

MANUAL

TEACHING PRACTICE-II

B.Ed (2.5-Year)
Specialization in Science Education

Course Code: 6499



Department of Science Education
Faculty of Education
Allama Iqbal Open University, Islamabad

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1. Course Description

This course involves field experiences for trainee teacher in a classroom/school setting. This experience encompasses the application of effective teaching theories, techniques and skills by trainee teacher in a classroom/school setting. This course provides opportunities to trainee teacher for classroom teaching/school based experiences. Besides classroom teaching, this experience will also assist trainee teacher in learning classroom management skills. This course consists of workshop of 01 week duration and teaching practicum of 06 weeks duration. Teaching practicum requires trainee teacher to spend 144 hours in a school during 06 weeks of teaching practicum. The trainee teacher will work 04 hours per day in the school during 06 weeks of teaching practicum. Site approval form for the school, where a prospective teacher wants to perform teaching practicum, must be submitted for approval to respective regional center of the Allama Iqbal Open University. The submission of Site Approval Form for approval of practicum school must be completed at least 04 weeks prior to the start of teaching practicum. The respective regional center of the University will issue a teaching practicum letter to trainee teacher in the name of head of that school. The purpose of this letter would be to facilitate trainee teacher to get permission for teaching practicum in the school.

2. Course Learning Outcomes

At the end of Teaching Practice-II, the trainee teacher would be able to:

1. Apply knowledge and skills of teaching in schools
2. Develop lesson plans for teaching science subjects using appropriate instructional materials, methods and techniques.
3. Reflect on teaching practice and gain expertise in teaching.
4. Use modern teaching strategies for maximizing learning of science students
5. Use lesson plans effectively to deliver the content to students especially science students.
6. Manage the classroom effectively.
7. Plan the science practical in an efficient way.
8. Engage the science students in laboratory activities in a smooth manner.
9. Use collaborative style in teaching profession.
10. Seek help from feedback for improving teaching learning process.
11. Utilize best fit techniques for assessing students performance.

3. Components of Teaching Practice-II

Teaching Practice (II) consists of the following components:

- i. Workshop of 07 days duration
- ii. Teaching Practicum of 06 weeks duration
- iii. 02 Final Lessons

- iv. Professional Portfolio (including record of all the Lesson plans performed by trainee teachers, laboratory report, proof of attendance and record of other activities during teaching practicum)

Plan of Action

The schedule of workshop, teaching practicum and final lessons will be communicated to prospective science teacher through a letter from the university. The Prospective teacher is required to attend compulsory workshop of 7days 5 hours duration/day before teaching practicum. During seven days workshop a tutor and a supervisor will supervise the prospective teachers during seven days workshop. The tutor will keep the record of names of prospective teachers, their phone numbers and email addresses by filling Students' Bio Data Form (see appendix I) for future correspondence. The tutor will arrange the resource persons for sessions during workshop. The tutor will also make arrangements for final lesson presentation of prospective teachers after workshop and teaching practice. At the end of workshop, the tutor will submit the workshop report (see appendix II), workshop progress report of students (appendix III) and student bio data form to the regional office/center of the university as soon as possible.

After the successful completion of workshop of 07 days duration, the prospective teachers will present 02 final lessons before a panel. The panel will consist of tutor, supervisor/s and expert(s). The panel will rate the prospective teacher on a number of components of lesson planning and presentation (mentioned in the rubrics for lesson planning and presentation. Sample is given on next pages.

For teaching practicum, the prospective teachers will intimate the respective Regional Center of the university about the school where he/she would perform teaching practicum by filling the Teaching Practicum Site Approval Form (given in appendix IV) and submitting in the respective Regional Center. The regional office/center of the university will prepare a Teaching Practicum Letter (see appendix V) for the prospective teachers. The prospective teachers would submit the Teaching Practicum letter to the school where he/she would perform teaching practicum. However, the prospective teacher must ensure about the availability of opportunity for teaching practicum at that school before the submission of Teaching Practicum Site Approval Form. This process must be completed at least 05 days before the end of workshop.

At the end of teaching practicum, the Prospective teachers will present two final lessons before a panel. The panel will consist of tutor, cooperating teacher and expert(s). Higher authorities may also visit the model lesson presentation activities. The panel will rate the trainee teacher on a number of components of lesson planning and. The responsibilities of all the agencies involved in the course, are as follows:

Table 1: Responsibilities of the Stakeholders

S/No	Stakeholder	Responsibilities
1.	Regional Centre	<ul style="list-style-type: none"> i. To facilitate prospective teachers to perform teaching practice in a school ii. To monitor the teaching practicum by prospective teacher
2.	Tutor	<ul style="list-style-type: none"> i. To make necessary arrangement for conducting workshop and final lessons presentation ii. To ensure the smooth progress of workshop iii. To make arrangements for monitoring the teaching practicum of trainee teacher by coordinating with the Regional Center of the University.
3.	Cooperating Teacher(in school) & Supervisor(in workshop)	<ul style="list-style-type: none"> i. To provide skills of effective science teaching to prospective teachers by providing them hands-on experience ii. To provide guidance for development of professionalism among prospective teachers iii. To observe lesson presentation by the prospective teachers during workshop by using microteaching. iv. To monitor and assess the performance of prospective teachers. v. To provide feedback on the performance of prospective teachers vi. To give suggestions to prospective teachers for improving his/her teaching performance vii. To supervise prospective teachers for reflection on his/her teaching performance
4.	School Administration	<ul style="list-style-type: none"> i. To allocate a cooperating teacher/ senior Science teacher to a perspective teacher ii. To provide resources including classrooms, electricity, AV aids and furniture i.e., table and chair etc., for teaching practicum of prospective teachers iii. To ensure the availability of opportunities for providing teaching and administrative experience to prospective teachers
5.	Prospective Teachers	<ul style="list-style-type: none"> i. To demonstrate professional behaviour depicting punctuality, responsibility, dedication, respect, integrity, teamwork and self-reflection during the workshop and teaching practicum ii. To seek guidance from tutor, cooperating teacher and school teachers in performing teaching and administrative tasks iii. To work collaboratively with teachers on teaching and administrative tasks iv. To co-plan and co-teach with teachers of the school v. To plan for performing teaching, management and assessment responsibilities in the classroom vi. To reflect on his/her teaching practice vii. To develop a portfolio containing lesson plans taught by the trainee teacher and proof of attendance record for teaching practicum

4. Assessment

As there is no written exam in the course, the trainee teacher will be assessed by the cooperating teacher and the tutor on his/her performance within classroom/school. The trainee teacher will discuss and get feedback about his/her performance from his/her tutor and cooperating teacher throughout the workshop. During teaching practicum, the trainee teacher can also seek guidance from the teachers at the school. The lesson planning, teaching performance in the classroom and classroom/school management skills of the trainee teachers will be assessed in the course. Additionally, final lessons and portfolio

containing lesson plans will also contribute towards assessment of trainee teacher during this course. Portfolio contains lesson plans taught by the trainee teacher and proof of attendance record for teaching practicum.

