) the nature and requirements of the topic or the subject, (ii) viewers' age, characteristics, needs and interests, (iii) programme objectives, and (iv) a balanced presentation of the given content in an interesting way.

Programme structure and visual treatment

Programme structuring is the creative process of giving the programme a definite shape and form. It is at this stage that the programme begins to unfold its shape or structure with a clear-cut storyline with a beginning, a middle and an end. Here, the scriptwriter must give some thought to such questions as:

- How will the programme begin? (or what will be the first or introductory sequence of the programme?)
- How will the programme end? (or what will be the concluding sequence of the programme?)
- What will be the shape and Order of the sequences that will form the middle part (or the body) of the programme?
- How many sequences will the programme finally contain? And in what order?
- What will be the length, sequence, emphases and amount of educational content of each of the sequences?
- Does the content of each of the sequences contribute to and match the programme objectives set out in the beginning? If yes, to what extent? If .not, how can content and objectives be matched optimally?

While finding solutions to such questions as noted above, the writer must rethink of a good beginning for the programme. Most often, it is the introductory sequence which holds the attention of the audience and keeps their motivation high for receiving the rest of the programme. On the contrary, however, if the beginning is uninteresting and dull, the programme may fail to click with the viewers.

The scriptwriter should also devote some time to think about a good natural ending for the programme. Viewers invariably tend to like and remember for long a programme that ends on a cheerful and satisfying note and provokes them to think and act in the desired way. Rest of the sequences that constitute the middle part or the body of the programme, must also receive writer's attention in the same way - arranging the visual and aural content logically and meshing it with the given objectives.

As the programme structure takes a definite shape, the writer has to work out simultaneously a detailed visual treatment for different sequences of the programme. The visual treatment must provide at each step a full description of:

- What will the viewers see?
- What will they hear?
- What will they think?

- How will they feel and react to a particular visual sequence or a part of it?

In this process, the writer must again think of and provide for visual illustration and analogies for abstract ideas and key concepts proposed to be presented in the programme. Different sequences of the script should be arranged in a logical and natural order so that they appear to be evolving from one sequence to the other. The writer must also think of and decide on possible visual and/or aural links or transitions from one sequence to the other. It is very helpful to draw a 'timeline' showing how Much time should be devoted to each sequence keeping in view: (i) the coverage of the content, (ii) weightage or emphasis on programme objectives and key teaching points, and (iii) the attention span of viewers. Some scriptwriters, especially those who write for young children, draw up an 'interest curve' or a 'tension chart' to ascertain uninterrupted attention of viewers.

Storyboard making

The storyboard means a detailed, shot-by-shot description of the programme on sheets of paper divided into two vertical columns. The rectangular boxes (3:4) in the left hand column are used for drawing pictures/sketches with shot sums described on each; and the right hand column is used for writing supporting words, sound effects and music, as shown in Figure 2.2.

A STORYBOARD OUTLINE

A STORYBOARD OUTLINE
Video   Audio
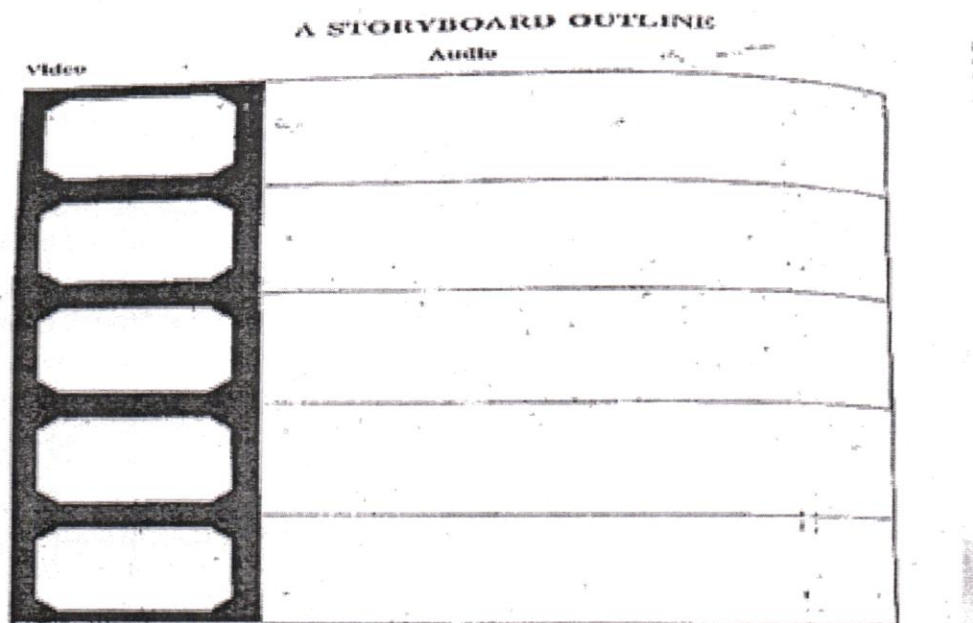
2. 2 A suggestive outline of a storyboard for a video script

The story board is important because:

- It forces the writer to think in terms of visuals.
- It is at this stage the TV/video script begins to appear as evolving into a series of pictures in sequential continuity, with sound and action described side by side.
- It is easily possible to study the overall development and progression of the script with the use of the storyboard.
- It is possible and advisable to make script changes, if any, by adding deleting, shifting or restaging of shots and sequences.
- It is useful for all production team members to study the storyboard.

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Some experienced TV Scriptwriters skip the storyboard stage and straightway prepare a draft script. For beginners, however, storyboard Making is immensely useful and is strongly recommended. Let's at this stage describe a little more about a draft script and the final script.

Draft script

The storyboard, when complete, at once road to the preparation of a draft script. The draft script is the first full length script that includes a complete listing and description of all visuals, captions, accompanying commentary, dialogues, actions, movements, music, sound effects and any kind of pre-recorded inserts or audio/video inputs. The draft script must be shared and discussed with all team members, experts as well as the producer to get their reactions and suggestions on various aspects. The scriptwriter must be open to criticism and ideas fur improvement of the Script should be welcomed.

Final script

At the final script stage, the writer incorporates all suggestions made at the stage of the draft script. This stage suggests that the scriptwriter has more or less finally accomplished his/her job. In most cases, he/she hands over the script to the TV producer. As the scriptwriter usually bows out at this stage, the producer and his/het team take over. However, the interaction between the scriptwriter and the producer and other team members must continue up to the point the programme has been finally produced.

From the above description, it may be amply clear that video scriptwriting is a co-operative activity. It is not just a process of writing words and sentences and thinking of pictures to accompany them or vice versa. TV/video scriptwriting is indeed a highly creative process. Video scripts are evolved bit by bit, rather than written. That is why each video programme is unique Milts message, design, format, style and technique. In all cases, however, a video scriptwriter must go through all the stages and processes of script development as described above.

SOURCES

e-Pathshala

National Repository of Open Educational Resources (NROER)

e-pgpathshala

Gyanpitara

Karnataka Open Educational Resources (KOER)

The Open Educational Resources universitas (OERu)
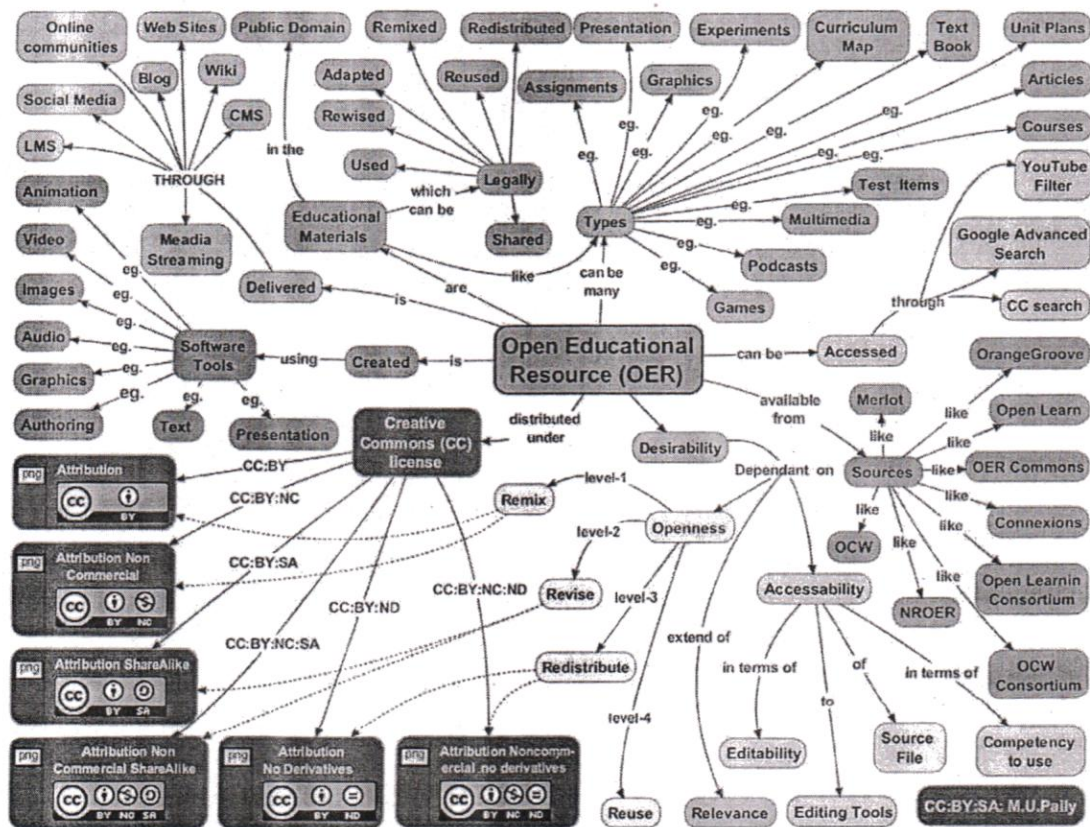
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TEACHING AND LEARNING USING TECHNOLOGY
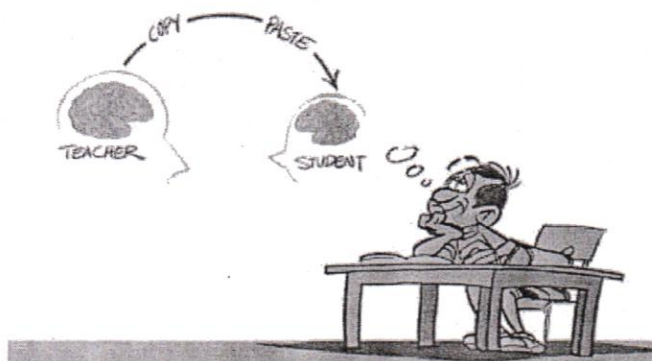
It is largely believed that technology (in particular Information and Communication Technology) will bring about the desired learning outcomes and that students will develop conceptual understanding of themes. In schools, this view has given way to an understanding of ICT as being an enchanted means for students to acquire knowledge. Though ICT has been critical in opening access and opportunities to information and knowledge, its use in schools has been limited to the bare minimum – PowerPoint. I do not consider that using PowerPoint necessarily makes of our class an ICT-driven one. Technically, there is no difference between a PowerPoint presentation (of a lesson) and the dictation of notes, as is most often the case in our schools. There is a need to demarcate between access to information (whether PowerPoint or digital materials) and knowledge construction and skills development. Many researches have shown that ICT can be integrated in a system on the express condition that a technology paradigm that incorporates inquiry, critical thinking, problem-solving, creativity and values is adopted. Technology should be the vehicle for helping teachers to create the adequate learning environment to enable learners to construct knowledge as well as develop the appropriate skills, as illustrated by the figure (based on our own team research): What is important in the knowledge construction process is the interaction among a

number of variables, such as contextual knowledge, pedagogy and technology. Let me explain how each one should be locked into a single entity for learners to construct purposeful knowledge structures in their minds so that knowledge makes sense. Ideas (and not knowledge) that are disunited are meaningless and create confusion in the minds of learners and this further hinders acquisition of knowledge. This is what is presently happening in our society, where people are always prompt to 'act' without first 'thinking'. And when the 'thinking' occurs, it is much too late. Let me clearly explain the meaning of the three elements to clarify matters.

Contextualknowledge

Understanding about a new situation happens when we have some previous understanding (prior knowledge) of the situation, which could either be similar or different but related. When there is understanding, this implies that knowledge has been constructed and it makes sense. Now, this newly constructed knowledge should be in harmony with other concepts acquired in other subject areas. At times, it is sad to note that concepts learnt in one subject area are not in congruence with concepts learnt in another subject area and this adds to more confusion. For example, a concept learnt in mathematics (gradient) is rarely related to a similar concept learnt in science (rate of change).

Pedagogy

This is the most important variable in the whole process; it captures a variety of elements, such as teaching-learning strategies, assessment and values. It is high time that teachers put aside their beloved traditional approach to teaching and adopt learner-centered strategies and engage learners to interact with their peers and with them (teachers), for knowledge construction is most effective in a social milieu. Discussion (general or in groups) under the supervision of the teacher becomes imperative for learners, as they need to learn how to respect the views of others. There is a degradation of values in our society and the school – which forms part of what I call 'the education triangle' (State-School-Parent) – is one the most important elements for the development of values in our learners.

Technology

Technology, which includes the hardware and software, is the means to help learners acquire knowledge. In this case, the teaching method adopted has to change and the lessons will have to be based on a thematic (context) approach. Technology can serve the purpose of helping learners make sense out of nonsense (all the stuff they have to study). We should not forget that a classroom is composed of learners of different abilities, normally categorized in three groups: low, average and high abilities. This means that a teacher can expect that learning will occur if only he/she engages learners (I am focusing on learning rather than on teaching to lay emphasis on acquisition of knowledge by learners) to construct knowledge by unfolding the lessons with a clear-cut demarcation between the three abilities. That is, the teacher has to adopt at least three different strategies to capture all the abilities during the lessons. It is then that technology will be an indispensable tool to engage learners to construct purposeful knowledge structures, that is, knowledge that makes sense. At the same time, teachers can monitor progress of individual learners and report to parents about progress and also involve them to form part of the whole process. Removing one of the elements creates a vacuum, leaving learners with the opportunity to haphazardly construct 'their own knowledge', which might be contradictory to the general values. To summarise, the adoption of technology in our schools should have a well-planned dimension and elements of research should be considered while integrating it in the teaching-learning routines. Technology can, no doubt, speed up learning, but it can also slow down learning, with unpredictable consequences. An overwhelming majority of young primary school kids can fascinate us with their technology-savvy aptitude, but how many of them can tie their shoelaces (development of skills) properly and display the desired type of respect to teachers at school and to elders at home or on the streets?

NLP for children

NLP for children is not concerned with one-size-fits all; rather it is deals with finding flexible strategies to suit individual children and their various needs.

All healthy children absorb information from their surroundings like blotting paper absorbs ink from the moment they are born.

Unfortunately, instead of being encouraged to soar, there comes a time when that natural learning curve is stunted.

Although children's brains will take time to mature fully, they nonetheless respond to intelligent stimulation.

They will make far better progress if they are allowed to adopt the natural adult language around them, rather than being spoken down to in some sort of baby talk.

If they are given wide and varying experiences rather than being confined, they will blossom and grow.

Children are often fine until they go to school for the first time and find they are in a system that works to the lowest common denominator which is being taught by people who have little or no experience of life except their own education.

Immediately the child's horizons are adapted to fit the narrow experience of the teacher and too much time and effort is spent talking about limitations rather than possibilities.

NLP for children means finding an effective strategy

You can help your child by finding an effective strategy to meet that child's needs. If the child does not respond well to formal education, find out what the child's true values are.

For example, if he is spending hours and hours playing computer games and virtually no time doing homework, it is not because he is suffering from attention deficit disorder (ADHD); it is because playing computer games is much higher on his hierarchy of values than homework.

In those circumstances, it is necessary to find a strategy that will link homework to the computer skills that have already been acquired and are enjoyed.

The way to get children to learn willingly is to give them encouragement and confidence in themselves; chastisement and telling them they are "no good" or "thick" didn't ever spur a child to greater achievements.

If the child appears to be a slow learner, look instead to the teacher to see what alternative methods are being tried.

et us consider spelling as an example. As far as I know, there isn't a right or a wrong way to learn to spell. Different people learn in different ways. How were you taught to spell?

Were you, like me, given a list of words and told to take them away and learn how to spell them by tomorrow or next week?

Consider that for a moment. Where exactly is the teaching in this method? Certainly in the English language, phonetics doesn't help – even the word "phonetics" doesn't start with an "f".

NLP for children and spelling

When we returned for the spelling test at the end of the week, some people scored very highly and some performed badly.

At that stage those who hadn't performed well were chided for not learning the words properly and told to do better next time.

Surprise, surprise, when the next spelling test came around the same people who did well first time round, did well again, and those who didn't perform well last time did badly again

NLP for children – what are the good ones doing?

You'd have thought at that stage some teacher might have thought, "I wonder what the good ones are doing well that the bad ones are not doing." No, not at all.

Some children were just regarded as bright and easy to teach and others as thick or lazy and difficult to teach.

The truth was that no-one had been taught anything. The successful spellers just had a good strategy for spelling.

I think it is fair to say that *most* good spellers (and I stress the word "most" and not "all") tend to see the words as pictures, whereas those who don't spell well do not see the pictures.

I have always spelt pretty well and I know that if I am asked to recall a word to spell aloud, my eyes go up to see the word that appears almost as an external image and then I read off the letters.

If you are helping your child to learn to spell, note where the eyes go when you read out the word. If they look up, the child is inevitably looking at an external picture.

There is no official NLP strategy as such for spelling, but NLP will always look to see what particular strategies work for which people in different circumstances. So as this strategy works for many people, it is worth considering.

NLP for children - visualisation

If your child is struggling with spelling try this method. Write the word on a large card. Colour each letter of the word differently.

Hold the card up and ask the child to visualise the word and make a mental picture of it. Make a game of it. Turn the card away and ask the child, for example, where the green letters came, or where the red letters came.

Play around with the game until the child can spell the word forwards and then backwards.

Making pictures is a big aid to learning. Whenever you wish to teach your child something which he or she finds difficult, find out what strategies the successful children are using and try them.

There is no point in persisting with a method that doesn't work. Telling a child to go away and learn it without giving a strategy isn't beneficial to anyone, because the one who already has a bad strategy will persist with it and keep getting the wrong answers.

NLP for children - encouragement

Remember above all else to congratulate and encourage when the child does well. When he is struggling support, encourage and experiment with new strategies that appear to be working for others.

Sometimes people don't know why they are good at a particular subject so their behaviour will need to be examined closely to elicit the strategy.

Equally, where your child is very good at one subject but not so good at another, look carefully at what he does in the successful subject and what he does in the unsuccessful subject?

If he demonstrates different skills, are the good skills transferable to the other subject? Sometimes it is a question of motivation because the particular subject matter does not appeal.

Think what can be done to make that subject more interesting for this particular child.

How different is information and communication technology (ICT) from IT? How does incorporating ICT in everyday lessons help our children learn? And why is it so important?

What is ICT?

Technology has advanced at a speed that man never thought possible ten years ago and it has now spread its tentacles in varied areas, such as banking, communication, travel, etc. But for the purposes of this article, our interest is not in IT or Information Technology, but in ICT or Information and Communication Technology. What's the difference? Information and communication technologies (ICT) are a diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information. ICT has been largely associated with computer and Internet usage. However, ICT also includes TV, radio, LCD, audio devices, etc. ICT deals with not only information but communication as well. ICT means creating information and sharing it. Computers, mobiles, Internet, radio, TV, and such devices help us do that. How does ICT relate to teaching?

Paradigm shift

The present generation has easy access to any kind of information they want. The thrust, today, is on dissemination rather than accumulation of information and on sharing it. But if we look at the transactions in the classrooms, it is still the teacher talking and students listening. But this method of teaching-learning will not work in an information age. We need to shift from giving information to 'constructing' knowledge! This is where the student becomes an active learner and teacher a facilitator of learning. This is the paradigm shift that should happen.

The purpose of teaching has not been understood in the new scenario. Information need not be given rather it has to be extracted from the learners. Very few things are new to the learners now. They see, hear, read a lot from TV, Internet, and the newspaper. The main role of the teacher, therefore, is to help students organize, create, and share the information they are gathering.

ICT in teaching

Before we see how ICT can be used to teach, let us list the problems in a regular Indian classroom— large number of students, students with different abilities, lack of space, deficient attention, lack of exhibit facilities, vast syllabus. Can ICT help? You will see a drastic change in the attention and participation of students if ICT is incorporated into the teaching method. For that we first need to change our approach to teaching. We need to involve students in the teaching–learning process. Gathering information is possible through ICT. The teacher only has to facilitate this gathering of information.

There are different ways of using ICT in teaching.

• **Use of multimedia (computer, LCD projectors, speakers) in the classroom**
The teaching method depends on the nature of the topic. Certain topics are easily adaptable to group discussions, while some need to be explained, some can be debated, while others require lab work. For a topic that requires many pictures, animation, videos, etc., to be shown, multimedia can be used in the classroom. PowerPoint is very useful in making multimedia presentations on topics of study. Pictures and information on a variety of topics are available on the Internet, but you could use your own photos and videos in your PowerPoint lessons. All the information in the textbook need not be reproduced in the ppt. Students could be given worksheets to respond to based on the ppt as the lesson proceeds. This helps to assimilate information.

Your teaching should follow three different phases:

1. Initial – to create a perfect environment
2. Main development— to expand the topic
3. Discussion/assessment— discuss, recap, assess

Multimedia can be used for all 3, but mainly in the initial phase.

If you are teaching a poem by Rabindranath Tagore, a picture of the poet, places, events related to the poem, pictures showing the lifestyle in Bengal during the poet's lifetime, etc., will help set the stage for you to teach further. Kabuliwala by Tagore can be better understood by today's mall hopping generation if the scene and setting of the story can be created for them on the computer.

If the lesson is about East India company, then short videos depicting India then, the lifestyle in those times, the political situation that lead to the establishment could be shown. Showing children life then will help create the environment and interest required to learn more. How did the English communicate with the Indian rulers, traders?

If the lesson is about the animal kingdom, then pictures, videos of different types of organisms and the environment they are found in, etc. can be shown very effectively on ppt.

If the lesson is about the digestive or the respiratory system then computers can be of great help. An animated video of what happens inside our bodies when we eat or breathe is the best tool to incite children's curiosity.

- **Use of computers in teaching (without the Internet)**

Computers are used for teaching in the computer lab. This is a very different style of teaching from use of multimedia in the classroom. In this method, 4 or 5 students are given a computer. The teacher prepares a ppt for a topic and loads it on all the computers. The ppt contains instructions, tasks and questions for students to respond to. It is made to encourage discussion among the group members, collate their ideas and share. The topic is presented through related situation.

This can be tailored to suit students of different abilities.

- Students can store their work in a word doc for the teacher to see and respond.

- The presentation can end with a discussion about the topic.

- Try to get the students to use the various applications on the computer to make their responses more interesting.

- If you are teaching about the trapezium ask the students to draw a trapezium on the computer and colour it!

- If you are teaching about soil ask students to draw the layers of soil on computer and colour them!

- **Use of Internet in teaching**

The possibilities of using the Internet in the classroom are many. The teacher can create a blog to store pictures, lessons, worksheets, assignments, notes related to a topic. This way the teacher can discuss the topic anywhere and with many students even outside the classroom. Students can also upload their work on the blog. If you type 'teacher blog' in Google you will get many sites that will help you to create a blog of your own. Your students can have their own accounts in your blog. This helps to supplement your teaching by providing more information and a platform for students to share their ideas, which is not always possible in a large class. Shy, introvert, slow students also get a chance to participate. You can give diversified assignments that students can choose from. You can test the students and mark them too. Students get a chance to learn and relearn, go through the topic several times ask questions without being embarrassed. You can also ask students to get information from sites related to the topic.

- **Use of TV, radio in teaching**

The students could be given assignments based on radio, TV programmes on history, geography, science, and environment. This not only creates interest in the students but also enables them to get more information. This could be shared in the class. It can be planned in such a way that much of the syllabus could be covered. All topics need not be taught in the class by the teacher. Some could be presented by the students and supplemented by the teacher.

Conclusion

The idea here is not just to use gizmos to make teaching very techno-driven. The purpose is much higher. I have used ICT in all the ways mentioned above for several years with my students who are trained to become teachers. The results are unbelievable. Even I didn't know the nuances of using ICT, the features of the computer, MS office, or using the Internet. But continuous use enabled me to use ICT in a very effective way.

Teaching Strategies for Different Learning Styles

No two teachers are alike, and any teacher with classroom teaching experience will agree that their style of teaching is uniquely their own. An effective teaching style engages students in the learning process and helps them develop critical thinking skills. Traditional teaching styles have evolved with the advent of differentiated instruction, prompting teachers to adjust their styles toward students' learning needs.

Authority, or lecture style

The authority model is teacher-centered and frequently entails lengthy lecture sessions or one-way presentations. Students are expected to take notes or absorb information.

- **Pros**: This style is acceptable for certain higher-education disciplines and auditorium settings with large groups of students. The pure lecture style is most suitable for subjects like history that necessitate memorization of key facts, dates, names, etc.
- **Cons**: It is a questionable model for teaching children because there is little or no interaction with the teacher.

A learning style can best be defined as the most consistent way in which a student prefers to learn new concepts. A student's style is determined by genetic factors, previous learning experiences, and her culture and society. Few individuals use one style exclusively; most of us have one dominant style, however. Students learn faster and more effectively when instruction is matched to their individual preferred styles, according to education researchers Sue Davidoff and Owen van den Berg. These scholars also assert that self-esteem blossoms through successful learning, reinforcing a positive attitude toward future learning. They also believe that good student-teacher relationships result from teaching to different learning styles.

The VAK Learning Styles Model

Education researchers have applied several learning style models in the last several decades. The most widely-applied model is the VAK system, developed by New Zealand teacher Neil Fleming in 1987, and today, it is very popular in the United States. Its name corresponds to three styles of learning: visual (seeing), auditory (hearing), and kinesthetic (moving). Education researchers Dr. Rita Dunn and Dr. Kenneth Dunn determined that

teachers can reach all learning styles through small-group activities in which students collaborate on a topic. Team activities and brainstorming can also aid in teaching diverse learning styles effectively.

Teaching Visual Learners

Visual learners do best through viewing concepts. These learners benefit from reading, seeing, writing or drawing concepts, and like written instructions. They learn best when they can observe, and pictures, diagrams, films and displays are effective for them. Flashcards, cartoons and the use of highlighted material or different computer fonts is appealing to them. Teachers should consider the use of maps, flowcharts or webs to help these students learn concepts. They appreciate opportunities to highlight material or to use checklists. Visual learners represent about 65 percent of the population.

Teaching Auditory Learners

Auditory learners comprise about 30 percent of the population and master new material best through hearing. Written information tends to have little meaning for these learners until they have the opportunity to discuss it. They benefit from speaking information aloud and repeating key concepts. In contrast to visual learners, auditory learners prefer spoken instructions and benefit from lectures, debates, audiotapes and discussions. Teachers can best foster learning for these students through repeating instructions and key concepts, being open to music and videos in the curriculum and implementing oral presentations.

The Kinesthetic Learner

Kinesthetic learners comprise only about five percent of the population. They learn best when permitted to move, touch and get active in some way. They enjoy discovery and benefit from using tools and building models from hands-on teaching techniques. Field trips and labs are well-matched to these students. Teachers will do well to encourage and allow physical movement from these students. These students study most effectively when permitted to fidget, hum or move about. They tend to seem "slower" to teachers because traditional classroom teaching doesn't permit them to practice, touch and perform what they are learning. Clearly, teachers can empower students by analyzing their learning styles and accommodating them.

