

STANDARD

SCIENCE

Class-7

TEACHER GUIDE

I N D E X

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PREFACE

The series standard science and its teacher guide is a set of books according to the new syllabus of 6th, 7th and 8th class students. These science books and guides are in particular written for young children to build up awareness about basic science in their scientific background.

In these books and guides we give most activities and exercise for students to increase their knowledge about science easily.

It is important that your children start learning early. The aim is to spark the interest of the students in the sciences and prevent them from disliking and rejecting the sciences and possibly scientific professions as the result of negative experience at school and at home.

It is especially for those students who later work in a field related to the sciences to have a foundation for understanding their world that allows them to make informed decisions.

This will expand their horizon and they will be interested about things they read, hear or see in this 21st century and ahead.

The guide is written in simple and easy language. For help of students short and long questions also giving in these books. All these things will make learning cool for children.

DISTRIBUTION OF SYLLABUS

There are 12 (Twelve) chapters in Standard Science for Class-VII. These chapters are useful for Class-VII and level of VII Class Students. These chapters are prepared and designed according to competition level of modern era. The detail of these chapters are:

S.#	CHAPTER NO:	CHAPTER'S NAME
01	CHAPTER-01	SCIENCE AND SCIENTIFIC WORLD
02	CHAPTER-02	STUDY OF LIFE (BIOLOGY)
03	CHAPTER-03	ORGANIZATION OF LIFE
04	CHAPTER-04	CLASSIFICATION OF LIVING ORGANISMS
05	CHAPTER-05	VIRUSES, BACTERIA, CYNOBACTERIA
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08	CHAPTER-08	STRUCTURE OF ATOM
09	CHAPTER-09	PERIODICITY OF ELEMENTS
10	CHAPTER-10	STUDY OF MATTER AND ENERGY (PHYSICS)
11	CHAPTER-11	MEASUREMENT
12	CHAPTER-12	FORCE AND FRICTION

Syllabus wise these chapters are divided into three terms:

- (i) First Term Syllabus.
- (ii) Second Term Syllabus
- (iii) Final Term Syllabus.

DISTRIBUTION OF FIRST TERM'S SYLLABUS

There are four chapters in First term syllabus. These chapters are suitable for first term. The further details of these chapters are:

S.#	CHAPTER NO:	CHAPTER'S NAME
01	CHAPTER-01	SCIENCE AND SCIENTIFIC WORLD
02	CHAPTER-02	STUDY OF LIFE (BIOLOGY)
03	CHAPTER-03	ORGANIZATION OF LIFE
04	CHAPTER-04	CLASSIFICATION OF LIVING ORGANISMS

DISTRIBUTION OF SECOND TERM'S SYLLABUS

There are four chapters in second term syllabus. These chapters are suitable for second term. The further details of these chapters are:

S.#	CHAPTER NO:	CHAPTER'S NAME
05	CHAPTER-05	VIRUSES, BACTERIA, CYNOBACTERIA
06	CHAPTER-06	STUDY OF MATTER (CHEMISTRY)
07	CHAPTER-07	CHEMICAL COMBINATION
08	CHAPTER-08	STRUCTURE OF ATOM

DISTRIBUTION OF FINAL TERM'S SYLLABUS

There are four chapters in final term syllabus. These chapters are suitable for final term. The further details of these chapters are:

S.#	CHAPTER #	CHAPTER'S NAME
09	CHAPTER-09	PERIODICITY OF ELEMENTS
10	CHAPTER-10	STUDY OF MATTER AND ENERGY (PHYSICS)
11	CHAPTER-11	MEASUREMENT
12	CHAPTER-12	FORCE AND FRICTION

NOTES FOR TEACHERS**CHAPTER-01 SCIENCE AND SCIENTIFIC WORLD**

Demonstrate students, the term science. Give them different examples of scientific functions of our daily life. Describe them importance of science. Describe them various branches of science. Describe teachings of Islam and science. Let them understand the scientific method, steps of scientific method, Handling data etc.

CHAPTER-02 STUDY OF LIFE (BIOLOGY)

Demonstrate students, the term Biology. Give them different examples of life phenomenas. Describe them History and importance of Biology. Describe them various branches of Biology. Tell them the different concepts of abiogenesis and Biogenesis.

CHAPTER-03 ORGANIZATION OF LIFE

Demonstrate students, the meaning of organization of life. Describe the various examples of composition of living body. Define them the term cell, Cell organelles etc. Describe them the structure of animal and plant cell. Define the cell division.

CHAPTER-04 CLASSIFICATION OF ORGANISMS

Demonstrate students, the term classification. Describe them the need and importance of classification. Describe them the concepts of kingdoms. Tell them the scientific names of different organisms. Describe the scheme of Robert H. Whittaker, Margulis and Schwartz. Define them the aims of classification and units of classification.

CHAPTER-05	VIRUSES, BACTERIA AND CYNOBACTERIA
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Demonstrate students, the term Micro-organisms such as viruses, bacteria and cynobacteria. Describe them the advantages and disadvantages of viruses. Describe them advantages and disadvantages of bacteria. Discuss and explain structure, shape and characteristics of viruses. Describe them the shape and modes of Nutrition in bacteria. Tell them the some bacterial and viral diseases.

CHAPTER-06	STUDY OF MATTER (CHEMISTRY)
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Demonstrate studnets, the term chemistry. Describe them different historical period and importance of chemistry. Give them different models to study and analyze the chemistry of objects or materials. Tell them the composition, decomposition, structure and properties of matter. Describe the various fields and bracnhes of chemistry.

CHAPTER-07	CHEMICAL COMBINATION
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Demonstrate students, the chemical combinations. Describe the different laws of chemical combinations. Introduce them the term symbol, chemical formula, ion, valency etc. Decribe them the meaning of chemical reaction. Discuss and explain them different examples of chemical reaction. Decribe them the various types of chemical reactions. Define these terms Atomic Mass, Mole, Molecular formula mass, formula Mass, Molar Mass and Arogadro's Number. Explain them chemical equation. Tell them the methods to balance chemical equation.

CHAPTER-08	STRUCTURE OF ATOM
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Demonstrate students, the term Atom. Describe them structure of atom. Discuss and explain them

fundamental particles of atoms. Describe them various theories of atoms. Explain them Dalton's, Rutherford and Bohr's atomic models. Describe the modern concepts of atom. Describe them Isotopes of various elements and electronic configuration.

CHAPTER-09	PERIODICITY OF ELEMENTS
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Demonstrate students, the meaning of Periodicity of elements. Describe them difference between periodicity and periodic table. Describe them different rules and models of periodic table. Define the causes, need and importance of periodic table. Describe methods and limitations to understand the periodic table. Define them following terms Ionization Energy, Electron Affinity, Electronegativity, Atomic Radius, Metals, Non-Metals and Metalloids.

CHAPTER-10	STUDY OF MATTER AND ENERGY (PHYSICS)
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Demonstrate students, the meaning of Physics. Give them the importance of physics in our daily life. Describe them comparison and contract between matter and energy. Prove them with our daily life that matter and energy are inter-related. Describe them contribution of Muslim scientists in the field of physics. Describe them the concepts of scientific method in physics.

CHAPTER-11	MEASUREMENT
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Demonstrate students, the concept of measurement. Describe the importance of measurement in our daily life. Then ask them questions that why is measurement necessary? Tell the different system of units for measurement. Visit students in science lab and show them different instrument and describe them their usage, precautions and importance.

CHAPTER-12

FORCE AND FRICTION

Demonstrate students, the terms force and friction. Describe daily examples of force and friction. Describe the need, importance and limitations of force and friction. Describe them various kinds and effects of force. Discuss and explain them advantages and disadvantages of friction. Describe the kinds of friction.

POINTS TO REMEMBER

- ☆ Arrange the monthly quiz competition to increase the interest of learning science.
- ☆ Arrange weekly students demonstrate class to enhance the confidence and adapting skills.
- ☆ Arrange group discussion of students after completing a chapter or topic.
- ☆ Give them different projects to make their own notes/ script/ data.
- ☆ Give them projects to make different models i.e. Planetary system, Green House Effect, Atomic Models of elements, Jet fighter, power stations etc.
- ☆ Visit them zoological gardens to understand them different living organisms i.e. Animals and plants.
- ☆ Visit the scientific apparatus.
- ☆ Describe and teach them that Islam and science are closely related each other, show and tell different verses of the Holy Quran are witness of Phenomenas, relating science.
- ☆ Arrange the science workshop for students. Arrange a lot scientific models and brief the students and tell them to give their view about workshop.

CHAPTER-01

SCIENCE AND SCIENTIFIC WORLD

MCQ's**(MULTIPLE CHOICE QUESTIONS)****A: CHOOSE THE**

1. The word science is derived from a _____ word scientia.
(French, Greek, Latin)
2. Science means _____.
(to hide, to tell, to know)
3. _____ is the study of nature.
(Science, Social, Economics)
4. Bio means _____.
(life, wide, hide)
5. Logos means _____.
(Study, convey, Theory)
6. The study of life is called _____.
(Biology, chemistry, physics)
7. _____ is derived from the word "Kheem" which is the old name of Egypt.
(Biology, chemistry, physics)
8. _____ is the branch of science that deals with the study of composition, structure and properties of matter.
(Biology, chemistry, physics)
9. The word physics is come from _____ word physikos.
(Greek, Latin, French)
10. _____ is the branch of science that deals with the study of matter, energy and relationship between them.
(Physics, Psychology, Astrology)
11. The study of earth, movement of the earth is called _____.
(Ecology, Geology, cosmology)
12. _____ is the basic tool for elaborating a phenomenon.

(observation, Hypothesis, Theory)

13. A _____ is an intelligent scientific guess.

(observation, Hypothesis, Theory)

14. Scientific information is sometimes called _____.

(Data, Prediction, Chart)

15. A _____ shows the result of an experiment as a picture.

(Linegraph, Bar chart, Pie chart)

ANSWER KEY					
01	Latin	02	to know	03	Science
04	Life	05	Study	06	Biology
07	Chemistry	08	chemistry	09	Physics
10	Physics	11	Geology	12	Observation
13	Hypothesis	14	Data	15	Bar chart

B: SHORT ANSWER QUESTIONS.

Q1: What is Science?

Ans: SCIENCE:

The word science is derived from a latin word "scientia" meaning to know.

Q2: What is Biology?

Ans: The word biology comes from two Greek words.

Bios = meaning life

Logos = meaning thinking or study.

Biology is the branch of natural science that deals with organisms and different phenomenon of life.

Q3: What is Chemistry?

Ans: Chemistry is the branch of science that deals with the study of composition, decomposition, properties and structure of matter.

Q4: What is Physics?

Ans: The word physics has come from a Greek word "Physikos" meaning natural.

Physics is the branch of science which deals with the study of matter and energy and also relationship between them.

Q5: What is Astrology?

Ans: The study of space, heavenly bodies such as the sun, the moon, stars and planets is known as Astrology.

Q6: What is Geology?

Ans: The study of the Earth, movement of the Earth is known as Geology.

Q7: What is Electricity?

Ans: The study of electric charge in motion is known as electricity.

Q8: What is difference between Hypothesis and theory?

HYPOTHESIS	THEORY
Hypothesis is a statement that may be possible answer of the problem. A hypothesis is an intelligent scientific guess.	Theory is the verified result of hypothesis, which is obtained, with the help of careful experimentation.

Q9: What is Scientific law?

Ans: SCIENTIFIC LAW:

A theory which is tested again and again and found to fit the facts and from which valid prediction may be made is then known as scientific law or principle.

Q10: What is Bar Chart?

Ans: BAR CHART:

A bar chart shows the results of an experiment as a picture. You can see at a glance what the results show. This bar chart shows the range of hand span sizes found in a group of people.

LONG ANSWER QUESTIONS

Q1: What is significance of science? Describe the fields of science.

Ans: SIGNIFICANCE OF SCIENCE:

- ☆ It helps us to understand the natural world.
- ☆ It is concerned with information gained by observing and testing the natural world.

FIELDS OF SCIENCE:

The main fields of science are:

- ☆ Biology ☆ Chemistry ☆ Physics

Other fields of science:

- ☆ Astrology ☆ Geology ☆ Cosmology
- ☆ Electricity

☆ **BIOLOGY:** Biology is the branch of natural science that deals with organisms and different phenomenon of life.

☆ **CHEMISTRY:** Chemistry is the branch of science that deals with the study of composition, decomposition, properties and structure of matter.

☆ **PHYSICS:** Physics is the branch of science which deals with the study of matter and energy and also relationship between them.

☆ **ASTROLOGY:** The study of space, heavenly bodies such as the sun, the moon, stars and planets is known as Astrology.

☆ **GEOLOGY** The study of the earth, movement of the earth is known as geology.

☆ **COSMOLOGY:** The study of weather and climatic change of various places is known as cosmology.

☆ **ELECTRICITY:** The study of electric charge in motion is known as electricity.

Q2: Describe the teachings of Islam for acquiring knowledge.

Ans: In an authentic hadith saheeh Bukhari Sharif the mode of the first revelation is narrated when the Holy Prophet (S.A.W.W) was in the cave of Hira.

"Read: In the name of the Lord who createth".

"Createth man from a cloth"

"Read: And it is the Lord the most Bountiful".

"Who teacheth by pen, Teacheth man that which he knew not." (Surah: Al-Alaq, Ayat 1-5).

It is obvious from the first revelation that the reading in Islam is the most important feature of life. In the Holy Quran the Knowledge of names of things is related to the very first man, Adam (May Allah place his soul in peace and tranquility). Superiority of Adam to angels is due knowledge of things.

"And He taught Adam all the names, then showed them to the angels, Saying:

Inform me of the names of these it ye are truthful."

"They said: Be glorified! We have no knowledge saying that which. Thou has taught us. Lo! Thoos, only Thou, art the knower, the wise."