For trainee teacher with specialization courses in Leadership and Management, will be assessed on their final report containing reflective journals of day-to-day activities and presentation on it. For further details, trainee teacher with specialization courses in Leadership and Management must consult the last portion of manual entitled “School Administration Practicum”.

Marks Distribution & Pass Marks

Passing marks in Teaching Practice (II) are 50%. The passing marks in final lesson and portfolio components are also 50%. The percentage for various components is as follows:

Table 2: Marks Distribution for Teaching Practice-II

S/No.	Components	Marks Allocated
01	Workshop (Compulsory)	15
02	Two Final Lessons / *Practicum Report	60 (30x2=60)
03	Portfolio	25
	Total Marks	100
	Passing Marks	50

Workshop/Practicum marks distribution
95 % & above 10 marks
90-94% 09 marks
85-89% 08 marks
80-84% 07 marks
Below 80% Does not qualify

5. Code of Conduct for Prospective Teachers

All Prospective teachers are required to follow following code of conduct:

1. All Prospective teachers are expected to be physically present in the workshop and teaching practicum site for the specified time period. Trainee teacher will perform all curricular and co-curricular activities as may be suggested by a teacher/school within the territory of school.
2. Absence due to illness or personal emergency must be timely notified to the school and the regional office/center of the university. 80% attendance separately for workshop and teaching practicum is compulsory to pass the teaching practice-II. Two absences are permitted during teaching practicum. If a prospective teacher was unable to maintain 80% attendance during workshop or teaching practicum, then it would result in failing the course “Teaching Practice II”. Attendance record

of prospective teachers during teaching practicum is to be maintained by the school and the trainee teacher. The prospective teacher will submit the attendance record along with its portfolio to regional office/center of the university at the end of teaching practicum.

3. Phone calls, messaging or Face book are not allowed during the workshop and at the teaching practicum site. All cell phones must be turned off/ switched on silent during the workshop and the teaching practicum site. If trainee teacher feels the need to use his/her cell phone, he/she must first get permission of the head teacher for it.
4. Communication must be on regular basis between trainee teacher and regional center of the university. The concerned regional center will manage to visit practicum school on regular intervals during teaching practicum. The purpose of this visit would be to ensure the successful completion of teaching practicum in school by the trainee teacher.
5. Trainee teacher must maintain the confidentiality concerning pupil records and any other information related to concerned classroom/school. The permission from school administrator must be obtained before collecting and sharing any school related information to anyone outside the school.
6. Trainee teacher must not use corporal punishment in the classroom.
7. Strictly follow rules and regulations of institutions where workshop takes place and where attached for teaching practicum.
8. Keep the decorum of teaching profession.

6. Workshop

Workshop is a mandatory part of Practice Teaching (II). Attending workshop is compulsory to pass the course of Teaching Practice (II). The purpose of the workshop is to equip trainee teachers with the strategies, skills and techniques for effective teaching practicum. This workshop comprise components of lesson planning, pedagogical skills, classroom management skills, assessment skills, resolution of issues which arise during teaching and learning (conflict management), time management and preparation of portfolio.

The tentative program for the workshop is given below. However, minor amendments can be made to make adjustment to local circumstances.

Table 3: Schedule of the Workshop

Day	Sessions	Activity	Responsibility of	Time
1	Session-I:	Inauguration of the Workshop	Officer from concerned Regional Centre of the University/Faculty Member in case of Workshop in Main Campus	02:00 p.m. to 03:00 p.
	Session-II:	The Purpose, Pattern, Schedule of Workshop & Practicum	Supervisor(s)/Tutor	03:00 p.m. to 04:00 p.m.
	Session III:	Professionalism in Teaching: Dress Code, Behavior, Attitude and Interaction with Students & Teachers	Supervisor(s)/Tutor	04:00 to 4.50
	Session-IV:	Lesson Planning & its	Resource Person	05.10 p.m. to 6.00
	Session-V	Formulation of Objectives	Tutor, Supervisor	06:00 p.m. to 07:00 p.m.
2	Session-I:	Selection of Teaching Method (Lecture, Cooperative Learning, Discussion, Problem-solving and activity method) for a Lesson (Model Presentation of lesson)	Resource Person /Supervisor	02:00 p.m. to 03:00 p.m.
	Session-II:	Session II: Exercise on Selecting a Teaching Method for a Lesson	Tutor/ Supervisor and Prospective Teacher	03:00 p.m. to 04:00 p.m.
	Session III:	Development & Use of AV Aids	Tutor/ Supervisor and Prospective Teacher	04:00 p.m. to 04.50 p.m.
	Session-IV:	Exercise on Development & Use of AV Aids	Tutor/ Supervisor and Prospective Teacher	05:100 p.m. to 06:00 p.m.
	Session-V	Exercise on Formulation of Objectives on selected subject and topics	Tutor/ Supervisor and Prospective Teacher	06:00 p.m. to 07:00 p.m.
3	Session-I:	Classroom Management Skills	Resource Person	02:00 p.m. to 03:00 p.m.
	Session-II:	Questioning & Activities to Pace a Lesson	Tutor, Supervisor(s)	03:00 p.m. to 04:00 p.m.
	Session III:	Lesson Planning, Discussion & Queries of Trainee Teachers	Tutor/ Supervisor and Prospective Teacher	04:00 p.m. to 05:00 p.m.
	Session-IV:	Lesson Planning & Presentation by Trainee Teachers	Tutor/ Supervisor and Prospective Teacher	05:00 p.m. to 06:00 p.m.
	Session-V	Session V: Lesson Planning & Presentation by Trainee Teachers	Tutor/ Supervisor and Prospective Teacher	06:00 p.m. to 07:00 p.m.
4	Session-I	Session I: Classroom Assessment: Developing Test Items	Tutor/ Supervisor and Prospective Teacher	02:00 p.m. to 03:00 p.
	Session-II	Practice on development of Assessment	Tutor/ Supervisor and Prospective Teacher	03:00 p.m. to 04:00 p.m.
	Session III	Use of TEAM activities for Science Education	Tutor/ Supervisor and Prospective Teacher	04:00 to 4.50
	Session-IV	Activity on Development of AV Aids from low cast material	Tutor/ Supervisor and Prospective Teacher	05.10 p.m. to 6.00
	Session-V	Presentation of Prospective teachers (Micro-teaching Mode)/ feedback and discussions	Tutor/ Supervisor and Prospective Teacher	06:00 p.m. to 07:00 p.m.