डॉ. राम प्रकाश प्रजापति

सहायक प्राध्यापक रसायन विज्ञान

क्षेत्रीय शिक्षा संस्थान भोपाल

विषय – विज्ञान

अध्याय – 2

अम्ल, क्षार एवं लवण

कक्षा – 10

कार्बन डाइऑक्साइड गैस के गुणधर्मो का अध्ययन करना ।

कार्बन डाइऑक्साइड (CO_2)

गैस – ऐसे पदार्थ जिनकी आकृति एवं आयतन अनिश्चित होते हैं। उन्हे गैस कहते हैं। गैस को जिस पात्र में रखते हैं, उसी का आयतन गृहण कर लेती हैं। प्रत्येक गैस की एक विशिष्ट प्रकृति होती है। जिसे हम उस गैस के भौतिक रसायनिक गुण भी कहते हैं। गैस हानिकारक और लाभदायक दोनो तरह का व्यवहार प्रदर्शित करती हैं।

उदाहरण – कार्बन डाइऑक्साइड सल्फर डाइऑक्साइड, मेथेन, हाइड्रोजन सल्फाइड, कार्बन मोनो ऑक्साइड, ऑक्सीजन, नाईट्रोजन एवं हाइड्रोजन आदि। कुछ गैस स्वयं ही जलने का गुण रखती हैं और कुछ गैसे जलने में सहायक नहीं होती हैं।

आज हम कार्बन डाइऑक्साइड गैस के बारे में अध्ययन करेगें।

CO_2 – कार्बन डाइऑक्साइड

यह गैस कार्बन की ऑक्साइड होती है। यह वायु मंडल में 0.03 प्रतिशत पाई जाती है। यह गैस प्रकाश संश्लेषण की क्रिया का प्रमुख अवयव है। पेड़ पौधे, कार्बन डाइऑक्साइड और जल का प्रयोग भोजन बनाने में करते हैं। यह क्रिया सूर्य के प्रकाश की उपस्थिति में होती है। कार्बन डाइऑक्साइड को ग्रीन हाउस प्रभाव या हरित गृह प्रभाव उत्पन्न करने वाली गैस भी कहा जाता है। क्योकि इसकी सांद्रता वायु प्रदूषण के कारण पर्यावरण में बढ़ रही है। जिसके कारण पर्यावरण का तापमान निरंतर बढ़ रहा है। इस गैस को जीव जंतु श्वसन के दौरान बाहर निकालते हैं और ऑक्सीजन को ग्रहण करते हैं।

उददेश्य –

- कार्बन डाइऑक्साइड की प्रकृति का अध्ययन करना।
- गैस के रंग और गंध की पहचान करना।
- जल में विलेयता और ज्वलनशीलता का निर्धारण करना।
- सूचक के साथ रंगों के आधार पर अम्लीय एवं क्षारीय गुणों की पहचान करना।

आवश्यक सामग्री – कैल्शियम कार्बोनेट, तनु हाइड्रोक्लोरिक अम्ल, परखनली, लिटमस पत्र, मोमबत्ती माचिस, स्टैंड, कार्क, फीनाल्फ्थेलिन, कैल्शियम हाइड्राक्साइड, थिसेल फनेल(कीप) निकास नली, गैस जार एवं जल।

क्रियाकलाप की प्रकिया – सर्वप्रथम लगभग 10 ग्राम कैल्शियम कार्बोनेट को परखनली में लेते हैं। इसको कार्क की सहायता से बंद कर देते हैं। कार्क को थिसेल फनेल एवं एक निकास नली लगाते हैं। अब थिसेल फनेल की सहायता से तनु हाइड्रोक्लोरिक अम्ल (लगभग 6 – 10 मिली) परखनली में डालते हैं। दोनो पदार्थों की क्रिया के फलस्वरूप कार्बन डाइऑक्साइड गैस बनती है। जिसे परखनली के अंदर बुलबुलों के रूप में आसानी से देख सकते हैं। गैस जार या परखनली में एकत्रित या संग्रह करके लिए गये पदार्थों के साथ परिक्षण करते हैं और CO_2 के विभिन्न गुणों को प्रेक्षण तालिका में दर्शा सकते हैं।

रसायनिक समीकरण –

$$Na_2CO_3 + 2HCl \rightarrow 2NaCl + CO_2 + H_2O$$

$$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$$
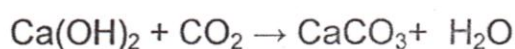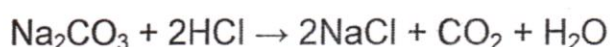
(चूने का पानी)   (दूधिया रंग)

अत्यधिक मात्रा में CO_2 गैस चूने के पानी में प्रवाहित करने पर चूने का पानी रंगहीन हो जाता हैं।

$$CaCO_3 + CO_2 + H_2O \rightarrow Ca(HCO_3)_2$$
(रंगहीन)
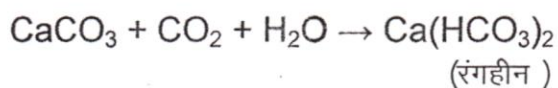
प्रेक्षण –

- बनी हुई गैस की गंध एवं रंग के आधार पर पहचान करना ।
- ज्वलनशीलता का परिक्षण करना। (जलती हुई माचिस की तीली या मोमबत्ती द्वारा)
- चूने के पानी के साथ परिक्षण करना।
- लिटमस पेपर या फीनाल्फथेनिल सूचक के साथ क्रिया कराना।

प्रेक्षण तालिका

क्र0	परीक्षण	प्रयोग	प्रेक्षण	परिणाम
1	रंग	देखकर	रंगहीन	
2	गंध	सूघंकर (दुर से)	गंधहीन	
3	ज्वलनशीलता	जलती हुई तीली के साथ	बुझ जाती है	जलने में सहायक नहीं है
4	धुलमशीलता	जल के साथ	जल मे विलेय है	कार्बोनिक अम्ल बनाती है।
5	अम्लीय गुण एंव संयोजन	चूने के पानी के साथ	चूने का पानी दूधिया हो जाता है। उचित	अम्लीय गुण है

डॉ. राम प्रकाश प्रजापति

सहायक प्राध्यापक रसायन विज्ञान

क्षेत्रीय शिक्षा संस्थान भोपाल

विषय – विज्ञान कक्षा – 10

अध्याय – 02

अम्ल क्षार और लवण,

अम्ल, क्षार एवं लवणो के गुणधर्मो का अध्ययन करना ।

अम्ल – अम्ल ऐसे पदार्थ होते हैं, जो –

- स्वाद में खट्टे होते हैं।

- नीले लिटमस को लाल कर देते हैं क्योंकि स्टार्च बेस्ड होते हैं।

- धातुओं से किया करते हैं और हाईड्रोजन गैस बनाते हैं।

- विलयन अवस्था में विद्युत के चालक होतें हैं।

- क्षार को उदासीनिकृत कर देते हैं। तथा विलयन मे एच प्लस आयन देते हैं।

क्षार – क्षार ऐसे पदार्थ होते हैं, जो –

- स्वाद में कड़वे होते हैं।

- लाल लिटमस को नीला कर देते हैं।

- विलयन अवस्था में विद्युत के चालक होते हैं।

- अम्ल को उदासीनीकृत कर देते हैं, तथा विलयन में ओ एच आयन देते हैं।

लवण – ऐसे पदार्थ होते हैं, जो

- जल में घोलने पर अम्ल और क्षार उत्पन्न करते हैं।

- इनकी प्रकृति उदासीन, अम्लीय और क्षारीय होती है।

- अम्लीय प्रकृति के लवण नीले लिटमस को लाल कर देते हैं।

- क्षारीय प्रकृति के लवण लाल लिटमस को नीला कर देते है।

- उदासीन प्रकृति के लवण लिटमस पेपर पर कोई प्रभाव नहीं छोड़ते अथवा रंग में कोई परिवर्तन करते हैं।

उदाहरण – पोटेशियम क्लोराइड, सोडियम कार्बोनेट, सोडियम बाइकार्बोनेट एवं कॉपर सल्फेट

सूचक – सूचक ऐसे पदार्थ होते हैं। जो रंग के माध्यम से विभिन्न पदार्थों के अम्लीय एवं क्षारीय गुणों की पहचान करने के काम आते हैं। सूचक प्राकृतिक और संश्लषित दोनों प्रकार के होते हैं।

	अभिक्रिया		समय तक अधिक प्रवाहित करने पर पुनः रंगहीन हो जाता है।	
6	अम्लीय एंव क्षारीय गुण	लिटमस पत्र के साथ	नीला लिटमस पत्र लाल हो जाता है, लाल के साथ रंग परिवर्तन नहीं होता है।	अम्कीय गुण
7	अम्लीय गुण	की फीनाल्फथेलिन एंव चुने के पानी के साथ	गुलाबी रंग उड जाता है।	अम्कीय गुण

सावधानियाँ –

- सभी उपकरण साफ और शुष्क होना चाहिए।
- सभी उपकरण एयरटाइट होना आवश्यक हैं।
- अम्ल का प्रयोग सावधानी से करें साथ ही शरीर को ढँक कर रखें।
- थिसेल फनल का अंतिम भाग अम्ल में डूबा हुआ होना चाहिए।

परिणाम – प्रेक्षण तालिका के आधार पर कार्बन डाइऑक्साइड गैस के सभी गुणधर्मों का हमने अच्छी तरह से अध्ययन कर लिया है। पुनः एक बार फिर कार्बन डाइऑक्साड गैस के प्रमुख बिंदुओं पर ध्यान केन्द्रित करते हैं।

कार्य का विस्तार

इस प्रयोग या क्रियाकलाप की सहायता से हम अन्य गैसों जैसे हाइड्रोजन सल्फाइड, अमोनिया जैसी गैसों का अध्ययन कर सकते हैं।

अभ्यास प्रश्न –

- कार्बन डाइऑक्साइड एंव चुने के पानी के साथ अभिक्रिया लिखियें।
- जलती हुई तीली कार्बन डाइऑक्साइड गैस में बुझ जाती है क्यों ?
- कैसे सिद्ध करोगें कार्बन डाइऑक्साइड अम्लीय प्रकृति की होती है?
- चुने का पानी क्या है?
- जल में धुलकर कार्बन डाइऑक्साइड गैस क्या बनाती है?
- नीले एंव लाल लिटमस पत्र के प्रति कार्बनडाइऑक्साइड गैस का व्यवहार कैसा होता है ?

प्रेक्षण तालिका

क्र0	पदार्थ का विलयन	सूचक के साथ रंग				गुण	
		लाल लिटमस पत्र के साथ रंग	नीले लिटमस पत्र के साथ रंग	मेथिल आरेज के साथ रंग	फिनाल्फ्थेलिन सूचक के साथ रंग	अम्कीय	क्षारीय
1	HCl	–	लाल	पीला			
2	HNO_3	–	लाल	पीला			
3	H_2SO_4	–	लाल	पीला			
4	CH_3COOH		लाल	पीला			
5	NaOH	नीला	–	गुलाबी	गुलाबी		
6	KOH	नीला	–	गुलाबी	गुलाबी		
7	NH_4OH	नीला	–	गुलाबी	गुलाबी		
8	$Ca(OH)_2$	नीला	–	गुलाबी	गुलाबी		
9	NaCl	–	–	–	–	–	–
10	$CaSO_4.5H_2O$	–	लाल	पीला			
11	नीबू		लाल	पीला			
12	संतरा		लाल	पीला			
13	सेब		लाल	पीला			
14	दुध		लाल	पीला			
15	पीने का पानी	–	–	–	–	–	–
16	अमरूद		लाल	पीला			
17	नहाने का साबुन	नीला	–	–	गुलाबी		
18	धोने का साबुन	नीला	–	–	गुलाबी		

प्राकृतिक सूचक – लाल एवं नीला लिटमस पेपर

संश्लेषित सूचक –

- फिनाल्फ्थेलिन एक संश्लेषित सूचक है जो प्रबल क्षारीय माध्यम में गुलाबी रंग प्रदान करता है।

- मेथिल ऑरेंज – यह अम्लीय माध्यम में हल्का पीला रंग एवं क्षारीय माध्यम में गुलाबी रंग प्रदान करता है।

- सार्वत्रिक सूचक – पीएच पेपर का हम सार्वत्रिक सूचक के रूप में प्रयोग करते हैं।

  उद्देश्य –

  - अम्ल, क्षार एवं लवण की पहचान करना।

  - रासायनिक पदार्थों के अम्लीय एवं क्षारीय व्यवहार की पहचान करना।

  - सूचक की प्रकृति का अध्ययन करना।

  - फल, सब्जी एवं अन्य खाद्य पदार्थ के अम्लीय एवं क्षारीय गुणों का अध्ययन करना।

आइये पहचान करते हैं पदार्थों के अम्लीय एवं क्षारीय व्यवहार को

सर्वप्रथम पदार्थों के अम्लीय और क्षारीय गुणों (व्यवहार)की पहचान के लिए आवश्यक सामग्री की आवश्यकता होती है, जिसे हम व्यवस्थित करके एक निश्चित स्थान पर रख लेते हैं।

आवश्यक सामग्री – परखनली, परखनली स्टैंड, पदार्थ जिनका परिक्षण करना है। जैसे फल, फूल, सब्जी एवं रासायनिक पदार्थ, ड्रापर, वाच गिलास, लिटमस पेपर, परखनली होल्डर, फिनाल्फ्थेलीन और मेथिल ऑरेंज सूचक ।

क्रियाकलाप की प्रक्रिया – सबसे पहले जिन पदार्थों के अम्लीय एवं क्षारीय व्यवहार की जानकारी हम प्राप्त करना चाहते हैं तो उन पदार्थों के विलयन आसुत जल में तैयार करते हैं। इसके पश्चात एक निश्चित क्रम का उपयोग करके ड्रापर की सहायता से विलयन की बूंदों को वाच गिलास में रखते हैं। इसमें लिटमस पेपर को डुबों कर या सूचक मिलाकर उत्पन्न रंग के आधार पर पदार्थ के अम्लीय और क्षारीय व्यवहार की पहचान करते हैं।

कार्य का विस्तार

आज हमने पदार्थों के अम्लीय एवं क्षयिप व्यवहार का अध्ययन किया । हम इस प्रायोगिक कौशल का उपयोग करके अन्य दैनिक जीवन से सम्बन्धित पदार्थों के अम्लीय एवं क्षारीय गुणों की पहचान कर सकतें है।

अभ्यास प्रश्न

- अम्ल किसे कहतें है?

- क्षार किसे कहतें है?

- लवण क्या होते है?

- सूचक की परिभाषा लिखियें।

डॉ. राम प्रकाश प्रजापति

सहायक प्राध्यापक रसायन विज्ञान

क्षेत्रीय शिक्षा संस्थान भोपाल

विषय – विज्ञान

कक्षा – 10

अध्याय – 01

रासायनिक अभिक्रियाएँ एवं समीकरण

रासायनिक अभिक्रियाएँ के गुणधर्मो का अध्ययन करना ।

रासायनिक अभिक्रिया – जब तत्व या यौगिक या कोई पदार्थ आपस में क्रिया करके नये पदार्थ का निर्माण करते हैं तो उसे रासायनिक अभिक्रिया कहते हैं। रासायनिक अभिक्रिया में भाग लेने वाले पदार्थों को क्रियाकारक एवं बने हुए नये पदार्थ को उत्पाद कहते हैं। जैसे – मेथेन गैस का जलना, प्रकाश संश्लेषण क्रिया एवं श्वसन । रासायनिक अभिक्रियाओं में भौतिक एवं रासायनिक दोनो प्रकार के परिवर्तन होते हैं। इन परिवर्तन को हम प्रेक्षण के आधार पर निर्धारित कर सकते हैं। जैसे –

- अवस्था में परिवर्तन

- रंग एवं गंध में परिवर्तन

- गैस का उत्सर्जन

- तापमान में परिवर्तन

उद्देश्य –

- रासायनिक अभिक्रियाओं एवं इसके प्रमुख पदों का अध्ययन करना (जैसे – क्रियात्मक एवं उत्पाद)

- रासायनिक अभिक्रियाओं के प्रकारों की पहचान करना।

- कार्यकलाप के द्वारा विभिन्न रासायनिक अभिक्रियाओं को समझना ।

- रासायनिक अभिक्रियाओं के विभिन्न लक्षणों की जानकारी हासिल करना।

रासायनिक अभिक्रियाओं के प्रकार

- उष्माक्षेपी अभिक्रिया

- उष्माशोषी अभिक्रिया

- संयोजन अभिक्रिया या संश्लेषण अभिक्रिया

- वियोजन या अपघटन अभिक्रिया

- विस्थापन अभिक्रिया

- आक्सीकरण एवं अपचयन (रेडॉक्स) अभिक्रिया

- अवक्षेपण अभिक्रिया

उष्माक्षेपी एवं उष्माशोषी अभिक्रिया

उष्माक्षेपी अभिक्रिया – ऐसी अभिक्रिया जिनमें उष्मा का उत्सर्जन होता है। उन्हे उष्माक्षेपी अभिक्रिया कहते हैं।

उदाहरण – मोमबत्ती का जलना, प्राकृतिक गैस (CH_4) का जलना, अमोनियम डाइक्रोमेट का जलना, कैल्शियम आक्सॉइड की जल के साथ क्रिया, ठोस ($NaOH$) को जल में घोलना, सोडियम की जल के साथ क्रिया एवं श्वसन क्रिया आदि।

आवश्यक सामग्री – 100 मिली चार बीकर, थर्मामीटर (-10 --- 100) ठोस ($NaOH$) आसुत जल, कैल्शियम आक्सॉइड, ठोस अमोनियम डाइक्रोमेट, माचिस, कांच की छड़ एवं आसुत जल।

क्रियाकलाप की प्रक्रिया

01.   सर्वप्रथम 100 मिली के दो बीकर लेते हैं। एक बीकर में ठोस ($NaOH$) लगभग दस ग्राम एवं दूसरे बीकर में 20 मिली आसुत जल लेते हैं। दोनो पदार्थ के तापमान को थर्मामीटर की सहायता से नोट कर लेते हैं। इसके बाद ($NaOH$) को आसुत जल के बीकर में डालते हैं और अच्छी तरह से हिलाते हैं। पूर्ण विलयन बनने के बाद थर्मा मीटर की सहायता से तापमान नोट कर लेते हैं। इसी प्रकार प्रयुक्त क्रियाकलाप को ठोस (CaO) एवं आसुत जल के साथ करके तापमान को नोट कर लेते हैं। अन्त में अमानियम डाईक्रोमेट को जलाते हैं जिससे ज्वालामुखी के समान पदार्थ का दहन होता है।

प्रेक्षण –

- सोडियम हाइड्राक्सॉइउ का तापमान (T_1)

- आसुत जल का तापमान (T_1)

- कैल्शियम आक्सॉइड का तापमान (T_1)

प्रेक्षण तालिका –

क्र0	क्रिया के अभिकर्मक	प्रारंभिक तापमान	अंतिम तापमान	तापमान में परिवर्तन
01	$NaOH + H_2O$	T_1	T_2	$T_2 - T_1$
02	$CaO + H_2O$	T_1	T_2	$T_2 - T_1$
03	अमोनियम डाइक्रोमेट का जलना	T_1	T_2	$T_2 - T_1$

रासायनिक समीकरण –

$$NaOH + H_2O \longrightarrow NaOH \,(Solution)$$

$$CaO + H_2O \longrightarrow Ca(OH)_2$$

$$(NH_4)_2Cr_2O_7 \xrightarrow{\Delta} Cr_2O_3 + H_2O + N_2$$

सावधानियाँ –

1. उष्माक्षेपी क्रियाओं के सभी प्रयोगो को सावधानी पूर्वक करने चाहिए क्योंकि उष्मा का उत्सर्जन होता है।

2. रासायनिक पदार्थों को सही अनुपात में लेकर सही तरह से मिश्रित करके तापमान को नोट करना चाहिए।

कार्य का विस्तार – प्रयुक्त क्रियाकलापों की सहायता से अन्य क्रियाओं के उष्माक्षेपी व्यवहार का अध्ययन कर सकते हैं।

अभ्यास प्रश्न –

01. उष्माक्षेपी अभिक्रिया क्या है?

02. क्रियाकारक और उत्पाद किसे कहते हैं?

03. किसी जैविक उष्माक्षेपी अभिक्रिया का उदाहरण बताईये ?

उष्माशोषी अभिक्रिया – ऐसी रासायनिक अभिक्रिया जिसमें उष्मा का अवशोषण होता हैं। उसे उष्माशोषी अभिक्रिया कहतें है।

उदाहरण – प्रकाश संश्लेषण अभिक्रिया, बर्फ के टुकड़ें का पिघलना, जल का वाष्पन, ठोस आमोनिया क्लोराइड का जल में धुलना, बेरियम हाइड्राक्साइड एवं अमोनिया क्लोराइड की क्रिया एवं ठोस लवणों या पदार्थों का पिघलना आदि।

आवश्यक सामाग्री– 100 मिली के दो बीकर   बेरियम हाइड्राक्साइड, ठोस आमोलिनया क्लोराइड थर्मामीटर (-10·ᶜ -100·ᶜ) आतुस जल, कॉच की छड, डापर एव वाच ग्लास।

क्रियाकलाप की प्रकिया–

सर्वप्रथम एक बीकर में लगभग 10 ग्राम ठोस बेरियम हाइड्राक्साइड लेते है । इसके बाद इसमें लगभग 25 मिली आसुत जल मिलातें हैं, एवं कॉच की छड की सहायता से अच्छी तरह विडोलक करके विलयन बना लेते है तथा थर्मामीटर की सहायता से पहले बीकर का तापमान नोट कर लेते हैं । दूसरे बीकर में ठोस अमोनिय क्लोराइड लेते है एव थर्मामीटर से तापमान नोट कर लेते है। इसके बाद पहले बीकर का विलयन दूसरे बीकर में डालतें हैं, तथा कॉच की छड की सहायता से अच्छी तरह विडोलक करकें थर्मामीटर की सहायता से तापमान नोट कर लेते है।

प्रेक्षण –

*   बेरियम हाइड्राक्साइड विलयन का तापमान (T_1)

*   अमोनिया क्लोराइड का तापमान (T_1)

प्रेक्षण तालिका

क्र0	अभिक्रिया के क्रियाकारक	प्रारंभिक तापमान	अंतिम तापमान	तापमान में परिवर्तन
01	$Ba(OH)_2 8H_2O + 2NH_4Cl$	$T_1^{\cdot c}$	$T_2^{\cdot c}$	$T_2^{\cdot c} - T_1^{\cdot c}$

रासायनिक समीकरण

$$Ba(OH)_2 . 8H_2O + 2NH_4Cl \rightarrow BaCl_2 + 10H_2O + 2NH_3$$
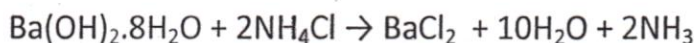
कार्य का विस्तार

प्रयुक्त क्रियाकलाप की सहायता से अन्य क्रियाओं के उष्माशोषी व्यवहार का अध्ययन कर सकतें है।

अभ्यास के प्रश्न –

*   उष्माशोषी अभिक्रिया क्या है?

संयोजन या संश्लेषण अभिक्रिया – जब दो या दो से अधिक पदार्थ आपस में क्रिया करके एकल उत्पाद का निर्माण करतें है, तो इसे संयोजन अभिक्रिया कहतें है। संयोजन अभिक्रिया उष्माक्षेपी या उष्माशोषी लक्षण प्रदार्शित कर सकती है

उदाहरण – कैल्शियम ऑक्साइड की जल के साथ क्रिया, सल्फर डाइऑक्साइड की जल के साथ क्रिया, मैग्निशियम की आक्सीजन के साथ साथ क्रिया।

आवश्यक सामग्री – ठोस कैल्शियम आक्साइड, मैग्निशियम का तार, वाच ग्लास, 100 मिली बीकर, काँच की छड, आसुत जल, परखनली, परखनली होल्डर, लाल एवं नीला लिटमस पेपर, फिनाल्फ्थेलिन सुचक एवं डापर।

क्रियाकलाप की प्रक्रिया–

- सर्वप्रथम एक बीकर में लगभग 5 ग्राम कैल्शियम ऑक्साइड लेते है । इसमें 20 मिली आसुत जल डालते है अभिक्रिया मिश्रण को काँच की छड की सहायता से अच्छी तरह मिलातें है। बीकर को स्पर्श करते है, तो हमें गर्म महसूस होता है । यह एक उष्माक्षेपी अभिक्रिया है। बनें हुये पदार्थ का लिटमस पेपर एवं सूचक की सहायता से परीक्षण करतें है।

- सर्वप्रथम एक वाच ग्लास एवं मैग्निशयम तार का टुकडा लेते हैं। तार को माचिस की सहायता से जलातें है। जलें हुये पदार्थ को वाच ग्लास में एकत्रित कर लेते है, यह पदार्थ मैग्निशियम आक्साइड है। इसको जल में घोलते है, बने हुयें विलयन का परीक्षण लिटमस पेपर एवं सूचक की सहायता से कर लेते है। तथा प्रेक्षण के आधार पर अभिक्रिया की प्रकृति पहचान लेते है।

प्रेक्षण तलिका

क्र0	अभिक्रिया के क्रियाकारक	उत्पाद	लिटमस के प्रति व्यवहार (रंग)		सूचक के प्रति व्यवहार (रंग)	
			लाल	नीला	मेथिल आरेंज	फिनाल्फ्थेलिन
01	$CaO + H_2O$	$Ca(OH)_2$	नीला	–	गुलाबी	गुलाबी
02	$2Mg + O_2$ $MgO + H_2O$	$2MgO$ $Mg(OH)_2$	नीला	–	गुलाबी	गुलाबी

कार्य का विस्तार

प्रयुक्त अभिक्रिया की सहायता से अन्य अभिक्रियाओं के संयोजन गुणों की पहचान कर सकतें है

अभ्यास प्रश्न

- संयोजन अभिक्रिया क्या है?

- बुझा हुआ चूना किसे कहते है ?

वियोजन या अपघटन अभिक्रिया – ऐसी अभिक्रिया जिसमें एकल क्रियाकारक या पदार्थ यौगिक विघटित होकर दो या दो से अधिक उत्पाद बनाते है। तो उसे वियोजन अभिक्रिया कहतें है ।

उदाहरण – कैल्शियम कार्बोनेट का विघटन, फेरस सल्फेट का विघटन, लेड नाइट्रेट का विघटन आदि।

आवश्यक सामग्री – कैल्शियम कार्बोनेट, चूने का पानी, परखनली, परखनली होल्डर, कार्क, फेरस सल्फेट, पोटेशियम ड़ाइक्रोमेट विलयन, फिल्टर पेपर एव टोन्ग

क्रियाकलाप की प्रक्रिया

- सर्वप्रथम शुष्क परखमकी लेते है। इसमें एक छिद्र वाला कार्क लगातें है, कार्क में निकास नली फिट कर देते है। दूसरी परखनली में चूने का पानी लेते है। अब लगभग 4.5 ग्राम कैल्शियम कर्बोनेट परखनली में डालते है, इसके बाद परखनलीं को टॉग या परखनली होल्डर की सहायता से गर्म करतें है। निकली हुई गैस को चूने के पानी में प्रवाहित करतें है।

- फेरस सल्केट किस्टल को शुष्क परखनली में लेकर , परखनली होल्डर से पकड कर गर्म करतें है। किस्टल के रंग का परिवर्तन देखकर एवं निकली हुई गैस को सूघकर पहचान सकते है। इसके बाद पोटेशियम डाइक्रोमेट से भीगा हुआ फिल्टर पेपर परखनली के मुह के पास रखते है तो हरा हो जाता है। प्रेक्षण के आधार अभिक्रिया की प्रकृति पहचान लेते है

प्रेक्षण तालिका

क्र0	अभिक्रिया के क्रियाकारक	उत्पाद	चूने के पानी के के प्रति व्यवहार	पोटेशियम डाइक्रोमेट विलयम के प्रति व्यवहार फिल्टर पेपर	गैस का रंग एव गंध
1	$CaCO_3 \xrightarrow{\Delta}$	$CaO + CO_2$	दूधिया	–	रंगहीन गंधहीन
2	$2FeSO_4 \xrightarrow{\Delta}$	$Fe_2O_3 + SO_2 + SO_3$	–	हरा रंग	विधिष्ट गंध जलतें हुये सल्फर के समान

अभ्यास प्रश्न

- वियोजन अभिक्रिया क्या है?

- कैल्शियम कार्बोनेट को गर्म करने पर कौन सी गैस निकलती है?

- फेरस सल्फेट को गर्म करने पर कौन की गैस उत्सजित होती है?

ICT INCLUSION in INCLUSIVE EDUCATION

JAGRATI SHARMA
KV 2 BHOPAL

"If special children are unable to move towards education, the education should go towards them"-

- **Swami Vivekananda**

INTRODUCTION-

Schools should accommodate all children regardless of their physical, intellectual, emotional, social, linguistic or other conditions.Every child has the right to education according to the

limits of his capacity,

whether that capacity be small or great. So every child is welcomed and valued regardless of ability or disability. RTE act 2009 has made elementary education a fundamental right of every child .Our schools and classrooms need to reflect this social, constitutional and legal right of every child to be included in the educational processes and practices.

To achieve this goal of education, curriculum should be flexible.

This calls for appropriate modification in conventional curriculum models. NCF 2005 also emphasizes the need of inclusive curriculum keeping in view the diversity of learners. Within the context of facilitating entry and retention of learners with & without special needs, flexible approaches become necessary. This refers to introducing creative strategies to introduce inclusive learning environments along with systemic changes in teacher preparation. Diversity among learners demands appropriate mechanisms that facilitate optimal learning through curriculum adaptations that includes need based teaching strategies, inclusive TLMs and flexibility in evaluation methodology. Curricular adaptations aim to facilitate learning in every possible manner to maximize learning or to provide opportunities in such a way, where all children can learn including children with disabilities.

Inclusive Education is an attitude-

- ✖ It means the doors to schools, classrooms and school activities are open to every child and they are afforded every pportunity to be <u>included</u> with their non-disabled peers.\
- ✖ The focus is on giving every child the help she needs to learn.
- ✖ *"Inclusion works when teachers believe that all children can learn." dayle timmons*
- ✖ *Inclusion is changing the rules of the game so that everyone can play and everyone can win.*

A FEW TYPES OF EXCEPTIONAL CHILDREN

- ★ Mentally Retarded
- ★ Visually Impaired
- ★ Hearing Impaired
- ★ Gifted Children
- ★ Physically Handicapped
- ★ Learning Disabled

PRINCIPLES FOR THE INCLUSION OF DISABLED CHILDREN IN SCHOOLS

- ★ Zero rejection
- ★ All the disabled children have the equal right to learn and benefit from education and co-curricular activities.
- ★ It is the school which has to adjust according to the needs and requirements of the disabled children.
- ★ To provide for the training of regular teachers.
- ★ To provide for vocational training suitable according to their abilities at higher and senior secondary level.
- ★ To promote awareness and realization in the community for the education of the disabled children.

CONTINUUM OF INCLUSIVE EDUCATION-

- ★ Full time placement in regular classroom.
- ★ Full time placement in the regular classroom with special education consultations.
- ★ Full time placement in regular classroom with provision of itinerant educator.
- ★ Full time placement in regular classroom with a resource room and resource teacher. ·
- ★ Education in special class in general schools.