Q3: What is Scientific method? Describe its steps.

Ans: SCIENTIFIC METHOD: The way to perform experiments, make observations and deduce the results in science is known as scientific method.

STEPS OF SCIENTIFIC METHOD:

Scientific method is based on the following steps.

- | | |
|---------------|--------------|
| ☆ Observation | ☆ Hypothesis |
| ☆ Experiment | ☆ Theory |
| ☆ Prediction | ☆ Law |

☆ **Observation:** Study of collection of data about natural processes and scientific problems is called observation. Observation is the basic tool for elaborating a phenomenon.

☆ **Hypothesis:** Hypothesis is a statement that may be a possible answer of the problem. A hypothesis is an intelligent scientific guess.

☆ **Experiment:** Experiment is an organized process, which is used to test the truth of the hypothesis.

☆ **Theory:** Theory is the verified result of hypothesis, which is obtained, with the help of careful experimentation.

☆ **Prediction:** Forecast made after careful analysis of a theory is called prediction.

☆ **Law/ Scientific Law:** A theory which is tested again and again and found to fit the facts and from which valid prediction may be made is then known as scientific law or principle.

CHAPTER-02

STUDY OF LIFE (BIOLOGY)

MCQ's

(MULTIPLE CHOICE QUESTIONS)

A: CHOOSE THE CORRECT ANSWER.

1. The study of life is called _____.
(Biology, Non-living things, space)
2. The study of plants is called _____.
(Botany, Zoology, Anatomy)
3. The study of animals is called _____.
(Botany, Zoology, Anatomy)
4. This branch of biology deals with the study of external structural characteristics of plants and animals.
(Morphology, Anatomy, Histology)
5. Study of structure, function and composition of cell is called _____.
(Cytology, Histology, Physiology)
6. It deals with the chemistry and chemical aspects of living system.
(Biometry, Biophysics, Biochemistry)
7. Abdul Malik Asmai wrote _____ on horses.
(Al-Kheil, Al-Ibil, Ash Sha)
8. _____ wrote book, Firdus -ul-Hikma.
(Ali Bin Rabban Tubri, Al-Farabi, Ali Bin Isa)
9. He is considered as one the founder of medicine.
(Bu Ali Sina, Al-Farabi, Ibn-al-Nafees)
10. He was famous for removal of urinary bladder stone.
(Abul Qasim Al Zahravi, Ziauddin Ibn-Baitar, Abul Qasim Majreeti)
11. _____ discovered bacteria as causes of many diseases like Tuberculosis.
(Louis Pasteur, Robert Hook, E-Jinnar)
12. _____ discovered antiseptics e.g Iodine and carbolic

acid.

(J-Lister, E-Jennar, Charles Darwin)

13. _____ discovered method of vaccination against small pox.

(J.Lister, E-Jennar, Charles Darwin)

14. _____ gave his famous laws of heredity and laid the foundation of Genetics.

(Charles Darwin, Gregor John Mendal, Galileo)

15. _____ proposed double helix model of DNA to explain the function of DNA as hereditary material.

(Charles Darwin, Gregor John Mendal, Watson and Crack)

ANSWER KEY

01	Biology	02	Botany	03	Zoology
04	Morphology	05	Cytology	06	Biochemistry
07	Al-Kheil	08	Ali Bin Rabban Tabri	09	Bu Ali Sina
10	Abul Qasim, Al-Zahravi	11	Louis Pasteur	12	J-Lister
13	E-Jennar	14	Charles Darwin	15	Watson and Crack

B: SHORT ANSWER QUESTIONS.

Q1: Define Biology. Name branches of Biology.

Ans: BIOLOGY:

The word Biology is composed of two Greek words bios meaning life and logos meaning study. It is a branchh of natural science that deals with organisms and different phenomenon of life.

☆ Main Branches of Biology:

BOTANY ZOOLOGY MICRO BIOLOGY

OTHER BRANCHES OF BIOLGOY:

- ☆ Morphology ☆ Anatomy
- ☆ Histology ☆ Cytology of Cell Biology
- ☆ Physiology ☆ Ecology

☆ Embryology or Developmental Biology

☆ Taxonomy ☆ Genetics

☆ Palaeontology

Q2: What is difference between Botany and Zoology?

Ans:

BOTANY	ZOOLOGY
It is branch of biology which deals with scientific study of plants.	It is branch of biology which deals with scientific study of animals.

Q3: What is difference between Anatomy and Morphology?

Ans:

MORPHOLOGY	ANATOMY
This branch deals with the study of external structural characteristics of plants and animals.	It deals with the internal structures or organs of an organism. In plants it deals with the arrangement of different types of tissues in root, stem, leaf etc.

Q4: Write a short note on history of Biology?

Ans: HISTORY OF BIOLOGY:

The history of biology goes back to the ancient and pre-historic time very briefly, perhaps the first noticeable development in our knowledge of biology occurred during the Greek period. Individual like Aristotle is remembered even today. He wrote book "Historial Animalia". Carlous Linnaeus founder of biological classification, classified animals into two units i.e genus and species. Hardly any original addition to biological knowledge was made by the Biomass, who follwed the Greeks. From 8th to 18th

century, Muslims studied Greek and other literature, translated books of Roman and Sanskrit into Arabic, wrote new books and opened numerous centres of learning.

Q5: Define the importance of Biology.

Ans: IMPORTANCE OF BIOLOGY:

Biology has made an enormous impact on human welfare and in improving quality of life. It has helped us to produce more food and enabled man to realize the importance of balanced diet. It is through advancement in biology that man has been able to control diseases with the consequence that mortality rate has decreased and individuals live longer and lead healthy lives.

Q6: Write short biography of Abdul Malik Asmai.

Ans: Abdul Malik Asmai:

Abdul Malik Asmai was born in 741 AD. He wrote books Al-Kheil, Al-Ibil, Al-Wahoosh, Ash-sha and Khalaqul Insan, describing structure and function of body parts of horses, camels, sheep, wild animals and human beings. Kalaq-ul-Insan was popular among the western experts in zoology. He was regarded a specialist of his time.

Q7: Write short biography of Ali Bin Rabban Tubri.

Ans: Ali Bin Rabban Tubri:

Ali Bin Rabban Tubri was born in 775 AD. He wrote book Firdus-ul-Hikma having many illustrations and detailed articles on philosophy, zoology, psychology and Astronomy.

Q8: Write short biography of Al-Farabi.

Ans: Al-Farabi:

Al-Farabi was born in 870 AD. He was the renowned hakim and surgeon of the Islamic world. Al-Farabi is the author of two very well known books i.e. Kitab-ul-Nabatat and Kitab-ul-Haywanat.

Q9: Write short biography of Bu-Ali Sina.

Ans: Bu-Ali Sina:

Bu Ali Sina was born in 980 AD. He wrote books Al-Qanoon and Fill Tib Al-Shifa, about plants and animals and non-living things. He is considered as one of the founder of medicine, acknowledged by the greatest expert of his time in medicines in east and west.

Q10: Define Needham's Experiment.

Ans: Needham's Experiment:

In 1748, an English Scientist Needham, boiled meat in water, poured this gravy in bottles and closed their mouth with cork. After a few days many micro-organisms were produced in these covered bottles. This once again excited the believers of Abiogenesis i.e. life from non-life.

LONG ANSWER QUESTIONS

Q1: Describe the branches of biology. Also describe the relation of biology with other branches of science.

Ans: MORPHOLOGY: (Greek: Morphe = form):

This branch deals with the study of external structural characteristics of plants and animals.

ANATOMY: (Greek: Ana= up, tome = to cut)

It deals with the internal structures or organs of an organism. In plants it deals with the arrangement of different types of tissues in root, stem, leaf etc.

HISTOLOGY:

(Greek: Histos = web or tissues):

It deals with the study of tissues of plants and animals under a microscope.

CYTOLOGY OR CELL-BIOLOGY:

(Greek: Kytos = hollow vessel or cell):

The study of structure, function and composition of cell and cell organelles is called cytology or cell-biology.

PHYSIOLOGY: (Greek: Phusis = nature):

It is the study of functions of different parts of living organisms.

ECOLOGY: (Greek: Oikos = home)

It is the study of relationships of living organisms with each other and with their non-living environment. It is also called environmental biology.

EMBRYOLOGY OR DEVELOPMENT BIOLOGY:

(Greek: Embryon = embryo)

It is the study of progressive developmental changes which occur after zygote formation upto an organism is formed.

TAXONOMY: (Greek: Taxis = arrangement or grouping; Noms = laws related to naming)

It deals with the description, identification, classification and scientific naming of living organisms, according to their similarities and dissimilarities.

GENETICS: (Greek: Genesis = origin)

It deals with the study of inheritance including transmission of hereditary characters from parents to their offspring.

PALAEONTOLOGY:

(Greek: Palaios = ancient, ontos = being organisms)

It is the study of animals and plants that lived in remote past and are now found as fossils in the rocks. It can be further divided into two branches i.e. Palaeobotany; study of plant fossils, Palaeozoology; study of animal fossils.

BIOLOGY AND OTHER SCIENCES:

Biology is a multi dimensional science. It is linked with the knowledge of chemistry, physics, mathematics, sociology, statistics etc, and these branches which are related to biology are biochemistry, biophysics, biometry, etc. Some of them are

discussed below.

BIOCHEMISTRY

The branch of chemistry which requires firm knowledge of biology and chemistry to explain the synthesis of bio-molecules, their requirement and the effect caused by the deficiency and efficiency of different molecules on the organisms and their metabolism.

BIOPHYSICS: The branch of physics where we apply laws and techniques of physics to explain the metabolism of living organism, to find out the age of fossils etc. One of the sub-branch of biophysics, where radioactive isotopes are used to trace the translocation of different material "in vivo", that is, within the living organism. Radio labeling and carbon dating also show some uses of radio active isotopes in determining the age of fossils. Use of sound waves as ultrasound and laser technology show some relationship of physics with biology.

BIOMETRY: It is branch of mathematics where data and measurements related to living organisms are dealt with. Without knowledge of mathematics and statistics no biological research and data analysis is possible. All biologists conclude their results by using knowledge of statistics and mathematics.

BEHAVIOURAL BIOLOGY: Many of the facts of biology are reflected in the study of behaviour, it is an intersection of biochemistry, genetics, physiology, evolutionary theory and ecology. It also deals with psychology.

BIOSOCIOLOGY: The study of behaviour, especially social behaviour, also associates biology to the social sciences and humanities. Through the study of life in general, we will learn more about ourselves.

Q: Describe the contribution of Muslim Scientists in the field of biology.

Muslims have made important contributions in the field of biology in earlier ages.

Jabir Bin Hayan (722-817 A.D), wrote books named "Al-Nabatat" and "Al-Haywan" on plants and animals respectively.

Abdul Malik Asmai (741 A.D), wrote books "Alkheil, Al-Ibil, "Al-wahoosh", "As-Sha" and "Khalaqul Insan", describing structure and function of body parts of horses, camels, sheep, wild animals and human being. "Khalaqul Insan" was popular among the western experts in Zoology. He was regarded a specialist of his time.

Ali bin Rabban Tubri (775-870 A.D), wrote book "Firdus-ul-Hikma" having many illustrations and detailed articles on Philosophy, zoology, Psychology and Astronomy.

Abu Usman Umer Aljahiz, wrote book "Ala-Haywan" which described characteristics of 350 species of animals especially, about life of ants.

Al-Farabi (870-950 A.D) and Abul-Qasim Al-Zahravi (736-1004 A.D), both were the renowned hakim and surgeon of the Islamic World. Al Farabi is the author of two very well known books i.e. "Kitab-ul-Nabatat" and "Kitab-ul-Haywanat", and Zahravi was famous for the removal of urinary bladder stone.

Ibn-al Haitham (965-1039 A.D), Wrote books like "Kitabul Manazir" and "Mizanul-Hikma", He explained the phenomenon of vision and corrected the Greek concept of vision.

Bu-Ali Sina (980 A.D) wrote books "Al-Qanoon" and "Fill Tib Al-Shifa", about plants, animals and non-living things. He is considered as one of the founder of medicine, acknowledged by the greatest expert of his time in medicines in east and west.

Q: Describe the contribution of European Scientists in the field of biology.

Ans: After 15 century, European and other biologists made important contribution in the field of Biology.

William Harvey (1578-1657 A.D), described circulation of blood. Galileo (1610) invented microscope to examine small organisms. Robert Hook (1665) discovered "cell" the basic unit of living organisms.

Linnaeus (1707-1778 A.D), developed methods of classification for organisms and gave nomenclature and therefore, called father of taxonomy.

Schleiden and Schawann (1839), worked on the detailed structure of plant and animal cell, finally formulated cell theory. Louis Pasteur (1822-1895), discovered bacteria as causes of many diseases like Tuberculosis. J. Lister (1860), discovered antiseptics e.g Iodine and carbolic acid. E. Jenner (1896), discovered method of vaccination against small pox. Charles Darwin (1859), wrote his famous book "origin of species" about evolution of different species through natural selection. Gregor John Mendal (1822-1884) gave his famous laws of heredity and laid foundation of Genetics. Watson and Crick (1953), proposed double helix model of DNA to explain the function of DNA as heredity material.

Q: Discuss the concept of biogenesis and Abiogenesis. Prove the concept of biogenesis with the help of Redi's Experiment.

ANS: CONCEPT OF ABIOTENESIS AND BIOTENESIS:

Man had believed since ancient times that living organisms (both plants and animals) arise from clay, earth and other non-living matter from pre-existing parents of their own kind. This was based on sure observations as growth of fungus on pieces of bread and the appearance of maggots on dead bodies of animals. Aristotle believed that fishes, frogs are aquatic insects spontaneously developed from mud. This old belief that living beings can spontaneously develop from the non-living is termed as abiogenesis.