5	Session-I:	Science lab visits and teaching	Tutor/ Supervisor and Prospective Teacher	02:00 p.m. to 03:00 p.m.
	Session-II:	Developing Time table	Tutor/ Supervisor and Prospective Teacher	03:00 p.m. to 04:00 p.m.
	Session III:	Lesson presentation, feedback and suggestions by peers and T/S	Tutor/ Supervisor and Prospective Teacher	04:00 p.m. to 04.50 p.m.
	Session-IV:	Lesson presentation, feedback and suggestions by peers and T/S	Tutor/ Supervisor and Prospective Teacher	05:100 p.m. to 06:00 p.m.
	Session-V	Lesson presentation, feedback and suggestions by peers and T/S	Tutor/ Supervisor and Prospective Teacher	02:00 p.m. to 03:00 p.
6	Session-I:	Role and importance of action research in teaching learning process	R/Person	2.0-3.0
	Session-II:	Lesson presentation, feedback and suggestions by peers and T/S	Tutor/ Supervisor and Prospective Teacher	3.0-.4.0
	Session III:	Lesson presentation, feedback and suggestions by peers and T/S	Tutor/ Supervisor and Prospective Teacher	4.0-4.50
	Session-IV:	Lesson presentation, feedback and suggestions by peers and T/S	Tutor/ Supervisor and Prospective Teacher	5.10-6.0
	Session-V	Lesson presentation, feedback and suggestions by peers and T/S	Tutor/ Supervisor and Prospective Teacher	6.0-7.0
7	Session-I:	Concept and importance of budget for science laboratory and school	Resource person	2.0-3.0
	Session-II:	Presentation of lessons and evaluation/feedback	Tutor/ Supervisor and Prospective Teacher	3.0-4.0
	Session III:	Presentation of lessons and evaluation/feedback	Tutor/ Supervisor and Prospective Teacher	4.0-4.50
	Session-IV:	Presentation of lessons and evaluation/feedback	Tutor/ Supervisor and Prospective Teacher	5.10-6.0
	Session-V	Presentation of lessons and evaluation/feedback	Tutor/ Supervisor and Prospective Teacher	6.0-7.0

7. Teaching Practice

All prospective teachers who had completed their workshop will be eligible for teaching practice in schools. During the workshop your tutor will provide you a letter signed by regional director to show to your school administration as a confirmation that you are trainee teachers. (annex-V)

All trainee teachers are required to submit site approval form to the tutor/supervisor duly signed by administrator of the school where you will do teaching practice (Annex-IV).

All prospective teachers will be required to make maximum use of opportunities for development of teaching skills which would ultimately promote teaching professionalism.

8. Activities during Teaching Practicum

The activities that a prospective teacher is supposed to perform at school are given in the following:

- a) Performing curricular, co-curricular and administrative tasks assigned by school within the school.
- b) Teaching in the classroom: the prospective teachers will develop at least 40 lesson plans and teach them in the class during the teaching practicum. The duration of each lesson will be equal to one period in the school.
- c) Development of management and leadership skills.
- d) Follow the instructions of the head or senior teacher in the school.

9. Format of the Lesson Plan

Format of the lesson plan is given as following:

- i. **Preliminary Section:** This section contains information about title of the lesson, date of teaching the lesson, name of the prospective teacher, roll number/registration number of the prospective teacher, subject name for which topic has been selected for teaching, topic to be taught, class and number of students.
- ii. **Objectives of the Lesson:** Smart objectives and also will be given in the lesson plan. The general objective will be related to purpose of the education and subject. the specific objectives reflect the target teaching about particular topic.
- iii. **Teaching Method:** A suitable teaching method or teaching strategy must be mentioned for that lesson. Teaching method or strategy should be helpful to achieve the specific learning outcomes of the topic.
- iv. **Av Aids:** Selection and using Av aids make the teaching learning process more effective. AV aids should be relevant and supportive to teaching.
- v. **Previous Knowledge:** In this section description of set induction should be given. It involves asking the question from students to test their previous knowledge. Previous knowledge testing is helpful to connect the previous knowledge with new information and knowledge.
- vi. **Announcement of the Topic:** The prospective science teachers will announce the topic in such a way that will arouse the interest of the students.
- vii. **Presentation:** Presentation of the lesson may have many steps. Presentation, formative assessment, then next activity and summative assessment. During presentation rule of deductive and inductive method may be applied and move from easy to complex by using iterative process. The style of presentation of the lesson must be appropriate to age, background knowledge, and mental level of the students. Psychology of the

learner is prime factor for consideration during presentation. Formative assessment will keep the lesson fresh in the minds of the students.

- viii. **Recapitulation (evaluation):** Summative evaluation will be carried out at the end of the lesson. It will be helpful to inform teacher how much she/he was successful in achieving objectives of the lesson.
- ix. **Homework:** The students must be assigned brief but interesting homework for practicing the lesson of the day in more detail.

(Note): All prospective teachers will prepare 40 lessons, a portfolio and two model lessons till the end of the teaching practicum. Portfolio and lesson plans will be evaluated during final presentation of the model lessons as per criteria.

10. Final Lessons

At the end of the teaching practicum, the prospective teachers would be required to prepare two final lessons and present them before the panel. The panel will consist of tutor, cooperating teacher and expert(s). The marks allocated to prospective during final lesson will be added up in the final score for the course “Teaching Practice-II”. Therefore, successful presentation of two final lessons is compulsory for all prospective teachers to pass the course.

Table 4: Rubric for Lesson Planning and Presentation

S.N	Components of lesson Planning	Beginning (1)	Developing(2)	Accomplished(3)	Exemplary(4)
1.	Objectives	Objective(s) lack clarity, no connection to the goals	Some of the lesson objectives are clear & measureable; some objectives have connection to the goals	Objectives are clear, measureable and connected to the goals of the subject	Objectives are clear and measureable, covers all aspects of the lesson
2.	Introduction/Set Induction	No attempt to make students attentive	Inadequate attempt to get the attention	Introduces lesson by sharing purpose of the lesson and relevance of lesson to students life.	Introduces lesson by sharing purpose of the lesson and relevance of lesson to students life in a friendly language
3.	Use of Instructional Aids /AV Aids/ Technology	Limited use of instructional material	Incomplete or inaccurate use of instructional material	Accurate and appropriate use of AV Aids	Effective and purposefull use of AV Aids and Technology
4.	Instructional Methods/ Strategies	Less aligned with lesson objectives and minor knowledge of use of Methods	Some parts are of instructional methods /strategies aligned with lesson objectives and delivery style	Clear match with lesson objectives and instructional methodology/strategies	All aspects of teaching Methods are used by prospective teacher keeping in view psychology of the learners