INSTRUCTIONAL STRATEGIES AND COMPENSATORY SUPPORT DEVICES –USE OF ICT

FOR PHYSICALLY HANDICAPPED

* ★ Adjustable furniture
* ★ Wheel chairs, Crutches
* ★ Removing structural barriers
* ★ Standing frames

FOR BLIND CHILDREN

* ★ Braille
* ★ Mobility sticks
* ★ Yellow path
* ★ Audio aids and recordings
* ★ Concrete objects to teach shape, size, weight, thickness etc. near to real experiences through touch, smell and hearing.
* ★ Teacher should be more verbal.
* ★ Talking books and calculator
* ★ Making them familiar with the directions
* ★ Providing for auditory cues in games and sports.

FOR HEARING IMPAIRED:
* ★ Hearing aid
* ★ Action oriented situations like dramatization for teaching emotional concepts.
* ★ Use of visual aids like transparencies, chalk board, flash cards, handouts of classroom instructions
* ★ Lip reading.
* ★ Placing the child in the front row.
* ★ Providing speech trainer

FOR MENTALLY RETARDED (slow learners):
* ★ Concrete objects for teaching different concepts real life like situations
* ★ Making repetitions.
* ★ Activity based learning rather than seat based learning.
* ★ Limit the distractions as much as possible
* ★ Providing the content in easy language with a lot pictures

LEARNING DISABILITY-

✖ The National Joint Committee for Learning Disabilities (NJCLD) defined "Learning disability as a generic term refers to a heterogeneous group of disorders manifested by significant difficulties/errors/delays in the acquisition/performance and use of listening, speaking, reading, writing, reasoning or mathematical abilities" (Hammil, Leigh, McNutt and Larsen, 1981).A learning disability is a problem that affects how a person receives and processes information. People with learning disability may have trouble with any of the following:
✖ Reading
✖ Writing
✖ Doing math
✖ Understanding directions
  Learning disabilities are common.

Types of Learning Disabilities
✖ **Dyspraxia**
✖ **Dyslexia**
✖ **Dysgraphia**
✖ **Dyscalculia**
✖ **Auditory Processing Disorder**
✖ **Visual Processing Disorder**

Identification of learning disabilities: Academic problems
✖ Reverses letters or symbols too frequently while reading, for example, b as d, saw as was, etc.
✖ Reverses numbers too frequently while reading or writing, for example, 31 as 13, 6 as 9, etc.
✖ Poor in mathematical calculations
✖ Problems in accurate copying from common sources like a book or a blackboard, even though vision is normal
✖ Writes letters or words either too close or too far (spacing problems)
✖ The child appears to comprehend satisfactorily but is not able to answer the questions.

Classroom design modifications for an Inclusive class.

1. Students who are able to lip read or not able to see should be placed in front rows.
2. Classroom should be well lit without glares and shadows.
3. Make children with disabilities sit with competent peer.
4. Remove sources of excessive noise from the classroom.
5. Speak and write on the blackboard simultaneously.
6. Put posters and displays in the classrooms at eye level of students.
7. Provide adequate furniture for meeting the special needs of children.
8. Eliminate sharp objects from wall.
9. Assist the visually impaired with good colour schemes.
10. Have flexible time schedule.

Hence a teacher can use any or the following supplement <u>as per the need</u> to facilitate adaptations for an inclusive classroom :

- ❖ Charts and posters
- ❖ Adaptive furniture
- ❖ Magnifying glass
- ❖ Visual and auditory aids/ toys/ puzzles/ talking books
- ❖ Braille books
- ❖ Embossed TLMs
- ❖ Tactile maps/Tactile graphs
- ❖ Computers with appropriate software (JAWS, DAISY, educational CDs)
- ❖ Abacus
- ❖ Taylor frame etc.

If I don't learn the way you teach, then teach the way I learn!

COMPETENCIES NEEDED FOR AN INCLUSIVE TEACHER

★ Should have the ability to solve problems.
★ Should know about the interest, aptitude and abilities of the disabled children and use them to develop various skills in them.
★ Have the ability to set high targets for disabled children.
★ Have the ability to provide success experiences to the disabled children.
★ Should have the knowledge of special instructional material and how to use them.
★ Should be highly patient, welcoming, polite and devoted.
★ Should work as team with parents and special educators.
  Keep a record of the child's achievements and failures.

Ways of adaptation to achieve inclusiveness in learning

S.No	Ways of adaptation	Adaptation In Transaction	Example	Concessions given to physically challenged students by CBSE
1	Quantity	➤ Adapt the number of items that the learner is expected to learn or ➤ number of activities student will complete prior to assessment for mastery.	*Reduce the number of terms a learner must learn at any one time.	Exemption from studying third language up to middle school level (i.e. Class VIII).
2	Time	Adapt the time allotted and allowed for ➤ Learning ➤ Task completion ➤ Testing	*Individualize a timeline for completing a task; pace learning differently (increase or decrease) for some learners.	Additional time as under is given in each paper; For paper of 3 hours duration: 60minutes For paper of 2½ hours duration: 50 minutes For paper of 2 hours duration: 40 minutes For paper of 1½ hours duration: 30 minutes
3	Level of support	➤ Personalassistance can be provided to keep the student on task or to reinforce or prompt use of specific skills. ➤ Enhance adult-student relationship.	*Assign peer buddies, teaching assistants, peer tutors	Permission to use scribe

4	Input/output	➤ Pre-teach key concepts or terms before the lesson. ➤ Adapt the way instruction is delivered to the learner. Use multi level approach ➤ Adapt how the student can respond to instruction	*Use different visual aids, enlarge text, plan more concrete examples, and provide hands-on activities, Place students in cooperative groups *Instead of answering questions in writing, allow a verbal response, use a communication book for some students, Allow students to show knowledge with hands on materials. Use ICT	Separate question papers in enlarged print for Mathematics and Science & Technology in Class X are provided
5	Difficulty	➤ Adapt the skill level, problem type, or the rules on how the learner may approach the work	*Allow the use of a calculator to figure math problems, *Simplify task directions, *Change rules to accommodate learner needs.	Alternative type questions are provided in lieu of questions having visual inputs for the blind candidates in English Communicative and Social Science for Class X and History, Geography and Economics for Class XII.
6	Participation	➤ Adapt the extent to which a learner is actively involved in the task.	*In geography, have a student hold the globe, while others point out locations. Ask the student to lead a group. *For a project divide the work equally encourage equal participation	The Centre Superintendent makes the sitting arrangements for the dyslexic, blind, physically handicapped and spastic candidates on the ground floor, as far as possible.
7	Alternate Goals	➤ Adapt the goals or outcome expectations	*In a social studies lesson,	Blind candidates from Delhi have the

		while using the same materials. When routinely utilized, this is only for students with moderate to severe disabilities.	expect a student to be able to locate the colors of the states on a map, while other students learn to locate each state and name the capital.	facilityto use computer or a type writer for writing answers

CBSE GUIDELINES-
CBSE CIRCULAR –
29th Oct.,2008Circular No. 45
Circular dated 24th January, 2017
WEB RESOURCES-

National council for Teacher Education (2009) , Curriculum Framework for Teacher Education:New Delhi
National Curriculum Framework -2005
MHRD (2011) SSA framework for implementation, New Delhi ,GOI
NCLB: Determining Appropriate Assessment Accommodations for Students with Disabilities - National Center for Learning Disabilities.Inc.U.S
The inclusive teaching and learning handbook-The University of Sheffield

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Google Images

PROPAGATING REFLECTIVE PRACTICES FOR ICT-MEDIATED LEARNING AND CREATIVE WRITING

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Introduction

We live in exponential times – digital technologies have already transformed the way we work and play. From cell phones to websites, from YouTube videos to multiplayer games like World of Warcraft, technology is fundamentally changing how we humans interact with information and with each other. It is the age of Information and Communication Technology. All over the globe, there is a trend to use ICT in the teaching learning process. The teacher and learner must gain access to technology for improving learning outcomes. Educational reforms include successful designing and implementation of ICT in teaching learning process, which is the key to success. But there are some challenges that teachers face in using the ICT. This article will help the teacher in understanding the challenges for learning in the digital era as well as the importance of reflective practices. The teacher themselves can also know their potentialities in using the ICT in the learning processes. This will also help them in publishing their innovative practices in journals in order to contribute for the creation of knowledge.

Challenges for Learning in the Digital Era

Several attempts have been made, during the first decade of the 21st century, to formulate key challenges for learning and schooling due to social and cultural changes happening across the world [e.g., European Union (EU), 2007; Organisation for Economic Co-operation and Development (OECD), 2005]. The globalization and internationalization of national economies, along with the rapid development of information and communication technologies (ICT), are continuously transforming the way in which we live, work and learn (e.g., Anderson, 2008). While demand for routine production workers has decreased, the need for service and knowledge workers has grown (Reich, 1992). Studies increasingly indicate for a shortage of creative and innovative workers (Levy & Murnane, 2004, 2006). Advances in ICT have created jobs that did not exist a decade ago, and young people need to be educated for careers that do not yet exist (Dede, 2011; Voogt & Odenthal, 1997). All these developments impose new challenges to us as educators and require fundamental changes in both *what* has to be learned and *how* this learning is to happen. The discourse on how digital technology is seen as transforming education has moved from prophecies of the end of schooling as we know it (Papert, 1994) and cyber-learning manifestos (Perlman, 1992) to scenarios of e-learning and mobile learning that question the formal, institutionalized ways of learning. Research, however, has shown a significant gap between such visions and how technologies are actually instantiated in educational practice (e.g., Law, Pelgrum, & Plomp, 2008; Voogt, 2008). In contrast to past overoptimistic scenarios within policy and research about the impact of ICT on our education system at large, scholars are now exploring how to use different technological tools in specific circumstances and for certain purposes (e.g., Dede, 2008; Hinostroza, Labbé, López, & Iost, 2008; Rutten, van Joolingen, & van der Veen, 2012), as well as attempting to understand how technology is shaping competencies

necessary for life today and in the future (e.g., Anderson, 2008). The new competencies are often referred to as *'21st century skills'*, a term more familiar in North America, or '21st century competencies', a term more common in Europe. In this article, the author will use the term '21st century competencies', drawing on our research experiences from a broad international context, to address the knowledge skills and attitudes that are needed for living and working in the 21st century. It is required to discuss (a) what competencies are agreed to be necessary for living in the 21st century, in particular competencies associated with digital technologies, including the implications for learning; and (b) issues related to the implementation of 21st century competencies in educational practice.

While demand for routine production workers has decreased, the need for service and knowledge workers has grown (Reich, 1992). Studies increasingly indicate for a shortage of creative and innovative workers (Levy & Murnane, 2004, 2006). Advances in ICT have created jobs that did not exist a decade ago, and young people need to be educated for careers that do not yet exist (Dede, 2011; Voogt & Odenthal, 1997). All these developments impose new challenges to us as educators and require fundamental changes in both *what* has to be learned and *how* this learning is to happen. The discourse on how digital technology is seen as transforming education has moved from prophecies of the end of schooling as we know it (Papert, 1994) and cyber-learning manifestos (Perlman, 1992) to scenarios of e-learning and mobile learning that question the formal, institutionalized ways of learning. Research, however, has shown a significant gap between such visions and how technologies are actually instantiated in educational practice (e.g., Law, Pelgrum, & Plomp, 2008; Voogt, 2008). In contrast to past overoptimistic scenarios within policy and research about the impact of ICT on our education system at large, scholars are now exploring how to use different technological tools in specific circumstances and for certain purposes (e.g., Dede, 2008; Hinostroza, Labbé, López, & Iost, 2008; Rutten, van Joolingen, & van der Veen, 2012), as well as attempting to understand how technology is shaping competencies necessary for life today and in the future (e.g., Anderson, 2008). The new competencies are

Frameworks for 21st Century Competencies

During the last decade, oppositional discourses have evolved around both (a) the specific competencies that are needed in our current and future societies: such as hard (e.g., a focus on Science Technology Engineering and Mathematics) versus soft skills (e.g., emphasizing collaboration and creativity), basic competencies (e.g., knowledge of standard school subjects, literacy, math and so on) versus key competencies (e.g., adaptability, ability to think laterally), and (b) approaches to acquiring these competencies, such as individual (e.g., adaptive online or computer-mediated learning) versus collective (e.g., Computer Supported Collaborative Learning) approaches to learning. International organizations such as the OECD and the International Association of Educational Evaluation and Achievement (IEA) are performing international studies (Programme for International Student Assessment PISA), Trends in International Mathematics and Science Study (TIMSS)] related both to familiar skills of reading, writing, science and math and to 21st century competencies for 'new millennium learners'. This illustrates that these two paths could be integrated in their ambitions to pinpoint what learners need to know today and in the future.

Mishra and Kereluik (2011) argue that not all competencies are unique and novel to this century. Cognitive skills such as critical thinking and problem solving have a long empirical history closely connected with academic achievement. These skills, rather than being novel to the 21st century and necessary for success in the 21st century, are skills that are required for successful learning and achievement in any time, including but not limited to the 21st century. Additionally, interpersonal competencies such as communication, collaboration and responsible behaviour have been integral to successful interpersonal relationships for centuries, although all of these take on new dimensions in 21st century virtual interaction. One must be able to effectively regulate one's needs and goals with that of the larger society to successfully navigate our social world. Other competencies such as creativity, productivity and digital literacy are less familiar. Creativity, especially, is an area that has been growing in importance as a key 21st century thinking skill (Wegerif & Dawes, 2004). However, one of the problems with the discussions around creativity has been the often simplified and naive notions and romantic conceptions of the creative individual (Banaji & Burn, 2007), without clear specifications of what this skill area might entail. In a systematic review of the impact of the use of ICT on students and teachers for the assessment of creative and critical thinking skills, Harlen and Deakin Crick (2003) argue that the neglect of creative and critical thinking in assessment methods is a cause for concern, given the importance of these skills in the preparation for life in a rapidly changing society and for lifelong learning. Therefore, from the above discussions, it can be said that for developing creativity, critical thinking in addition to the other skills, ICT can be used in the teaching learning process. Moreover, in teaching science, teachers have to present the contents before the learners in a systematic way in order to enable them to understand the concepts, clearly. It is the teachers who have to undertake and practice the process of meta-cognition, in the classroom. From teachers, they have to transform themselves in to the reflective practitioners. They have to understand not only the cognitive process of learning but to understand the individual learners' learning ability and the other psychological components required for learning. So, the teachers should reflect upon their own practices.

What is Reflective Practice?
Reflective practice is the ability to reflect on one's actions so as to engage in a process of continuous learning. According to one definition it involves "paying critical attention to the practical values and theories which inform everyday actions, by examining practice reflectively and reflexively. In reflective practice, practitioners engage in a continuous cycle of self-observation and self-evaluation in order to understand their own actions and the reactions they prompt in themselves and in learners (Brookfield, 1995; Thiel, 1999). The goal is not necessarily to address a specific problem or question defined at the outset, as in practitioner research, but to observe and refine practice in general on an ongoing basis (Cunningham, 2001). Reflective practice... is the habitual and judicious use of communication, knowledge, technical skills, reasoning, emotions, values and reflection in daily practice for the benefit of the individuals and communities being served (Epstein and Hundert, 2002). Practitioners frame the problem of the situation, they determine the features to which they will attend, the order they will attempt to impose on the situation, the directions

in which they will try to change it. In this process, they identify both the ends to be sought and the means to be employed (Schön, 1983).

Why Reflect on Teaching?

Reflecting on teaching is frequently cited as a fundamental practice for personal and professional development (Biggs, 2003; Boud et al., 1985; Lyons, 2002), though for many it remains a slightly woolly, abstract concept with no real practical benefits. In an already cramped schedule, why take the time to reflect on practice?

Teaching changes from one context to the next. The skills you develop in one teaching session may be markedly different from those required in another, or while demonstrating, or in a lecturing environment. Because there is no 'teaching template' competent academics continually reflect on their teaching, critically analysing and evaluating their own practices, taking the opportunity to learn from each teaching session.

Reflection is process in which lecturers become aware, or are supported to become aware, of the theory and motives behind their own teaching, to reflect on this, and to take some deliberate steps to develop (Gibbs, 1996).

This reflective process is triggered by the acknowledgement that there is some aspect of their teaching that requires special attention. Eurat (2002) has likened this to pulling the practitioner out of 'auto-pilot' and causing them to focus on some part of their teaching. This realisation may be caused by an unexpected experience or outcome or just a sense that something isn't quite right. For example if, during a teaching, students do not respond or engage well, and any questions are met with a wall of uncomfortable silence, the tutor is aware there is a problem somewhere. One option is to attribute blame for this lack of interaction to the students and continue as planned. Another option is to reflect on the teaching and learning to help to identify how the teaching or dynamic may be changed to stimulate more discussion and student response.

Engaging in self-reflection should involve a move from this semi-conscious, informal approach to a more explicit, intentional approach. This enables the teacher to learn from and potentially enhance their practice (and their awareness of the reflection process) and can be applied to any aspect of teaching.

Types of Reflection

Hatton and Smith (1995) distinguish between dialogic and critical reflection and the level of engagement associated with each.

Dialogic Reflection refers to a less intensive approach that involves 'discourse with the self' to explore a given event or incident. It involves considering the decisions and judgments made and possible reasons for these.

An example of dialogic reflection is the basic model proposed by Brockbank & McGill (2000).

The individual thinks about what they're going to do in their lecture, about the information they'd like to convey, the methods they intend to use, the level of engagement and so on, in advance of the delivery of the class. Afterwards they then consider how well they achieved their intended goals and which aspects require further attention.

As with all forms of reflection this approach is couched in constructivism (Moon, 2004), and requires the individual to re-evaluate their own personal view of education, teaching and learning. While this is an important first step, and may lead to increased confidence or sense of pride, awareness alone doesn't necessarily result in an improvement of the situation (Moon, 2004).

Critical reflection refers to efforts to accounting for the broader historic, cultural, and political values in framing practical problems to arrive at a solution (Hatton and Smith, 1995). This process has been described as Boyd and Fales (1983) as: "... the core difference between whether a person repeats the same experience several times becoming highly proficient at one behaviour, or learns from experience in such a way that he or she is cognitively or affectively changed" (1983 p.100). Critical reflection facilitates transformational learning that can happen either gradually or from a sudden or critical incident and alter the way people see themselves and their world (Baumgartner, 2001). European Union (EU), 2007;

Methods of Reflection
Action Research
Reflective practice can be more formally encouraged and directed as action research (Kember & Kelly, 1993). Action research involves systematically changing your teaching using 'on the ground' evidence that suggests the changes you make are in the right direction and enhancing student learning (Biggs & Tang, 2007). The target of action research is the teacher, not the change that's being implemented.

Learning new techniques for teaching is like the fish that provides a meal today; reflective practice is the net that provides meals for the rest of your life (Biggs & Tang, 2007, p). In action research the term 'reflection' is considered misleading. Transformative reflection (Brockbank & McGill, 2000) suggests that teaching is being altered as a result of the reflection and is deemed more accurate. Engaging in action research to improve teaching practice however involves a more explicit theory of teaching (Biggs & Tang, 2007). While many teachers have an implicit theory of teaching there is a need for a more consciously worked-out theory that generates answers to teaching problems. This helps to rephrases the unhelpful and not very useful 'there's something wrong with my teaching' to the more manageable and approachable 'students are only regurgitating what I give to them in class'. The latter also brings it back to the teaching, not the students, and allows the problem to framed in a way that that can be addressed by the teacher.

Guided Reflection
To help progress reflection from dialogic to critical Johns (1994) developed the concept of guided reflection. This involves engaging with a series of questions that help you to explore and reconsider your motivation or rationale for your actions. These can be designed by a third party or by the individual themselves and serve as a guide through the reflection process. Questions can include: What was I trying to achieve? Why did I do (*activity*) as I did? What were the consequences of (*activity*), etc. This can be designed to form a reflective diary, with

one side of the page consisting of the descriptive material and the other consisting of the reflection and exploration (Moon, 2004).

Nine Dimensions of Reflective Practice

Strategies to use in your practice

1. Study your teaching for personal improvement — *Reflect regularly*
2. Evaluate your teaching using Research — *Action research*
3. Link theory with practice — *Use the literature*
4. Question your personal theories and beliefs — *Critical analysis*
5. Consider alternative perspectives and possibilities — *Learning conversations*
6. Try out new strategies and ideas — *Innovation*
7. Maximise the learning potential of students — *Inclusive practices*
8. Enhance the quality of your teaching — *Effective practice*
9. Continue to improve your teaching — *Professional learning*

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Steps to Writing a Research Article
1. Selection of the Content/Area/Topic
i. Expertise

ii. Relevant issues/Current issues/problems

iii. Propagating a theory/introducing innovation(s)/creation of knowledge/floating an idea

iv. Suggesting measures to some issues/problems

v. Critical reflection on policy matters

2. Decide it is time to publish. It is time to publish when your findings represent a complete story (or at least a complete chapter), one that will make a significant contribution to the scientific literature. Simply collecting a given amount of data is not adequate.

3. Start writing before the experiments are complete. Start writing while you are still doing the experiments. Writing often evokes new ideas: you may realize that there are additional experiments to run or additional controls that you need to add. If you wait until you are done in the lab, have dismantled the equipment, and possibly moved on to another position, you will not have the opportunity to test these ideas.

4. Draft a title & abstract. Drafting a working title and an abstract helps define the contents of the paper, identifying which experiments you will publish in this paper, and which studies you will save for inclusion in another paper.

5. Determine the basic format. There are three basic formats for peer-reviewed research articles:

• **Full-length research articles:** These articles contain a comprehensive investigation of the subject matter and are viewed as the standard format. It uses the "IMRAD" format: Introduction, Methods, Results and Discussion. (See "Components of a Research Article.")

• **Short (or brief) communications:** While not as comprehensive in scope as full-length research articles, these papers also make a significant contribution to the literature. Their length will be set by the journal but is usually 3500 words or less and will contain up to 2 tables and figures. Unlike full papers, methods, results, and discussions may be combined into a single section.

• **Rapid communications:** These articles quickly disseminate particularly "hot" findings, usually in a brief communication format. Articles that have immediate implications for public health would be appropriate for such a format, as might findings in a highly competitive and quickly moving field.

• **Language:** English has become the dominant form for international scientific communication. Thus, if you are interested in communicating your results widely to the international scientific community, then it is essential to publish in English. If, on the other hand, you wish to communicate to a more localized community (e.g., physicians in a particular geographical area), you might chose a journal that permits another language.

• **Focus:** What type of research does the journal publish? Is its focus broad or narrow? Which disciplines are represented? What is the journal's orientation – for example, is it clinical or basic, theoretical or applied?

• **Indexing:** Is the journal indexed in the major electronic databases of the related discipline(s)

• **Availability:** Is the journal broadly available? Is there an online version of the journal? Are papers provided in PDF format?

• **Format:** Do you like the appearance of published articles – the format, typeface, and style used in citing references? If relevant, does the journal publish short and/or rapid communications?

• **Figures:** Do figures published in the journal have the resolution that you need? Time to Print: Using the "date submitted" and a "date accepted" that are published on the article, along with the date of the issue, you can estimate the length of the review process as well as the time from acceptance to publication in print.

• **Charges:** Some journals bill the author for page charges, a cost per final printed page. Most journals have a separate charge for color plates. This may be as much as $1000 per color plate. Many journals will waive page charges if this presents a financial hardship for the author; color plate charges are less-readily waived and would at least require evidence that the color is essential to the presentation of the data (e.g., to show a double-labeled cell).

Once you decide on a journal, obtain and read that journal's instructions to authors. This document describes the format for your article and provides information on how to submit

your manuscript. You can usually obtain a copy of the journal's instructions to authors on its Web site or in the firstissue of a new volume.

6. Stock the sections of your paper. As you think about your paper, store relevant material in folders marked Introduction, Methods, Results, and Discussion. This will save time and avoid frustration when the writing begins. Stored items might include figures, references, and ideas.

7. Construct the tables, figures, and legends: Create figures and tables before the writing begins. The entire paper should be organized around the data you will present. By preparing the tables and figures (and their legends and appropriate statistical analyses), you will be certain of your results before you worry too much about their interpretation. You also may be able to determine if you have all the data you need. It may be noted here that except under unusual circumstance, you may not include any data that you have already published.

8. Outline the paper. An outline is like a road map. An outline details how you will get from here to there, and helps ensure that you take the most direct and logical route. Do not start writing without it. If you have co-authors, you may wish to get feedback from them before you proceed to the actual writing phase. And if you have "stocked" your sections, those files should be useful here and in the writing that follows.

9. Write the first draft. Write the first draft of the entire manuscript. If you are writing with co-authors, you may wish to assign different aspects of the manuscript to different authors. This can save time, allow more individuals to feel that are making substantive contributions to the writing process, and ensure the best use of expertise. However, it also can lead to a mixture of styles. Thus, if you take this approach, be certain that the final product is carefully edited to provide a single voice.

Some people recommend that you begin your writing with the Introduction and continue through in order each section of the paper. This can help ensure flow. However, others suggest that you start wherever you wish – anything to get rid of that blank screen or piece of paper. Whatever your approach, heed the advice of Charles Sides (1991): "If you try to write and edit at the same time, you will do neither well." And because editing is often a lot easier than writing, push through this step as quickly as possible. If you are taking much more than two full days, you have probably paused to edit!

10. Revise the manuscript. This step involves three major tasks, each to be carried out in the order given:

• **Make major alterations**: Fill in gaps, correct flaws in logic, restructure the document to present the material in the most logical order.

• **Polish the style**: Refine the text, then correct grammar and spelling.

• **Format the document**: Make your manuscript attractive and easy to read. It is important to do the tasks in the stated order. Otherwise, you may find yourself spending a lot of time revising material that you later delete.

11. Check the references. Ensure that the citations are correct and complete. Do one last literature search to make certain that you are up to date.

12. Write the final title and abstract. Many changes are made during the editing process. Make certain that your title and abstract match the final version of your article.

13. Reread the journal's Instructions to Authors. Review the details of how the manuscript is to be formatted and submitted. Revise where necessary.

14. Prepare the final illustrations. Ensure that your tables, figures, and figure legends are complete, clear, self-contained, and in the format required by the journal. Do not allow any chance for misunderstanding.

15. Get feedback on your manuscript and then revise your manuscript again. Getting feedback is one of the most important things that you can do to improve your article. First, be sure your co-authors have had a chance to read and comment on the draft. Then, when it is ready, give the manuscript to some colleagues. Indicate when you would like to receive their comments, and what levels of information you would like (e.g., comments on the science, logic, language, and/or style). After you get their comments, revise your manuscript to address their concerns.

Do not submit manuscript until you feel it is ready for publication. Once it is accepted, further changes in your manuscript will be difficult and may also be costly.

16. Submit the manuscript to the editor. Follow the Instructions to Authors to determine what items you need to submit, how to submit them, and to whom you should send them. Note that some journals permit (or even require) a "pre-review," i.e., a letter indicating the content of the article so that the editors can determine whether they will accept the manuscript for a full review. At this point you may wish to list possible reviewers (or individuals to be avoided). If necessary, contact the editor to be sure that the manuscript was received. And if after a month you have not received a response concerning the acceptability of your manuscript for publication you may wish to contact the editor about this, too.

17. Deal with reviewers' comments. Most manuscripts are not accepted on the first submission. However, you may well be invited to resubmit a revised manuscript. If you choose to do so, you will need to respond to the reviewer comments. Do this with tact. Answer every concern of the reviewers, and indicate where the corresponding changes were made in the manuscript if they were, indeed, made. You do not need to make all of the changes that the reviewer recommended, but you do need to provide a convincing rationale for any changes that you did not make. When you resubmit the manuscript, indicate in your cover letter that this is a revised version. An alternative is to submit the manuscript to another

journal. However, if you do so, it may still be best to take the reviewer comments into consideration. Even if you feel that the reviewers have misunderstood something in your paper, others might do the same. Of course, if you submit to another journal you probably will need to modify the format. And, note that do not submit your manuscript to more than one journal at a time.

18. Check the proofs. Once the manuscript is accepted and prepared for print, the publisher will send the corresponding author page proofs of the article. This may be accompanied by a list of queries, such as missing information regarding a reference. The proofs may be sent via e-mail or as hard copy. If there is a chance that you will be away when the proofs arrive, have a plan for making certain that they are received and you are notified. You may only have 24–48 hr to return the proofs. Carefully, correct any typos and factual errors. And read the manuscript for clarity – this is your last chance.

However, try to limit changes to editorial queries plus minor modifications. If you think anything more major is required, you must first get permission from the journal editor and be prepared for additional costs and publication delays.

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Carbon and Its Compounds

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Carbon : Introduction

Atomic Number: 6 Electronic configuration: 2, 4

Valence electrons: 4Property: Non-metal

The food we consume daily are also made up of Carbon. The clothes we wear are also made up of Carbon. Either cotton or Nylon The fuel we use (Petrol, Diesel,LPG,CNGetc) are also made of carbon. The soaps and detergents are also made of Carbon The books we read made of paper also made up of Carbon All the living structures are carbon based

Now we will discuss what happen when a compound containing carbon.

All these compounds produce a colourless and odourless gas Carbon dioxide on burning. Carbon di oxide gas turn lime water milky.