The idea of production of living from the non-living was

experimentally analyzed. The pioneer in such experiments was an Italian scientist named Redi. Through several experiments he showed that living organisms arise from their parents and neglected the idea of abiogenesis. The view that living beings can develop only from other living being is called biogenesis. The following are a few of the experiments which Redi performed and which led to the concept of biogenesis.

EXPERIMENT NO:(1): Some dead snakes were placed in a box. It was noticed that flies gathered around the dead snakes. After three days maggots appeared in their bodies. After about eighteen days these maggots transformed into pupae. Some of these pupae were then transferred to separate glass containers covered with a sheet of paper. After eight days, a fly emerged from each pupa and all flies were similar to those which visited the body of the dead snakes. From this it was concluded that maggots were the offsprings of flies. The flies had laid eggs on the dead snakes. These eggs gave rise to maggots which formed pupae and ultimately flies emerged from them.

EXPERIMENT NO:(2): In another experiment Redi took eight bottles. He put dead snakes in two; pieces of meat in other bottle and dead fishes in other bottle. He kept four bottles open and four covered. After a few days, maggots appeared in the open bottles only. No maggots appeared in the bottles kept covered. This showed that if the flies were prevented from entering the bottles, the maggots did not appear.

EXPERIMENT NO:(3): Some pieces of meat were put in a bottle whose mouth was covered with gauze. Thus, air could enter the bottle while flies remained out. Again no maggots appeared on the piece of meat, even after many days in spite of the fact that entry of air was possible.

These experiments provide evidence supporting the idea that only living beings give rise to living beings. Thus, the concept of Biogenesis is correct and that of Abiogenesis is wrong.

CHAPTER-03

ORGANIZATION OF LIFE

MCQ's

(MULTIPLE CHOICE QUESTIONS)

A: CHOOSE THE CORRECT ANSWER.

- In _____, Galileo, an Italian astronomer and physicist developed microscope.
(1610, 1620, 1630)
- In _____, Robert Hook made an improved microscope by combining lenses, called compound microscope.
(1665, 1675, 1685)
- _____ is basic structural and functional unit of life.
(Cell, Tissue, Organ)
- In 1831, _____ discovered the nucleus of cell.
(Robert Hook, Robert Brown, Rudolf Virchow)
- In 1838, a German botanist _____ proposed that all plants are made up of cells.
(Schlieden, Schwann, Rudolf Virchow)
- New _____ are formed by the division of pre-existing cells.
(Atom, Cell, Tissue)
- The most important and visible part of a cell is _____.
(Cytoplasm, Nucleus, Golgi Bodies)
- The number of chromosomes in man's cell is _____.
(48, 46, 42)
- The number of chromosomes in onion's cell is _____.
(16, 12, 20)
- It provides energy to the cell and known as the power house of the cell.
(Nucleus, Ribosomes, Mitochondria)
- The organisms made of prokaryotic cell are called _____. e.g. Bacteria and cyanobacteria.

- (Prokaryote, Eukaryote, Not)
12. The organisms made of eukaryotic cell are called _____ e.g. Animals, plants, fungi and protists.
(Prokaryote, Eukaryote, Not)
13. These are involved in the synthesis of protein.
(Ribosomes, Centriole, Vacuole)
14. _____ is a fluid filled structure bounded by a single membrane.
(Ribosome, Centriole, Vacuole)
15. The cell wall of fungi is made up of _____.
(Cellulose, Carbohydrate, Chitin)

ANSWER KEY

01	1610	02	1665	03	Cell
04	Rober Brown	05	Schlieden	06	Cell
07	Nucleus	08	46	09	16
10	Mitochondria	11	Prokaryote	12	Eukaryote
13	Ribosomes	14	Racuole	15	Chitin

B: SHORT ANSWER QUESTIONS.**Q1: Define Cell.****Ans: CELL:**

A cell is a set of a organelles made up of molecules of proteins., carbohydrates, lipids and nucleic acid. Cell is basic structural and functional unit of organisms.

Q2: Give main points of cell theory.**Ans: CELL THEORY:**

The combined efforts of scleiden, schwann and R. Virchow finally gave rise to cell theory.

The salient features of the cell theory are as under:

- (1) All living organisms are composed of one or more cells.
- (2) The cell is the smallest, basic structural and functional unit of all organisms.

- (3) New cells are formed by the division of pre-existing cells.

Q3: Define the structure of cell.**Ans: STRUCTURE OF CELL:**

Basically cell is round or oval in shape. Cell consists of cell-membrane, Nucleus and cytoplasm as basic structure. In the cell different organelles have their own specific roles, involving their specialized structure and chemistry. Nucleus, mitochondria, Golgi bodies, endoplasmic reticulum and vacuoles are found both in plant and animals cells, while plastids are found in plant cells and centrioles occur only in animals cell.

Q4: What is cell membrane?**Ans: CELL MEMBRANE:**

It is the outermost membrane of an animal cell while in plant cell, it lies next to the cell wall. With the help of latest techniques and electron microscopy, different models have been presented to understand the cell membrane. Fluid mosaic model is the most acceptable model. According to this model cell membrane consists of lipid bilayer in which most protein molecules float. It controls the movement of materials passing through it.

Q5: What is Nucleus?**Ans: NUCLEUS:**

The most important and visible part of a cell is nucleus. It is present, in the centre of the animal cell but due to presence of large central vacuole it is pushed on one side in the plant cell. Its envelope is called the nuclear membrane, which is double membrane and porous. It controls the all activities of cell.

Q6: What is mitochondria?**Ans: MITOCHONDRIA:**

Mitochondria (single mitochondrion) are important organelles of a eukaryotic cell, because they provide

energy to the cell and are thus known as the power house of the cell. They are oval or rod like in shape, bounded by double membrane. Outer membrane is smooth while inner membrane forms infolding in the inner chamber or mitochondrial box.

Q7: Define Plastids.

Ans: **PLASTIDS:**

These are present only in the plant cell. Many plastids have one or more than one pigments. Plastids are of three types, the most important of which are chloroplasts. These are present in the green parts of the plant particularly in leaves. Chlorophyll is present in them, which helps in photosynthesis.

Q8: Define Vacuole.

Ans: **VACUOLE:**

Vacuole is a fluid filled structure bounded by a single membrane. Animal cell contain relatively small vacuoles, which are usually more than one in number. However, in mature plant cells there is a large central vacuole filled with water and salts.

Q9: Distinguish between Animal and Plant Cell.

Ans:

ANIMAL CELL	PLANT CELL
1. Cell wall is absent in animal cell.	1. Cell wall is present in plant cell.
2. Cell membrane is the outer most structure of animal cell.	2. In plant cell cell-membrane lies inside the cell wall.
3. Nucleus generally lies in the centre of the cell.	3. Nucleus often lies near the side of centre of the plant cell.
4. Many small vacuoles are present in the cytoplasm.	4. A large vacuole is filled with water liquid present in the centre of the cell.

5. Chloroplasts are absent in animal cell.

5. In green parts of plants the cytoplasm contain small bodies called chloroplast.

Q10: Define Golgi Bodies.

Ans: **GOLGI BODIES:**

Golgi bodies have been named after a scientist called Golgi, who first discovered them. This consists of a set of smooth, fattened membranous sacs called cisternae that are stacked over each other. In some cells Golgi bodies may occur as a network. Their function is to store the secretions, convert them into finished products and pack them at their margins into small rounded sacs called Golgi vesicles, which transport secretions outside the cell.

LONG ANSWER QUESTIONS

Q1: Describe the discovery of cell and nucleus.

Ans: DISCOVERY OF CELL: In 1610 Galileo, an Italian astronomer and physicist developed microscope to observe small organisms. In 1665, Robert Hook made an improved microscope by combining lenses, called compound microscope and examined a slice of cork under it. He found small honey comb like chambers, which reminded him small rooms of monastery are said cellula in Italian, so he also named these structure as cellulae or cell (small rooms).

DISCOVERY OF NUCLEUS: In 1831, Robert Brown discovered a spherical body, the nucleus in the cells of orchids.

Q2: Describe Cell theory. Write its Salient features.

Ans: **CELL THEORY:**

In 1838 a German botanist schleiden, proposed

that all plants are made up of cells. Next year another German zoologist, Theodor schawann stated that all animals are made up of cell. In 1858 Rudolf Vichow stated that new cells come only from other cells i.e. Animal cells come from animal cells and plant cells from plant cells. The combined efforts of schleiden, shwann and Rudolf virchow finally gave rise to cell theory.

SALIENT FEATURES OF CELL THEORY:

The salient features of the cell theory are as under.

- (1) All living organisms are composed of one or more cells.
- (2) The cell is the smallest, basic structural and functional unit of all organisms.
- (3) New Cells are formed by the division of Pre-existing cells.

Q3: What is difference between Prokaryotic and Eukaryotic cell?

Ans:

PROKARYOTIC CELL	EUKARYOTIC CELL
1. The organisms made of prokaryotic cell are called prokaryotes e.g. Bacteria and cyanobacteria.	1. The organisms made of eukaryotic cell are called eukaryotes e.g animals, plants, fungi and protists.
2. Chromosomes are present in the cytoplasm and no membrane bounded nucleus is present.	2. Chromosomes are present in membrane bounded nucleus.
3. No membrane bounded cell organelles are present.	3. Membrane bounded organelles are present.
4. Ribosomes are of small size and freely scattered in cytoplasm.	4. Ribosomes are of large size and are present on endoplasmic reticulum or free in cytoplasm.

5. Cell wall is composed of peptidoglycan or murein. Cellulose is absent.	5. Cell wall of plant cell is composed of cellulose while in fungi it is of chitin.
6. These cells are simple, comparatively smaller in size (average diameter 0.5-10 nm).	6. These cells are complex comparatively larger in size (average diameter 10-100 nm).

Q4: What is Endoplasmic Reticulum? Define its types.

Ans: ENDOPLASMIC RETICULUM:

It is the network of channels and cisternae extending throughout the cytoplasm from nucleus membrane to the plasma membrane. These are of two types.

(1) SMOOTH ENDOPLASMIC RETICULUM:

It is non granular because ribosomes are not attached on it. These play an important role in lipids formation.

(2) ROUGH ENDOPLASMIC RETICULUM:

It is granular because ribosomes in the form of small granules are attached on it, which are involved in protein synthesis. Endoplasmic reticulum plays an important role in transport of materials from one part of the cells to the other.

ACTIVITY

Note For Teachers:

Write answer of each activity yourself and with the help of students, group discussion.

**CHAPTER
04**
**CLASSIFICATION OF LIVING
ORGANISMS**
MCQ's
(MULTIPLE CHOICE QUESTIONS)
A: CHOOSE THE CORRECT ANSWER.

01. The division of living things into different groups is called _____.
(Organization, classification, taxonomy)
02. _____ deals with the laws governing the arrangement or classification of living organisms.
(Organization, classification, taxonomy)
03. The basic unit of classification is _____.
(Species, Genus, Family)
04. _____ adopted the binomial nomenclature system for naming organisms.
(C. Linnaeus, H. Whittaker, Margulis)
05. The family of mustard is _____.
(Prassicacea, Poaceae, Rosaceae)
06. Closely related species are grouped together into _____.
(Family, Genus, Order)
07. Multicellular organisms having no cell wall and no chlorophyll are _____.
(Animals, Plants, Bacteria)
08. The family of man is _____.
(Palmaceae, Ranidae, Hominidae)
09. Scientific name for Mustard is _____.
(Brassica Tuberosa, Brassica Campestris, Brassica Anelida)
10. Scientific name for Frog is _____.
(Rana Tanha, Rantigricea, Rana Tigrina)
11. Scientific name for Human is _____.
(Homodreams, Homosapiens, Homppathiens)

12. All the _____ have feathers, beak and claws.
(Insects, Reptiles, Birds)
13. These are animals with an elongated soft body and no back bone.
(Worms, Reptiles, Birds)
14. They have thick, dry and rough skin.
(Worms, Reptiles, Amphibians)
15. Indus dolphin is a _____ and found only in the Indus.
(Worms, Reptiles, mammals)

ANSWER KEY

01	classification	02	taxonomy	03	species
04	C. Linnaeus	05	Prassicacea	06	Genus
07	Plants	08	Hominidae	09	Brassica Campestris
10	Rana Tigrina	11	Homosapiens	12	Birds
13	Worms	14	Amphibians	15	mammals

B: SHORT ANSWER QUESTIONS.
Q1: Define Classification.
Ans: CLASSIFICATION:

The division of living things into different group is called classification.

Q2: Define Taxonomy.
Ans: TAXONOMY:

The scientific study which deals with the classification of living organisms is called taxonomy. (Taxis = arrangement and Nomos = law), so, taxonomy deals with the laws governing the arrangement or classification of living organisms.

Q3: Define species.
Ans: SPECIES:

The basic unit of biological classification is the species. A species is a group of organisms which has

numerous physical features in common and which are normally capable of inter breeding and producing fertile offspring.

Q4: Define units of Classification.

Ans: UNITS OF CLASSIFICATION:

The basic unit of biological classification is the species. A species is a group of organisms which has numerous physical features in common and which are normally capable of inter breeding and producing fertile offspring. Closely related species are group together into genera (singular-genus). Similar genera are grouped together into families, families into orders, orders into classes, classes into phyla (singular-phylum) or division into kingdoms. Intermediate categories are also sometimes used; for example a sub-phylum or sub division between phylum and class, and sub classes between class and order.

Q5: What is binomial nomenclature.

Ans: BINOMIAL NOMENCLATURE:

C-Linnaeus adopted the binomial nomenclature system for naming organisms to eliminate confusion while using native or common names when describing an organism. He gave each species a scientific name comprising of two words. This is known as binomial nomenclature.

Q6: Write the classification of Mustard.