5.	Procedures	Lesson plan has no match with objectives, no support to students for guided or independent practice, lesson plan missing	Limited match between objectives, students are guided for independent practice, lesson plan has missing some important details.	Lesson plan has match with objectives, students are provided support with examples and guided properly for independent practice.	Lesson plan has match with objectives, students are provided support with examples and guided properly for independent practice. Students are motivated. actions are taken step by step.
6.	Communication	One way communication	Sometimes two way communication	Two way communication by using verbal and non-verbal modes of communications	Two way communication by using all possible modes of communications
7.	Dealing with Students diversity	Little attempt to explain lesson in a variety of way.	Lesson presented in variety of ways but not linked to learners needs	Lesson presented in variety of ways but linked to learners needs to some extent	Planned for Lesson presented in variety of ways but not linked to learners needs
8.	Evaluation/Recap itulation	No evaluation techniques are provided. If used techniques do not measure the lesson objectives	Evaluation techniques are provided for the lesson but in an inaccurate way	Formative and summative evaluation techniques are provided and are related to lesson objectives	All types of evaluation techniques are provided and are related to lesson objectives and students nature.
9.	Closure	Lesson finishes without a review	Lesson finished with insufficient review.	Teacher finished lesson by summarizing and reviewing with engagement of students.	Teacher made students involved in review the lesson with proper feedback.
10.	Questioning	Question asked but of no value. Few students were involved.	Question asked with little relevance with objectives. Some students were involved	Most students were involved in questioning. Related to objectives.	Question provoked the thinking, developed reasoning and logic.
11.	Organization of time	Not cared for time to achieve the lesson objectives	Consider time for various components of lesson but time slot was not appropriate	Use reasonable time slot for achievement of lesson objectives. Gave proper time to each component.	Exemplary time management.
12.	Monitoring Students work	Donot monitor/review students work	Sometimes review the students progress, but with less attention	Review students work during the lesson and provided the information about students progress.	Review the students work systematically.
13.	Professional write up of Lesson Plans	Lesson plan contains lot of errors	Lesson plan contains reasonable errors	Lesson plan is written in a good way a	Lesson plans written with full spirit and shows the zeal of the prospective teacher.

Model Lesson Plans Appendix I

Topic: Structure of Atoms by ARSHAD MEHMOOD QAMAR

2. Learning Outcomes

After studying this topic you will be able to

- Describe Atom and basic related concepts.
- Explain Composition of an Atom on the basis of atomic theories.
- Define and Calculate Atomic Number and Mass Number of atoms.
- Elaborate Isotopes, give their examples and tell the uses of isotopes in our daily life.
- Know the distribution of electrons in various shells and sub-shells
- Discuss electronic Configuration of Atoms and draw atomic structures.

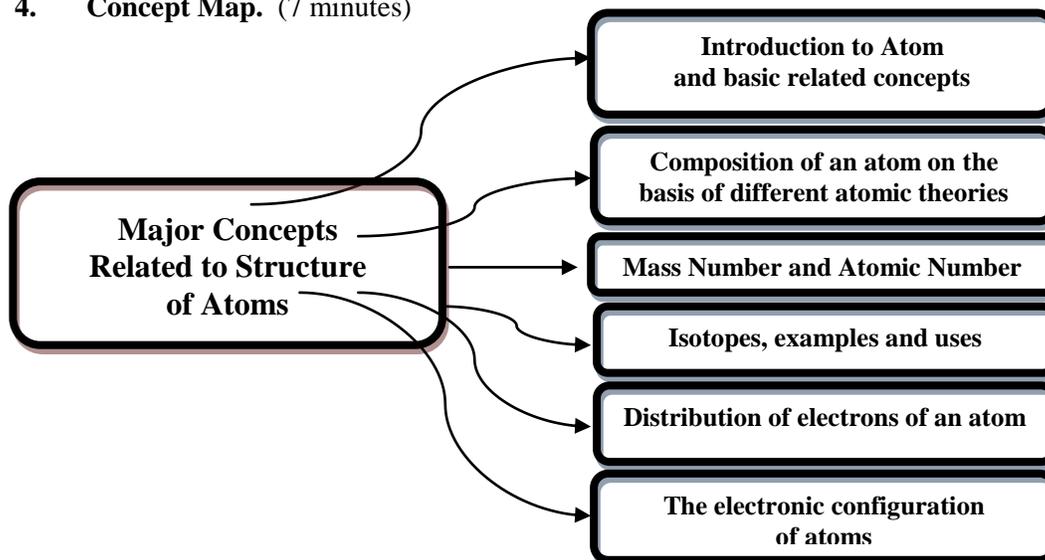
3. Method and Resource

- Inquiry, Questioning and discussion, Investigation and problem solving.
- Utilizing whole class, group, and individual work.
- Incorporating literacy strategies(reading, writing, speaking and listening)

3.1 Resources

- Science Supplies and Equipments.(models of atomic structure, models of shapes of shells, model of Rutherford's experiment, indigenous materials)
- Print Resources, Students text books, sheets, reference books etc.
- Non- print (Computer soft wares offering simulations models And net links etc)
- Technology (Computers, Multimedia including active boards).

4. Concept Map. (7 minutes)

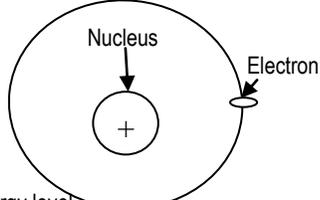


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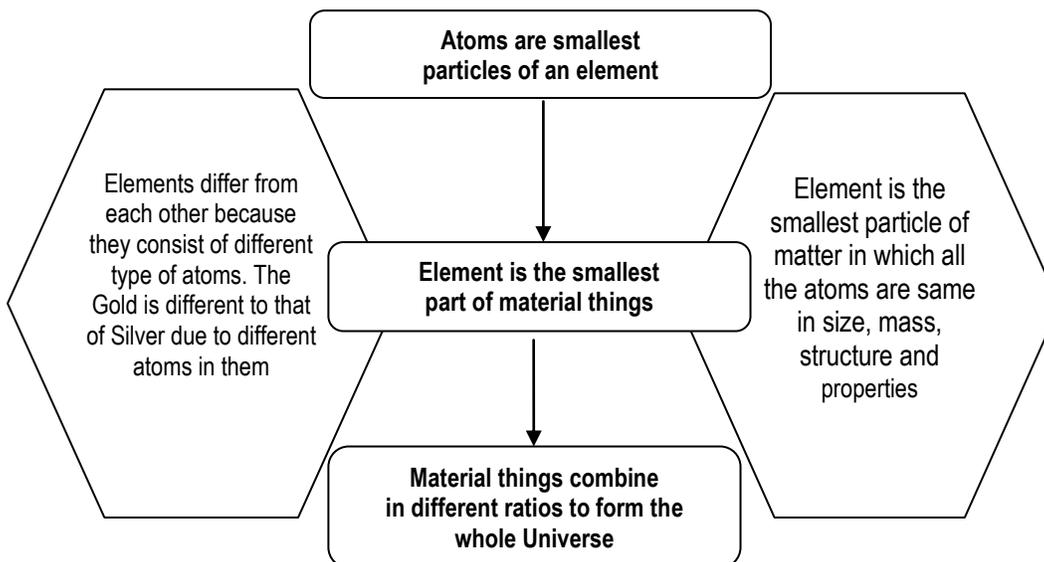
Do students know the concept of matter? Do students know meanings of Composition?