Carbon Compounds + Air $\rightarrow CO_2(g)$

$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$ (Lime water turns milky due to formation of calcium carbonate)

Carbon is the 4th most abundant substance in universe and 15th most abundant substance in the earth's crust.

Bonding in Carbon:
Elements forming ionic compounds complete the noble gas configuration either by losing or gaining electrons from outermost shell. Now carbon has four electrons in its valance shell,therefor it should lose or gain four electrons to acquire noble gas configuration. But it is difficult because:

(i) It could gain four electrons forming C^{4-} anion. But it would be difficult for the nucleus with six protons to hold on to ten electrons, that is, four extra electrons.

(ii) It could lose four electrons forming C^{4+}cation. But it would require a large amount of energy to remove four electrons leaving behind a carbon cation with six protons in its nucleus holding on to just two electrons.

So, Carbon neither lose nor gain electrons to achieve noble gas configuration. Now the only way to acquire noble gas configuration is by sharing of valance electrons with electrons of other carbon atom or atoms of other elements.

Such bonds which are formed by the mutual sharing of electrons is called covalent bond.

Two of more atoms share electrons to make their configuration stable. In this type of bond, all the atoms have similar rights over shared electrons. Compounds which are formed because of covalent bond are called COVALNET COMPOUNDS.

Covalent bonds are of three types: Single, double and triple covalent bond.

Single Covalent Bond: Single covalent bond is formed by the sharing of two electrons, one from each of the two atoms.

$$H \cdot + H \cdot \rightarrow$$

Valence electron

Shared pair of electron

$$H \overset{\cdot\cdot}{\cdot} H \rightarrow$$

$$H - H \rightarrow H_2$$

Single bond

$$:\overset{\cdot\cdot}{Cl} : \overset{\cdot\cdot}{Cl}:$$

$$H :\overset{\cdot\cdot}{Cl}:$$

$$H :\overset{\cdot\cdot}{O}: H$$
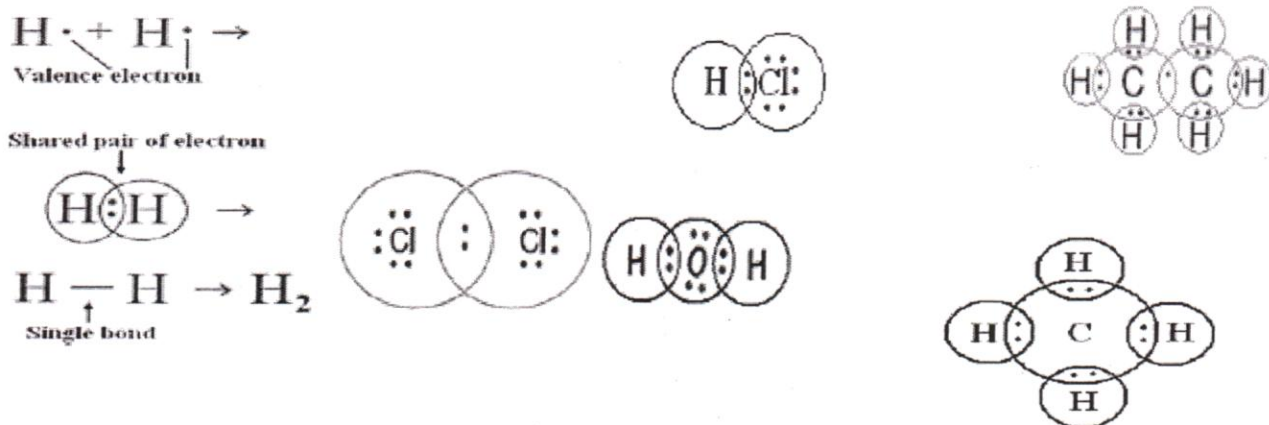
Double covalent bond: Double bond is formed by sharing of four electrons, two from each of the two atoms.

$$\overset{\cdot\cdot}{O} \overset{xx}{:} \overset{\cdot\cdot}{O} \rightarrow \overset{\cdot\cdot}{O} = \overset{xx}{O}$$
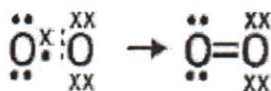
Triple Covalent Bond: Triple covalent bond is formed because of the sharing of six electrons, three from each of the two atoms.

Triple bond is formed by the sharing of total six electrons

$$:N \overset{\cdot\cdot}{\underset{\cdot\cdot}{:}} N:$$

Sharing of three pair of electrons

$$H \overset{x}{(} C \overset{\cdot\cdot}{:} C \overset{x}{)} H$$
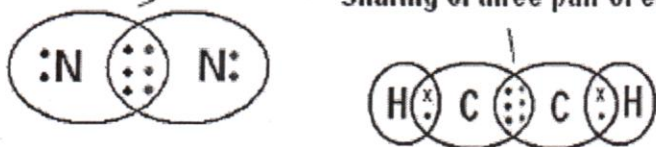
Properties of Covalent Bond:

Intermolecular force are weaker than ionic bond. As a result, covalent compounds have low melting and boiling points.

Covalent compounds are poor conductor of electricity as bonding in these compounds does not give rise to any ions

Since, carbon compounds are formed by the formation of covalent bond, so carbon compounds generally have low melting and boiling points and are poor conductor of electricity.

Allotropes of Carbon

Allotropy - Two or more different physical forms in which an element can exist is called allotropy. Allotropes are different structural modifications of an element; the atoms of the element are bonded together in a different manner.

Graphite, diamond charcoal, and fullerenes are all allotropes of carbon.

The structure of graphite

The structure of diamond

The structure of C-60 Buckminsterfullerene
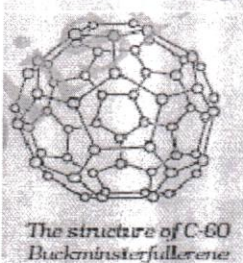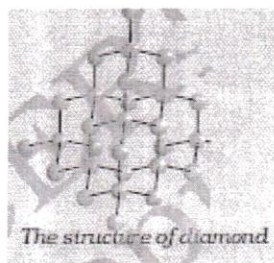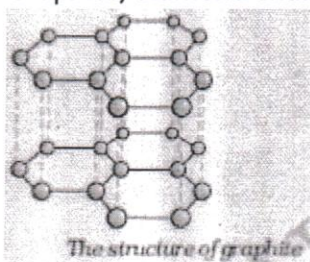
Versatile Nature of Carbon

The nature of the covalent bond enables carbon to form alarge number of compounds. Two factors noticed in the case ofcarbon are –

(i) **Catenation -:**Carbon has the unique ability to form bonds with other atoms ofcarbon, giving rise to large molecules. This property is calledcatenation. These compounds may have long chains of carbon,branched chains of carbon or even carbon atoms arranged in rings.

In addition, carbon atoms may be linked by single, double or triplebonds. Compounds of carbon, which are linked by only singlebonds between the carbon atoms are called saturated compounds.Compounds of carbon having double or triple bonds between theircarbon atoms are called unsaturated compounds.No other element exhibits the property of catenation to the extentseen in carbon compoundsThe carbon-carbon bond is very strongand hence stable. This gives us the large number of compoundswith many carbon atoms linked to each other.

(ii) **Tetravalency -:**Since carbon has a four valance electrons, so it is capable of bonding withfour other atoms of carbon or atoms of some other mono-valentelement. Compounds of carbon are formed with oxygen, hydrogen,nitrogen, sulphur, chlorine and many other elements giving rise tocompounds with specific properties which depend on the elementsother than carbon present in the molecule.Again the bonds that carbon forms with most other elements arevery strong making these compounds exceptionally stable. Onereason for the formation of strong bonds by carbon is its small size.

This enables the nucleus to hold on to the shared pairs of electronsstrongly. The bonds formed by elements having larger atoms aremuch weaker.

Saturated and Unsaturated Carbon Compounds

Carbon compounds which contain just carbon and hydrogen are called hydrocarbons. Among these, the saturated hydrocarbons are called **alkanes**. The unsaturated hydrocarbons which contain one or more double bonds are called **alkenes**. Those containing one or more triple bonds are called **alkynes**.
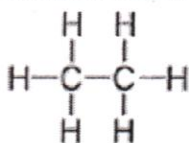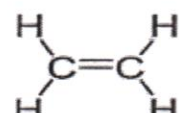
Ethane   **Structure of Ethene Structure of Ethyne**

General Formulas : C_nH_{2n+2} (Alkanes) C_nH_{2n} (Alkenes) C_nH_{2n-2} (Alkynes)

Functional Groups – Carbon is a very friendly element becayse it also form bond with other elements such as Halogens, Oxygen, Nitrogen, Sulphur and Phosphorous. These elements replace one or more hydrogen of hydrocarbon chain in such a way that the valency of carbon remains satisfied. As a result of this replacement, new compounds are formed having specific chemical properties and hence are called functional groups.

Functional group may be defined as an atom or group of atoms present in the molecule responsible for the specific chemical properties.

Hetero atom	Functional group	Formula of functional group
Cl/Br	Halo- (Chloro/bromo)	—Cl, —Br (substitutes for hydrogen atom)
Oxygen	1. Alcohol	—OH
	2. Aldehyde	$-C{\Large\substack{H\\ \diagdown\\ =O}}$
	3. Ketone	$-C-$ on O
	4. Carboxylic acid	$-C{\Large\substack{O\\ \|}}-OH$

Homologous Series

Series of compounds with same general formula and functional group is known as **homologous series**.

Compounds belonging to the same homologous series show similar properties. Compounds of homologous series differ by CH_2 from their consecutive members. Each subsequent compound in a **homologous series** differs by 14u. Example: Alkanes; such as, Methane, Ethane, Propane, **Butane**, etc. belong to same homologous series.

a. Compounds of same homologous series have same **general formula.**
b. Compounds of same homologous series differ from **their consecutive members** by by CH_2
c. Compounds of same homologous series have same **chemical properties.**
d. Compounds of same homologous series differ in their **physical properties** with increase or decrease in molecular mass.

Nomenclature of Carbon Compounds

The names of compounds in a homologous series are based on the name of the basic carbon chain modified by a "prefix" "phrase before" or "suffix" "phrase after" indicating the nature of the functional group. For example, the names of the alcohols taken in Activity 4.2 are methanol, ethanol, propanol and butanol.

Naming a carbon compound can be done by the following method –

(i) Identify the number of carbon atoms in the compound. A compound having three carbon atoms would have the name propane.

(ii) In case a functional group is present, it is indicated in the name of the compound with either a prefix or a suffix.

(iii) If the name of the functional group is to be given as a suffix, the name of the carbon chain is modified by deleting the final 'e' and adding the appropriate suffix. For example, a three-carbon chain with a ketone group would be named in the following manner –Propane – 'e' = propan + 'one' = propanone.

(iv) If the carbon chain is unsaturated, then the final 'ane' in the name of the carbon chain is substituted by 'ene' or 'yne'. For example, a three-carbon chain with a double bond would be called propene and if it has a triple bond, it would be called propyne.

Chemical Properties of Carbon Compounds

Combustion Reaction: Carbon and carbon compounds gives carbon dioxide, water vapors, heat and light on burning in air. Following are some of the examples of combustion reaction of organic compounds:

$C + O_2 \Rightarrow CO_2 + Heat + Light$

$CH_4 + 2O_2 \Rightarrow CO_2 + 2H_2O + Heat + Light$

$CH_3C_2OH + O_2 \Rightarrow CO_2 + H_2O + Heat + Light$
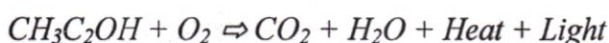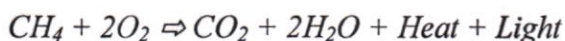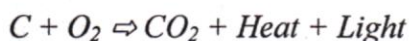
Oxidation:

In combustion reaction, carbon compounds are oxidized in the presence of oxygen. The following example is different because alkaline KMnO4 is the oxidizing agent in this reaction.

$CH_3CH_2OH + (Alkaline\ KMnO_4/Acidified\ K_2Cr_2O_7) \Rightarrow CH_3COOH$

Addition Reaction:

Formation of larger molecules by addition of more radicals is known as addition reaction. For example; ethene is converted into ethane when heated with the catalyst nickel.

$CH_2=CH_2 + H_2 + (Nickel\ catalyst) \Rightarrow CH_3-CH_3$

When ethene undergoes addition reaction with chlorine, it gives dichloroethane.
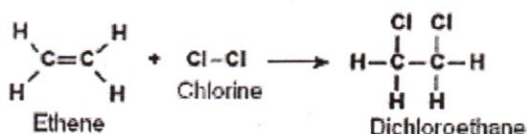
Substitution Reaction:

Replacement of a functional group or any atom by another atom or functional group is known as substitution reaction. Substitution reactions are single displacement reactions.

When methane reacts with chlorine gas in the presence of sunlight, it gives chloromethane and hydrogen chloride.

$CH_4 + Cl_2 + Sunlight \Rightarrow CH_3Cl + HCl$

Similarly, ethane gives chloroethane when it reacts with chlorine in the presence of sunlight.

$C_2H_6 + Cl_2 + Sunlight \Rightarrow C_2H_5Cl + HCl$
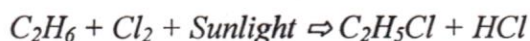
Developing digital content on the biology educational power point presentation.

Introduction

Computers are used in many aspects of teaching by biological departments. They may be used to present biological information and concepts, to simulate complex situations, develop generic skills, to graph and manipulate data, and to assess students. Even within these broad functions, there may still be a wide diversity in the ways New Technologies are used. For example, Computer Aided Learning packages that are of the `tutorial style' may be used to extend talented or more motivated students, or they may provide remedial help, or for revision. When computers are used for testing students they can provide automated and immediate feedback to a student about their progress, or for assessment purposes. The use of computers to assess student performance has been adopted by some departments to reduce costs of marking. The use of computers has the benefit of providing feedback at a speed impossible if marked by staff. This allows many biology departments to provide the large number of students with guidance as to whether they have grasped the material at hand and where they need extra effort. There are clear advantages of using computers across a wide range of teaching activities, and planning for the future should be alert to the diversity in this area.

Points to remember for making Power Point Presentation

Internet resources may be used for the following purposes in biology teaching in higher education:

(i) Illustration of a concept or phenomenon

(ii) Assuring a visual interactive component to a lesson where the teacher has not proper didactic tools

(iii) Building a scientific vocabulary by developing science reading and writing skills

(iv) Using scientific methods and developing science understanding

(v) Developing scientific reasoning by critically thinking

(vi) Developing scientific research skills by use of scientific databases, visualization, mapping and analysis of the data.

Tips to make an effective power point

Tip 1 Stick to your content

Keep it simple. The best advice you will ever get when it comes to presentations. Yes, PowerPoint comes with default themes and wide array of transitions and animations but don't let them detract from your content.

Tip #2 – Think of your students

It sounds like an obvious thing to say, but don't use small text.

Think about the teaching space and where the furthest student from the screen will be. The further away they are, the larger your text should be. Walk around your classroom and make sure students don't have to strain their eyes to read any of the text. Alternatively you can use the magnifier tool to zoom in on the text.

Tip #3 – Don't read from the screen

Don't read the screen!

It's such an important thing not to do during presentations that it needs repeating. If your head is looking down at a computer screen or if your head is turned facing the projector screen you are not looking at your audience, which means you are not engaging with them.

One way to avoid this is not to write too much text on your slide and if you need additional prompts, write them in the notes section.

Tip #4 – Shifting focus

Your presentation doesn't have to be the focal point for your students. If they are spending too much time looking at the screen, switch it off.

Tip #5 – Don't point

Depending on the position of the projector screen you may find large parts of it are out of reach and if you are pointing in a vague direction, will your students mistake what you are pointing at?

Tip #6 – Skipping Slides

When you need to skip several slides, don't resort to panicked clicking, just use this quick keyboard shortcut and your audience will never know there was another section to your presentation.

Short cut 5+enter will take you to 5th slide

Tip #7 – Use SmartArt

It is also useful for explaining information.

Tip #8 – Photo Galleries

Teacher's lives are very busy and we often don't have the time to do all the things we like. PowerPoint is great for showing images in class, but creating presentations can be time consuming and often seen as a low priority because our time could be used better to do something else.

Tip #9 – It's good to share

Tip # 10

- Use attractive graphics and avoid too much text. Too much is too much.
- Avoid too much information on one slide.
- Use audio & video clips for your presentations.
- Graphs increase understanding of content.
- Bulleted lists help them organize ideas.
- PowerPoint can help to structure lectures.
- Verbal explanations of pictures/graphs help more than written clarifications.

You should avoid

Too many words on a slide

clip art

movement

template with too many colours
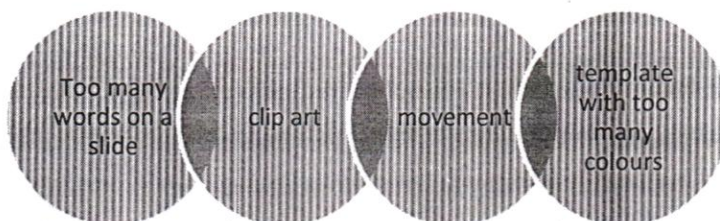
How to start ?

> ➤ Make a list of the concepts you want to teach.
> ➤ Arrange the phrases which are to be communicated to the students.
> ➤ Arrange it in proper sequence (make a story board).
> ➤ Design the navigation of the chapter or topic (know where you are going).
> ➤ Collect the graphics, animations and other resources from the net.

Starting Power point presentation

> ➤ Write the text in the slides as per your story board planning.
> ➤ Search related graphics & insert it them in the slide.
> ➤ Arrange them in the slides and go through the presentation.

Importing the data

> ➤ Insert the videos, sound files and provide hyperlinks if necessary.
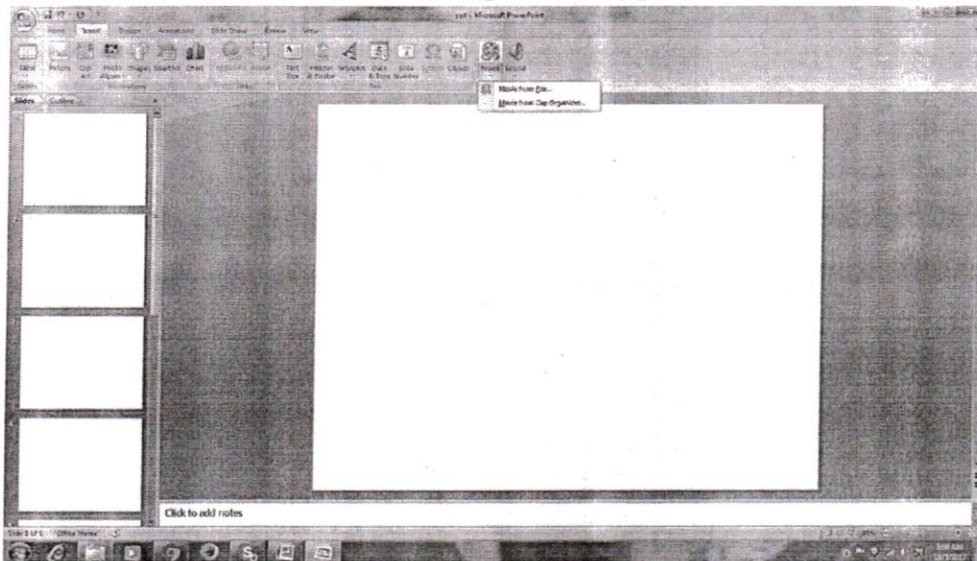
> ➤ If you are going to explain any video insert the video at appropriate place.
> ➤ If the requirement is sound file then insert a sound file.
> ➤ Every time when you go through the Power Point Presentation you may feel that you should make some changes as per the need of the students.

How to insert a file in Power point presentation?

Sound file
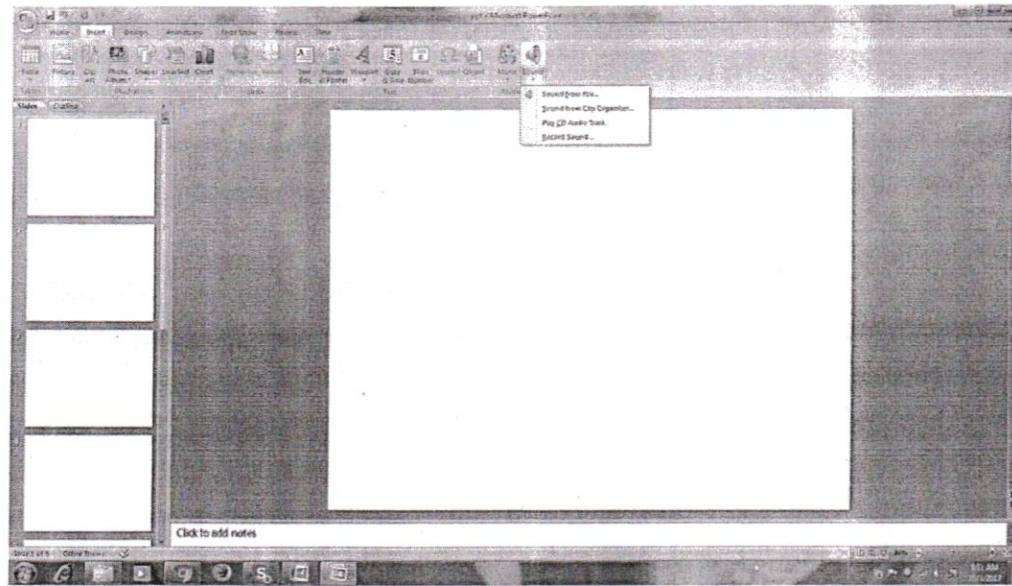
➢ If you want to spice up your PowerPoint presentation, a good soundtrack can make it much more compelling. PowerPoint allows you to use any WAV or MP3 file to play in the background, though it requires a little finagling on older versions. If you want to play multiple songs back-to-back, you'll get the best results by combining the songs into a single file first.

➢ Open the slide you want to start the music on. If you want the music to play from the beginning of the presentation, select the first slide.

➢ If you want to play multiple sound throughout a presentation, you could try to line them up by spacing them out between your slides, but you'll likely find it easier and less jarring to create a new file that combines all of the sound into one, back-to-back.

➢ Click the Insert tab. You can insert MP3 and WAV files.

➢ If you want the sound to start automatically and play in the background across all of your slides, select the "Play in Background" option in the Playback tab. This will set the sound to start automatically, continue playing when slides are changed, loop when finished, and hide the sound button. The sound will start playing immediately when that slide is opened.

➢ If you prefer to click the button to start the sound instead, select "No Style" from the Playback tab. The sound will play when you click the audio button. You can change the look of the button using the Format tab. This will let you design a button or import a picture to use instead.

➤ Use the **Volume** button to adjust the master volume for the song. Make sure to test the sound before the presentation and adjust the volume accordingly so that you don't startle the audience.

<u>Always Keep in mind</u>

Every presentation will be meaningful if you prepare & present according to the need of you students because every class have different levels and types of students.

Bibliography

https://tekhnologic.wordpress.com/2015/06/20/10-powerpoint-tips-for-teachers/

http://www.wikihow.com/Add-Music-to-PowerPoint

Developing digital content on advanced setting of power point presentation.

Tissues

Story board creation:-

List of concepts

1. Division of labour in multicellular organisms.
2. Cells work together to do the same work with efficiency.
3. Definition of tissue.
4. Difference b/w plants and animals.
5. Types of plant & animal tissue.
6. Classification of plant tissue.
7. Simple & complex tissues
8. Types of Meristematic tissues
9. Structure & functions of (Apical, lateral & intercalary)
10. Types of simple tissues (parenchyma ,collenchyma & Sclerenchyma)
11. Characteristic properties & functions of permanent tissues
12. Epidermal tissues Properties & functions
13. Complex tissues – structure function & properties

   Activity / video to be included -

   1. Onion root tip
   2. Transverse section of dicot stem
   3. Stomata slide preparation

Collection of graphics pictures from various internet sources collects the pictures in the folder. (Graphics will be according to level of understanding of the class. If the detailed structure is not required as per the syllabus, choose simple diagrams.)

Practical experience to make a Power Point Presentation

Open a Power Point presentation select new presentation. Name it as per the topic name .Open first slide .Select the slide lay out as per your requirement.

＋ Slide 1   Title   Plant tissue
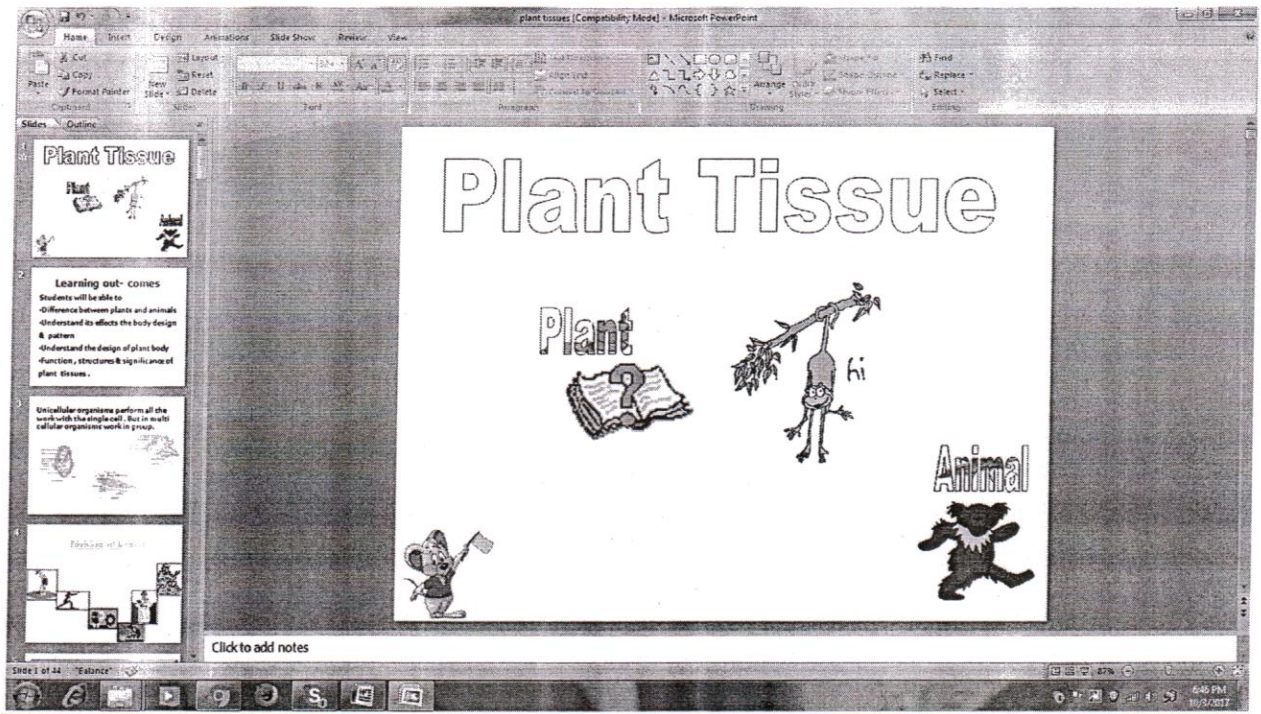
＋ Slide 2 Learning outcomes

All living organisms are made up of cell.

- Learning outcomes :-Students will be able to
- Difference between plants and animals
- Understand its effects the body design & pattern
- Understand the design of plant body
- Function , structures & significance of plant tissues .
-

Slide 3 to 14 of the presentation will contain graphics and text .

After the explanation you need to insert video of the activity write the script of the experiment .
Record it and insert in the powerpoint
slide 15

Experiment script

Take two glasses to jars and fill them with water. Take two onion bulbs and place one on each jar.

Observe the growth of roots in both the bulbs for a few days.

Measure the length of roots on day 1, 2 and 3.

On day 4, cut the root tips of the onion bulb in jar 2 by about 1 cm.

After this, observe the growth of roots in both the jars and measure their lengths each day for five more days and record the observations.

Length	Day 1	Day 2	Day 3	Day 4	Day 5
Jar 1	....cm	...cm	....cm	...cm	....cm
Jar 2	....cm	...cm	....cm	...cm	....cm

We can see the roots of this onion is short than the other. We cut the root tips and because the meristematic tissues are cut, growth of the root stopped.

You can observe the same experiment by doing it yourself.

Record the video with any video camera and save it as video format

How to insert video ?