Ans: CLASSIFICATION OF MUSTARD:

Kingdom	_____	Plantae
Division	_____	Tracheophyta
Class	_____	Dicotyledonae
Order	_____	Capparales
Family	_____	Brassicaceae
Genus	_____	Brassica
Species	_____	Campestris
Scientific Name	_____	Brassica Campestris

Q7: Name the five kingdoms, suggested by Robert H. Whittaker.

Ans: KINGDOM SYSTEM:

Robert H Whittaker in 1969 suggested a new system of classifying living organisms.

- (1) Kingdom Monera.
- (2) Kingdom Protista
- (3) Kingdom Fungi
- (4) Kingdom Plantae
- (5) Kingdom Animalia.

Q8: What is difference between vertebrate and invertebrate?

Ans:

VERTEBRATE	INVERTEBRATE
The group of animals with backbone is called vertebrate. For example: Goat, Fish and Sparrow.	The group of animals without backbone is called invertebrate. For example: Housefly, Ant, Butterfly.

Q9: Write short note on Reptiles.

Ans: REPTILES:

Most of the reptiles live on land but some are found in water. They have thick, dry and rough skin. They also have scales on their whole body. The reptiles of today belong to the family of dinosaurs which are extinct now.

Q10: What are Amphibians?

Ans: AMPHIBIANS:

Amphibians spend a part of their life on land and a part in water. Therefore they are called amphibian which mean "living a double life."

LONG ANSWER QUESTIONS

Q1: Define classification. Describe the Aims of Classification.

Ans: **CLASSIFICATION:**

The division of living things into different groups is called classification.

AIMS OF CLASSIFICATION:

All the living organisms placed in a particular group have many fundamental similarities in their structure. It is not always easy to recognize these basic similarities. Many basis and techniques are used to classify organisms. It is principally the homologous structure that one consider in grouping organisms. Homologous structures are those that are similar because of their common origin. Sometimes it is impossible to classify organisms using morphological criteria, so one may compare the chemical substances which they contain. This is particularly useful when classify organisms like bacteria which may all look alike and have an identical cellular structures with the help of electron microscope, genetic constitution and their development patterns etc.

Q2: Describe the classification of man and frog.

Ans: **CLASSIFICATION OF MAN:**

Kingdom	Animalia
Division	Chordata
Class	Mammalia
Order	Primat
Family	hominidae
Genus	Homo
Species	Sapiens
Scientific Name	Homo Spaiens

CLASSIFICATION OF FROG

Common Name of Frog

Kingdom	Animalia
Division	Chordata
Class	Amphibia
Order	Salientia (Anura)
Family	Ranidae
Genus	Rana
Species	Tigrina
Scientific Name	Rana Tigrina

Q3: Write a detailed note on five kingdoms, suggested by Robert H. Whittaker.

Ans: **ROBERT H WHITTAKER KINGDOM SYSTEM:**

Previously living things were classified into two kingdoms namely plant kingdom and Animal kingdom. The basis of this division was presence or absence of cell wall and chlorophyll. All the living organisms having cell wall and chlorophyll were regarded as plants and placed and studied under kingdom plantae. All those living organisms having neither cell wall, nor chlorophyll were regarded as animals and placed and studied under kingdom Animalia. But a large number of living organisms did not fit clearly into the category of plants and animals. To solve this problem, Robert, H. Whittaker (1969) suggested a new system of classifying living organisms.

(1) KINGDOM MONERA:

Prokaryotes which feed by a variety of different methods.

(2) KINGDOM PROTISTA:

Unicellular eukaryotes which feed by a variety of methods.

(3) KINGDOM FUNGI:

Multicellular eukaryotes which feed heterotrophically by absorption.

(4) KINGDOM PLANTAE:

Multicellular eukaryotes which feed Photosynthetically.

(5) KINGDOM ANIMALIA:

Multicellular eukaryotes which feed heterotrophically by ingestion.

Q4: Write a detailed note on five kingdoms suggested by marglis and schwartz.

Ans: MARGULIS AND SCHWARTZ FIVE KINGDOM SYSTEM:

Although whittaker's scheme received wide spread approval, it had one major draw back. This relates to kingdom protista, which contained all multicellular organisms, including those that formerly had been regarded as animal (protozoa) and those that formerly had been regarded as plant (unicellular algae). Other problem was that it meant putting the algae into two separate kingdoms.

This leads two other biologists Margulis and shwartz, to put forward a modification of whittaker's scheme (1989). According to this, there are five kingdoms of living organisms as listed below:

(1) KINGDOM PROKARYOTES:

It includes all the prokaryotes, e.g: Bacteria and cynobacteria.

(2) KINGDOM PROTOCTISTA:

It includes all the eukaryotic organisms, which are no longer classified as animals, plants or fungi, e:g, Euglena, Paramecium, chlamydomonas, yeast etc.

(3) KINGDOM:

It includes non-chlorophyllous, multicellular eukaryotic organisms having cell-wall eg. Agricus (Mushroom). etc.

(4) KINGDOM PLANTAE:

It includes all the chlorophyllous multicellular eukaryotic living organisms, having cell-wall and the

embryonic development e.g Apples, sunflower etc.

(5) KINGDOM ANIMALIA:

It includes all the non-chlorophyllous multicellular eukaryotic organisms, having no cell-wall, e.g. Hydra, earthworm, man etc.

Q5: Define the following terms:

(1) WORMS:

These are animals with an elongated soft body and no back bone. There are three types of worms. Flat worms have flat body e.g Tapeworm. Round worms have round body e.g. hookworm and segmented worms have the segmented body e.g Earthworm.

(2) EXTINCT SPECIES:

We all know many creatures live on our earth. They all have to struggle hard to save their lives. For their survival, it is necessary that they have a lot of food and are able to reproduce (the ability of animals to produce their young ones). If all animals of the same kind could not reproduce their own kind, they would die and become extinct. An extinct species is one which has not a single member living on our earth.

(3) INDUS DOLPHIN:

Indus Dolphin is a mammal and found only in the Indus. It is almost blind and can differentiate between light and dark.

The Indus Dolphin has long beak which help it to catch fish. Now only 1100 dolphins are left. The major causes of their reduction are pollution of water and construction of dams and canals on rivers.

**CHAPTER
05**
**VIRUSES, BACTERIA AND
CYNOBACTERIA**
MCQ's
(MULTIPLE CHOICE QUESTIONS)
A: CHOOSE THE CORRECT ANSWER.

01. The minute living organisms which cannot be seen without the help of microscope are called _____ organisms.
(Micro, multicellular, Not)
02. Bacteria and cyanobacteria are prokaryotes and studied under kingdom _____.
(Prokaryota, Animalia, Plantae)
03. _____ (Latin word viron = poison) are the smallest, the simplest and perhaps the most primitive living things.
(Bacteria, Cyanobacteria, Viruses)
04. By _____ many biologists had demonstrated that many diseases of man and other organisms were caused by bacteria.
(1600, 1700, 1800)
05. Viruses, discovered by _____ in 1892.
(Louis Pasteur, Iwanoswsky, Leeuwenhook)
06. _____ are non-cellular obligate particles that always have a protein coat and nucleic acid core.
(Virus, Cyanobacteria, Bacteria)
07. Poliomyelitis caused by _____ virus.
(Human Immune, Polio, Influenza)
08. _____ are viral infectious of the upper respiratory tract.
(Cold, Cough, Sneezes)
09. Human Immune Virus (HIV) was discovered in _____ to be the cause of AIDS.
(1985, 1980, 1975)

10. Bacteria first observed by _____.
(Leeuwenhoek, Iwanoswsky, Robert Hook)
11. These bacteria are spherical in shape.
(Cocci, Bacilli, Spirilla)
12. These bacteria are rod in shape.
(Cocci, Bacilli, Spirilla)
13. Bacterial cell range in size from 0.2 µm to 20 µm in width and _____ in length.
(2µm to 20µm, 3µm to 15 µm, 4µm to 20µm)
14. They are found associated with living organisms.
(Symbiotic bacteria, parasitic bacteria, Autotrophic bacteria)
15. Typhoid, Cholera and tuberculosis, are _____ diseases.
(Bacterial, Viral, All of these)

ANSWER KEY

01	Micro	02	Prokaryota	03	Viruses
04	1800	05	Iwanoswsky	06	Virus
07	Polio	08	Cold	09	1985
10	Leeuwenhoek	11	Cocci	12	Bacilli
13	2µm to 20µm	14	Symbiotic	15	Bacterial

B: SHORT ANSWER QUESTIONS.
Q1: What are micro-organisms?
Ans: MICRO ORGANISMS:

The minute living organisms which cannot be seen without the help of microscope are called micro-organisms.

Q2: Is virus living thing or Non-living thing?

Ans: Viruses are considered as living organisms because of the following characteristics.

- (1) Viruses with their core of DNA or RNA surrounded by a protein coat somewhat resemble the chromosomes of other living organisms.
- (2) They have the ability to reproduce property of

replication/ reproduction.

- (3) Many kinds of viruses are known to undergo mutations.
- (4) Viruses show genetic recombination.

Q3: Name types of viruses.

Ans: TYPES OF VIRUSES:

Plant Viruses
Animal Viruses
Bacteriophage.

Q4: Name Some Viral Diseases.

Ans: VIRAL DISEASES:

- (1) Poliomyelitis causes by polio virus.
- (2) Colds are viral infections of the upper respiratory tract.
- (3) Measles and Mumps are the common viral diseases of children.
- (4) Flu is the most common disease caused by the influenza virus.

Q5: What is Bacteria? Name some shapes of bacteria.

Ans: BACTERIA:

- (1) Bacteria are unicellular prokaryotes.
- (2) Bacteria grow in every habitat of earth under all possible environmental conditions.
- (3) They can survive in freezing temperature and also in hot spring.
- (4) Bacteria, first observed by Leeuwenhoek.
- (5) Bacteria are considered as the smallest, oldest but the simplest living organisms.
- (6) Bacterial cell ranges in size from 0.2 micron 2 micron in width and 2 to 10 micron in length.

☆ **SOME SHAPES OF BACTERIA:**

- | | |
|-------------------------|-------------------------------|
| (i) Cocci Bacteria. | (ii) Bacilli Bacteria |
| (iii) Sprillia Bacteria | (iv) Vibro or comma Bacteria. |

Q6: Name some bacterial diseases.

Ans: SOME BACTERIAL DISEASES:

Bacteria are responsible for most varied kind of diseases in human beings, animals and plants. They may act as invisible enemies for man. Some of the diseases found in man due to bacteria are typhoid, tetanus, cholera, diphtheria, and tuberculosis.

Q7: Define Parasitic Bacteria.

Ans: PARASITIC BACTERIA:

They grow inside the tissues of other living organisms, They obtain and expense of host. These bacteria lack certain complex system of enzymes.

Q8: Define Chemosynthetic Bacteria.

Ans: CHEMOSYNTHETIC BACTERIA:

They obtain their energy from oxidation of some inorganic substances like Iron, Hydrogen, Nitrogen and sulphur compounds to synthesize their organic compounds.

Q9: Give three salient features of cyanobacteria.

Ans: Three Salient Features of Cyanobacteria:

- (1) These blue green algae are prokaryotic.
- (2) They may occur alone or in the form of colony.
- (3) Cell wall is double layered.

Q10: Define the structure of Nostoc.

Ans: STRUCTURE OF NOSTOC:

The Nostoc is filamentous. The filaments are intermixed in a gelatinous mass forming a ball like structure. It floats on water. A single filament look like a chain of beads. Each filament is unbranched and has a single row of rounded or oval cells. Each cell has double layered wall. The outer thicker layer is made up of cellulose mixed up with pectin. The inner thin layer is made up purely of cellulose.

LONG ANSWER QUESTIONS

Q1: Describe in detail the discovery and characteristics of viruses.

Ans: DISCOVERY OF VIRUS:

By 1800's many biologists had demonstrated that many disease of man and other organisms were caused by bacteria. Some diseases puzzled them. One such disease was tobacco mosaic disease occurring in tobacco plant leaves. In 1892, Russian biologist, Iwanowsky showed that this disease was due to some thing smaller than bacteria. He named them as viruses. No one had seen them because they were too small to be seen even with the compound microscope.

The year 1935 was important in solving the story of what viruses really are and how they behave. A new kind of microscope the electron microscope, had been constructed and any object smaller than μ (millimicron 1,000,000,000th. part of a metre) can be observed. Wendell Stanley crystallized the infectious particles, now known as Tobacco Mosaic virus (TMV). This TMV and many other viruses were actually seen with the help of the electron microscope.

CHARACTERISTICS OF VIRUS:

Viruses are non cellular obligate parasites that always have a protein coat and a nucleic acid core. They cannot live and reproduce outside of living cells since they lack the ability to do so by themselves. They range in size from 20nm to 250 nm (one nm = 10^{-9} metre). They are sub microscopic. There is no sexual reproduction. They reproduce by replication. The simple viruses use the enzymes of the host cell for both their protein synthesis and gene replication, the

more complex ones contain up to 200 genes and are capable of synthesizing, through their host many structural proteins and enzymes themselves.

Q2: Describe the structure and types of viruses. List the common viral disease.

Ans: STRUCTURE OF VIRUS:

They appear like small rods, tadpoles or may be polyhedrals or like little spheres.

Viruses may consist of nucleic acid, capsids, envelopes and tail fibres. Their nucleic acid may consist of a single or several molecules of DNA or RNA. The smallest viruses have only four genes while the largest have up to two hundred.

The protein coat that encloses the nucleic acid is called a capsid. It may be of different shapes. Capsid is made up of protein sub units called capsomers. The number of capsomeres is characteristic of particular virus.

Some viruses have accessory structure called viral envelopes that helps them infect their hosts. They are membranes covering their capsids.

The simplest viruses consist of a single molecule of a nucleic acid (DNA or RNA) surrounded by a capsid, which is made up of different protein molecules.