5. Presentation

5.1 Introduction to Atom (time= 10 Minutes).

<p>Hands on Activity: A piece of cardboard will be given to some students. They will be asked to cut it into smaller pieces. Then again tried to cut it into further into smaller pieces .When students will not be able to cut into further smaller pieces, the teacher will ask them this is the basic unit of element and is called Atom. The name atom comes from the Greek word <i>atomos</i> that means "indivisible".</p>	<p>Figure 1 Structure of an atom</p>  <p>The diagram illustrates the structure of an atom. It features a central nucleus, represented by a small circle with a '+' sign inside. This nucleus is surrounded by a larger circle representing the '1st Energy level'. On the right side of this energy level, a small circle with a '-' sign is labeled 'Electron'.</p>
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In 1808 John Dalton a school teacher put forwarded the Atomic Theory. According to it all matter is made up of small indivisible particles called atoms. After that when subatomic particles were discovered the concept of atom changed as follows; Atoms are the smallest particle of an element which can take part in chemical reaction and which may or may not exist independently. Like Hydrogen (H_2) and He (helium).



Assessment Questions

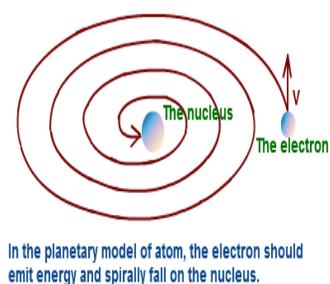
1. What is smallest particle of an element?
2. What are meanings of an atom?
3. Define atom?

5.2 Composition of an Atom. (10 minutes)

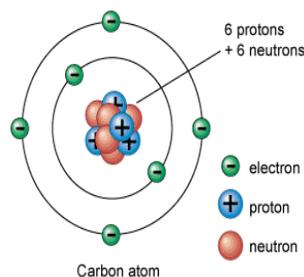
Parts of an Atom: An atom consists of two parts;

1. **Inner part.** Consists of protons and Neutrons.
2. **Outer Part.** Consists of energy levels in which electrons revolve.

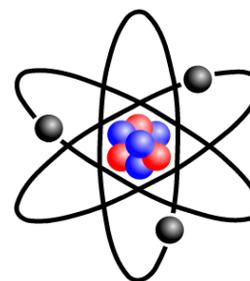
Electrons were discovered by Sir William Crooks in 1895. They carry negative charge. Protons were discovered by E. Goldstein in 1886. They carry positive charge. Neutrons were discovered by Chadwick in 1932. They are neutral. Different atomic Models presented by Rutherford, Bohr and Summerfield are based here.



Rutherford's atomic model



Bohr's atomic model



Sommerfeld's atomic model

In 1911 Lord Rutherford proposed that the structure of an atom consists of two parts, the central part and outer part. The central part is highly dense, and is called nucleus. Nucleus contains Protons and Neutrons. Proton and neutron make the main mass of an atom. Electrons are revolving around the nucleus in paths called orbits.

In 1913 Neil Bohr proposed that electrons revolve around the nucleus in energy levels. These energy levels has fixed energy. The energy of electron near the nucleus is smaller but energy of an electron is more which is revolving farther to the nucleus.

The atom as a whole is neutral as the number of proton and electron in an atom is always equal.

Number of Protons = Number of electron (in a neutral atom).

Activity: Find the number of electrons in the atom of hydrogen, carbon, oxygen, nitrogen and Sodium atoms when the number of protons is; 1, 6, 12, 8, 7 and 11.

5.3 Atomic Number and Mass Number: (10 minutes)

5.3 A) Atomic Number

Each type of atom has a specific number of protons. The number of protons present in the nucleus of an atom is called its atomic number. It is represented by symbol Z. atomic number is helpful to distinguish an element from other elements. Each

atom has a specific atomic number termed as its identification number. For example all atoms of hydrogen have 1 proton, their atomic number $Z=1$. All atoms in carbon have 6 protons, their atomic number $Z=6$. Similarly all Oxygen atoms have 8 protons having atomic number $Z=8$. We can also define atomic number as the number of electrons in a neutral atom.

5.3 (B) Mass Number:

Total number of protons and neutrons present in the nucleus of an atom is termed mass number. It is represented by symbol 'A'.

It can also be represented as $A = Z + n$ (where n is the number of neutrons.)

Each proton and neutron has one unit of mass. For example carbon has 6 proton and 6 neutron, hence its mass number $A = 6 + 6 = 12$.

Sodium has 11 protons and 12 neutrons in its Nucleus, hence its mass number $A = 11 + 12 = 23$.

$A = Z + N$	here A is mass no.
$Z = A - N$	Z is atomic number
$N = A - Z$	N is number of neutrons

Table showing Protons, Neutrons, Electrons, atomic number and mass numbers

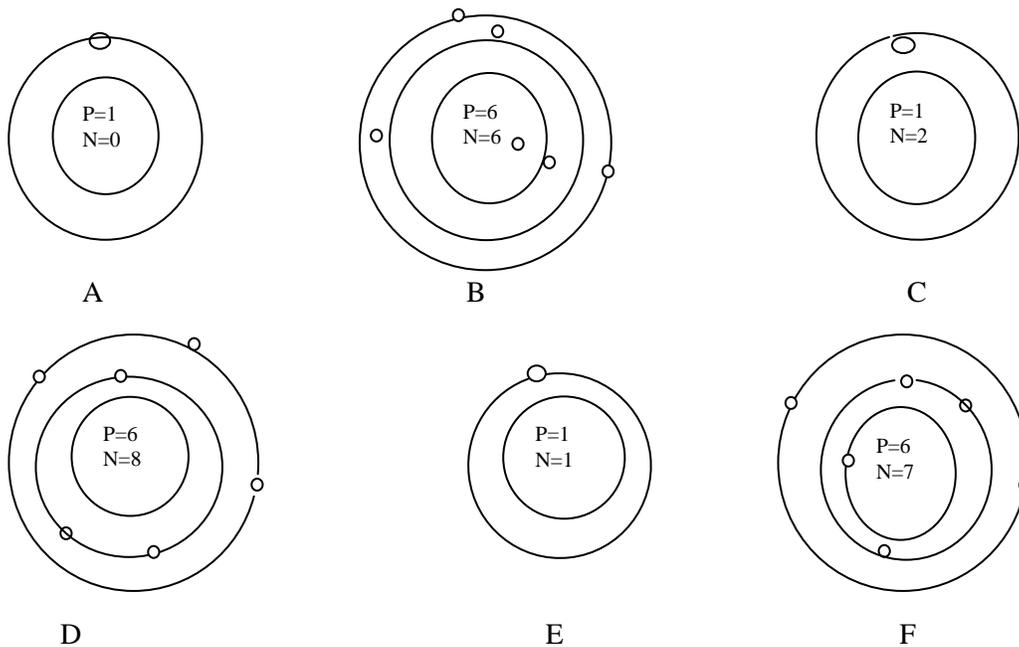
Element	Number of protons	Number of Neutrons	Number of Electrons	Atomic number (Z)	Mass Number(A)
Hydrogen	1	0	1	1	1
Helium	2	2	2	2	4
Lithium	3	4	3	3	7
Beryllium	4	5	4	4	9
Boron	5	6	5	5	11
Carbon	6	6	6	6	12
Nitrogen	7	7	7	7	14
Oxygen	8	8	8	8	16
Flourine	9	10	9	9	19
Neon	10	10	10	10	20