1. Click insert on the menu bar and click insert from file

2. Search the file location and click OK. It will be inserted and if you
   want it to start after mouse select it
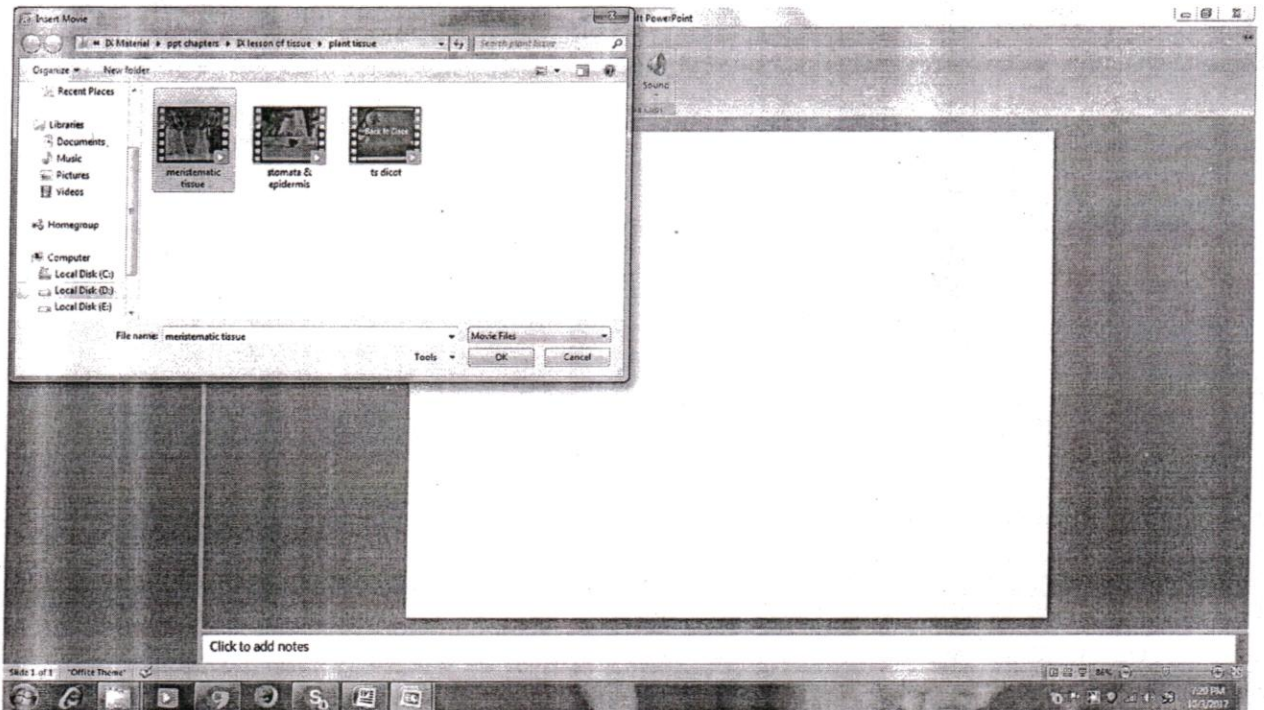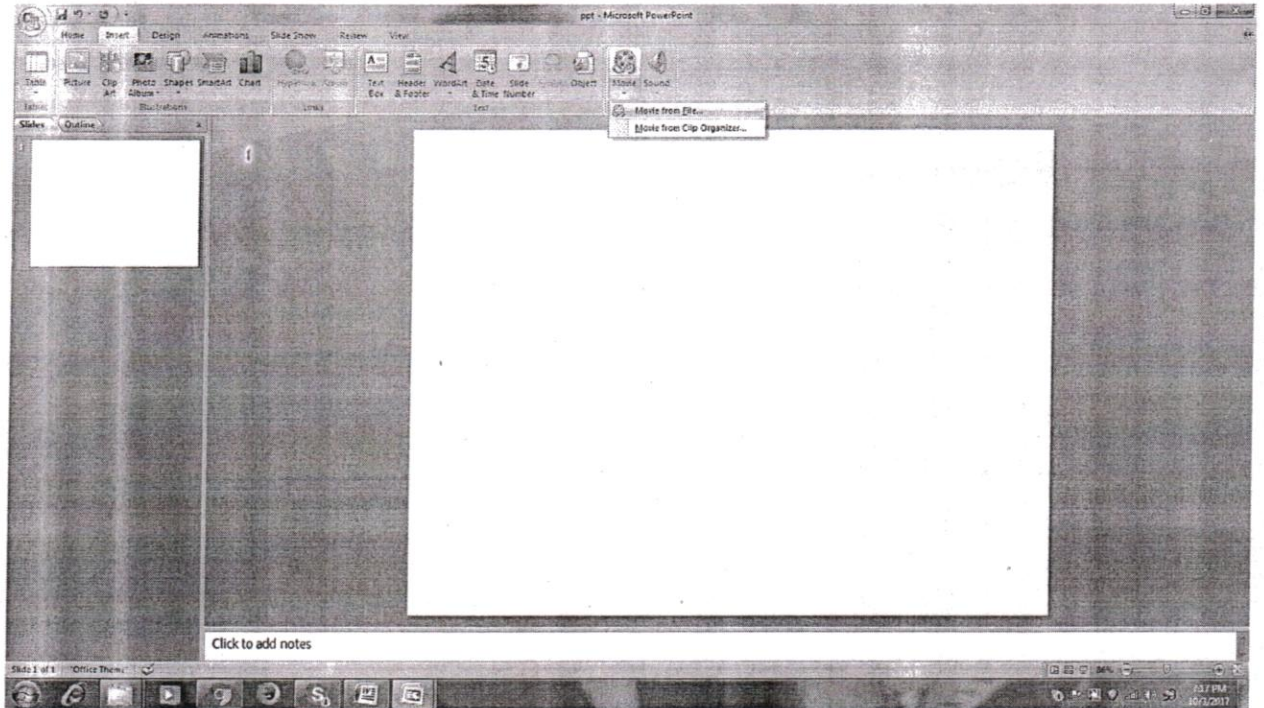
⤋ <u>What is hyperlink ?</u>

Many a times you need to show the slide in a different presentation or you do not want to insert the video in the power point presentation you can it link to the file.
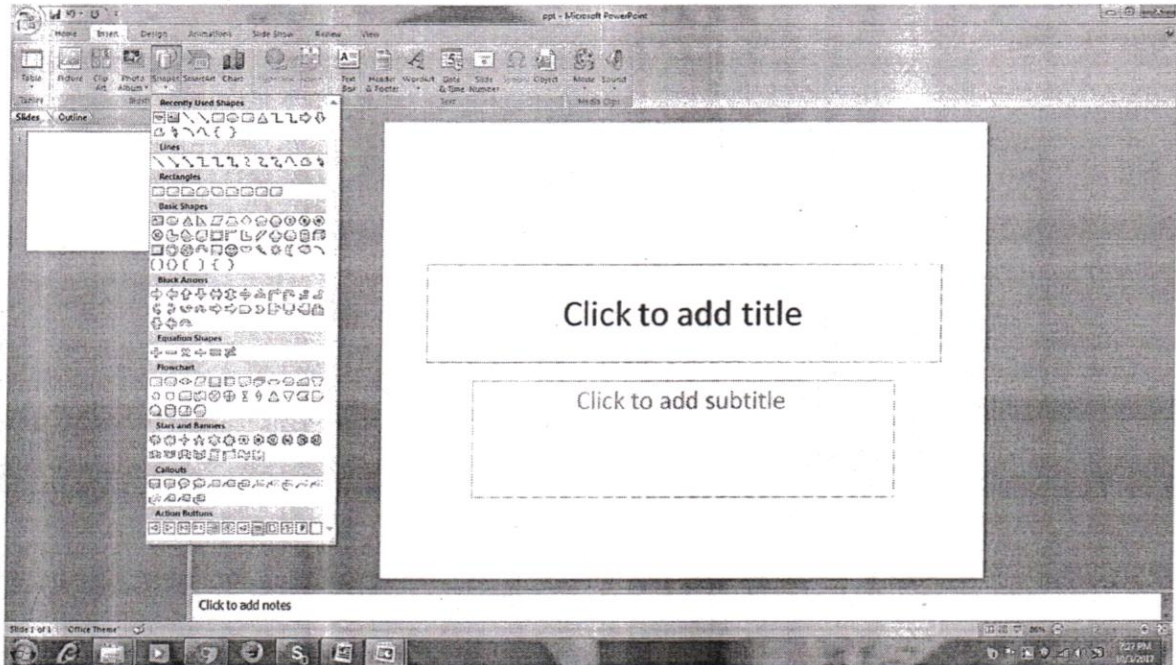
Click on insert > go to shapes > choose a button from the last row and drag the mouse to show button on the slide.
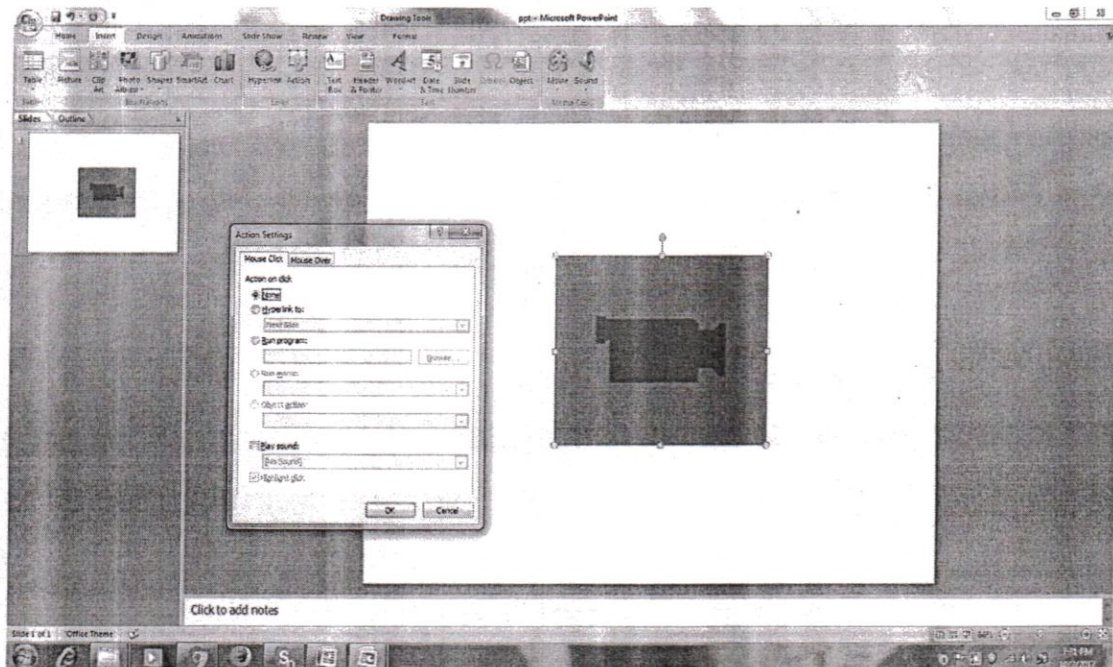
Click to hyperlink and select >hyperlink to > other file .> browse
the location of the file and select it > click ok
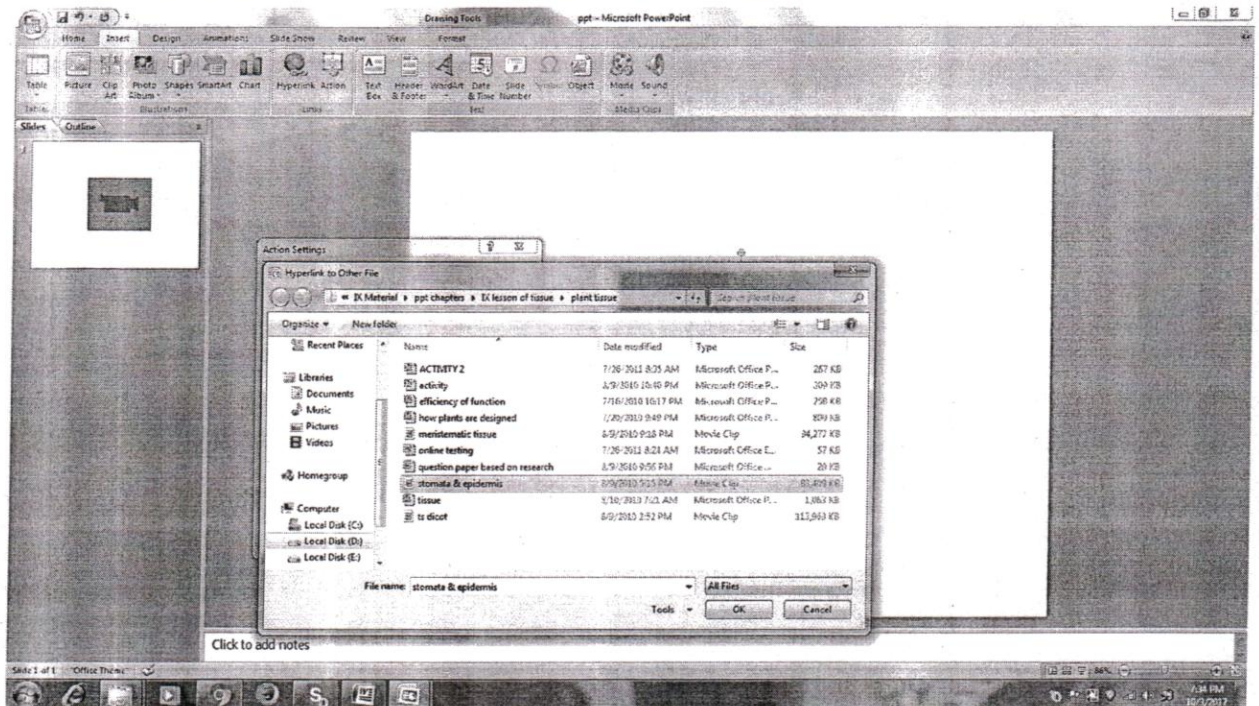
In this way you can hyperlink any video to your presentation or
you can connect it to other presentations also.

What is looping ?

When you have to show a small concept and you want to revise
the steps you can loop it.

Go to go to slide show in menu bar click on the > set up slide show
then select > loop continuously till Esc. > OK

If you want the show should continuously loop without mouse
click then follow the following steps

Go to animations >select advance slide >automatically > after 20
sec /10 sec as per you requirement and > select apply to all.

Your presentation will run without stop continuously and after the
last slide it will automatically start first slide.
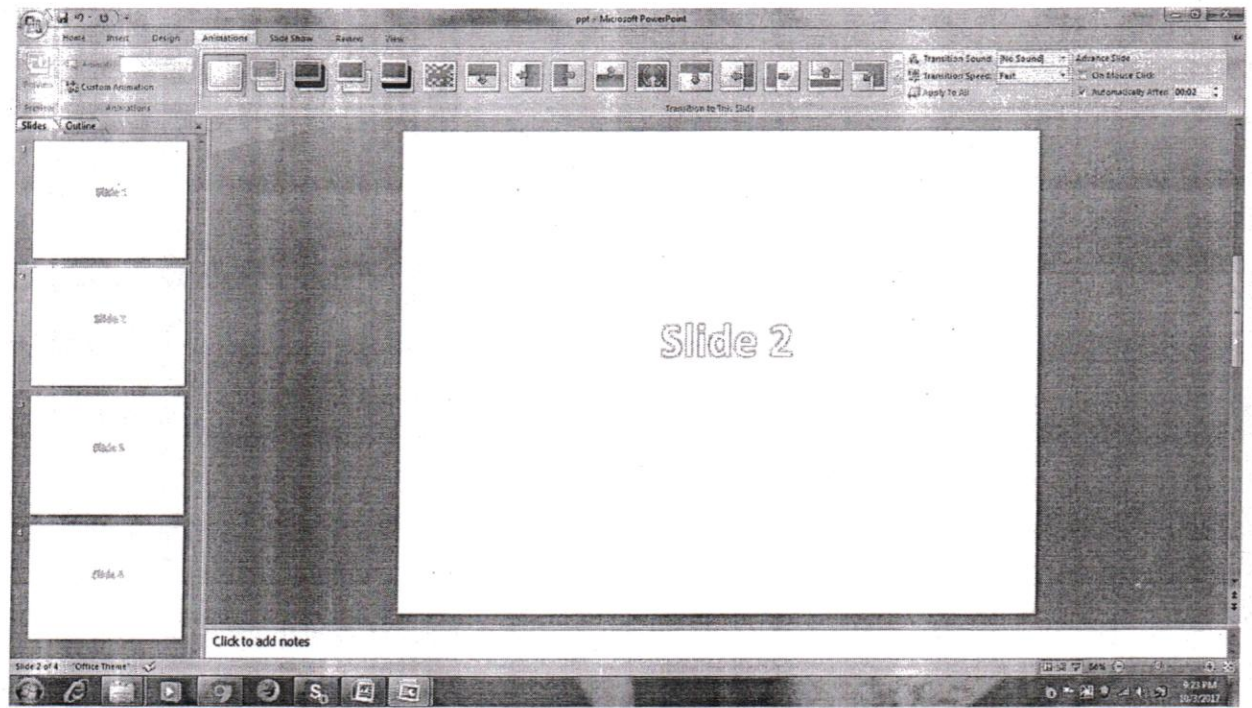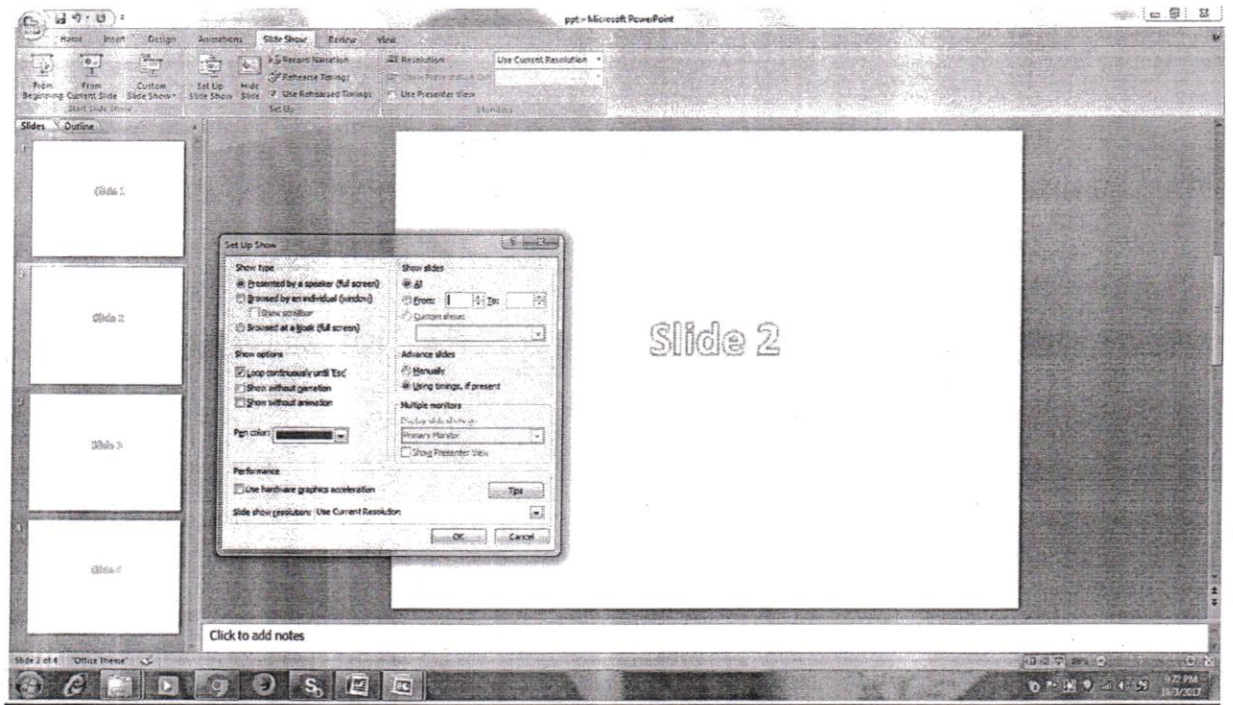
How to make a photo album ?

If you have many photos and you want to show them in slide show, you can make photo album in one click.
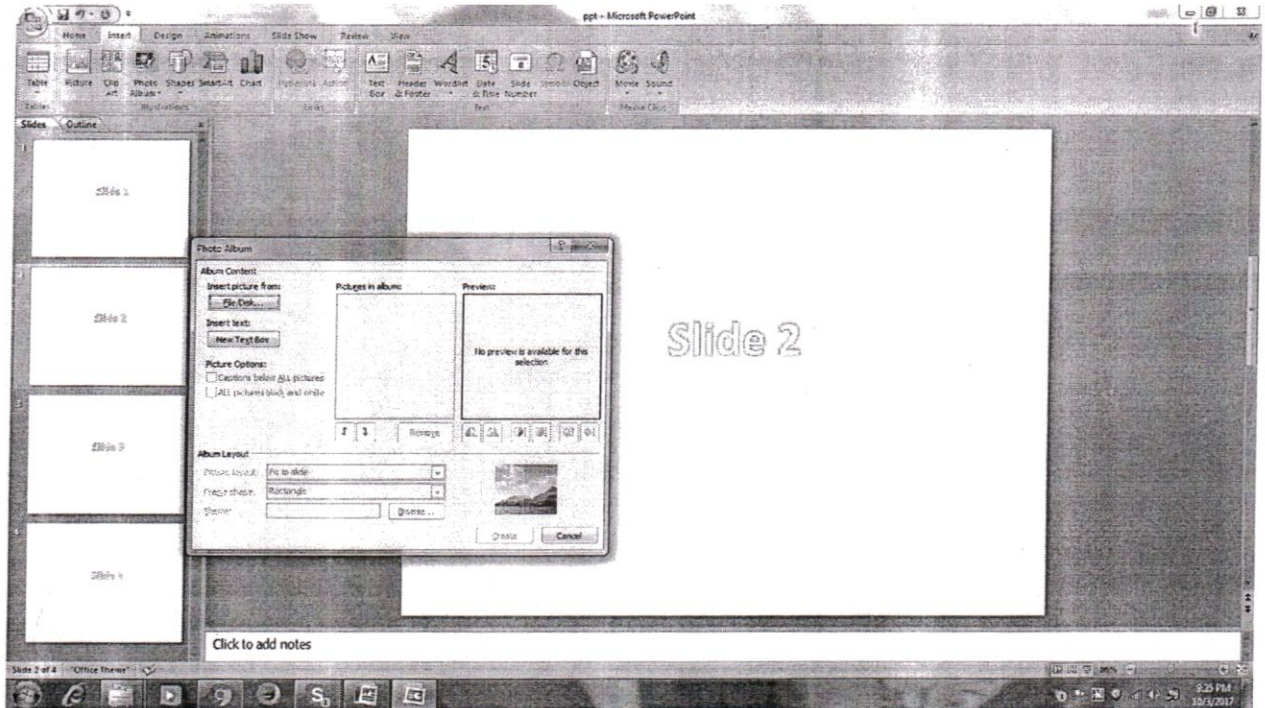
For creating you click on insert and go to photo album> insert picture from file > browse the location and click > create. You will get all the photos arranged in the form of an album.

What is smart art option ?

If you want to show any process, list, cycle, hierarchy, relation, matrix or pyramid you can insert smart art option.

For inserting you click insert on menu bar and go to> smart art select the option of your choice and click on that.

You can inset the text on the given place and can colour the parts accordingly.
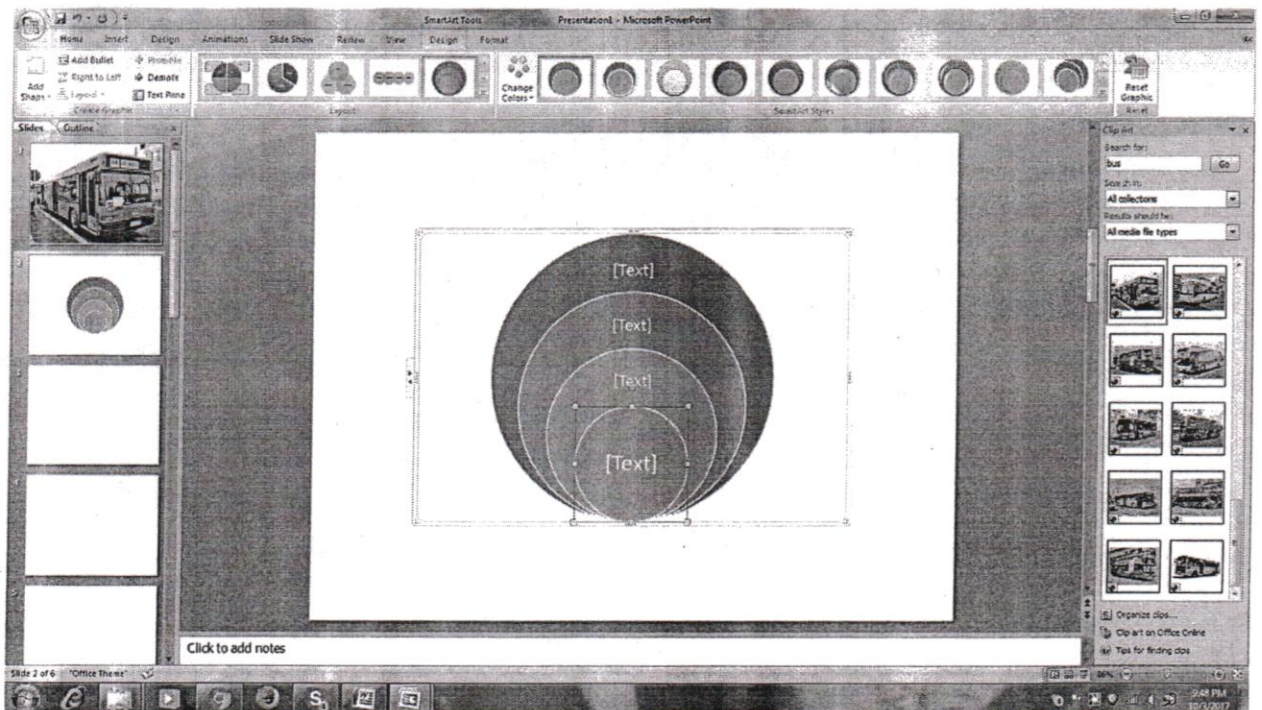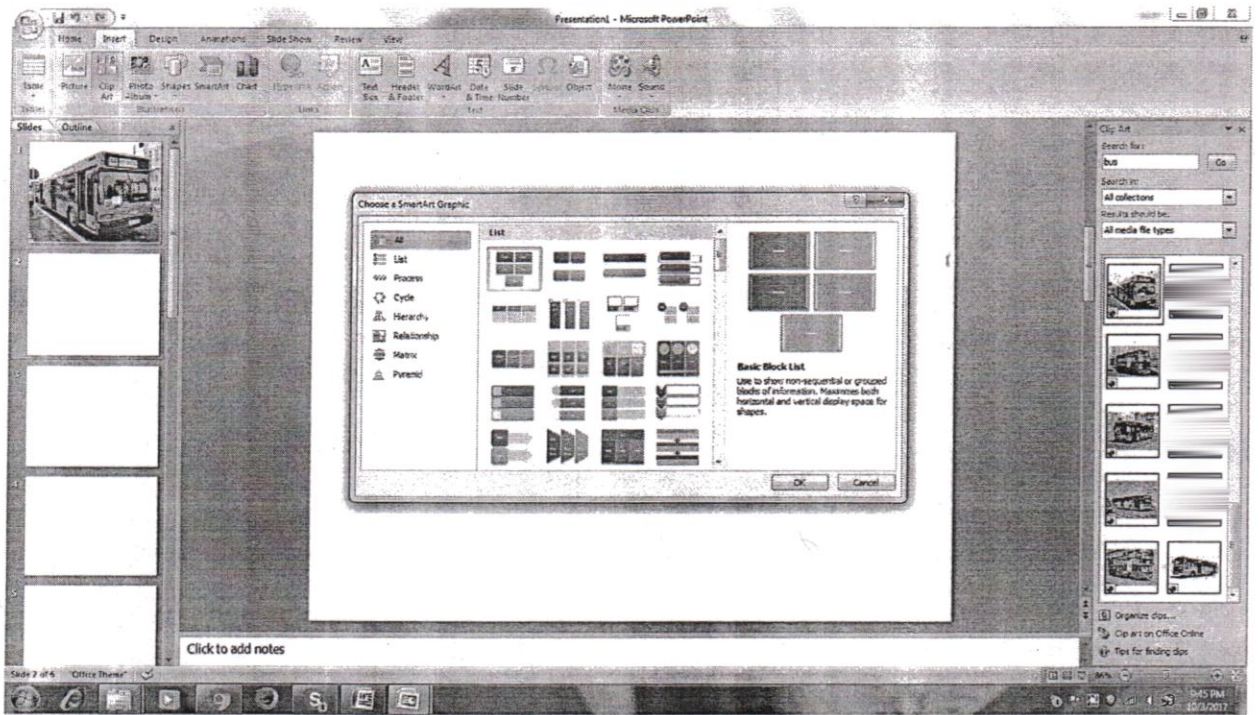
⬇ How to rearrange the sequence of the slides ?

After making the slides if you want to rearrange the pattern or sequence of the slides.