Some bacterial viruses or bacteriophages are among the most complex viruses. Each of them is made up of at least five separate proteins, these make up the head, the tail core, the molecules of the capsid, the base plate of the tail, and tail fibers. A long DNA molecule is coiled within the head.

TYPES OF VIRUS:

- ☆ Plant Viruses: Infecting plants.
- ☆ Animal Viruses; Infecting animals.
- ☆ Bacteriophages; Infecting bacteria.

VIRAL DISEASES:

- (1) Poliomyelitis caused by Polio Virus.
- (2) Colds are viral infectious of the upper respiratory tract.
- (3) Measles and Mumps are the common viral disease of children.
- (4) Flu is the most common diseases caused by the influenza virus.

Q3: Give the general characters, shapes of bacteria.

Ans: **GENERAL CHARACTERS OF BACTERIA:**

Bacteria grow in every habitat of earth under all possible environmental conditions. They are the largest number of creatures and are found everywhere. They can survive in freezing temperature and also in hot springs. Bacteria, first observed by Leeuwenhoek.

Bacteria are considered as the smallest, oldest but the simplest living organisms. Bacterial cell ranges in size from 0.2 Micron to 2 micron in width and .2 to 10 micron in length. Bacteria are unicellular prokaryotes. Bacterial cell consists of cell wall, plasma membrane, cytoplasm and nuclear material. Cell wall is chemically complex and totally different from ordinary plant cell wall as cellulose is not present. It is thick and rigid and made up of amino acids, sugar and sometimes chitin.

Next cell wall is thin outer layer of plasma membrane or cell membrane which is attached to cell wall at few places. It has many pores. Chemically, it is made up of lipids and proteins. Cell membrane performs the function of respiration as mitochondria are absent in them. It also acts as selective membrane.

Cytoplasm is granular, present in between cell membrane and nuclear region. It has many but small vacuoles, ribosomes and glycogen particles. It has no

endoplasmic reticulum and no other membranous organelles like Golgi apparatus, plastid and mitochondria.

SHAPES OF BACTERIA: There are different shapes of bacteria.

(i) Cocci: (Singular- Coccus = Gr. Kokkos Beery, rounded). They are spherical and according to cell arrangement they are solitary (single) (Monococcus), in pair (Diplococci), in chain (streptococci), in cluster (staphylococci) etc. They are non flagellated.

(ii) Bacilli: (Singular- Bacillus = L, Bakulus = A rod). They are rod shaped. They may be found in pairs (Diplobacillus) or in chains (strep to bacillus) etc. They may be flagellated.

(iii) Spirillia: (Singular - spirillum = Gr. Speria = A coil). They are spiral or cork screw shaped spirillum).

(iv) Vibrio or Comma: They are slightly curved or comma (,) shaped e.g vibrio cholerae. They may be flagellated.

Q4: Describe the nutrition and economic importance of bacterio. Discuss the disadvantages of bacteria.

Ans: **NUTRITION OF BACTERIA:**

Most bacteria are heterotrophic with few autotrophic. Heterotrophic bacteria are those which cannot synthesize their organism compounds from simple inorganic substances. According to their mode of feeding, heterotrophic bacteria may be saprophytic, symbiotic or parasitic.

(i) SAPROPHYTIC BACTERIA:

They get their food from dead organic matter. The soil is full of organic compounds in the form of humus. Bacteria living in the soil have large number of enzymes that break down the complex substances of humus to

simpler compounds. These bacteria absorb and utilize these simple compounds as a source of energy. Many other saprophytic bacteria cause decay of dead animal and plant material as they convert complex organic compounds to simpler ones.

(ii) SYMBIOTIC BACTERIA:

They are found associated with other living organisms. They food from the host without harming it e.g. Nitrogen fixing bacteria in the roots of leguminous plants.

(iii) PARASITIC BACTERIA: They grow inside the tissues of other living organisms. They obtain the expense of host. These bacteria lack certain complex system of enzymes.

(iv) AUTOTROPHIC BACTERIA: They can synthesize organic compounds from simple inorganic substances. Autotrophic bacteria may be photosynthetic or chemosynthetic.

(a) PHOTOSYNTHETIC BACTERIA: They have pigments very similar to the chlorophyll and named as bacterio chlorophyll. These pigments are bounded by invaginated plasma membrane in the cytoplasm and not in the chloroplast. They carryout photosynthesis.

(b) CHEMOSGNTHETIC BACTERIA: They obtain their energy from oxidation of some inorganic substances like Iron, Hydrogen, Nitrogen and sulphur compounds to synthesize their organic compounds.

ECONOMIC IMPORTANCE OF BACTERIA

USEFUL BACTERIA

(i) AGRICULTURAL BACTERIA:

Bacteria decompose dead plants and animals bodies and convert various organic compounds into simple form such as Nitrates, Sulphates, Phosphates, etc for utilization by green plants again. Nitrifying bacteria

convert the proteins of these dead bodies into Nitrates. Then these Nitrates are absorbed and utilized by the green plants. Soil bacteria increases the fertility of the soil by bring about physical and chemical changes in the soil.

(ii) ALIMENTARY CANAL BACTERIA:

They help herbivores in the digestion of cellulose by producing an enzyme cellulase. Similarly, some are present in human beings and make vitamins.

(iii) INDUSTRIAL BACTERIA:

They help in curing and ripening of tobacco leaves, fermentation of sugar into alcohol, ripening of cheese, retting (softening) of fibers, curdling of milk, conversion of hides into leather etc.

(iv) MEDICINAL BACTERIA:

Valuable antibiotic drugs have been obtained from bacteria. E.g Thyrothycin, subtilin, Riboflavin is a vitamin produced by clostridium.

DISADVANTAGES OF BACTERIA:

(i) PATHOGENIC BACTERIA:

They are responsible for most varied kinds of diseases in human beings, animals and plants. They may act as invisible enemies for man. Some of the diseases found in man due to bacteria are typhoid, tetanus, cholera, diphthria and tuberculosis (T.B). Plant diseases caused by bacteria are black roots of cabbage, citrus canker, fine- blight of pear and apple, ring rot of potato etc.

(ii) FOOD SPOILAGE:

Bacteria spoil food by fermentation and decomposition.

ACTIVITY

NOTE FOR TEACHERS:

Write answer of each activity yourself and with the group discussion of students.

CHAPTER
06STUDY OF MATTER
(CHEMISTRY)

MCQ's

(MULTIPLE CHOICE QUESTIONS)

A: CHOOSE THE CORRECT ANSWER.

01. Chemistry is derived from the word "kheem" which is the old name of _____.
(Greek, Rome, Egypt)
02. _____ is a branch of science which deals with the composition, structure and properties of matter.
(Chemistry, Physics, Biology)
03. The development of chemistry can be divided into _____ periods.
(Two, Three, Four)
04. The _____ believed that four elements (fire, air, water and earth) combined to form all things.
(Roman, Greek, Muslim)
05. The Greek Period was from _____ B.C, in the history of Chemistry.
(500 to 300 B.C, 400 to 200 B.C, 300 to 100 B.C)
06. The Muslim period was from _____ A.D in the history of chemistry.
(500 to 1500 A.D, 600 to 1600 A.D, 700 to 1700 A.D)
07. He was known as father of alchemy.
(Jabir Ibne Haiyan, Al-Razi, Al-Beruni)
08. He prepared alcohol by fermentation.
(Ibne-Sina, Al-Razi, Al-Beruni)
09. _____ described affectionately as the father of modern chemistry.
(Robert Boyle, J-Black, J-Priestley)
10. Oxygen was discovered by _____.
(J-Black, J-Priestley, Lavoisier)

11. The best disinfectant is _____.
(Flourine, Chlorine, Bromine)
12. _____ investigated the relationship between the pressure of a gas and its temperature.
(John Dalton, Cavendish, Gay Lussac)
13. _____ discovered hydrogen.
(Cavendish, Scheele, Lavoisier)
14. _____ discovered chlorine.
(Cavendish, Scheele, Lavoisier)
15. _____ is the branch of chemistry which deals with the carbon compounds.
(Organic Chemistry, In-organic Chemistry, Physical Chemistry)

ANSWER KEY

01	Egypt	02	Chemistry	03	Three
04	Greek	05	300 to 500 BC	06	600 to 1600 AD
07	Jabin Ibne Haiyan	08	Al-Razi	09	Robert Boyle
10	J. Priestley	11	Chlorine	12	Gay Lussac
13	Cavendish	14	Scheele	15	Organic Chemistry

B: SHORT ANSWER QUESTIONS.**Q1: What is Chemistry?****Ans: CHEMISTRY:**

Chemistry is a branch of science, which deals with the composition, structure, and properties of matter and the chemical changes involved in it.

Q2: Define importance of chemistry.**Ans: IMPORTANCE OF CHEMISTRY:**

Chemistry enables us to design all sorts of materials, drug to fight disease, pesticides to protect our health and fertilizers to grow our crops for abundant food, fuels for transportation, fibres to provide comfort and variety in clothes and a lot of other things.

Q3: Define History of Chemistry.**Ans: HISTORY OF CHEMISTRY:**

The earliest practical knowledge of chemistry was concerned with metallurgy, pottery and dyes, these crafts were developed with considerable skill, but with no understanding of the principles involved, as early as 3500 B.C in Egypt and Mesopotamia.

Q4: Name Periods of chemistry.**Ans: PERIODS OF CHEMISTRY:**

The development of chemistry can be divided into following three periods.

- (1) The Greek Period.
- (2) The Muslim Period
- (3) The Modern Period

Q5: Write a short note on Jabir Ibne-Hayan.**Ans: JABIR IBN-E-HAIYAN:**

He is known as father of alchemy.

WORK:

- ☆ He invented experimental methods for the preparation of Nitric acid, hydrochloric acid and white lead.
- ☆ He developed methods for the extraction of metals.
- ☆ He developed methods for the dyeing of clothes.
- ☆ He introduced experimental investigation into alchemy, which is rapidly changes its character into modern chemistry.
- ☆ His contribution includes perfection of scientific techniques such as crystallization, distillation, calcination, instrument for the same.

Q6: Write a short note on Al-Razi.**Ans: AL-RAZI:****WORK:**

- ☆ He was the first who use opium as a anaesthesia.
- ☆ He divided the substances into living and non-living.

- ☆ He prepared alcohol by fermentation.
- ☆ He has portrayed in great detail several chemical reactions.
- ☆ He has also givenfull description of and designed for about twenty instruments used in chemical reaction.

Q7: Write a short note on Robert Boyle.**Ans: ROBERT BOYLE:**

Robert Boyle describe affectionately as the father of modern chemistry.

WORK:

- ☆ He was the first to develop modern concepts of element and compounds; to distinguish between acids, bases and neutral substances.
- ☆ Boyle's best know contribution to scientific knowledge is the publication of the sceptical chymist" in which he discuss the idea of an element.

Q8: Write a short note on J.Priestley.**Ans: J.PRIESTLEY:**

- J. Priestley discovered oxygen. Sulphur dioxide and hydrogen chloride, Priestley is best known for his experiments with gases especially that which we now call oxygen.
- ☆ Invented soda water, used as the basis for soft drink industry.
 - ☆ Priestley was a pioneer in the manipulation of gases, including collection in bottles by water displacement and methods for transferring gases.

Q9: Name branches of chemistry.**Ans: BRANCHES OF CHEMISTRY:**

The main branches of chemistry are:

- (1) Physical Chemistry.
- (2) Organic Chemistry.
- (3) In-organic Chemistry.
- (4) Analytical Chemistry.

- (5) Bio-Chemistry.
- (6) Industrial Chemistry.
- (7) Nuclear Chemistry.
- (8) Environmental Chemistry.
- (9) Polymeric Chemistry.

Q10: What is difference between organic and In-organic Chemistry?

Ans:

ORGANIC CHEMISTRY	INORGANIC CHEMISTRY
It is the branch of chemistry that deals with carbon compounds with the exception of CO ₂ , Co, Metal carbonates, bicarbonates and carbides. Actually it is the chemistry of hydrocarbons and their derivatives.	It is the branch of chemistry that deals with the chemistry of elements and their compounds, generally obtained from non-living organisms i.e from minerals.

LONG ANSWER QUESTIONS

Q1: Why do we study chemistry? Discuss.

Ans: There are three significant reasons to study chemistry.

Ans: (1) PRACTICAL APPLICATION:

Chemistry is studied because it has important practical applications the society, for example:

- ☆ Development of life saving drugs.
- ☆ Modern Technology.

(2) INTELLECTUAL ENTERPRISE:

Chemistry is an intellectual enterprise, a way of explaining our material world.

(3) INTELLECTUAL TOOL:

Chemistry in every field is a useful intellectual tool for making important decisions. It helps in other fields, such as in biology in the advancement of medicines.

Q2: Describe the history of chemistry with respect to periods of chemistry.

Ans: HISTORY OF CHEMISTRY:

The earliest practical knowledge of chemistry was concerned with metallurgy, pottery and dyes, these crafts were developed with considerable skill, but with no understanding of the principles involved, as early as 3500 B.C in Egypt and Mesopotamia.

PERIODS OF CHEMISTRY:

The development of chemistry can be divided into following three periods.

- (1) The Greek Period.
- (2) The Muslim Period.
- (3) The Modern Period.

(1) The Greek Period.

The Greek period was from 300 to 500 B.C in the history of chemistry and is known as the period of Greeks.

☆ **CONTRIBUTION OF GREEKS:**

Greek philosophers like Plato, Aristotle, Democritus and many other introduced the concept of elements, atoms, shapes of atoms and chemical combination during that the period of 500 to 300 B.C.

- ☆ It was generally believed that four elements (fire, air, water and earth) combined to form all things.

(2) The Muslim Period.

The Muslim period was from 600 to 1600 A.D in the history of chemistry and is known as period of alchemist.