Activity: Identify an element whose mass number is 19. Calculate the number of protons, electrons and atomic number when number of neutron is 10.

Activity: write name of an element whose atomic number and mass number is same. Give reasons to explain your answer.

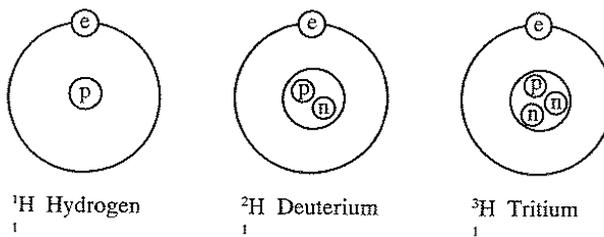
5.4 Isotopes and their uses (10 minutes)

Activity: In the atomic structures below identify structures in which numbers of protons, number of electrons and number of orbits is same. Also tell what difference in the structures is? Also calculate atomic numbers and mass numbers for all these structures.

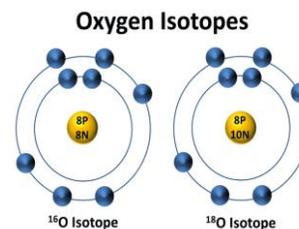


Which structures have same atomic numbers? Which structures have different mass numbers? Structures A, E and C have same atomic numbers. And structures B, D and F also have same atomic numbers. The structures having same atomic numbers are called isotopes. Atoms of the same element which have same number of protons and electrons but different of neutrons are called isotopes. Isotopes are chemically alike but differ in their physical properties.

Figure A, E and C are isotopes of Hydrogen. Fig A is called Protium, E is Deuterium and C is called Tritium. More clear picture of isotopes of hydrogen is given below in fig no



Oxygen has two isotopes. Both has same number of protons or atomic number $Z=8$ But different Number of neutrons and mass numbers $A= 16$ and $A= 18$



Uses of Isotopes

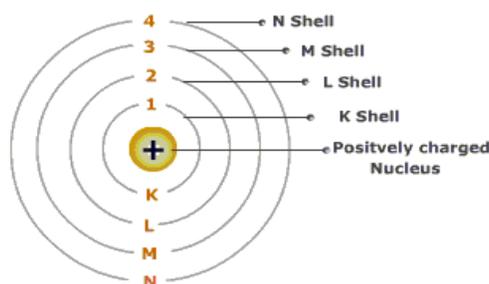
Isotopes have many uses in our daily life. Some are given as under:

1. Iodine-131 is used as a tracer in diagnosing thyroid problems.
2. Na-24 is used to trace the flow of blood and detect problems in the circulatory system.
3. Cobalt- 60 is used to irritate cancer cells.
4. Carbon-14 is used to trace the path of carbon in photosynthesis.
5. Hydrogen isotope deuterium is used in the preparation of heavy water. Heavy water is used as a neutron moderator and coolant for nuclear reactors.

5.5 Distribution of Electrons in an atom

(10 minutes)

Electrons revolve around the nucleus in different energy levels or shells. Energy levels are denoted by 1, 2, 3 and so on. While shells are denoted by the alphabets or shells K, L, M and N. The energy of the electron in an orbit is proportional to its distance from the nucleus. For example the first shell has less energy and it increases from K shell to onward. In simple words shells are the main energy levels that electron occupy. Shells are represented by circles around the nucleus. The number of electrons that a shell can accommodate is calculated by $2n^2$, where 'n' is the shell number.



A shell further consists of sub-shells or orbitals and is denoted by smaller letters **s**, **p**, **d** and **f**. Distribution of electrons around the nucleus in various shells and sub-shells according to their increasing energy is called electronic configuration.

Energy level	Shell	Sub-shell	Number of electrons
1	K	s	2
2	L	s, p	8
3	M	s, p, d	18
4	N	s, p, d, f	32

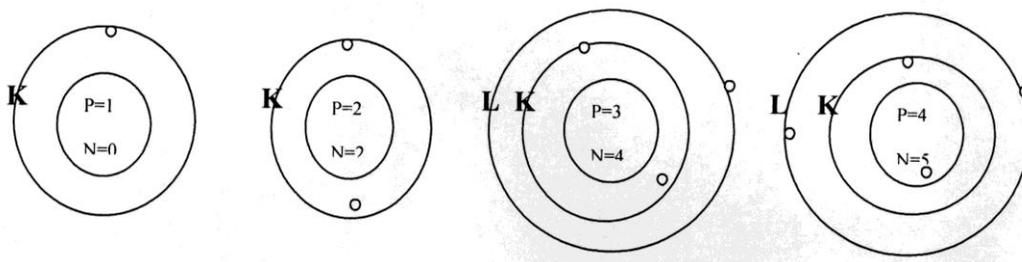
5.6 Electronic Configuration of Atoms (10 minutes)

The sequence of filling of electrons in different sub-shells is: $s < s < p < s < p < s < d < p < s < \dots$

Element	Atomic Number	Electronic configuration	Element	Atomic number	Electronic configuration
hydrogen	1	$1s^1$	neon	10	$1s^2 2s^2 2p^6$
helium	2	$1s^2$	sodium	11	$1s^2 2s^2 2p^6 3s^1$
lithium	3	$1s^2 2s^1$	magnesium	12	$1s^2 2s^2 2p^6 3s^2$
beryllium	4	$1s^2 2s^2$	aluminum	13	$1s^2 2s^2 2p^6 3s^2 3p^1$

boron	5	$1s^2 2s^2 2p^1$	silicon	14	$1s^2 2s^2 2p^6 3s^2 3p^2$
carbon	6	$1s^2 2s^2 2p^2$	phosphorus	15	$1s^2 2s^2 2p^6 3s^2 3p^3$
nitrogen	7	$1s^2 2s^2 2p^3$	sulfur	16	$1s^2 2s^2 2p^6 3s^2 3p^4$
oxygen	8	$1s^2 2s^2 2p^4$	chlorine	17	$1s^2 2s^2 2p^6 3s^2 3p^5$
fluorine	9	$1s^2 2s^2 2p^5$	argon	18	$1s^2 2s^2 2p^6 3s^2 3p^6$

Atomic structures of some atoms



The students will draw atomic structures of atoms of first twenty elements on activity sheets provided, and teacher will guide and monitor them.