Click on the view > slide sorter view. Keep the cursor on the slide. Drag the slide to its proper place. You can shift it in normal view but if number of slides is more, you can make the changes more easily.
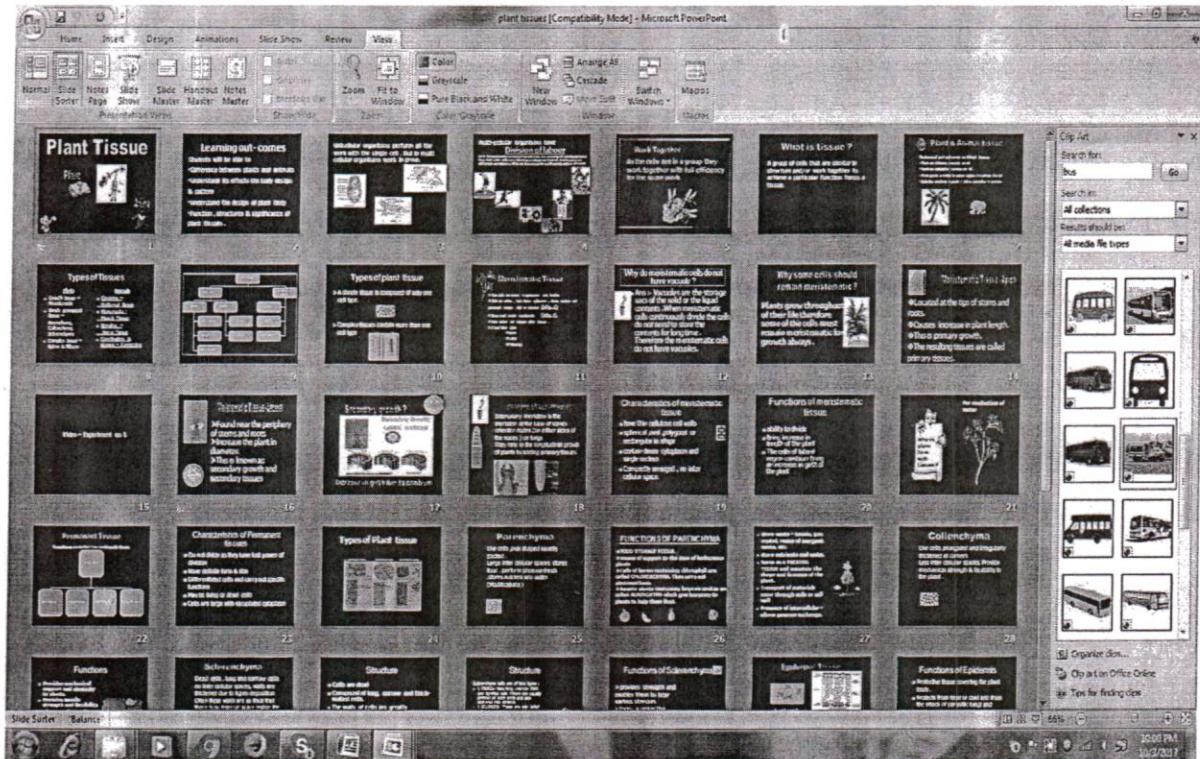
These are some tools which will make your presentation fast smart effective and informative.

Summary of the lesson tissues

Tissue

All living organisms are made up of cell.

- Learning outcomes :-Students will be able to
- Difference between plants and animals
- Understand its effects the body design & pattern

- Understand the design of plant body
- Function, structures & significance of plant tissues.

In unicellular organisms all the life processes are carried out by a single cell. But in multi-cellular organisms all the cells do not perform the functions separately. There is a clear cut division of labour .

Division of labour

They work together to perform a function. When you see in our social set up we depend on others for some specific work all persons canot do all the work efficiently. Similarly it is there in plants. Group of cells with same structure perform some specific function efficiently & are called tissue.

They work together efficiently for a specific function.

In the living world organisms which we see around and can understand as multi-cellular are generally plants and animals.

There is a main difference in the pattern of tissues in plant and animals because:-

- Plants are fixed, animals move in search of food, shelter, protection and mates.
- Plants growth is limited to tips and girth but animals grow uniformly.
- Plants get mechanical strength from dead tissues, animal do not have any dead cells to provide any strength.
  Because of all these differences basic pattern of plants and animals their tissue systems are different.

Simple and complex tissues are different. Simple tissue consists of all similar cells but complex tissue consists of different types of cells and they work together.

In plants the tissues are mainly required for growth, transport and storage. So the tissues which are helpful in growth are named as **meristamatic**. After the division some tissues modify their shapes and permanently perform a specific function. These are called permanent tissues. Simple tissues which are providing mechanical strength to the plant and work for food preparation is **Simple permanent tissue**. Tissues which transport water and prepared food in the plant are complex in structure and are called vascular tissue.

Plant tissues can be classified into 2 groups, Meristematic tissues and Permanent tissues. Plants can grow throughout their life so some tissues remain always meristematic.

Materials required:-Plants of different types .

Meristematic tissues are helpful in growth and in the plants growth regions are specific.

 Meristems are classified by their location in the plant as apical (located at root and shoot tips), lateral (in the vascular and cork cambia), and intercalary (at internodes, or stem regions between the places at which leaves attach, and leaf bases as in grass.

Meristematic tissues do not consists of vacuole because they divide continuously so they do not need to store and do not have vacuoles.

Meristematic cells divide continuously and cause growth of the plant throughout the life.

Apical meristematic tissue is at the tips of root and shoot, they divide to increase length of the root & shoot.

Let us see an experiment if we cut the root tips what will happen.

Experiment script

Take two glasses to jars and fill them with water. Take two onion bulbs and place one on each jar.

Observe the growth of roots in both the bulbs for a few days.

Measure the length of roots on day 1, 2 and 3.

On day 4, cut the root tips of the onion bulb in jar 2 by about 1 cm.

After this, observe the growth of roots in both the jars and measure their lengths each day for five more days and record the observations.

Length	Day 1	Day 2	Day 3	Day 4	Day 5
Jar 1	....cm	...cm	....cm	...cm	....cm
Jar 2	....cm	...cm	....cm	...cm	....cm

We can see the roots of this onion is short than the other. We cut the root tips and because the meristematic tissues are cut, growth of the root stopped.

The lateral meristem is present is responsible for the increase in the girth of the plant. It is found near the periphery of stems and roots and causes secondary growth and wood formation. See in the figure shown

Intercalary meristem is the meristem at the base of leaves oriented nodes (on either side of the nodes) on twigs.

They help in the longitudinal growth of plants by adding primary tissues.

Characteristics of the meristematic tissue -

- have thin cellulose cell walls
- spherical ,oval ,polygonal or rectangular in shape
- contain dense cytoplasm and single nucleus
- Compactly arranged, no inter cellular space.

Simple permanent tissues. They are of four types – parenchyma , colenchyma , sclerenchyma and epithelial .

Characteristics of permanent tissues

- Do not divide as they have lost power of division

- Have definite form & size

- Differentiated cells and carry out specific functions

- May be living or dead cells

- Cells are large with vacuolated cytoplasm

Parenchyma

Live cells, oval shaped loosely packed.

Large inter cellular spaces, stores food, perform photosynthesis, stores nutrient and water (Modifications)

Functions of parenchyma

❖ Food storage tissue .

❖ means of support to the stem of herbaceous plants

❖ Cells of leaves containing chlorophyll are called CHLORENCHYMA. They carry out photosynthesis.

❖ Aquatic plants containing large air cavities are called AERENCHYMA which give buoyancy to plants to help them float.

- Store waste - tannin, gum, crystal, resins of inorganic waste, etc.

- Store nutrients and water.

- Serve as a PACKING TISSUE and maintain the shape and firmness of the plant.

- Transport of materials occur through cells or cell wall

- Presence of intercellular - allows gaseous exchange.

Collenchyma

Live cells, elongated and irregularly thickened at corners

Less inter cellular spaces. Provide mechanical strength & flexibility to the plant.

Functions

- Provides mechanical support and elasticity to plants.

- Provides tensile strength and flexibility.

- Allows easily bending without breaking.

- Cells of collenchyma containing chloroplast, manufacture sugar starch (food).

Sclerenchyma

Dead cells , long and narrow cells no inter cellular spaces, walls are thickened due to lignin deposition Often these walls are so thick that there is no internal space inside the cell .

Structure of sclerenchyma

- Cells are dead

- Composed of long, narrow and thick-walled cells.

- The walls of cells are greatly thickened with deposition of lignin

- No intercellular space.

- Present in stems, around vascular bundles, in the veins of leaves and in the hard covering of seeds and nuts.

Sclerenchyma cells are of two types ;

- 1 FIBRES- Very long, narrow thick and lignified cells. Fibers are usually pointed at both ends and are clustered into strands.

- 2 SCLEREIDS- These are also called grit cells or stone cells and are irregular shaped.

- Dead and develop into various parts of the plants such as cortex, pith, phloem, hard seeds, etc. Sclereids are broad and highly thick-walled sclerenchyma cells which occurs singly or in small groups.

Functions of sclerenchya

➢ Provides strength and enables them to bear various stresses.

➢ Forms a protective covering around seeds and nuts.

➢ Gives rigidity, flexibility and elasticity to the plant body.

Epidermal tissue

Outer layer of cells in the plants, no intercellular spaces, flat in structure, stomata are present in the leaf cells.

Function of epidermal tissue

- Protective tissue covering the plant body .

- Protects from heat or cold and from the attack of parasitic fungi and bacteria .

- It allow exchange of gases and transpiration through stomata .

- Cuticle of epidermis checks the excessive evaporation of water.

Complex tissue
Xylem & phloem

Xylem have 4 types of cells tracheids ,vessels ,xylem parenchyma ,xylem fibres. These tissue conduct water for the plant.

- Also called wood

- Vascular & mechanical tissue

- Composed of 4 elements :-

    - Trachieds

    - Vessels

    - Xylem parenchyma

- Xylem fibers

Xylem conducts water and minerals from root to different parts of plant.

- Thick lignified cells give mechanical support to the plant.

- Only xylem parenchyma is lining which help in lateral conduction and store metabolic waste

Phloem have 4 types cells sieve tubes, companion cells, phloem parenchyma, phloem fibres. These tissue conduct food for the plant.

Living conducting tissue & is composed of four elements:-Sieve tubes, Companion cells, Phloem parenchyma,

Phloem fibers

- Transport food from leaves to the storage organs and later from storage organ to growing part of the body
- Source of commercial fiber as Jute, hemp etc.

These are some tools which will make your presentation fast smart effective and informative.

Thank you

Mrs Ragini Bhatt (PGT)

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Education For Sustainable Development And Science Education

RashmiSinghai
RIE, Bhopal

Science and technology is a systematic study and knowledge of natural and physical phenomena. In this era, scientific education is much emphasized in all societies world over. The main goal of science and technology education is to prepare the right type of environment for the individual, to allow learners grow physically, mentally and spiritually so the learner can develop harmoniously. Inculcation of science and technology education all over the world leads to sustainable development. Over the last five decades or more global environmental changes have taken place due to population growth, industrialization, urbanization, deforestation or selfish human activities resulting in environmental degradation. Therefore, science and technology education is the need of 21st century for better work to safeguard environmental, social and economic wellbeing for both in the present and for future generation. Unplanned actions of man have to be checked to protect and prevent further damage to the environment. It can be inculcated by using science and technology education at school levels for sustainable development. Science education should be recognized as an essential component of school education in achieving effective sustainable development. While teaching about the sustainable development at school to help the children to identify the causative agent of environmental degradation the teacher should act as a facilitator. For the need of sustainable development biotechnology must be recognized as an essential component for school education. Biotechnology is the integration of natural science in order to achieve the application of microorganism for sustainable development in industrial manufacturing, agriculture, food processing, medicine, environmental protection and natural resource conservation. The start of the 21st century has found biotechnology emerging as a key enabling technology for sustainable development. Therefore, science and technology education must be the need for social, environmental, economic benefits and go hand-in-hand to contribute more towards sustainable development.

Science and technology education for sustainable development is the process of equipping students with knowledge and understanding, skills and attributes needed to work and live in a way that safeguards environmental, social and economic wellbeing, both in the present and for future generations(Ahmed, and Stein ,2004) . Sustainable development is the development that meet the need of the present without compromising the ability of future generation to meet their own needs. It can be completed using science and technology transaction in classroom. The term sustainable development is subject to many different interpretations (Kates and Parris, 2003) . The concept of three pillars of sustainability - the economic, social and environmental factors that need to be taken into

consideration and their cultural context. There is increasing recognition that these three factors are interconnected, overlapping and interdependent. So, science education (science and technology) for sustainable development means working with students to encourage them to:

(1) Consider what the concept of global citizenship means in the context of their own discipline and in their future professional and personal lives.

(2) Think about issues of social justice, ethics and wellbeing, and how these relate to ecological and economic factors.

(3) Develop a future - facing outlook, learning to think about the consequences of actions, and how systems and societies can be adapted to ensure sustainable future.

These core themes form the basis of a framework for the knowledge, understanding, skills and attributes fostered through learning for and about sustainability. Students are already familiar with science and technology for sustainable development through school and further education, though not necessarily having encountered it by the name. Science education for sustainable development encourages different disciplines to enter into dialogue, make connections, share knowledge, and work together on emergent areas. It aims to develop student's ability to understand and evaluate connections between big issues, such as inequality, public health, global consumption, biodiversity loss and the limits of natural systems (Rauch ,2004) .

Learning science and technology for sustainable development aims to prepare students to contribute to, stimulate and lead the debate on complex issues such as, global citizenship and good governance, sustainable resource use, and the determination of ecological limits. In future - students are encouraged to think about current and emergent situations relevant to their studies, to gain a wider socioeconomic and environmental perspective on the relevance of their work (Glenn, 2006) . The present guidance is not prescriptive about how science education for sustainable development should be delivered, because it recognizes that educators have their own ideas, will be working with in distinct local, national and international contexts, and will be influenced in most cases by broader institutional strategies. While the guidance is focused on curricular activities, it recognizes that students may also learn through extracurricular activities, both on and off campus, such as volunteering or participation in community-based project (UN ,2002a) . It encourages students to develop critical thinking and to take a wide-ranging, systematic and reflective approach, adapting to novel situations that can arise from complexity. In addition, participatory learning approaches, peer learning and collaboration within and beyond the classroom should be encouraged, allowing students to be exposed to multiple perspectives and enabling creative response to emerge, to sustainable development (Desai, 1997).

Science encourages rational, critical and analytical thinking, learning for and about sustainable development while in school education through science and technology should not be limited to the formal curriculum, wherever, possible teaching-learning and assessment should take into account informal and campus learning opportunities at school levels. There are a number of teaching-learning methods that are likely to be effective depending upon the sustainability challenge to be addressed, such as-

(1) Case studies

(2) Stimulus activities

(3) Simulation

(4) Experiential project work

(5) Problem-based learning.

Experiential, interactive, or participatory activities to engage the students for sustainability issues at numerous levels, not only in relation to their discipline, but also in terms of reflecting on their own values, attitudes and accepted socials norms. Place –based learning can also be used effectively to embed sustainability in the curriculum. In place-based science learning related to sustainable environment development (global warming, climate change, ozone layer depletion, hazardous waste, industrial waste, water pollution, air pollution and soil pollution), student work in collaboration with local communities, public sector bodies, businesses and shakeholders' to define a problem together, using local knowledge, and jointly devising and implementing solutions that will be locally and culturally acceptable (Ahmed, 2004) . Place-based learning might include, for example, students working in partnership with a local community group on a 'real-world' teaching-learning, such as community wellbeing where students can help to improve the physical environment, enhance biodiversity, implement local growing schemes, develop healthy eating programme or design local transport plan to encourage physical activity (Stein, 2002) . This is particularly useful approach for an interdisciplinary programme, since the expertise of students from different disciplines can be brought to the problem or issue identified related to sustainable development through science education. Problem - based learning approaches can be effective for sustainability. This approach is equally suitable for both single and multidiscipline teaching-learning. Problem identification is also an important skill that can be developed through this route. In problem-based learning scenarios, students are usually given an area of interest and are expected to define various aspects of the problem related to sustainable development through science, in order to identify where they can gain further information, to the problem posed. This leads to the development of more democratic classroom environments. Problem-based learning approaches can also lead to deep and transformative learning on the part of students and

develop a wide range of skills for sustainable development through science and technology education.

The aims of the teaching and study of sciences are to encourage and enable students to:

➤ develop inquiring minds and curiosity about science and the natural world
➤ acquire knowledge, conceptual understanding and skills to solve problems and make informed decisions in scientific and other contexts
➤ develop skills of scientific inquiry to design and carry out scientific investigations and evaluate scientific evidence to draw conclusions
➤ communicate scientific ideas, arguments and practical experiences accurately in a variety of ways
➤ think analytically, critically and creatively to solve problems, judge arguments and make decisions in scientific and other contexts
➤ appreciate the benefits and limitations of science and its application in technological developments
➤ understand the international nature of science and the interdependence of science, technology and society, including the benefits, limitations and implications imposed by social, economic, political, environmental, cultural and ethical factorsdemonstrate attitudes and develop values of honesty and respect for themselves, others, and their shared environment

Inculcation of science and technology education all over the world at school levels for proper sustainable development is need of 21st century for better future generation. To achieve this, science teaching-learning in schools must allow students to build skills to- (1) Observe and understand phenomena and explain and propose solutions related to sustainable development. (2) Explore, think creatively and engage with problems around us with a questioning mind, with a scientific temper and make rational decisions. (3) Understand, appreciate the nature around and work to conserve nature. (4) Apply their knowledge to problems and challenges of everyday life and build solutions through systematic thinking and effort. (5) Think innovatively and engage in research related to sustainable development. (6) Build their skills and a productive and healthy life with out polluting our natural resources. Therefore, science and technology education in schools addresses the problems of environment and social equity.

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नाम — शैलेन्द्र कुमार जैन (वरिष्ठ अध्यापक)

शा. उ.मा. विद्यालय, बरारु, सागर

कक्षा — 10 वीं

विषय — विज्ञान

इकाई — 3 (धातु एवं अधातु)

टापिक — धातुऐं

उद्देश्य — कक्षा 10 वीं के विद्यार्थी धात्विक तत्वों की पहचान,उनके भौतिक व रासायनिक गुण तथा उपयोग की समझ बना सकेंगे।

परिचय — प्रकृति में लगभग 118 तत्वों की खोज की जा चुकी हैं इनके गुण भिन्न भिन्न है। पूरी आवर्त सारणी को हम तीन भागों में वर्गीकृत करते है —

(१) धातु   (२) अधातु   (३) उपधातु

आवश्यक सामग्री— (i) for physical properties सोडियम धातु, चाकू, लोहे की रॉड, अलपिन , मोम, बर्नर आदि।

(ii) for Chemical Properties - water, Mg ribbon,बर्नर, वाचग्लास , लिटमस पेपर,

आज हम धातु को समझते है–

भौतिक गुणों के आधार पर धातुओं की पहचान सरलता से की जा सकती है। आवर्त सारणी में बॉयी ओर के तत्व धातुऐं ही है। धातुओं के प्रमुख भौतिक गुण निम्नानुसार है–

(1) धात्विक चमक– प्रत्येक धातु में एक विशिष्ट चमक होती है। यद्यपि यह चमक कुछ ही समय में धुंधली पड़ जाती है। क्योंकि ये वायु से क्रिया कर आक्साइड की परत बना लेती है।

(2) कठोरता– धातुऐं सामान्यत: कठोर होती है। यद्यपि इनकी कठोरता की मात्रा अलग–अलग धातु के लिए अलग अलग होती है।

(3) आघात वर्धनीयता – धातुओं को पीट पीटकर पतली शीट में परिवर्तित किया जा सकता हैं इस गुण को आघात वर्धनीयता कहते है। समस्त धातुओं में सोना व चांदी सबसे ज्यादा आघातवर्धनीयता का गुण रखते है।

(4) **तन्यता** –धातुओं में तन्यता का गुण होता है। अर्थात् उनके पतले, बहुत पतले तार बनाए जा सकते है। सोना में सबसे अधिक तन्यता होती है। लगभग 1 Gm सोने के 2 Km लम्बे तार तग बनाए जा सकते है।

(5) **ताप की सुचालक** – धातुऐं ताप की सुचालक होती है। धातुओं के इसी गुण की वजह से हम धातुओं के बर्तन में खाना पका लेते है।

(6) **विद्युत की सुचालक** – धातुऐं विद्युत की सुचालक होती है। यही कारण है कि धर में विद्युत फिटिंग में Cu या Al के तार लगाये जाते है।

(7) धातुओं में चोट मारने पर विशिष्ट खनक की आवाज आती हैं

धातुओं के रासायनिक गुण

(1) **वायु से क्रिया** – लगभग सभी धातुऐं वायु से क्रिया करके धातु आक्साइड का निर्माण करती है।

$$2Mg_{(s)} + O_{2(g)} \rightarrow 2\,MgO_{(s)}$$
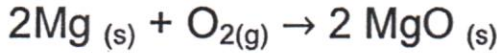
(2) धातओं के आक्साइड क्षारीय प्रकृति के होते है। जब इनको पानी में घोला जाता है। तब ये लाल लिटमस को नील कर देते है।

$$Na_2O + H_2O \rightarrow 2NaOH$$

(3) कुछ धातुओं जैसे Al, Zn के आक्साइड उभयधर्मी प्रकृति के होते है। ये अम्लीय तथा क्षारीय दोनो प्रकार के व्यवहार प्रदर्शित करते है।

$$Al_2O_3 + 6HCl \rightarrow 2\,AlCl_3 + 3\,H_2O$$
(Basic)

$$Al_2O_3 + 2\,NaOH \rightarrow 2NaAlO_2 + H_2O$$
(Acidic)

तथा

$$ZnO + 2HCl \rightarrow 2\,AlCl_3 + 3\,H_2O$$
(Basic)

$$ZnO + 2NaOH \rightarrow Na_2\,ZnO_2 + H_2O$$
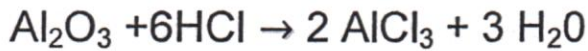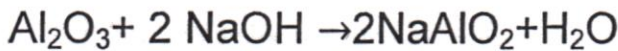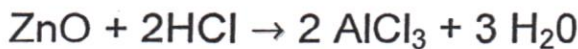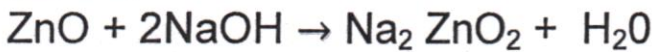
(४) **एनोडाइजिंग** – धातुओं की सतह पर आक्साइड की मोटी पर जम जाना एनोडाइजिंग कहलाता है। इस प्रक्रिया में शुद्ध धातु को एनोड बनाते है। तथा H_2SO_4 विद्युत

अपघट्य होता है। जब विद्युत धारा प्रवाहित की जाती तब O_2 गैस मुक्त होती है। तथा धातु से क्रिया कर मोटी आक्साइड की परत बनाती है।

(५) धातुओं की पानी से क्रिया – धातुएँ पानी से क्रिया करने धातु आक्साइड का निर्माण करती है। जो धातु के हाइड्रोक्साइड बनाते हैं।

(i) $2k + 2H_2O \rightarrow 2KOH + H_2 + Heat$

$2Na + 2H_2O \rightarrow 2NaOH + H_2$
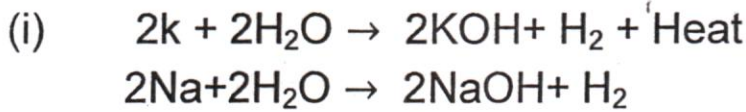
इन क्रियाओं में उष्मा का उत्सर्जन इतनी मात्रा में होता है कि हाइड्रोजन गैस लो के रूप में डालने लगती है।

(ii) Ca धातु पानी से क्रिया अपेक्षाकृत कम उग्रता से करती है, इस क्रिया में इतनी उष्मा नहीं निकलती कि हाइड्रोजन गैस आग पकड़ ले।

$Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2 + Heat$

कैल्शियम धातु का सतह पर हाइड्रोजन गैस के बुलबुले जमा हो जाने के कारण Ca धातु का टुकड़ा पानी पर तैरने लगता है।

(iii) Mg धातु ठंडे पानी के साथ क्रिया नहीं करता। गर्मपानी के साथ यह मैग्निशियम हाइड्राक्साइड बनाता है।

$Mg_{(s)} + 2H_2O_{(l)} \rightarrow Mg(OH)_2 + H_2$
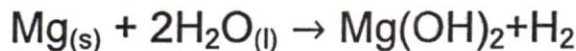
(iv) Al, Fe, Zn ठंडे या गर्म पानी के साथ क्रिया नहीं करते। ये भाप के साथ क्रिया करके धातु आक्साइड व हाइड्रोजन उत्पन्न करते है।

$2Al(s) + 3H_2O(g) \rightarrow Al_2O_3 + 3H_2(g)$

$3fe(s) + 4H_2(g) \rightarrow Fe_3O_4 | + 4H_2(g)$
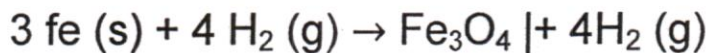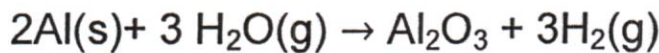
(v) Pb, Cu, Ag और Au पानी से किसी भी स्थिति में क्रिया नहीं करते। अतः पानी से धातुओं की क्रियाशीलता का क्रम इस प्रकार है–

$K > Na > Ca > Mg > Al > Fe > Pb > Cu > Ag > Au.$

6- धातुओं की तनु अम्लों से क्रिया–

(i) dil HCl and dil H_2SO_4 से क्रिया –कुछ कम क्रियाशील धातुओं जैसे Cu, Hg, Ag Au, pt, etc को छोड़कर अन्य सभी धातुएँ तनु HCl व H_2SO_4 से क्रिया करके लवण और हाइड्रोजन गैस उत्पन्न करती है।

$Zn + 2HCl \rightarrow ZnCl_2 + H_2 \uparrow$

$Mg + H_2SO_4 \rightarrow MgSO_4 + H_2 \uparrow$
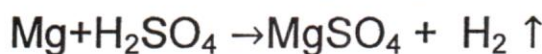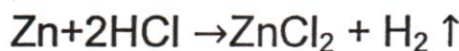
(२) धातुओं की तुन HNO_3 पर अभिक्रिया Mg, Mn को छोड़कर अन्य कोई धातु $dil\ HNO_3$ से क्रिया करके H_2 मुक्त नहीं करती क्योंकि HNO_3 की प्रकृति आक्सीकारक होती है।

सामान्यत:

धातु $+ dil\ HNO_3\ \rightarrow\ Salt + NO_2/\ N_2O \uparrow +\ H_2O$

$Mn/Mg + dil\ HNO_3\ \rightarrow\ Salt + H_2 \uparrow$

(२) धातु के लवणों के साथ अन्य धातु की क्रिया – अधिक सक्रिय धातु कम सक्रिय धातु को उसके यौगिक के विलयन में से विस्थापित कर देती है।

$Cu\ (s) + 2\ AgNO_3\ \rightarrow\ Ca(NO_3)_2 + 2\ Ag$
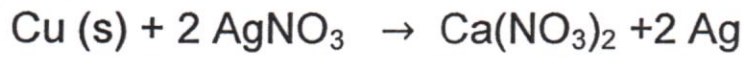
धातओं सक्रियता श्रेणी – सक्रिय धातु कम सक्रिय धातुओं की उनके लवण के विलयन में से विस्थापित कर देती हैं इस आधार पर धातुओं का क्रम सक्रियता श्रेणी कहलाता है।

सक्रियता श्रेणी का महत्व		
	K	वे धातुएँ जो सक्रियता श्रेणी में हाइड्रोजन के ऊपर रखी गई है वे भ्ॅ या भ्ॅवत में से हाइड्रोजन गैस को विस्थापित कर सकती है।
	Na	
	Ca	
	Mg	
	Al	ऊपर आने वाली धातु अपने नीचे आने वाली धातुओं को उनके लवण के विलयन में से विस्थापित कर सकती है।
	Sn	
	Pb	
	H	
	Cu	
	Hg	
	Ag	
	Au	

इस प्रकार हमने धातुओं को भौतिक गुण तथा रासायनिक गुणों के आधार पर समझा।

ॅ अधातु—अधातुओं के भौतिक व रासायनिक गुण

कार्बन, सल्फर, आयोडिन, आक्सीजन, हाइड्रोजन आदि अधातुओं के उदाहरण है। ये ठोस, द्रव व गैस किसी भी अवस्था में पाई जाती है। (Br द्रव अवस्था में पाया जता है), इनके भी विशिष्ट गुण होते है जिनसे इनकी पहचान होती है ये सभी विद्युत ऋणात्मकता करते है।

भौतिक गुण :—

१. **भंगुरता** —अधातुएँ ठोकर मारने पर टूट जाती है। यह गुण भंगुरता कहलाता है।

२. **धात्विक चमक** — अधातुओं में धातुओं जैसी चमक नही होती है। कुछ अधातुओं में जैसे हीरा, आयोडीन ग्रेफाइट में चमक तो होती है पर ये अधातु ही है।

३. **ताप एवं विद्युत के कुचालक** — अधातुएँ सामान्यत: ताप एवं विद्युत के कुचालक होते है पर (अधातु होते हुये) ग्रेफाइट विद्युत की सुचालक है।

४. **गलनांक व क्वथनांक** — सामान्यत: अधातुओं के गलनांक व क्वथनांक अपेक्षाकृत उच्च होते है। जैसे B,Si,C etc.