CONTRIBUTION OF MUSLIMS:

During the first few centuries of Hijra, the Muslim scientists made rich contribution to the various branches of science, specially in the field of chemistry.

- ☆ Muslim Scientists introduced scientific methods.
- ☆ Muslim Scientists introduced experimentation.
- ☆ Muslim scientists developed and used many laboratory

equipments such as funnels, beakers, crucibles for melting and fusion, retorts for distillation, balances for weighing etc.

- ☆ They discovered acids, alcohols and medicines.
- ☆ The modern scientific knowledge is based on the contribution of Muslim scholars.

(3) The Modern Period:

The modern period was started from 1600 and upto now. In this period various scientists contributed in the development of chemistry. The most famous scientists were Robert Boyle, J-Priestley, Scheele cavendish, Lavoisier, John Dalton and Joseph Louis Gay- Lussac.

- ☆ They promoted the systematic investigation.
- ☆ They discovered various gases.
- ☆ They made great stride in chemistry for the structure of atom.

Q3: Write a detailed note on the contribution of Muslim Scientists in the field of chemistry.

Ans: CONTRIBUTION MUSLIM SCIENTISTS IN THE FIELD OF CHEMISTRY:

☆ JABIR IBN-E-HAYAN (721-803 A.D)

He is known as father of alchemy.

WORK:

- ☆ He invented experimental methods for the preparation of Nitric acid, hydrochloric acid and white lead.
- ☆ He developed methods for the extraction of metals.
- ☆ He developed methods for the dyeing of clothes.
- ☆ He introduced experimental investigation into alchemy, which rapidly changed its character into modern chemistry.
- ☆ His contribution includes perfection of scientific techniques such as crystallization, distillation, calcination, instruments for the same.

- ☆ Jabir's major practical achievement was the discovery of minerals and other acids.

BOOKS:

His books on chemistry, including Kitab-ul-Kimya and Kitab al sabeen were translated into latin and various European languages.

AL-RAZI (862-930 A.D):

WORK:

- ☆ He was the first who used opium as anaesthesia.
- ☆ He divided the substances into living and non-living.
- ☆ He prepared alcohol by fermentation.
- ☆ He has portrayed in great detail several chemical reaction.
- ☆ As a chemist, he was the first to produce sulphuric acid together with some other acids.

BOOKS:

His book kitab-al-Asrar deals with the preparation of chemical materials and their utilization.

AL-BERUNI (973-1048 A.D):

He contributed in chemistry, physics, metaphysics, mathematics, geography and history.

WORK:

- ☆ He determined the densities of different substances.
- ☆ Chemical materials and their utilization.

IBN-E-SINA (980-1037 A.D):

He contributed in the field of medicine, medicinal chemistry, philosophy, mathematics and Astronomy.

CHAPTER-7

CHEMICAL COMBINATION

MCQ's

(MULTIPLE CHOICE QUESTIONS)

A: CHOOSE THE CORRECT ANSWER.

01. Chemical changes are governed by some empirical laws known as laws of _____.
(Biological Combination, Chemical Combination, Physical Combination)
02. Mass is neither created nor destroyed during a chemical change, is the statement of _____.
(Law of conservation of mass, law of definite proportion, law of multiple proportion)
03. A given compound always contains exactly the same proportion of elements, by mass, is the statement of _____.
(Law of conservation of mass, law of definite proportion, law of reciprocal proportion)
04. The average mass of natural mixture of isotopes, which is compare to the mass of one atom of C-12 a.m.u is called _____.
(Atomic number, Atomic Mass, All of these)
05. A formula that gives only the relative number of each type of atom in a molecule is called _____.
(Empirical Formula, Molecular Formula, None of these)
06. A formula that indicates actual number and type of atoms in a molecule is called _____.
(Empirical Formula, Molecular Formula, None of these)
07. The sum of atomic masses of all atoms in a molecule is called _____.

- (Molecular Mass, Formula Mass, Molar Mass)
08. The sum of atomic masses of all atoms in a formula unit of substance is called _____.
(Molecular Mass, Formula Mass, Molar Mass)
 09. The mass of one (1) mole of substance expressed in grams, is called _____.
(Molecular Mass, Formula Mass, Molar Mass)
 10. 44 a.m.u of CO_2 is equal to :
(Molecular Mass, Formula Mass, Molar Mass)
 11. 5 moles of H_2O are equal to:
(80g, 90g, 100g)
 12. A change which alters the composition of a substance is called _____.
(Chemical Reaction, Chemical Property, Chemical Ratio)
 13. When metals reacts with acids or water then produce _____ gas.
(Nitrogen, Oxygen, Hydrogen)
 14. 1 mole of carbon is equal to:
(12g, 24g, 36g)
 15. The value of Avogadro's number is:
(6.02×10^{24} , 6.002×10^{23} , 6.02×10^{23})

ANSWER KEY

1	Chemical Combination	2	Law of conservation of mass	3	Law of definite proportion
4	Atomic Mass	5	Empirical Formula	6	Molecular Formula
7	Molecular Mass	8	Formula Mass	9	Molar Mass
10	Molecular Mass	11	90g	12	Chemical Reaction
13	Hydrogen	14	12g	15	6.002×10^{23}

B: SHORT ANSWER QUESTIONS.**Q1: What is meant by laws of chemical combinations?****Ans: LAWS OF CHEMICAL COMBINATIONS:**

Chemistry deals with the matter and the changes occurring in it, chemists are particularly interested in these changes, where one or more substances. They had found that these chemical changes are governed by some empirical laws known as laws of chemical combinations.

Q2: Name laws of chemical combinations.**Ans: THESE LAWS ARE:**

- (1) Law of conservation of Mass.
- (2) Law of constant composition.

OR

- Law of definite proportions.
- (3) Law of Multiple Proportions.
 - (4) Law of Reciprocal Proportions.

Q3: State law of conservation of mass.**Ans: LAW OF CONSERVATION OF MASS:**

It states that mass is neither created nor destroyed during a chemical reaction. In other words, in any chemical reaction the initial weight of reacting substances is equal to the final weight of the product.

Q4: State law of definite proportion.**Ans: LAW OF DEFINITE PROPORTION:**

It states that different samples of the same compound always contain the same elements combined together in the same proportion by mass.

Q5: What is chemical formula? Name types of chemical formula.**Ans: CHEMICAL FORMULA:**

A formula is a combination of symbols for atoms or ions, that are held together chemically in a compound. By formula we mean not only the elements present

but also ratio in which the atoms are combined. These are two types of formula.

- (1) Empirical Formula.
- (2) Molecular Formula.

Q6: What is molecular formula mass?**Ans: MOLECULAR FORMULA MASS:**

The molecular formula mass (molecular mass) of a substance is the sum of the atomic masses of all atoms present in the molecular formula of a substance or molecule. Taking as an example let us calculate the molecular formula mass of CO_2 .

The molecule of CO_2 contain one atom C and two atoms of O. The atomic masses of C and O are 12 a.m.u and 16 a.m.u respectively.

$$\text{C} = 12 \times 1 = 12 \text{ a.m.u}$$

$$\text{O} = 16 \times 2 = 32 \text{ a.m.u}$$

$$\text{CO}_2 = 44 \text{ a.m.u}$$

Thus molecular formula mass of CO_2 is 44 a.m.u

Q7: What is mole?**Ans: MOLE:**

A mole can be defined as the molecular mass, atomic mass and formula mass of a substance expressed in grams. Thus 12g of carbon is equal to 1 mole of carbon atoms 24g of C is equal to 2 mole of carbon atoms.

Q8: Define Avogadro's Number.**Ans: AVOGADRO'S NUMBERS:**

A mole of substance always contains the same number of particles (atoms, ions, molecules or formula units) irrespective of its state, solid liquid or gaseous, that is 6.02×10^{23} particles. This constant number has been determined by several methods, called Avogadro's number (symbol NA) in the honour of Avogadro, the scientist who gave the chemistry for finding atomic and molecular masses.

Thus

1 mole of C-12g = 6.02×10^{23} atoms of carbons.

1 mof of Mg = 24 = 6.02×10^{23} atoms of Mg.

Q9: What is chemical reaction? Name types of chemical reaction.

Ans: CHEMICAL REACTION:

Any change which alters the composition of a substances, is a chemical change or chemical reaction. In this type of change one or more new substances are formed from the original substances, for example when iron (Fe) rusts, it reacts with oxygen (O) of air in presence of moisture to form red brown Iron oxide (rust).

TYPES OF CHEMICAL REACTION:

Chemical reactions can be divided commonly into five different types.

- (1) Decomposition reaction.
- (2) Addition reaction (Combination reaction).
- (3) Single displacement reaction.
- (4) Double displacement reaction.
- (5) Combustion reaction.

Q10: Define chemical equation. Define co-efficient.

Ans: CHEMICAL EQUATION:

Chemical equation is short hand method of describing (expressing) the chemical reaction, in term of symbols and formulae of the substances involved in a chemical reaction.

CO-EFFICIENT:

The numbers in front of the formulae in a chemical equation are called co-efficient (they show the number of molecules that react with each other) where no co-efficient appears, only one number is considered.

Q11: Define reactant and product.

Ans: REACTANT:

The starting substances are called reactants and are always written on the left hand side of an equation.

PRODUCT:

The substance which are produced (formed) are known as product and are always written on the right hand side of an equation.

LONG ANSWER QUESTIONS

Q1: What is law of conservation of mass? Give example. Prove it with practical varification (Landolt Experiment).

Ans: LAW OF CONSERVATION OF MASS:

This law was put forward by the French chemist Lavoisier in 1785.

STATEMENT:

This law states that mass is neither created nor destroyed during a chemical reaction. In other words in any chemical reaction the initial weight of reacting substances is equal to the final weight of the product.

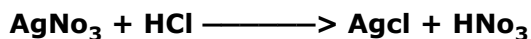
EXAMPLE:

The law of conservation of mass may be demonstrated by the union of Hydron (H) and oxygen (O₂) to form water. If the Hydrogen and oxygen are weighted before they unite, it will be found that their combined weight is equal to the weight of water (H₂O).

PRACTICAL VERIFICATION (LANDOLT EXPERIMENT)

German chemist H. landolt studied about fifteen different chemical reactions with a great skill to test the validity of the law of conservation of mass. For this, he took H. Shaped tube and filled two limbs A and B with silver nitrate (AgNO₃) in limb A and Hydrochloric acid (HCl) in limb B. The tube was sealed so that the material

could not escape outside. The tube was weight initially in a vertical position so that the solutions not intermix each other. The reactants were mixed by inverting and shaking the tube. The tube was weighted after mixing (on the formation of white precipitate of (AgCl). He observed that weight remains same.



Thus total mass of the substance before reaction is equal to the total mass of the substances after the reactions.

Q2: What is difference between empirical formula and molecular formula?

Ans:

EMPIRICAL FORMULA	MOLECULAR FORMULA
It gives only relative number of each type of atoms present in a molecule. In other words, the empirical formula does not necessarily give the actual number of atom in a molecule. For example the molecular formula of benzene is C_6H_6 . This indicates that benzene molecule consists of 6 carbon atoms and 6 Hydrogen atoms in this molecule is 6:6 or 1:1 The empirical formula of benzene is, therefore written as CH.	It indicates the actual number and type of atoms in a molecule. It represents the true composition of a molecule of the compound. The molecular formula may some as empirical formula as in the case of CO_2 or some simple multiple of empirical formula. Thus the molecular formula of glucose which shows that the molecule of glucose consist of 6 carbon, 12 hydrogen and 6 oxygen atoms and its simplest atomic ratio i.e empirical formula is (CH_2O) . Thus the molecular formula of glucose is $\text{C}_6\text{H}_{12}\text{O}_6$.

Q3: What is law of Multiple proportions? Explain with examples.

Ans: LAW OF MULTIPLE PROPORTIONS:

It states that if two elements combine to form more than one compounds, the masses of one element that combine with a fixed mass of the other elements are in the ratio of small whole numbers or simple multiple ratio.

FOR EXAMPLE:

Carbon forms two stable compounds with oxygen namely carbon monoxide (CO) and carbondioxide (CO_2).

COMPOUND	Mass of Carbon	Mass of Oxygen	Ratio of Oxygen
Carbon Monoxide	12	16	1
Carbon Dioxide	12	32	2

The different masses of oxygen 16 and 32 which combine with the fixed mass of c (12g) are in the ratio of (16=320 i.e 1:2, which is simple whole number ratio and obeys law of multiple proportion.

Q4: What is law of reciprocal proportion? Explain with examples.

Ans: LAW OF RECIPROCAL PROPORTION:

It states that when two different elements separately combine with the fixed mass of third element, the proportion in which they combine with one another shall be either in the same ratio or some simple multiple of it.

EXAMPLE:

For instance, when two elements carbon and oxygen separately combine with hydrogen to form methane (CH_4) and water (H_2O) repectively. It is very clear that in methane 3g of c combine with the same fixed mass i.e (1g) of Hydrogen, now when carbon and oxygen combine with each other to form carbon dioxide (CO_2),

they do so in the same proportion (i.e $12:32 = 3:8$ parts by mass).

Q5: Describe types of chemical reaction.

Ans: TYPES OF CHEMICAL REACTION:

Chemical reaction can be divided commonly into five different types.

- (1) Decomposition reaction.
- (2) Addition reaction or Combination Reaction.
- (3) Single displacement reaction.
- (4) Double displacement reaction.
- (5) Combustion reaction.

(1) Decomposition reaction:

A reaction in which a chemical substance breaks down to form two or more simpler substance is called a decomposition reaction. These reactions require some energy for decomposition.

For Example:

Calcium carbonate decomposes into calcium oxide and carbon dioxide in presence of heat.



(2) Addition reaction or Combination Reaction:

A reaction in which two or more substances combine to form a single substance is called an addition or combination reaction. These reactions are reverse of decomposition reactions.