6. Summary (Key points)

(10 minutes)

- Atom is the smallest particle of matter which can or cannot exist free in nature and can take part in a chemical reaction,
- An atom consists of three sub-atomic particles; electron, proton and neutron.
- Proton carries positive charge, electron carry negative charge whereas neutron is neutral.
- Number of protons present in the nucleus of an atom is called its atomic number.
- Total number of protons and neutrons present in the nucleus of an atom is called its mass number.
- Atoms of the same element which have same number of protons, but different number of neutrons are called isotopes.
- There are four shells K, L, M and N.
- Rutherford gave planetary model of atom, according to which atom have a central heavier dense portion called nucleus.
- Bohr gave the idea of energy levels in which electrons revolve around the nucleus.
- The energy of the shells is proportional to the distance from the nucleus. Farther an electron is more energy it has and so on.
- The number of electrons in K, L, M and N shells respectively is 2, 8, 18, and 32.
- Distribution of electrons around the nucleus in various shells and sub-shells according to their increasing energy is called electronic configuration.

7. **Assessment and Recapitulation.** (15 minutes)

1. An atom of chlorine has 17 protons and 18 neutrons in its nucleus. Find its atomic number and mass number?
2. Define atomic number and mass number? 3. Complete the missing spaces with correct answers in the table given below.

Element	Number of protons	Number of Neutrons	Number of Electrons	Atomic number (Z)	Mass Number(A)
Hydrogen	1	0	1	1	1
Helium	-	2	2	-	4
Lithium	3	-	3	-	7
Beryllium	4	5	-	4	-
Boron	-	-	5	5	11
Carbon	6	-	-	6	12
Nitrogen	-	7	-	7	-
Oxygen	8	8	-	8	-
Flourine	9	-	9	9	19
Neon	10	-	10	-	20

4. Define isotopes .Draw structures of isotopes of Carbon?
5. Describe Rutherford's and Bohr's atomic models?

Annex-A; MCQS for Pre-test

1. Which atom can exist independently?
A). Oxygen B) hydrogen C) helium
D) Nitrogen
2. "M" is considered in electronic configuration of atoms
A) Sub-shell B) Shell C) energy level
D) none of them
3. The correct electronic configuration of Carbon is..
A) $1s^2 2s^4$ B) $1s^2 2s^2 2p^2$ C) $2s^2 3p^4$ D) $2s^2 3p^2 3s^2$
4. Hydrogen has three isotopes
A) 2 B) 3 C) 4
D) 1
5. Nucleus as a whole is ...
A) neutral particle B). Positively charged C) Negatively Charged
D) sometimes negatively sometimes positively charged.

SAMPLE LESSON PLAN 2

Name of the Teacher: Class: 9
Subject: General Science No. of Students:.....
Duration of the Lesson: 45 min. Date:
Topic of the Lesson: Environment

General Objectives:

Students will be able to:

1. Know about the importance of environment.
2. Understand importance of clean environment.
3. Execute various steps for keeping environment clean.
4. Identify the importance environment for living organisms.

Specific Objectives:

After completion of this lesson you will be able to:

1. define the term 'Environment'.
2. enumerate the living and nonliving components of environment.
3. explain the relationship between the living beings of the environment.
4. exemplify the importance of various components of environment for one another.
5. Describe different methods to protect the environment

Teaching Method: Lecture-cum-inductive/deductive Method

AV Aids: Blackboard, Chalk, Textbook, Chart, Pictures of living and non-living things.

Previous Knowledge:

What is the difference between living and non-living things?

How many types of living things are there?

1. Give examples of non-living things?
2. What do we obtain from the sun?
3. What is the nature of light and energy?
4. Can life exist without water?
5. What do living things need to live?

Announcing the topic: Today, we are going to learn about "Environment"

Introduction:

Give two minutes to students to notice and tell various living and non-living things in the classroom and the school. Write down the names told by students on the blackboard.

Are all these things present in our home? Yes, nearly at all places, the various living and non-living things together make up the environment.

Presentation:

Now show a chart to students with the following main elements and pictures of living and non-living things.

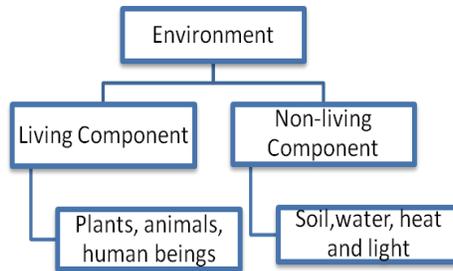


Figure 2: Components of Environment

Question: What are the main components of environment?

Now tell about the importance of plants in the environment. Plants prepare food on which other living things depend. Plants are called **producers**. Now draw the diagram of food chain and explain to students about the inter-dependence of various living things on each other. In the environment, energy travels from green plants to **herbivores** (animals eating plants) then to **carnivores** (animals eating animals) and finally to **omnivores** (animals who eat both plants and animals).

Now, explain the importance of green plants (**producers**) that they produce oxygen and regulate the temperature of the environment. Also tell about the importance of water in the environment for all the plants and animals and without it, life is impossible. Also mention the importance of soil for the living things in the environment.

Partial Recapitulation:

- What benefits we get from plants?
- What are the sources of energy in the environment?
- What are the man-made sources of energy?

Class work:

Activities and exercises at the end of the lesson will be discussed and done in the note books. Pictures of Living and Non-Living things will be drawn or pasted.

Final Recapitulation:

1. What do you mean by environment?
2. Give some examples of natural elements.
3. Is human being a producer or consumer?

4. Who are the producers? What do they do?
5. How carnivores depend on plants?

Homework:

1. Draw and describe food chain.
2. Write down the benefits of sunlight.
3. How increased plantation can influence the environment?

MODEL LESSON PLAN 3

(AUSUBELIAN TEACHING METHOD)

Topic: Pressure and atmospheric pressure

Class X

Time: 1 hour 10 min.

Concepts: matter and its properties, stress, force, area, Newton's third law of motion.