रासायनिक गुण :–

१) अधातुओं की आक्सीजन (वायु) से क्रिया अधातुओं की आक्सीजन से क्रिया कर आक्साइड बनाते है। इनके आक्साइड अम्लीय होते हैं। कुछ ही आक्साइड उदासीन आक्साइड है।

$C+O_2 \rightarrow CO_2$

$S+ O_2 \rightarrow SO_2$

$CO_2(g) + H_2O(l) \rightarrow H_2CO_3 (aq)$

$SO_2 (g)+ H_2O (l) \rightarrow H_2SO_3 (aq)$

CO, H_2O, N_2O
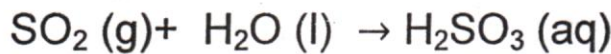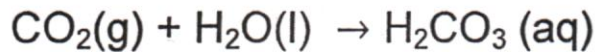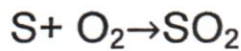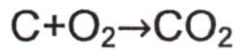
२. अधातुओं की पानी की पानी से क्रिया — अधातुएँ पानी से संभव हैं क्रिया करके हाइड्रोजन मुक्त नहीं करती क्योंकि अधातुएँ पानी के हाइड्रोजन को इलेक्ट्रान प्रदान नहीं कर सकती ।

३. अधातुओं पर अम्ल की क्रिया अधातुएं अम्ल के साथ क्रिया करके हाइड्रोजन गैस उत्पन्न नहीं करती क्योंकि अधातुऐं इलेक्ट्रान का त्याग करने में असमर्थ रहती है।

४. विस्थापन अभिक्रियाऐं – अधातुऐं विस्थापन अभिक्रियाऐं प्रदर्शित करती है जैसे:-

$$Cl_2 + 2NaBr \rightarrow 2\ NaCl + Br_2$$
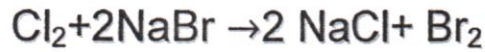
५. सहसंयोजनक यौगिको का निर्माण अधातुऐं – अधातुओं से मिलकर सहसंयोजक यौगिकों का निर्माण करती है जैसे

$$H_2(g) + S \rightarrow H_2S$$
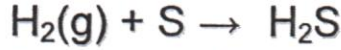
अधातुओं व धातुओं के अपवाद–

१) सामान्य ताप पर सभी धातुएं ठोस अवस्था में होती है। केवल भ्र द्रव अवस्था में है।

२) गैलियम व सीजियम धातुऐं के गलनांक बहुत कम होते है, हथेली पर रखते ही गलने लगते है।

३) आयोडिन, हीरा व ग्रेफाइट में चमक होती है यद्यपि वे अधातु है।

४) अधातु होते हुए भी हीरा का बहुत गलनांक होता है तथा बहुत कठोर होता हैं

५) क्षार धातुओं के घनत्व और गलनांक बहुत कम होते है तथा वे इतने नरम होते है कि चाकू काटे जा सकते है।

६) ग्रेफाइट अधातु होते हुये भी विद्युत का सुचालक होता है।

धातुओं की अधातुओं के साथ क्रिया –

आयनिक यौगिक – धातुऐं विद्युत घनात्मकता प्रदर्शित करती है अर्थात धात्विक तत्व में परमाणु अपना इलेक्ट्रान त्याग करने की प्रवृत्ति रखते हैं। जबकि अधात्विक परमाणु इलेक्ट्रान ग्रहण कर अपने ऊपर ऋण आवेश उत्पन्न कर लेते हैं। इस प्रकार धातुएं व अधातुएं इलेक्ट्रॉन त्याग कर अथवा इलेक्ट्रान ग्रहण कर यौगिकों का निर्माण करते हैं जिन्हें विद्युत संयोजी यौगिक अथवा आयनिक यौगिक कहते हैं ।

उदाहरण :–   NaCl   का निर्माण

$$Na \rightarrow Na^+ + e^-$$

$$Cl + e^- \rightarrow Cl^-$$

$$(2.8,7) \qquad\qquad 2,8,8$$

$$Na^+ + Cl^- \rightarrow [Na^+]\,[Cl^-]\ \text{or Na Cl}$$

आदर्श गैस समूह या शून्य समूह के सभी तत्वों में स्थाई इलेक्ट्रॉनिक विन्यास ns^2np^6 होता है, ये तत्व इलेक्ट्रॉनों का आदान प्रदान नहीं करते, इसलिए यौगिक नहीं बनाते।

आयनिक यौगिकों के गुण –

१. धनात्मक व ऋणात्मक आयनों के बीच प्रबल आकर्षण बल होने के कारण आयनिक यौगिक क्रिस्टलीय ठोस होते हैं ये सामान्यत: दाब आरोपित किये जाने पर टुकड़ों में टूट जाते हैं।

२. गलनांक और क्वथनांक – प्रबल विद्युतीय आकर्षण बल को तोड़ने के लिए अधिक मात्रा में ऊर्जा (ऊष्मा) की आवश्यकता होती है इसलिए आयनिक यौगिकों के गलनांक व क्वथनांक उच्च होते हैं ।

३. विलेयता – आयनिक यौगिक ध्रुवीय विलायकों में (जैसे पानी) में घुलनशील होते हैं जबकि अध्रुवीय विलायकों जैसे–बैंजीन, कार्बनटेट्रा क्लोराइड में अघुलनशील होते हैं ।

४. विद्युत चालकता – विद्युत संयोजी / आयनिक यौगिक ठोस अवस्था में विद्युत का चालन नहीं करते। पर जलीय विलयन में ये यौगिक आयनों में विभाजित हो जाते हैं। आयनों में विभाजित होने पर ये यौगिक विद्युत का चालन कर सकते हैं।

धातुओं का निष्कर्षण –

धातु के यौगिकों में से शुद्ध धातु प्राप्त करना धातु का निष्कर्षण कहलाता है। कुछ धातुएं जैसे Au, Ag, Pt etc. कम क्रियाशील होने के कारण प्रकृति में स्वतंत्र अवस्था में पाई जाती हैं। Cu, Ag संयुक्त अवस्था में सल्फाइड या आक्साइड के रूप में भी पाई जाती है। सक्रियता श्रेणी में सबसे उपर आने वाली धातुएं जैसे K, Na, Ca, Mg, etc कभी भी स्वतंत्र अवस्था में नहीं पायी जाती। मध्यम क्रियाशील धातुएं पृथ्वी की सतह पर मुख्यत: आक्साइड, सल्फाईड, या कार्बोनेट के रूप में पायी जाती है। क्रियाशीलता के आधार पर विभिन्न धातुओं के निष्कर्षण हेतु विभिन्न विधियॉ उपयोग में जाती है।

निष्कर्षण से संबंधित विभिन्न शब्दावली –

१. खनिज– प्राकृतिक रूप से पृथ्वी की उपरी सतह में पाये जाने वाले तत्व या यौगिक खनिज कहलाते हैं।

२. अयस्क – वे खनिज जिनके कोई विशिष्ट धातु सस्ती व सरल विधियों का उपयोग कर अधिक मात्रा में प्राप्त किया जा सके अयस्क कहलाते हैं।

३. गेंग – अयस्कों में पाये जाने वाले अवांछित पदार्थ जैसे मिट्टी, रेत, आदि गेंग कहलाते हैं।

४. अयस्क का शोधन – अयस्क से गेंग को हटाना अयस्क का शोधन कहलता है। गेंग के भौतिक व रासायनिक गुणों के आधार पर ही शोधन के लिए विधि निर्धारित करते हैं।

३. कॉपर ग्लास (Cu_2S) से – जब Cu_2S को वायु की उपस्थिति में गर्म किया जाता है तो आंशिक ऑक्सीजन हो जाता है। यह Cu_2O बचे हुए Cu_2S के साथ किया कर कॉपर धातु प्राप्त होती है।

$$2Cu_2S\ (s) +\ 3O_2\ (g) \rightarrow\ 2Cu_2O\ (s) + 2SO_2\ ^{(g)}$$

$$2Cu_2O\ (s) + Cu_2S(s) \xrightarrow{\Delta}\ 6Cu(s) + SO_2\ (g)$$
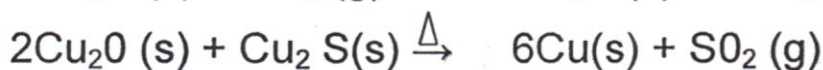
२. मध्यम क्रियाशाली वाली धातुओं का निष्कर्षण मध्यम क्रियाशील धातुएं प्रकृति में सामान्यत: सल्फाइड और कार्बोनेट के रूप में पाई जाती है। ये सल्फाइड या कार्बोनेट अयस्क पहले आक्साइड परिवर्तित किये जाते हैं क्योंकि धातु आक्साइड से धातु प्राप्त करना सरल होता है।

(१) धातु सल्फाइड का भर्जन कर धातु आक्साइड प्राप्त करते हैं –

$$i.e.\ Zn\,S\ (s) + 3O_2\ (s)\ \rightarrow\ 2ZnO\ (s) + 2\,SO_2\ (g)$$
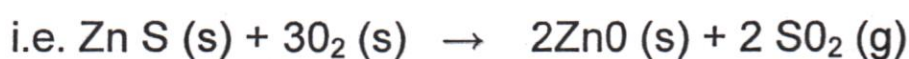
(२) धातु कार्बोनेटों का विस्तापन कर धातु आक्साइड प्राप्त करते हैं –

$$ZnCO_3\ (s)\ \rightarrow Heat\ \ ZnO\ (s) + CO_2\ (g)$$

तब धातु आक्साइउ का कोक या उचित अपचायक द्वारा अपचयन कर धातु निष्कर्षित की जाती है –

$$ZnO(s) + C\ \xrightarrow{\Delta}\ Zn\ (s) + CO\ (g)$$
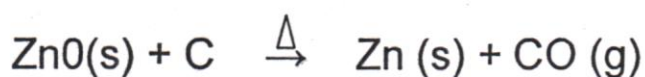
➤ कभी–कभी विस्थापन अभिक्रिया का उपयोग भी MOx के अपचयन किया जता है। अधिक क्रियाशील धातु जैसे $Na, Ca, Al\ etc$ का उपयोग धातु ऑक्साइड का अपचयन करने के लिए किया जाता है। क्योंकि ये धातु सक्रियता श्रेणी में नीचे आने वाली धातुओं को उनके योगिकों के विलयन में से विस्थापित कर सकती है जैसे –

$$3MnO_2\ (s) + 4Al(s)\ -\ 3\ Mn + 2Al_2O_3\ (s) + Heat$$

५. ऑक्साइडों का अपचयन — धातु के ऑक्साइडों को धातु में बदलने की प्रक्रिया अपचयन कहलाती है।

६. भर्जन— वायु के आधिक्य में एल्फाइड अयस्कों को उक्तताप पर गर्म कर ऑक्साइड में बढने की प्रक्रिया भर्जन कहलाती है।

७. निस्तापन — वायु की अनुपस्थिति में या नियंत्रित उपलब्धता में कार्बोनट या सल्फेट अयस्कों को गर्म कर ऑक्साइड में परिवर्तित करना निस्तापन कहलाता है।

— धातु के निष्कर्षण के विभिन्न पद —

१. कम क्रियाशील धातुओं का निष्कर्षण इन धातुओं के आक्साइड को मात्र गर्म करने पर ही अपचयित किया जा सकता है जैसे सिनेबार HgS से

$$2HgS(s) + 3O_2(j) \xrightarrow{\Delta} 2HgO + g + 2SO_2(g)$$
$$2HgO(s) \xrightarrow{\Delta} 2Hg(l) + O_2(g)$$
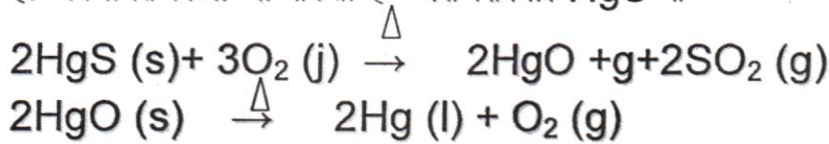
ये विस्थापन अभिक्रियाएं उष्माक्षेपी अभिक्रिया होती है तथा उष्मा इतनी अधिक होती है कि प्राप्त धातु पिघली अवस्था में होती है।

➤ आयरन ण्ण् आक्साइड (Fe_2O_3) की Al के साथ होने वाली अभिक्रिया रेलवे ट्रेक या टूटे हुए मशीनी पार्ट को जोडने (वेल्डिंग) के काम आती है।

३. बहुत अधिक क्रियाशील धातुओं का निष्कर्ष ऐसी धातुओं के योगिकों को कार्बन या अन्य किसी आवश्यक की सहायता से अपचयित नहीं किया जा सकता क्योंकि ये इनकी ऑक्सीजन के प्रति आकर्षण अत्यंत अधिक होता है। इसलिए इन धातुओं के आक्साइड का विद्युतीय अपचयन किया जाता है। इस अपघटन में शुद्ध धातु कैथोड पर जमा हो जाती है। धातु के क्लोराइड का विद्युत अपघटन निम्नानुसार होता है।

At cathode $M^+ + e^- \rightarrow M(s)$
At Anode $2Cl^- \rightarrow Cl_2 + 2e^-$

४. धातु का सोधन — उक्त पूरी प्रक्रिया से प्राप्त धातु में अशुद्धियाँ भी होती हैं जिनको सामान्यतः विद्युत अपघटन विधि से शुद्ध किया जाता है।

इस विधि में अशुद्ध धातु का द्वकम तथा शुद्ध धातु की पट्टी को कैथोड बनाया जाता है। उसी धातु के किसी लवण का विलयन इलेक्ट्रोलाइट की तरह उपयोग में लाया जाता है, जब विद्युत धारा प्रवाहित की जाती है तब अशुद्ध धातु के एनोड में से

शुद्ध धातु कैथोड पर जमा होने लगती है तथा अशुद्धियाँ नीचे अवक्षेपित हो जाती है जिसे एनोडमड कहते हैं। अभिक्रिया इस प्रकार होती है –

$$\text{At cathode} - \quad M^{n+} + ne^- \rightarrow M \text{ as } cu^{++} + ze^- \rightarrow cu$$
$$\text{At Anode} \quad M \rightarrow M^{n+} + ne^- \text{ as } Cu \rightarrow Cu^{++} + 2e^-$$
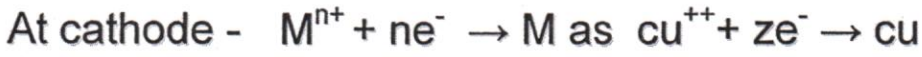
संक्षारण

वायुमण्डलीय हवा एवं नमी के द्वारा धातुओं का धीरे–धीरे क्षय होना संक्षारण कहलाता है, जैसे– लोहे पर जंग लगना, चांदी के ऊपर काली परत ,कापर के उपर हरे रंग की कोटिंग होना

–संक्षारण से बचाव –

१. पेंटिंग
२. ग्रीसिंग।
३. गैल्वनीकरण – लोहे पर जस्ते की परत चढाना गैल्वनीकरण कहलाती है। लोहे की वस्तु के पिघले हुए Zn में डुबाकर गैल्वनीकरण किया जाता है।
४. मिश्रधातु बनाना – इस विधि से किसी धातु के गुणों में वांछित परिवर्तन दूसरी एक या कई धातुओं को मिलाकर किये जाते हैं – ''दो या दो से अधिक धातुओं अथवा धातु और अधातु के संभागी मिश्रण को मिश्रधातु कहते हैं''? मिश्र धातु की विद्युत चालकता तथा गलनांक शुद्ध धातु की तुलना में कम होते हैं।

१. जैसे– अमलगम :– यदि किसी मिश्र धातु में एक घटक मरकरी(Hg) है तो यह मिश्रण अमलगम कहलाता है।

२. Alloying of Gold - शुद्ध सोना बहुत नरम होता है यह २४ कैरेट सोना कहलाता है। नरम सोने की कठोरता तथा मजबूती प्रदान करने के लिए मिश्रधातु बनाया जाता है, जिसमें Cu या Ag सोने में मिलाई जाती है। २२ कैरेट गोल्ड का अर्थ है २२ भाग सोना तथा २ भाग Cu/Ag

–विभिन्न मिश्र धातुएं एवं उनका संघटन् –

S.No.	Allog	Composition	Uses

१	पीतल Brass	Cu, zn	Utensils, taps
२	कांसा Bronze	Cu, sn	Medals, statues, values
३	टाका Solder	Pb, Sn	Welding electrical values
४	स्टील Steel	Fe, C	Machine parts
५	जंगरहित लोहा stonless steel	Fe, Ni, Cr	Utensils, surgical, methods
६	ड्यूरालुमिन	All, Cu, Mg, Mn	Aircraff parts
७	जर्मन सिल्वर	Cu, Ni, Zn	Artificial Jwellery
८	गन मेटल	Cu, Zn, Sn	Spectacles

मूल्यांकन :–

१. कोई एक उभयधर्मी आक्साइड का सूत्र बताईये।

२. हेबर विधि से अमोनिया के निर्माण में उत्प्रेर के रूप में किस धातु का उपयोग किया जाता है।

३. उस धातु का नाम बताइये जो द्रव अवस्था में है।

४. उस धातु का नाम बताइये जो हवा से तुरंत क्रिया कर लेता है।

५. सबसे अधिक तन्यता का गुण रखने वाली धातु का नाम है।

SCRIPT

PERIODIC CLASSIFICATION OF ELEMENTS
CLASS X   JAGRATI SHARMA

STORY BOARD:

Slide 1   title

Slide 2

- Picture of a shopping mall

Observe this picture:

How the articles are arranged?
Articles similar in use are kept together, you may also say that even they are segregated
brand wise and kept further according to their weight/ size
Why are they arranged so ?
Definitely they are arranged so, for our convenience to locate them
…What this can be termed as?
…………………….This may be called as grouping
slide 3

Picture of a child breathing deeply

Now breathe deeply
- Which gas you intake while breathing,
- Of course Oxygen
- Which other gas is present in the atmosphere more than oxygen?
- Yes Nitrogen
- Both are elements and present in the atmosphere so can they be grouped together ?
  BEFORE WE GET ANSWER

let us see how many more elements name you can recollect

Say;
Sodium, potassium, helium , Aluminum, Iron, copper, gold, platinum etc
Can we group them-
Definitely scientist must have tried to make such attempts
Let us discuss the need in present scenario:

Slide 4
Why should we classify elements:

- Before the 1800's, scientists did not consider the idea of patterns occurring
  between the known elements.
- Elements were considered unique and unrelated to any other element.
- Later, evidence suggested that elements could be sorted out in a particular order
- Classifying elements can help us understand the interrelationships between the
  physical and chemical properties of the substances better.

- For classification of elements, it is necessary that the elements which belong to a certain class must have similar properties.

Slide 5
BRIEF INTRODUCTION
- There are more than 115 elements known to scientists today and the search for more elements continues
    Since it is very difficult to study these elements and their properties individually, they have been classified using certain criteria

Slide 6
DEFINITION-
Periodic classification of elements in short is the method of organizing elements in a systematic way.
Developments made on earlier efforts for classification of elements ultimately led to formation of the modern periodic table.

Slide 7
Evolution of classification

Here are some of the early efforts made my scientists to classify elements:
ANTOINE LAVOISIER'S METHOD OF CLASSIFICATION
DOBEREINER'S TRIADS
NEWLAND'S LAW OF OCTAVES
MENDELEEV'S PERIODIC TABLE
MODERN PERIODIC TABLE

Slide 8
DOBEREINER'S TRIADS

The German chemist, Johann Dobereiner was the first to consider the idea of trends among properties of elements.
He noted a similarity among physical and chemical properties of several groups of 3 elements, called triads.
Also in each triad, the atomic mass of the middle element was found to be the average of the atomic masses of the first and last element in that triad

Slide 9
Triad one

This triad includes LITHIUM, SODIUM and POTASSIUM. They belong to the same triad due to the following properties:
They are very reactive metals
They form salts containing one positive ion (+1).
Almost all such salts formed are soluble.
They react violently with water to produce hydrogen and soluble ionic hydroxides.

Slide 10
Triad two
This triad includes CALCIUM, STRONTIUM AND BARIUM

Slide 11
TRIAD THREE
This triad includes CHLORINE, BROMINE and IODINE

Slide 12
DRAW BACK OF DOBEREINER'S TRIADs

Consider atomic mass of Cl as 35.5, Iodine as 126.9
Find the average to get atomic mass of Bromine-

$$\frac{35.5 + 126.9}{2} = 81.2 \ (\text{ACTUAL IS } 80)$$

This was not applicable for higher elements.
THERE WERE LIMITED TRIADS FORMED.
Slide 13
Newland law of octaves-

Do, re, mi, fa,so,la, ti
oSa re ga ma pa dhanisa
Based on musical notes as used in west and India he noticed that on placing the elements
in increasing order of atomic mass, every eighth element had similar properties to that of
the first.
Slide 14
NEWLAND'S TABLE-
He called this the law of octaves as this property resembled octaves in music.

Slide **15**
Drawback of Newland's law:
However, his method of classification was not very successful since:
1. It was not valid for elements that had atomic masses higher than Ca.
2. When further elements were discovered, such as the noble gases (He, Ne, Ar) they
   could not be accommodated in his table
Slide 16
CAPTION FOR VIDEO
Before we proceed further to Mendleev's classification lets get some insight to his
biography through this video

Slide 17
VIDEO
Imagine a boy 13 yrs old whose father expired leaving more than 10 siblings . His mother
managed with the glass factory but due to fire in the factory everything was destroyed, his
mother knew his scientific approach and with belief she got him admitted to st.Petersberg
university and has created history . The little boy was Mendleev.
Slide 18and slide 19
MENDLEEV'S PICTURE AND HIS TABLE
INTRODUCTION
Russian chemist Mendeleev arranged elements on the basis of atomic mass and chemical
properties of elements.

He arranged the elements in increasing order of atomic mass into vertical columns called groups and horizontal rows called periods.

The eighth group consisted of transition elements . The group number indicated valency of the elements.

Slide 20 and 21

FEATURES and PERIODIC TABLE AS PUBLISHED IN GERMAN JOURNAL:

- Also, formulae of common oxides and hydrides were placed in every group.
- The third period was considered to be the representative period, i.e. each element in the third group was the representative of its respective group.

Since chemical property of the element was given more priority, at some places, elements with lower atomic mass succeeded the higher

Slide 22

MERITS OF MENDELEEV'S PERIODICTABLE: Mendeleev's periodic law: " *the properties of elements are a periodic function of their atomic weights"*

- ❖ It was an extremely systematic classification at the earlier times.
- ❖ There was a regular gradation in physical and chemical properties of elements.
- ❖ He left spaces in the periodic table for the elements to be discovered. So, when new elements were discovered, he did not have to disturb the existing order of his periodic table. He named some of the to be discovered elements as Eka-Boron, Eka-Aluminium and Eka-silicon.
- ❖ He also predicted the properties of these undiscovered elements including atomic masses. These elements were discovered as Scandium, Gallium and Germanium with same features as he predicted.
- ❖ Mendeleev's arrangement helped to correct atomic masses of a number of elements.

Slide 23

- ❖ **DEMERITS OF MENDELEEV'S PERIODIC TABLE**
- ❖ Firstly, arrangement of elements on the basis of increasing atomic mass i was the root cause of all the other demerits of Mendeleev's periodic table.
- ❖ For placing the elements in proper groups, the order of the elements according to atomic mass was reversed in certain cases. He placed Iodine (127) after Tellurium (128) Potassium (39) and Ni (58)   after Co (59) which is against his periodic law (but correct according to properties.)
- ❖ Alkali metals and coinage metals (Cu, Ag and Au) which differ widely in properties were placed into the same group.
- ❖ There was no separate position for isotopes in his periodic table.
- ❖ The change in atomic mass of two successive elements is not constant. Hence it is not possible to predict the number of missing elements by knowing the atomic masses of two known elements.
- ❖ Controversial position of hydrogen, i.e. hydrogen could be placed in group one and group seven

Slide-1	Sound	
Slide-2	Sound is the form of energy which produces then sensation of hearing.	
Slide-3	Sound is produced due to the vibration of objects. Vibration is the rapid to and fro motion of an object.	
Slide- 4	Eg :- The sound of human voice is produced due to the vibration of the vocal cords. A stretched rubber band when plucked vibrates and produces sound.	DEMONSTRATION
Slide- 5,6,7	Production of sound :- Activity :- Strike the prongs of a tuning fork on a rubber pad and bring it near the ear. We can hear a sound. If a suspended table tennis ball is touched with the vibrating prong, the ball is pushed away repeatedly. This shows that the prong is vibrating and vibrating objects produces sound	DIAGRAM
Slide-8 Slide- 9 Slide-10 Slide- 11	Characteristics of the medium required for the propagation of sound: (i) Medium must be elastic so that the medium particles have the tendency to return back to their original positions after the displacement. (ii) Medium must have the inertia so that its particles have the capacity to store the energy. (iii)The frictional resistance of the medium should be negligible to minimise the loss of energy in propagation.	
Slide- 12 Slide- 13 Slide-1 4 Slide- 15 Slide- 16 Slide- 17	Propagation of sound The sound produced by a vibrating object travels through a medium to a listener. The medium can be solid, liquid or gas. When an object vibrates, the particles around the medium vibrates. The particle in contact with the vibrating object is first displaced from its equilibrium position. It then exerts a force on the adjacent particle and the adjacent particle is displaced from its position of rest. After displacing the adjacent particle the first particle comes back to its original position. This process repeats in the medium till the sound reaches the ear. The disturbance produced by the vibrating body travels through the medium but the particles do not move forward themselves	FIGURE
Slide- 18	Since sound waves are produced due to the vibration of particles of the medium sound waves are called mechanical waves.	
Slide- 19	A wave is a disturbance which moves through a medium by the vibration of the particles of the medium. So sound is considered as a wave.	FIGURE
Slide- 20 Slide- 21 Slide- 22 Slide- 23 Slide- 24 Slide- 25 Slide- 26	HOW SOUND PROPAGATES IN AIR Air is the most common medium through which sound travels. When a vibrating object moves forward, it pushes and compresses the air in front of it forming a region of high pressure called compression (C). The compression moves away from the vibrating object. When the vibrating object moves backward, it forms a region of low pressure called rarefaction (R). As the object moves to and fro rapidly, it produces a series of	FIGURE ANIMATION

	compressions and rarefaction in the air which makes the sound to propagate in the medium.	
Slide-27 Slide-28 Slide-29 Slide-30 Slide-31 Slide-32 Slide-33	Sound needs a medium to travel Sound is a mechanical wave and needs a medium for propagation. Sound travels through solids, liquids and gases. Sound does not travel in vacuum. Activity • Suspend an electric bell in an air tight bell jar. Connect the bell jar to a vacuum pump. If the switch is pressed, we can hear the sound of the bell. If air is pumped out through the vacuum pump, we cannot hear the sound of the bell. This shows that sound needs a medium to travel and sound cannot travel in vacuum.	FIGURE ANIMATION VEDIO

Slide-34
Slide-35
Slide-36
Slide-37
Slide-38
Slide-39
Slide-40
	TYPES OF THE WAVE
	Mechanical waves : A mechanical wave is a periodic disturbance which requires a material medium for its propagation. On the basis of motion of particles the mechanical waves are classified into two parts.
	     (a) Transverse wave
	     (b) Longitudinal wave
	Longitudinal wave : When the particles of the medium vibrate along the direction of propagation of the wave then the wave is known as the longitudinal wave. EX. sound wave in air.
	Transverse wave :When the particles of the medium vibrate in a direction perpendicular to the direction of propagation of the wave, the wave is known as the transverse wave. Ex. Waves produced in a stretched string.
	Electromagnetic waves : The waves which do not require medium for propagation are called electromagnetic waves these waves can travel through vacuum also. For example, light waves, X-rays.
		ANIMATION

Slide-41 Slide-42 Slide-43 Slide-44 Slide-45 Slide-46	Sound waves are longitudinal waves Sound propagates in a medium as a series of compressions (C) and rarefactions (R). In these waves the particles move back and forth parallel to the direction of propagation of the disturbance. Such waves are called longitudinal waves. • Activity :- Stretch a slinky and push and pull it alternately at one end. If you mark a dot on the slinky, the dot moves back and forth parallel to the direction of the propagation of the disturbance.	FIGURE DEMONSTRATION
Slide-47 To Slide-65	Characteristics of a sound wave Sound wave can be described by its frequency, amplitude and speed.	FIGURE ANIMATION

	Sound can be graphically represented as a wave. There is changes in the density and pressure as sound moves in a medium. Compressions are the regions of high pressure and density where the particles are crowded and are represented by the upper portion of the curve called crest. Rarefactions are the regions of low pressure and density where the particles are spread out and are represented by the lower portion of the curve called trough. The distance between two consecutive (crests) or two consecutive troughs is called wave length. It is represented by the symbol . (*Greek letter lamda*). Its SI unit is metre (m). It can also be defined as the distance travelled by the wave during which the particle complete one vibration.
	
	Frequency of sound wave
	The number of oscillations per unit time is called the frequency of the sound wave.
	   It is represented by the symbol v (*Greek letter nu*).
	   Its SI unit is hertz (Hz).
	
	Time period of sound wave
	The time taken for one complete oscillation in the density of the medium is called the time period of the sound wave. It is represented by the letter T.
	   The SI unit is second (s).
	   Realation betwwen time period and frequency
	• Time to complete 'v' vibration = 1sec
	• Time to complete 1 vibration = $1/v$
	• Therefore $T=1/v$
	• Or $v=1/T$
	
	Amplitude of sound wave
	The magnitude of the maximum displacement in the medium on either side of the mean value is the amplitude of the sound wave. It is represented by the letter A.
	   The SI unit that of density or pressure or displacement.
	
	Pitch and loudness of sound
	The pitch of sound (shrillness or flatness) depends on the frequency of vibration.
	   If the frequency is high, the sound has high pitch and if the frequency is low, the sound has low pitch.
	The loudness of sound depends upon the amplitude of vibration.
	   If the amplitude is bigger, the sound is loud and if the amplitude is smaller, the sound is soft.	