For Example:

Calcium oxide (CaO) reacts with carbon dioxide (CO_2) to form calcium carbonate (CaCO_3).

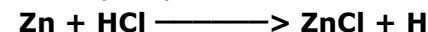


(3) Single displacement reaction:

A reaction in which one atom or group of atoms of a compound is replaced by another atom or group of atom is defined as single displacement reaction.

For Example:

Zinc replaces Hydrogen in hydrogen chloride (HCl) to give zinc chloride (ZnCl):



(4) Double displacement reaction:

It is a reaction in which two compounds exchange their partner, so that two new compounds are formed. In double displacement reaction usually there is an exchange of ionic radical.

For Example:

When sodium chloride (NaCl) is reacted with silver nitrate (AgNO_3) solution, they exchange their partners to form two different compounds silver chloride (AgCl) and sodium nitrate (NaNO_3).

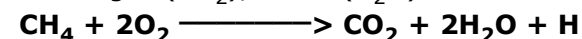


(5) Combustion reaction:

A reaction in which substances react with either free oxygen or oxygen of the air, with the rapid release of heat and flame is called combustion reaction.

For Example:

When methane (CH_4) gas burns in air it forms carbon dioxide gas (CO_2), water (H_2O) and heat.



SCIENTIFIC PROBLEMS

Q1: How many atoms are there is 5 moles of sulphur?

Ans: DATA:

No of moles = $n = 5\text{mol}$

Avogadro's Number = $\text{NA} = 6.02 \times 10^{23}$

No of atoms in 5 moles = ?

SOLUTION:

1 mole of sulphure contains = 6.02×10^{23} atoms

No of atoms in 5 moles = $\text{N} \times \text{NA}$

$$\text{No of atoms} = 5 \times 6.02 \times 10^{23}$$

$$\text{No of atoms} = 30.1 \times 10^{23} \quad \text{Ans}$$

Q2: What is mole? What is molar mass of substance? Find out the molar mass of SO₂?

MOLE:

See Q.7 of short Q/A.

MOLAR MASS:

Molar mass of a substance is its relative molecular mass expressed in gram. Thus molar of a substance has a fixed unit.

FOR EXAMPLE:

Calculate the molar mass of ammonia. (NH₃)

The molar mass is obtained by adding the atomic masses of component atoms.

$$\text{N} = 1 \times 14\text{g} = 14\text{g}$$

$$\text{N} = 3 \times 1\text{g} = 3\text{g}$$

$$\text{Molar Mass of NH}_3 = 17\text{g}$$

$$\text{Molar Mass of SO}_2$$

$$\text{S} = 1 \times 32 = 32\text{g}$$

$$\text{O} = 2 \times 16 = 32\text{g}$$

$$\text{Molar Mass of SO}_2 = 64\text{g} \quad \text{Ans}$$

Q3: Calculate the molecular mass in (a.m.u) of each of the following.

(a) H₂O

$$\text{H}_2 = 2 \times 1 = 2$$

$$\text{O} = 1 \times 16 = 16$$

$$\text{H}_2\text{O} = 18 \text{ a.m.u}$$

(a) H₂O₂

$$\text{H}_2 = 1 \times 2 = 2$$

$$\text{O}_2 = 2 \times 16 = 32$$

$$\text{H}_2\text{O}_2 = 34 \text{ a.m.u}$$

(c) C₆H₆

$$\text{C}_6 = 6 \times 12 = 72$$

$$\text{H}_6 = 6 \times 1 = 6$$

$$\text{C}_6\text{H}_6 = 78 \text{ a.m.u}$$

(d) KNO₃

$$\text{K} = 1 \times 39 = 39$$

$$\text{N} = 1 \times 14 = 14$$

$$\text{O}_3 = 3 \times 16 = 48$$

$$\text{KNO}_3 = 101 \text{ a.m.u}$$

(e) CaCO₃

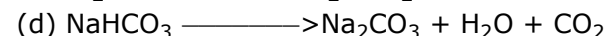
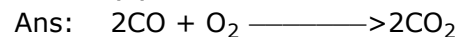
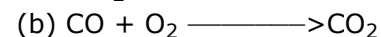
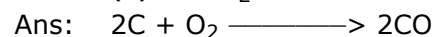
$$\text{Ca} = 1 \times 40 = 40$$

$$\text{C} = 1 \times 12 = 12$$

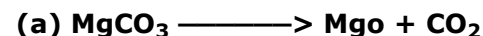
$$\text{O}_3 = 3 \times 16 = 48$$

$$\text{CaCO}_3 = 100 \text{ a.m.u}$$

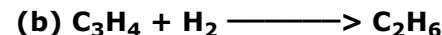
Q4: Balance the following equations.



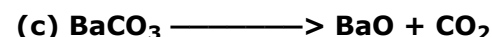
Q6: Which of the following reaction is either a decomposition reaction and combination reaction.



Ans: Decomposition Reaction.



Ans: Addition Reaction.



Ans: Decomposition Reaction.

CHAPTER-8

STRUCTURE OF ATOM

MCQ's

(MULTIPLE CHOICE QUESTIONS)

A: CHOOSE THE CORRECT ANSWER.

01. _____ a Greek philosopher, proposed that matter is made up of extremely small particles, the "atom".
(Democritus, Plato, Aristotle)
02. John Dalton in _____ published theory of atom assuming that atoms are the ultimate indivisible particles of matter.
(1806, 1807, 1808)
03. All elements are made up of small indivisible, indestructible particles called _____.
(Atoms, Ions, Molecule)
04. Electron was discovered by _____.
(M. Faraday, Goldstein, James Chadwick)
05. Proton was discovered by _____.
(M. Faraday, Goldstein, James Chadwick)
06. Neutron was discovered by _____.
(M. Faraday, Goldstein, James Chadwick)
07. Electron is _____ charged particle.
(Negative, Positive, Neutral)
08. Proton is _____ charged particle.
(Negative, Positive, Neutral)
09. Neutron is _____ charged particle.
(Negative, Positive, Neutral)
10. The nucleus of an atom consists of _____.
(Electron & Proton, Electron & Neutron, Proton & Neutron)
11. Which particle is lightest in the following:
(Electron, Proton, Neutron)

12. Which particle is heavier than others:
(Electron, Proton, Neutron)
13. The mass of electron is _____.
($9.11 \times 10^{-26} \text{g}$, $9.11 \times 10^{-27} \text{g}$, $9.11 \times 10^{-28} \text{g}$)
14. The mass of proton is _____.
($1.67 \times 10^{-22} \text{g}$, $1.67 \times 10^{-23} \text{g}$, $1.67 \times 10^{-24} \text{g}$)
15. Charge on electron is _____.
($1.602 \times 10^{-17} \text{C}$, $1.602 \times 10^{-18} \text{C}$, $1.602 \times 10^{-19} \text{C}$)

ANSWER KEY

01	Damocritus	02	1808	03	Atoms
04	J.J. Thomson	05	Goldstein	06	James Chadwick
07	Negative	08	Positive	09	Neutral
10	Proton & Neutron	11	Proton	12	Electron
13	$9.11 \times 10^{-27} \text{g}$	14	$1.67 \times 10^{-24} \text{g}$	15	$1.602 \times 10^{-19} \text{C}$

B: SHORT ANSWER QUESTIONS.**Q1: What is atom?****Ans: ATOM:**

In the fifth century B.C the Greek philosopher Democritus expressed the belief that all matter consists of very small indivisible particles, which he named Atom.

Q2: What was the concept of Democritus about atom?

Ans: Democritus, A Greek philosopher, proposed that matter is made up of extremely small particles, the "atoms". The name atoms comes from Greek language, meaning indivisible.

Q3: Write the introduction of Dalton atomic theory.

Ans: In the fifth century B.C the Greek Philosopher Democritus expressed the belief that all matter consists of very small indivisible particles, which he named Atom.

Q4: What was the concept of Democritus about atom?

Ans: DEMOCRITUS:

A greek philosopher, proposed that matter is made up of extremely small particles, the "atoms". The name atoms comes from Greek language, meaning indivisible.

Q3: Outline the main points of Dalton atomic theory.

Ans: Main Points of Dalton's Atomic Theory:

- (1) All elements are made up of small indivisible, indestructible particles called atoms.
- (2) All atoms of a given element are identical in all respect, having same size, mass and chemical properties. But the atoms of one element differ from the atoms of other element.
- (3) Compounds are formed when atoms of more than one element combine in a simple whole number ratio.
- (4) A chemical reaction is a rearrangement of atoms, but atoms themselves are not change, this means that atoms are neither created nor destroyed in chemical reactions.

Q4: Write any two drawbacks of Dalton's atomic theory.

Ans: DRAWBACKS OF DALTON'S ATOMIC THEORY:

- (1) Actually it is composed of still smaller particles called protons, neutrons and electrons.
- (2) The atoms of same element may differ in their atomic masses.

Q5: What is modern concept of atom?

Ans: (1) The atom consists of sub-atomic particles.

- (2) All atoms have a central core called nucleus.
- (3) The nucleus has a positive charge.
- (4) An atom is electrically neutral, such that total positive charge on the nucleus is equal to total negative charge on the electrons revolving around the nucleus.

Q6: Name the fundamental particles of atom.

Ans: FUNDAMENTAL PARTICLES OF ATOM:

☆ Electron ☆ Proton ☆ Neutron

Q7: What is Radioactivity?

Ans: Radioactivity is the spontaneously disintegration of nucleus of an atom, in which invisible radiations are emitted from the nucleus of atoms. The substances which emit such kind of radiations are known as radioactive substances and the Phenomenon is known as radioactivity.

Q8: Write any three properties of cathode rays.

Ans: PROPERTIES OF CATHODE RAYS:

- (1) They cast shadows of objects placed in their path towards the anode, proving that they travel in straight line.
- (2) They are deflected towards the positive plate in an electric field, showing that they are negatively charged particles.
- (3) They can produce mechanical pressure indicating that they possess kinetic energy (K.E).

Q9: What are isotopes? Define isotopes of Hydrogen.

Ans: ISOTOPES:

Atoms of the same element having the same atomic number but different atomic masses are called isotopes.

ISOTOPES OF HYDROGEN:

There are three isotopes of Hydrogen, these are named as:

☆ Protium ☆ Deuterium ☆ Tritium

PROTIUM:

The atom of Hydrogen that has no neutron and one proton in the nucleus is called protium.

DEUTERIUM:

The atom of Hydrogen that has one neutron and one proton in the nucleus is called deuterium.

TRITIUM:

The atom of Hydrogen that has two neutrons and one proton in the nucleus is called tritium.

Q10: What is electronic configuration?**Ans: ELECTRONIC CONFIGURATION:**

According to Bohr's theory the electron moves in specific circular orbits around the nucleus. These orbits are called energy levels or shells and are designated as K, L, M, N, O, P orbit and represented as 1, 2, 3, 4, 5, 6 starting from one nearest to the nucleus.

Q11: Define Atomic Number and Mass Number.**Ans: ATOMIC NUMBER:**

The number of protons in nucleus of an atom is called the atomic number.

EXAMPLE:

Atomic number of carbon is 6. This means that each carbon atom has 6 protons in the nucleus.

NOTATION:

Atomic number is denoted by Z.

REPRESENTATION:

Atomic number Z is written as superscript on the left hand side of chemical symbol.

MATHEMATICAL RELATION:

Atomic number Z of an element = Number of Protons in the nucleus of its atom.

MASS NUMBER:

The sum of the number of neutrons and protons in the nucleus of an atom is called its mass number.

NOTATION:

Mass number is denoted by A.

REPRESENTATION:

Mass number (A) of an element generally shown as superscript on the left side of its symbol. Mathematically,

$$\text{Mass number (A)} = \text{number of protons} + \text{Number of Neutrons}$$

$$A = P + N$$

LONG ANSWER QUESTIONS**Q1: Describe the properties of Electron, Proton and Neutron.**

Ans: Following are the important fundamental particles of atom.

☆ Electron ☆ Proton ☆ Neutron

ELECTRON:**DEFINITION:**

It is negatively charged particle moving around the nucleus in shell.

CHARACTERISTICS:

- ☆ It is negatively charged particle.
- ☆ It moves in orbit around the nucleus.
- ☆ It has a mass equal to 0.0005485 amu or $9.109390 \times 10^{-28} \text{g}$ or $9.109390 \times 10^{-31} \text{kg}$ or its mass is $1/1836$ part of that of proton.
- ☆ The charge on electron is $-1.602177 \times 10^{-19}$ coulomb.

PROTON:**DEFINITION:**

It is positively charged particle present in nucleus of an atom.

CHARACTERISTICS:

- ☆ It is positively charged particle.
- ☆ It lies in the nucleus.
- ☆ It has mass equal to 1.007276 amu or $1.672623 \times 10^{-24} \text{g}$ or $1.672623 \times 10^{-27} \text{kg}$.
- ☆ The charge on proton is equal to that of electron i.e.

+1.6.02x10⁻¹⁹C.

- ☆ it is 1836 times heavier than an electron.

PROTON

DEFINITION:

It is neutral particle present in the nucleus of an atom.

☆ CHARACTERISTICS:

- ☆ It is a neutral particle.
- ☆ It lies in the nucleus.
- ☆ It has mass equal to 1.0086654 amu or 1.674927x10⁻²⁴g or 1.674927x10⁻²⁷kg.
- ☆ It is 1840 times heavier than an electron.

Q: Describe the discovery of Electron.

Ans: DISCOVERY OF ELECTRON:

HISTORY:

The fundamental particle carrying a negative charge was discovered in 1897, by the British Physicist J.J. Thomson.