General objectives: To develop the sense of reasoning and logical thinking and scientific attitude among the students.

Specific Objective: After the end of this session, the students will be able to:

- Define matter and name some of its properties.
- Define the concepts of force, area, and pressure.
- Find the relationship between force and pressure.
- Find the relationship between area and pressure.
- Find the relationship between temperature and pressure.
- Apply the concept of pressure in daily life.

Dear students I hope you all will be fine.

O.K. like previous lessons we will study this lesson too in the same manner. In the beginning I will ask you some questions about the concepts, of which you are already familiar just to refresh your previous knowledge and to develop the linkage between the learnt material and the material to be learnt.

- **Teacher:** (just food for thought)
- Students do you ever think why athletes / player use spikes?
- Why is it easy to cut with a sharp knife than a blunt one although the applied force is same?

Lesson Plan (Phases of Ausubelian Teaching Method)

Phase One Advance Organizer	Phase Two Presentation of Learning Task or Material	Phase Three Strengthening Cognitive Organization
<ul style="list-style-type: none"> • Define matter. • Name and recall some properties of matter; weight, volume, force, area etc. • Air and all other material things exert pressure, and have weight. • What is force? • Weight is a force. • Unit of force. • Area and its units. • Volume 	<ul style="list-style-type: none"> • Pressure • $P = F/A$ • Pressure depends upon Force and Area • Unit of Pressure (N/m^2 or Pascal) <p>Examples (Blunt nail vs. sharp nail, Flat Shoes / Sandal with heel.</p> <ul style="list-style-type: none"> • Difference between stress and pressure. <div style="text-align: center;">  </div> <ul style="list-style-type: none"> • Which Triangle has greater pressure A or B? 	<ul style="list-style-type: none"> • Keeping in view of concept of pressure justify how horse is faster than camel. • Why athletes use spikes? • How you differentiate between stress and pressure? Are these scalars or vector quantities?

Model Lesson Plan 4

Using the Cell Engineer/Detective Approach to Explore Cell Structure and Function



Table 1. Cell Engineer-Teaching Timeline

Time (min)	Learning Outcome(s)	Activity/Assessment	Explanation, notes, suggestions, tips
Pre-class	<ol style="list-style-type: none"> 1. Identify the major cell organelles 2. List the major functions of the organelles 3. Know the major differences between plant and animal cells 	Using the textbook and a handout from the instructor, students will read about the typical cell in animals and plants as well as the organelles and their basic roles within the cell.	A sample handout is provided as part of the unit.
Learning activity #1: Preparatory material presentation (5 min)	<ol style="list-style-type: none"> 1. Identify the major cell organelles 2. List the major functions of the organelles 	Ask the class as a whole to list some activities that cells must perform (i.e. move, obtain energy, expel wastes); list these on the board. Then ask students to name the organelle(s) primarily responsible for that activity. If any functions/organelles are left out, bring them up.	
Learning Activity #1 (10 min)	<ol style="list-style-type: none"> 1. Identify the major cell organelles 2. List the major functions of the organelles 	Working in groups, students will be assessed on their pre-class reading by constructing a model plant and/or animal cell. The class as a whole will discuss this.	The cell diagrams from this activity are turned in and graded.
Learning Activity #2 (15 min)	<ol style="list-style-type: none"> 1. Cell Engineer: Students build an imaginary cell suited for a specific function. 2. Cell Detective: Students exchange cell drawings and attempt to guess function. 3. Discussion/share out Cell Detective guesses 	Each student group will receive a functional description of a cell. They will draw a diagram depicting how they think the cell will look in order to optimize that function. After constructing their cell, each group will exchange their cell with another group and try to guess the function of the other group's cell based on the structure.	
Follow up mini-lecture (15 min)	<ol style="list-style-type: none"> 1. Address any misconceptions that might arise during Activity 2. 2. Relate imaginary cell structures to real cell types in tissues of plants and animals 	This will include clicker questions to get the students thinking about this relationship between cell structure and organelles to function using real-life examples.	
Post-activity summing up or transition (5 min)		Have students ponder the question "Do differences in organelles alone account for the different functions of cells?" to prepare for next unit.	

Sestero, C., Tinsley, H., Ye, Z-H., Zhang, X., Graze, R., and Kearley, M. 2014. Using the Cell Engineer/Detective Approach to Explore Cell Structure and Function. CourseSource.

**APPENDIX II
STUDENT BIODATA FORM (WORKSHOP)**

S/No.	Student Name	Phone Number	Email Address
1.			
2.			
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25.			

APPENDIX IV

RESULT SHEET OF PROSPECTIVE TEACHERS

S/No.	Name of Student	Roll No.	Workshop					Teaching Practicum			Remarks
			Attendance (10 Marks)	Lesson Plans (40 Marks)	Assessment Tool Development (10 marks)	Development of Instructional Aids (20 Marks) Instructional aids will be from Low cost material, Laboratory material, electronic sources and models/charts	Peer Group Presentation of Two lessons (10+10=20 Marks)	Lesson Plans (40 Marks)	2 Final Lessons (30+30=60 Marks)	Total Marks (Obtained out of 200)	
1.											
2.											
3.											
4.											
5.											
6.											
7.											
8.											
9.											
10.											

APPENDIX V
TEACHING PRACTICUM SITE APPROVAL FORM

This form must be completed and submitted to the concerned Regional Office/Center of the Allama Iqbal Open University for approval at least 08 weeks prior to the start of teaching practicum.

Student Name:.....

Registration No:

Name & Address of School:

Phone Number of School:

Principal/Head Teacher Name & Signature:.....

APPENDIX VI
TEACHING PRACTICUM LETTER

Respected Head of the Institution,

Mr./Ms./Mrs. _____ is a student of B.Ed. (2.5 years) under registration number _____ in Allama Iqbal Open University, Islamabad. He/she is needed to perform teaching practicum in the school as a requirement of his/her degree program. Kindly facilitate him/her by providing this opportunity in your institution.

Director,
Regional Center _____,
AIOU, Islamabad.

APPENDIX VII
FORM FOR FINAL LESSON & PRESENTATION

Name of Trainee Teacher:

Roll No. of the Student:

Subject:

Date:

S/No.	Dimension	Total	Score
1.	Objectives	3	
2.	Checking Previous Knowledge	3	
3.	Use of AV aids	3	
4.	Instructional Method	3	
5.	Assessment Tool	3	
6.	Lesson Recapitulation	3	
7.	Questioning/ Closure	3	
8.	Home Assignment	3	
9.	Time Management	3	
10.	Write-up of Lesson Plan	3	
	Total	30	

NOTE: FOR ASSESSING EACH LESSON, SEPARATE FORM WILL BE USED.

Comments:

Supervisor Evaluator.....

Evaluator Tutor