Slide-66 To	Speed of sound The speed of sound is different in different media. The speed	

Slide-69	of sound is more in solids, less in liquids and least in gases. The speed of sound also depends on the temperature of the medium. If the temperature of the medium is more, the speed of sound is more.	
Slide-70	Relationship between Speed (v), frequency (^{V}) and wave length (λ) Speed = distance travelled / time taken Speed = λ/T Speed = wave length x frequency $v = \lambda \times {}^V$	

Slide-71
Slide-76
	Reflection of sound :-
	sound gets reflected at the surface of a solid or liquid and follows the laws of reflection.
	i) The angle of incidence is equal to the angle of reflection.
	ii) The incident ray, reflected ray and normal at the point of incidence all lie in the same plane.
	   • Take two pipes of the same length and arrange them on a table near a wall or metal plate. Keep a clock near the open end of one pipe and try to hear the sound of the clock through the other pipe by adjusting the position of the pipe.
	   • Now measure the angles of incidence and reflection. Then lift the second pipe and try to hear the sound. It will be seen that the angle of incidence is equal to the angle of reflection. The incident ray, the reflected ray and normal all lie in the same plane
		ACTIVITY

Slide-76 To Slide-80	Echo :- If we shout or clap near a reflecting surface like tall building or a mountain, we hear the same sound again. This sound which we hear is called echo. It is caused due to the reflection of sound. To hear an echo clearly, the time interval between the original sound and the echo must be at least 0.1 s. Since the speed of sound in air is 344 m/s, the distance travelled by sound in 0.l s = 344 m/s x 0.1 s = 34.4 m So to hear an echo clearly, the minimum distance of the reflecting surface should be half this distance, that is 17.2 m.	FIGURE
Slide-81 To Slide-82	Reverberation: Echoes may be heard more than once due to repeated or multiple reflections of sound from several reflecting surfaces. This causes persistence of sound called reverberation. In big halls or auditoriums to reduce reverberation, the roofs and walls are covered by sound absorbing materials like compressed fibre boards, rough plaster or draperies	FIGURE
Slide-83 To	Uses of multiple reflection of sound Megaphones, horns, musical instruments like trumpets,	FIGURE

Slide-90	shehnais etc. are deigned to send sound by multiple reflection in a particular direction without spreading in all directions.
	
	      Doctors listen to sounds from the human body through a stethoscope. The sound of heartbeat reaches the doctor's ears by multiple reflection.
	
	      Generally the ceilings of cinema halls and auditoriums are curved so that sound after multiple reflection reaches all parts of the hall. Sometimes a curved sound board is placed behind the stage so that sound after multiple reflection spreads evenly across the hall.	

Slide-91 To Slide-94	<u>Range of Hearing</u> • Human beings can hear sound frequencies between 20 Hz and 2000 Hz. Sound whose frequency is less than 20 Hz is called infrasonic sound. Animals like dogs, elephants, rhinoceros, whales etc. produce and hear infrasonic sound. Sound whose frequency is more than 2000 Hz is called ultrasonic sound. Animals like dolphins, bats, rats propoises etc. produce and hear ultrasonic sound Bats use reflection of ultrasonic sound waves to detect an obstacle or its prey.	
Slide-95 To Slide-103	<u>Uses of ultrasonic sound</u> Ultrasonic sound is used to clean objects like electronic components. The components to be cleaned are kept in a cleaning solution and ultrasonic waves are sent into the solution. Due to the high frequency, the dirt particles get detached from the components. Ultrasonic sound is used to detect cracks in metal blocks. Ultrasonic waves are sent through the metal blocks and if there are cracks, the waves are reflected back and the cracks can be detected. Ultrasonic sound is used in ultra sound scanners for getting images of internal organs of the human body and echocardiography Ultrasonic sound is used to break small stones formed in the kidneys into fine grains so that they are removed through the urine.	FIGURE
Slide-104 To Slide-108	<u>SONAR</u> Sonar stands for Sound Navigation And Ranging. It is a device which uses ultrasonic waves to measure distance, direction and speed of underwater objects. Sonar has a transmitter and a detector installed in ships. The	FIGURE

	transmitter produces ultrasonic sound waves which travel through the water and after striking the object in the sea bed is reflected back to the detector.	
	The distance of the object can be calculated by knowing the speed of sound in water and the time taken between the transmission and reception of ultrasound. If the time taken for the transmission and reception of ultra sound is *t* and the distance travelled is *2d* by the ultra sound, then $2d = v \times t$ or $d = (v \times t)/2$	
Slide-109 To Slide-114	**Structure of the human ear** **The outer ear called pinna collects the sound waves. The sound waves passes through the ear canal to a thin membrane called eardrum.** **The eardrum vibrates. The vibrations are amplified by the three bones of the middle ear called hammer, anvil and stirrup.** **The middle ear then transmits the sound waves to the inner ear. In the inner ear the sound waves are converted into electrical signals by the cochlea and sent to the brain through the auditory nerves. The brain then interprets the signals as sound.**	**FIGURE** **VEDIO**
Slide-115 To Slide-117	**EVALUATION**	

Tissue

1. Self introduction :- Name :- Mrs Ragini Bhatt (PGT Biology)
2. Jawahar Navodaya shyampur Sehore (MP)466651
3. E -content Plant tissues Class IX science NCERT book
4. Chapter 6
5. Topic- Plant tissue
6. Objective :- to explain about the plant tissues through experiments and demonstration
7. Required material :- Computer ppt ,material for experimentation –slide preparation material , section cutting material and digital images of the dicot plant and leaf peal
8. Procedure for 3 experiments is enclosed separately
9. Observation & observation table in the script (included)
10.   Result / inferences (separate ppt is made)
11.   Precautions mentioned in the ppt
12.   Exercises (included in ppt)
13.   Recapitulation. (included in ppt)

Slide 1   Title   Plant tissue

   Video :-   A living jungle -- gif image

Slide 2 Learning outcomes

   All living organisms are made up of cell.

- Learning outcomes :-Students will be able to
- Difference between plants and animals
- Understand its effects the body design & pattern
- Understand the design of plant body
- Function , structures & significance of plant tissues .

lide 3

In unicellular organisms all the life processes are carried out by a single cell. But in multi-cellular organisms all the cells do not perform the functions separately. There is a clear cut division of labour .

Slide 4

Division of labour

They work together to perform a function. When you see in our social set up we depend on others for some specific work all persons canot do all the work fficiently. Similarly it is there in plants. Group of cells with same structure perform some specific function efficiently & are called tissue.

Slide 5&6

They work together efficiently for a specific function.

Slide 7

the living world organisms which we see around and can understand as multi-cellular are generally plants and animals.

Here is a main difference in the pattern of tissues in plant and animals because:-

- Plants are fixed, animals move in search of food, shelter, protection and mates.
- Plants growth is limited to tips and girth but animals grow uniformly.
- Plants get mechanical strength from dead tissues, animal do not have any dead cells to provide any strength.
  Because of all these differences basic pattern of plants and animals their tissue systems are different.
  ## Slide no 8
  Simple and complex tissues are different. Simple tissue consists of all similar cells but complex tissue consists of different types of cells and they work together.
  ## Slide 9

In plants the tissues are mainly required for growth, transport and storage. So the tissues which are helpful in growth are named as **meristamatic**. After the division some tissues modify their shapes and permanently perform a specific function. These are called permanent tissues. Simple tissues which are providing mechanical strength to the plant and work for food preparation is **Simple permanent tissue**. Tissues which transport water and prepared food in the plant are complex in structure and are called vascular tissue.

Slide 10

Let us understand the tissue types in plants. Plant tissues can be classified into 2 groups, Meristematic tissues and Permanent tissues. Plants can grow throughout their life so some tissues remain always meristematic.

Slide 11

Materials required:-Plants of different types .

Meristematic tissues are helpful in growth and in the plants growth regions are specific.

Meristems are classified by their location in the plant as apical (located at root and shoot tips), lateral (in the vascular and cork cambia),
and intercalary (at internodes, or stem regions between the places at which leaves attach, and leaf bases as in grass.

Slide 12

Meristematic tissues do not consists of vacuole because they divide continuously so they do not need to store and do not have vacuoles.

Slide 13

Meristematic cells divide continuously and cause growth of the plant throughout the life.

Slide 14

Apical meristematic tissue is at the tips of root and shoot, they divide to increase length of the root & shoot.

Let us see an experiment if we cut the root tips what will happen.

Slide 15

Experiment script

Take two glasses to jars and fill them with water. Take two onion bulbs and place one on each jar.

Observe the growth of roots in both the bulbs for a few days.

Measure the length of roots on day 1, 2 and 3.

On day 4, cut the root tips of the onion bulb in jar 2 by about 1 cm.

After this, observe the growth of roots in both the jars and measure their lengths each day for five more days and record the observations.

ength	Day 1	Day 2	Day 3	Day 4	Day 5
ar 1	....cm	...cm	....cm	...cm	....cm
ar 2	....cm	...cm	....cm	...cm	....cm

Ve can see the roots of this onion is short than the other. We cut the root tips and ecause the meristematic tissues are cut, growth of the root stopped.

ou can observe the same experiment by doing it yourself

Slide 16 & 17

he lateral meristem is present is responsible for the increase in the girth of the lant. It is found near the periphery of stems and roots and causes secondary owth and wood formation. See in the figure shown

ide 18

tercalary meristem is the meristem at the base of leaves oriented nodes (on ther side of the nodes) on twigs.

ey help in the longitudinal growth of plants by adding primary tissues.

Slide 19 & 20

in total the characteristics of the meristematic tissue -

- have thin cellulose cell walls
- spherical ,oval ,polygonal or rectangular in shape
- contain dense cytoplasm and single nucleus
- Compactly arranged, no inter cellular space.

Slide 21

Let us observe the design of the plant patterns for the remaining tissues.

So you ever think why plants have such tissues?

For conduction of water

Slide 22

Now let us talk about simple permanent tissues. They are of four types – parenchyma , colenchyma , sclerenchyma and epithelial .

Slide 23

Characteristics of permanent tissues

- Do not divide as they have lost power of division
- Have definite form & size
- Differentiated cells and carry out specific functions
- May be living or dead cells
- Cells are large with vacuolated cytoplasm

Slide 24

You can see in the figure that the tissues are shown

Slide 25

Parenchyma

Live cells, oval shaped loosely packed.

Large inter cellular spaces, stores food, perform photosynthesis, stores nutrient and water (Modifications)

Slide 26 Functions of parenchyma

❖ Food storage tissue .

❖ means of support to the stem of herbaceous plants

❖ Cells of leaves containing chlorophyll are called CHLORENCHYMA. They carry out photosynthesis.

❖ Aquatic plants containing large air cavities are called AERENCHYMA which give buoyancy to plants to help them float.

Slide 27

■ Store waste - tannin, gum, crystal, resins of inorganic waste, etc.

■ Store nutrients and water.

■ Serve as a PACKING TISSUE and maintain the shape and firmness of the plant.

■ Transport of materials occur through cells or cell wall

■ Presence of intercellular - allows gaseous exchange.

Slide 28 Collenchya

Live cells, elongated and irregularly thickened at corners

Less inter cellular spaces. Provide mechanical strength & flexibility to the plant.

Slide 29

Functions

■ Provides mechanical support and elasticity to plants.

■ Provides tensile strength and flexibility.

■ Allows easily bending without breaking.

■ Cells of collenchyma containing chloroplast, manufacture sugar starch (food).

Slide 30

Sclerenchyma

Dead cells , long and narrow cells no inter cellular spaces, walls are thickened due to lignin deposition Often these walls are so thick that there is no internal space inside the cell .

Slide 31

Structure of sclerenchyma

- Cells are dead

- Composed of long, narrow and thick-walled cells.

- The walls of cells are greatly thickened with deposition of lignin

- No intercellular space.

- Present in stems, around vascular bundles, in the veins of leaves and in the hard covering of seeds and nuts.

Slide 32

Sclerenchyma cells are of two types ;

- 1 FIBRES- Very long, narrow thick and lignified cells. Fibers are usually pointed at both ends and are clustered into strands.

- 2 SCLEREIDS- These are also called grit cells or stone cells and are irregular shaped.

- Dead and develop into various parts of the plants such as cortex, pith, phloem, hard seeds, etc. Sclereids are broad and highly thick-walled sclerenchyma cells which occurs singly or in small groups.

Slide 33

Functions of sclerenchya

➢ Provides strength and enables them to bear various stresses.

➢ Forms a protective covering around seeds and nuts.

➢ Gives rigidity, flexibility and elasticity to the plant body.

Slide 34   Epidermal tissue

Outer layer of cells in the plants, no intercellular spaces, flat in structure, stomata are present in the leaf cells.

Slide 35

Function of epidermal tissue

- Protective tissue covering the plant body .

- Protects from heat or cold and from the attack of parasitic fungi and bacteria

  .

- It allow exchange of gases and transpiration through stomata .

- Cuticle of epidermis checks the excessive evaporation of water.

Slide 36
Complex tissue
Xylem & phloem

Slide 37

Xylem have 4 types of cells tracheids ,vessels ,xylem parenchyma ,xylem fibres. These tissue conduct water for the plant.

Slide 38

- Also called wood

- Vascular & mechanical tissue

- Composed of 4 elements :-

  - Trachieds

  - Vessels

  - Xylem parenchyma

- Xylem fibers

Slide 39

Xylem conducts water and minerals from root to different parts of plant.

■ Thick lignified cells give mechanical support to the plant.

■ Only xylem parenchyma is lining which help in lateral conduction and store metabolic waste

Slide 40

Phloem have 4 types cells sieve tubes, companion cells, phloem parenchyma, phloem fibres. These tissue conduct food for the plant.

Slide 41

Living conducting tissue & is composed of four elements:-Sieve tubes, Companion cells, Phloem parenchyma,

Phloem fibers

Slide 42

- Transport food from leaves to the storage organs and later from storage organ to growing part of the body
- Source of commercial fiber as Jute, hemp etc.

Slide 43   Bibliography

Slide 44   ASSESSENT

Let us learn about plant tissues:- Let us see the sections of the stem to get the real picture of the plant tissue .

- Slide preparation –video recording :- T.S. of dicot
- Model of the stem to show arrangement of tissues in stem
- Epidermis of tradescantia leaf temporary mount:-
- Leaf peel to show stomata
    - **Experiment of TS of dicot stem**
- AIM

- To study parenchyma and sclerenchyma tissues in plants by preparing temporary slides.

- **THEORY**

- Flowering plants are structurally complex as they are made up of different parts like roots, stem, leaves, flowers, fruits, etc. Each part is in turn an assembly of different types of tissues. Each tissue type has specific structure and performs a particular function. Plant tissues are broadly classified into meristematic and permanent tissues. Permanent tissues may be simple, permanent tissues like parenchyma, collenchyma and sclerenchyma. Complex permanent tissues are xylem and phloem. The structural features of tissues like wall characteristics, cell size, lumen size, and cytoplasmic contents are different in different tissues.

- **MATERIALS REQUIRED**

- Tender stem of a herb (balsam/Tridax/Petunia/any cultivated ornamental herb or wild plant), safranin stain solution, dilute glycerine , chart of transverse section of stem, compound microscope, razor blade, slide, cover slip, brush, petri dish, and a piece of blotting paper.

- **PROCEDURE**
- A. Making a temporary slide
- 1. Cut a tender stem of any of the above-mentioned plants into bits of about 3 cm length and place them in water.
- 2. Hold a piece between the thumb and forefinger in your left hand
- 3. Pass a wet blade across the stem in quick motion so as to get a thin, unbroken, circular cross section of the material
- 4. Repeat the process to get about fifteen transverse sections of the material.
- 5. Transfer the sections to a petri dish containing water. Select a thin, transparent section and with a brush transfer it to a drop of water taken on a slide. Add three drops of dilute safranin stain solution to the section and leave it for about five minutes.
- 6. Blot the excess stain. Add three drops of dilute glycerine on the stained section. Place a cover slip on it. Focus it under the low power of microscope and observe the section.
- 7. Now focus the section under high power and observe again. Note and record your observations.
- 8. Starting from the outermost layer, locate the epidermis, cortex and vascular tissues
- 9. In the layers of cells beginning from epidermis, observe the following features—
- a. Cell wall thin/thick;
- b. Arrangement compact/loose;
- c. Shape of cell circular/oval/rectangular/polygonal;

- d. Intercellular spaces present/absent;
- e. Lumen (cell cavity) small/large;
- f. Nucleus present/absent;
- g. Staining of cell wall deeply stained/mildly stained/no stain; and h. Cytoplasm: present/absent
- 10. Record your observations in the given tabular column.
- **OBSERVATIONS**

Features	Parenchyma	Sclerenchyma
a. Cell wall		
b. Arrangement		
c. Shape of cell		
d. Intercellular spaces		
e. Lumen		
f. Nucleus		
g. Staining of wall		
h. Cytoplasm		

- **RESULTS AND DISCUSSION**
- Parenchyma tissue is the most abundant type of tissue in plants. It forms the major bulk of stem, roots, leaves, fruits and seeds.
- The tissue is composed of living cells, with various shapes, sizes and functions. The cells provide mechanical support to the plant body.
- The parenchyma also acts as a storage tissue for food, air and water.
- Cells of sclerenchyma tissue are highly lignified with very thick cell walls and obliterated lumen.
- Cells are usually elongated and polygonal in shape in cross-section.
- The tissue provides the mechanical support and is found below the epidermis and around the vascular bundles.
- **PRECAUTIONS**
- • For sectioning, select soft, tender herbaceous stem only. Avoid stems that are hard and woody.
- • Take care not to injure your finger while sectioning. • Always keep the plant materials and sections in water.
- • Use dilute safranin stain solution.
- • The trachea and tracheids of xylem tissue appear to be very much similar to sclerenchyma and may be erroneously identified as sclerenchyma tissue. Xylem is always confined to the vascular bundle and is generally not seen in the cortex or pith.

 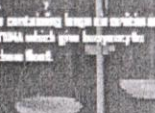

▶Found near the periphery of stems and roots
▶Increase stem in diameter.
▶ known as secondary growth & secondary tissues

Secondary growth ?

Increase in girth due to cambium

You can see in the figure

17

Meristematic Tissue-Intercalary

Intercalary meristem is the meristem at the base of leaves oriented nodes (on either sides of the nodes) on twigs They help in the longitudinal growth of plants by adding primary tissues.

18

Characteristics of meristematic tissue

- have thin cellulose cell walls
- spherical ,oval ,polygonal or rectangular in shape
- Have dense cytoplasm & 1 nucleus
- Compactly arranged ,no inter cellular space

19

Functions of meristematic tissue

- ability to divide
- bring increase in length of the plant
- The cells of lateral region cambium bring an increase in girth of the plant

20

Why do plant have such tissues ?

For conduction of water

21

Permanent Tissue

22

Characteristics of Permanent tissues

- Do not divide lost power of div
- definite form & size
- Differentiated cells and carry out specific functions
- May be living or dead cells
- Cells are large with vacuolated cytoplasm

23

Types of Plant tissue

24

Parenchyma

- Live cells ,oval shaped loosely packed.
- Large inter cellular spaces, stores food , perform photosynthesis, stores nutrient and water (Modifications)

25

FUNCTIONS OF PARENCHYMA

- FOOD STORAGE TISSUE.

26

27

Collenchyma

Live cells ,elongated and irregularly thickened at corners
Less inter cellular spaces. Provide mechanical strength & flexibility to the plant.

28

Functions

29

Sclerenchyma

Dead cells ,long and narrow cells no inter cellular spaces, walls are thickened due to lignin deposition Often these walls are so thick that there is no internal space inside the cell.

30

Structure

- Cells are dead
- Composed of long, narrow and thick-walled cells.
- The walls of cells are greatly thickened with deposition of lignin
- No intercellular space.

Structure

Functions of Sclerenchyma

>provides strength and enables them to bear various stresses.
>forms a protective covering around seeds and nuts.

Epidermal Tissue

Leaf peel

T.S of leaf

Functions of Epidermis

- Protective tissue covering the plant body.
- Protects from heat or cold and from the attack of parasitic fungi and bacteria.
- It allow exchange of gases and transpiration through stomata.

Slide Sorter
"Balance"
66%

Slide 1:

Tissue

Class IX
Science

Slide 2:

Unicellular organisms perform all the work with the single cell . So their group is not called Tissue.

Slide 3:

Multi-cellular organisms have Division of labour

Painter   Doctor
Scientist   Teacher
Tailor   Soldier

Slide 4:

Work Together

As the cells are in a group they work together with full efficiency for the same work .

Slide 5:

What is tissue ?

A group of cells that are similar in structure and/or work together to achieve a particular function forms a tissue.

Slide 6:

Plant & Animal tissue

- Plants stationary Active locomotion in animals.
- Plants are autotrophic
- Plants growth is limited to certain regions.

Slide 7:

Types of Tissues

Plants
- Growth tissue – Meristematic
- Simple pertis p, c sc
- Complex tissue – Xylem ,Phloem

Covering – Epidermal
Movements – Muscle
Signaling – Nerve Tissue
Coordination & storage – Connective

Slide 8:

Types of plant tissue

- A simple tissue is composed of only one cell type.
- Complex tissues contain more than one cell type

Slide 9:

Slide 10:
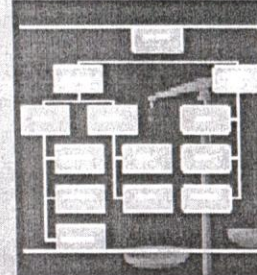
Meristematic Tissue

- Some must remain meristematic (Why?)
- Most mature and become other tissues .
- 3 types Apical Lateral

Slide 11:

- New cells are similar in appearance and function
- Cells are active , have dense cytoplasm , dense nucleus and prominant nucleus , but no vacuoles (Why ?)

Slide 12:

do not have vacuole ?

- Ans :- When meristematic cells continuously divide the cells do not need to store the contents for long time .

Slide 13:

Why some cells should remain meristematic ?

Plants grow throughout of their life therefore some of the cells must remain meristematic for growth always .

Slide 14:

Meristematic Tissue -Apical

- tips of stems and roots.
- Causes increase in plant length primary growth.
- The resulting tissues are called primary tissues.

Slide 15:

Video – Experiment

Slide 16:

Lateral meristem

- Found near the periphery of stems and roots
- Increase stem in diameter.
- known as secondary

Slide 17:

Secondary growth

Increase in girth due to cambium

You can see in the figure

Slide 18:

Meristematic Tissue -Intercalary

Intercalary meristem is the meristem at the base of leaves oriented nodes (on either sides of the nodes) on twigs They help in the

Slide 19:

Characteristics of meristematic tissue

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Slide 20:

Functions of meristematic tissue

- ability to divide
- bring increase in length of the plant
- The cells of lateral region

Structure
- Cells are dead
- Composed of long, narrow and thick-walled cells
- The walls of cells are greatly thickened with deposition of lignin
- No intercellular space
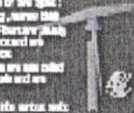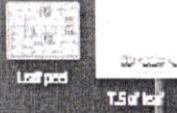- Present in stems, around vascular bundles, in the veins of leaves and in the hard covering of seeds and nuts

31

Structure
Sclerenchyma cells are of two types :
- 1. Fibres- Very long, narrow thick-walled lignified cells. Resembles plainly pointed at cells around and lumen at the centre.
- 2. Sclereids- These are also called grit cells or stone cells and are irregular shaped.
- Both are develop into various cells of the plants such as in stems, stiff phloem, hard seeds, etc. Sclereids are found and highly thickened sclerenchyma cells and occurs singly or in small groups.

32

Functions of Sclerenchyma
- provides strength and enables them to bear various stresses.
- forms a protective covering around seeds and nuts.
- gives rigidity, flexibility and elasticity to the plant body.
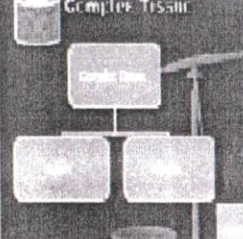
33

Epidermal Tissue

Leaf peel

T.S of leaf

Outer layer of cells in the plants, no intercellular spaces flat in structure, stomata are present in the leaf cells

34

Functions of Epidermis
- Protective tissue covering the plant body.
- Protects from heat or cold and from the attack of parasitic fungi and bacteria.
- allow exchange of gases and transpiration through stomata.
- Cuticle of epidermis checks the excessive evaporation of water.

35

Complex Tissue

Complex Tissue

36

Xylem
Xylem have 4 types of cells tracheids vessels xylem parenchyma xylem fibres. These tissue conduct water for the plant.

37

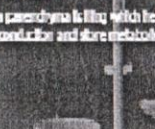## Xylem
- Also called wood
- Vascular & mechanical tissue
- Composed of 4 elements :-
  - Tracheids
  - Vessels
  - Xylem parenchyma
  - Xylem fibres

38

Functions
- Xylem conducts water and minerals from root to different parts of plant.
- Tracheids and vessels give mechanical support to the plant.
- Only xylem parenchyma is living which help in lateral conduction and store metabolic wastes.
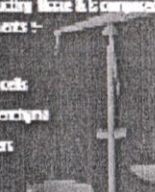
39

Phloem
Phloem have 4 types cells sieve tubes companion cells, phloem parenchyma, phloem fibres. These tissue conduct food for the plant.
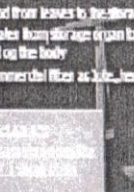
40

Phloem
Living conducting tissue & is composed of four elements :-
- Sieve tubes
- Companion cells
- Phloem parenchyma
- Phloem fibres

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Function
- Transport food from leaves to the storage organs and later from storage organ to growing part of the body
- Source of commercial fibre as jute, hemp etc.

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Bibliography
- Coral magic gallery
- NCERT Text book
- Britanica

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Prepared by:- Mrs Ragini Dixit
PGT(Bio)
JNV Shipapur ,Sehore (MP)

Thank You

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TRAINING PROGRAMME ON THE USE OF ICT IN TEACHING OF SCIENCE AT SECONDARY SCHOOL LEVEL TRAINING

3rd October 7th October, 2017

Regional Institute of Education, NCERT, Bhopal

Training Programme Evaluation

Please provide your feedback on the workshop that you have attended on "Trainir Programme on the Use of ICT in Teaching of Science at Secondary School Leve from 3rd October 7th October, 2017 at RIE, Bhopal.

1. **Your overall reaction on this training:**

   ☐ Very good   ☐ Good   ☐ Fair   ☐ Poor   ☐ Very Poor

2. **The training met my expectations:**

   ☐ To a large extent   ☐ Up to certain extant   ☐ Poor   ☐ Not to all

3. **The duration of training:**

   ☐ Too long   ☐ Sufficient   ☐ Too short

4. **Logical sequence of the training was:**

   ☐ Very useful   ☐ Some what useful   ☐ Not very Useful   ☐ Not at all useful

5. **Overall organization arrangements:**

   ☐ Very good   ☐ Good   ☐ Fair   ☐ Poor Very

   ☐ Poor

6. **Number of trainers involved:**

   ☐ Too many   ☐ Just right   ☐ Too few

7. **Kindly rate in general the effectiveness of the trainers:**

		Very Effective	Somewhat Effective	Somewhat Not Effective	Not Effective
i)	Knowledge of the subject matter	☐	☐	☐	☐
ii)	Organization and Presentation	☐	☐	☐	☐
iii)	Style and delivery	☐	☐	☐	☐
iv)	Responsive to participants	☐	☐	☐	☐
v)	Creating appropriate learning environment	☐	☐	☐	☐

8. **Sufficient of the training material supplied:**

   ☐ Sufficient   ☐ Somewhat sufficient   ☐ Not sufficient   ☐ Not all sufficient

9. To what extent the training was helpful in the following area:

		To large Extent	Somewhat	Poor	Not at all
i)	Understanding in ICT in Education: History &development Theoretical framework and ICT Competency of Teacher Educator (UNESCO framework)	☐	☐	☐	☐
ii)	Understanding RIE community of practice for teacher Educator	☐	☐	☐	☐
iii)	Understanding ICT tool for Teaching and learning	☐	☐	☐	☐
iv)	Preparing teaching content Using audio and video	☐	☐	☐	☐
v)	Using social media for teaching And learning	☐	☐	☐	☐
vi)	Understanding open licenses	☐	☐	☐	☐
vii)	Developing e-content				

10. Mix of theory and practical in the training:
☐ Too Theoretical   ☐ Good Balance   ☐ Too Practical

11. Did you have sufficient time for skill practice?
☐ Yes   ☐ No

12. Value of training to immediate/future work :
☐ Very Valuable   ☐ Somewhat Valuable ☐ Somewhat Not Valuable ☐ Not Valuable

13. Your Comments/Suggestion, if any:

Thank you very much for your feedback

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Date	TIME TABLE							
	9:30 - 11:00		11:30 - 13:00		14:00 - 15:30		15:45 - 17:15
03-Oct-17	Registration and Inauguration	T E A T I M E	Constructivism in Science Education Prof. N Pradhan	L U N C H T I M E	Use of ICT in blended learning JS	T E A T I M E	E-Content Development NCO
04-Oct-17	Presentation of Report of the First Day/ Learning and Styles of Learning KK		Developing Digital Content on Acids & Bases RP/RS		ICT inclusion in Inclusive Education JS		Propagating Science Education through Reflective writting/ Practice Session and Development of Digital Content NCO
05-Oct-17	Presentation of Report of the Second Day/NLP For high Achievers and Slow Learners KK		Developing Digital Content on Periodic Classification of Elements JS		Developing Digital Content on Use of ICT AK		Practice Session
06-Oct-17	Presentation of Report of the Third Day/Is Matter Pure Around us SKJ		ESD and Science Education RS		Developing Digital Content on Biology-Educational PPT RB		Practice Session
07-Oct-17	Presentation of Report of the Fourth Day/Light LSC		Developing Digital Content on Metal & Non-Metals SKJ		Developing Digital Content on Advanced Setting of PPT RB		Presentation of Report of the Fifth Day/Valedictory

NCO – N.C.Ojha   **KK-** K.Kanthimati   **JS** – Jagrati Sharma   **RB** – Ragini Bhatt   **AK-** Amir Khan   **RP** – R.Prajapati

SKJ – Shailendra Jain   **LSC** – L.S.Chouhan   **KS-** Kaushailendra Singh   **RS-** Rashmi Singhai