APPARATUS:

The apparatus used for the discovery of negative charge particle is called the discharge tube which consists of:

Glass Tube
Metallic Electrodes
High voltage source
Vacuum Pump

CONSTRUCTION OF DISCHARGE TUBE:

It is a simple tube filled with a gas and fitted with two metallic electrodes, which are connected to a high voltage battery. The tube is connected to a vacuum pump in order to reduce the pressure inside the tube.

WORKING:

A high voltage is applied across the electrodes at very low pressure (0.01 atmosphere).

OBSERVATIONS:

When the tube is evacuated and a current of high potential is passed between the electrodes, streaks of bluish light extending from negative electrode (cathode) towards positive electrode (anode).

The rays appear to travel in straight lines, from the cathode to anode, cause the wall at the opposite end of the tube glow where they strike.

Thomson showed that these rays were deflected towards the positive plate in electric and magnetic field.

Cathode rays (negative charge particles) obtain irrespective of the nature of cathode or the gas in the discharge tube.

CONCLUSIONS:

- ☆ The name electron was given to these units of negative charges.
- ☆ Deflection in electric field (towards positive plate) shows that these rays consisted of negative charge particles.
- ☆ Electrons are essential constituents of all matter, because they were obtain irrespective of the nature of cathode or gas in the discharge tube.
- ☆ Electrons are integral part of all atoms which are negatively charged.
- ☆ Since atoms are electrically neutral, therefore an atom must contain another kind of particles which are positively charged.

Q3: Describe the discovery of Proton.

Ans: DISCOVERY OF PROTONS:

CLUE ABOUT PROTONS:

Since atoms are electrically neutral and electrons carry negative charge, it follows that for each electron, there must be one equivalent positive charge to neutralize

that electron. This particle is called a proton.

The knowledge about proton was derived as a result of the study of electric discharge in the discharge tube by German physicist goldstein in 1886.

APPARATUS:

Apparatus required for this experiment consist of:

Glass

Metallic Electrodes (perforated cathode)

High voltage source

CONSTRUCTION OF DISCHARGE TUBE:

A simple discharge tube consists of a glass tube fitted with two metallic electrodes at either end. These electrodes are connected to a high voltage source.

The perforated electrodes which is connected to negative terminal called cathode and the other which is connected to positive terminal called anode.

WORKING:

Goldstein conducted a series of processes during his experiment. He reduce pressure of a gas from higher to very low limits.

OBSERVATIONS: Goldstein observed fluorescence at the end of the tube opposite to the anode due to the rays which are flowing opposite to the cathode rays.

These rays are named as canal rays because they pass through the canals or holes of the cathode.

Q: Describe the discovery of Neutron.

Ans: DISCOVERY OF NEUTRON:

In 1932 the English Physicist James chadwick discovered a third type of fundamental particle of atom through artificial radioactivity. He named the third type of fundamental particle, "Neutron".

Q5: Discuss the Rutherford's gold foil metal experiment. What did it tell about the structure of atom.

Ans: INTRODUCTION:

Having known that atom contains electrons and a positive ion. Rutherford proceeded to perform experiments to known as to how and where these were located in the atom. Rutherford perform lot of researches in this connection and in 1911 he was able to get some results from his effort.

EXPERIMENT:

Rutherford bombarded a thin foil of metal (gold) by streams of positively charged particles i.e. Alpha particles comes from a radioactive source Polonium. These particles can be detected on a screen coated with Zn sulphide.

OBSERVATION:

Rutherford found that:

- * Most of the alpha particles passed right to the metal foil without changing direction.
- * Some of them deflected at differetn angles fairly.
- * A few were reflected back along their path.

CONCLUSION:

From the result of his experiment, Rutherford concluded that:

1. VOLUME:

The volume occupied by an atom must be largely empty as most of the particles a-passed through the foil un-deflected.

2. NUCLEUS:

The positive charge, in the atom is concentrated in extremely dense region which he called the nucleus. This was from the fact that a-particles after collision with the heavy positively charged nucleus had bounced back.

Q6: Explain the main features of Bohr's theory.

Ans: After Planks and Einstein's discoveries. Niels Bohr, A Danish physicist in 1913 offered theoretical explanation of line spectra. The important assumptions for the atomic structure are given below.

- (1) Neils Bohr adopted Planks idea, that energies are quantized. He proposed that the electrons in atoms move only in certain allowed energy level (energy states).
- (2) An electron in an allowed energy state will not radiate energy continuously and therefore will not fall in the nucleus.
- (3) The atom radiates energy as a light only when the electron jumps from higher energy level (E₂). The quantity of energy radiated is in discrete quantity, called quanta.
- (4) A quantum of energy is directly proportional to the frequency of the radiation.

i.e

$$DE = E_2 - E_1 = h\nu$$

Where

h = Planck's constant

ν = is the frequency of radiation.

- (5) According to Bohr's model, only those orbits are permissible whose angular momentum, $mvr = \frac{nh}{2\pi}$

Where,

m = mass of electron

v = velocity of electron

r = radius of orbit

n = an integral number called Principal Quantum Number. Its value may be 1,2,3..... ∞ .

CHAPTER-9**PERIODCITY OF ELEMENTS****MCQ's****(MULTIPLE CHOICE QUESTIONS)****A: CHOOSE THE CORRECT ANSWER.**

01. In _____ Johann Dobereiner, noticed that of three elements with very similar chemical behaviour.
(1827, 1828, 1829)
02. "Central Atom of each set of triad had an atom mass almost equal to the arithmetical mean of the atomic masses of other two elements. It is the statement of _____.
(Dobereiner, Newland, Mendeleev)
03. In _____ John Newland, a london industrial chemist proposed Newland's law of octave.
(1862, 1863, 1864)
04. The arithmetic mean of lithium and potassium is _____.
(7, 23, 39)
05. The rule of triad was introduced by _____.
(Dobereiner, Newland, Mendeleev)
06. The repetition of properties after regular intervals is called _____.
(Periodicity, Periodictability, productivity)
07. Lothar Meyer's curve included about _____ elements.
(Thirty three, Fifty Six, Sixty Six)
08. The most reactive metal is _____.
(Sodium, Potassium, Rubidium)
09. The only liquid metal is _____.
(Molybdenum, Gold, Mercury)
10. _____ put forward his periodic law in 1869.
(Dobereiner, Newland, Mendeleev)

11. To which family does Ga belong?
(Boron, Carbon, Nitrogen)
12. Mendeleev's periodic table contain _____ periods.
(8, 12, 14)
13. The ionization energy of hydrogen is _____.
(1312K.J/mol, 1225K.J, 1166K.J)
14. _____ calculated the electronegativities of different elements.
(Medeleev, Mosely, Linus Pauling)
15. The _____ period contains two elements, hydrogen and helium.
(First, Second, Third)

ANSWER KEY

01	1829	02	Dobernenier	03	1863
04	23	05	Dobereiner	06	Periodicity
07	Fifty	08	Sodium	09	Mercury
10	Mendeleev	11	Boron	12	12
13	1312K.J/mol	14	Linus	15	First

B: SHORT ANSWER QUESTIONS.**Q1: What is periodicity?****Ans: Periodicity:**

The recurrence of elements with respect to chemical and physical properties at regular interval is called periodicity.

Q2: What is role of Traid?**Ans: Rule of Traid:**

In 1829 Johann Debereiner, noticed that of the three elements with very similar behaviour i.e calcium (Ca), Strontium (Sr) and Barium (Ba), the atomic mass of the middle element i.e Sr is almost the arithmetic mean of the other two. This is known as rule of traid.

Q3: State newland's law of octave.**Ans: Newland's law of octave:**

If elements are arranged in the order of increasing atomic masses, the eight elements starting from a given one, has similar properties as first one i.e. It properties are a kind of repetition of the first, like the eight note in a octave of music

Q4: What was the work of Iother Myer?

Ans: Julius Iother Meyer, German scientist, in December 1869 published a Periodic table, in which known 56 elements were arranged on the basis of their atomic masses in nine vertical Columns or groups. But he laid down emphasis on the physical properties of elements.

Q5: Define mendeleev's Classification.**Ans: Mendeleev classification:**

In March 1869 Dimitri Mendeleev a Russian chemist arranged the elements in order of increasing atomic mass, Placing the elements with similar chemical Properties vertically beneath each other. By doing so, he observed that the properties of elements with slight modification repeated themselves at intervals. So he put forward his periodic law which states that.

"The Physical and chemical properties of elements are a periodic function of their atomic weights.

Q6: What is modern periodic law?**Ans: Modern periodic Law:**

The Physical and chemical properties of all elements are periodic functions of their atomic numbers.

Q7: Define main or representative element.**Ans: Main or Representative Element:**

The elements of sub group "A" are called "Main" or representative elements, as the properties of these elements are represented by valency electron.

Q8: Define Transition elements.**Ans: Transition Elements:**

The elements of sub-group "B" are called Transition elements, because the properties of these elements show a gradual change or transition between the two sets of representative elements, on either side of them.

Q9: Define Atomic Radius.**Ans: ATOMIC RADIUS:**

Atomic Radius may be defined as half the distance between two adjacent nuclei of two similar atom in touch with each other.

Q10: Define Ionization Energy.**Ans: IONIZATION ENERGY:**

Ionization energy may be defined as the minimum energy required to remove an electron from a gaseous atom in its ground state.

Q11: Define Electron Affinity.**Ans: ELECTRON AFFINITY:**

Electron affinity is defined as the energy that occurs when electron is gained by an atom in the gaseous state.

Q12: Define Electronegativity.**Ans: ELECTRONEGATIVITY:**

Electronegativity is defined the relative tendency of an atom in a molecule to attract shared pair of electrons to itself.

LONG ANSWER QUESTIONS

Q: Explain Newland's law of octave. How this law provided the longer scope for the classification of elements.

Ans: NEWLAND'S CLASSIFICATION:

In 1863 John Newland, a London industrial chemist proposed NEWLAND'S LAW OF OCTAVE, which states that:

"If elements are arranged in the order of increasing atomic masses, the eighth element starting from a given one, has similar properties as first one i.e. Its properties are a kind of repetition of the first, like the eighth note in an octave of music."

Elements	Li	Be	B	C	N	O	F
Atomic Mass	7	9	11	12	14	16	19
Element	Na	Mg	Al	Si	P	S	Cl
Atomic Mass	23	24	27	28	31	32	35.5
Element	K	Ca					
Atomic Mass	39	40					

For Example,

Na is eighth element from Li and has similar properties, Mg is eighth element from Be and has similar properties etc.

This arrangement of elements for the first time brought to light the existence of PERIODICITY i.e recurrence of chemical and physical properties at regular interval and provided a great idea towards the development of modern periodic table. This law failed because it held good for the first sixteen elements but did not work after seventeenth element. Moreover hydrogen was not included in this sequence.

Q2: State Mendeleev's periodic law. Write down the advantages and disadvantages of Mendeleev's Periodic table.

Ans: In March 1869 Dimitri Mendeleev a Russian chemist arranged the elements in order of increasing atomic mass, placing the elements with similar chemical properties vertically beneath each other. By doing so, he observed that the properties of the elements with slight modification repeated themselves at intervals. So he put forward his

Periodic Law which states that.

"The physical and chemical properties of elements are a periodic function of their atomic weights."

The periodic table published by Mendeleev consisted of eight vertical columns called groups (i.e. Group I to VIII) and horizontal rows called series. Now a days these series are called periods.

ADVANTAGES OF MANDELEEVE'S PERIODIC TABLE:

- (1) It helped in systematic study of elements. For example the study sodium helps means to a large extent in predicting the properties other alkali metals as potassium, rubidium, cesium. It forcefully proved the concept of periodicity.
- (2) Prediction of new elements was made possible.
The physical and chemical properties of eka-boron, eka-aluminium and eka-silicon were predicted by Mendeleev. This helped in their discovery. These have been named as scandium (Sc), Gallium (Ga) and Germanium (Ge). Their properties are remarkably the same were predicted by Mendeleev.
- (3) Mendeleev's periodic table helped in correcting many doubtful atom masses.

DEFECTS IN MANDELEEVE'S PERIODIC TABLE:

- (1) There are three pairs of elements i.e. Elements of higher atomic masses placed before elements of lower atomic masses. I.e.
 - (a) Argon (40 placed before potassium (39)
 - (b) Cobalt (59.9) placed before nickel (58.6)
 - (c) Tellurium (127.6) placed before Iodine (126.9)
- (2) No place for isotopes of elements.
- (3) Dissimilar elements placed in same group i.e. Alkali metals (Li, Na, K, Rb, Cs, Fr) were placed with coinage metals (Ag, Cu, Au)
- (4) Similar elements placed in different groups for

example Barium (Ba) and lead (Pb) resemble in many properties but they are placed in separate groups.

- (5) It failed to give the idea of atomic structure.

Q: What do you understand by long form of periodic table? Explain some of its application.

Ans: MODERN PERIODIC TABLE:

The arrangement of elements on the basis of their atomic masses left many anomalies in the position of different elements in the periodic table. Moreover the existence of isotopes showed that the atomic mass of an element is not the fundamental property of an element.

The modern periodic table is the result of discovery of atomic number by Moseley in 1914.

Based on the concept of atomic number Bohr, Werner and Bury proposed the "Modern Periodic Law" which states that,

"The physical and chemical properties of all elements are periodic functions of their atomic numbers. "

In modern periodic table, also known as Bohr's Long Form of periodic table, elements are arranged in order of their increasing atomic number. The elements having similar properties are repeated at regular intervals. As atomic number is related to the number of protons in an atom, so the real basis of periodicity of properties is due to recurrence of similar valence shell configuration of the next element in the same group.

Q4: How does the modern periodic law differ from Mendeleev's Periodic law? Explain clearly groups and periods in the modern periodic table.

Ans: The modern periodic law is differ from Mendeleev's Periodic law by following statements.

- (1) In Mendeleev's periodic law it is stated that the chemical and physical properties of elements are the periodic functions of their atomic weights.
- (2) In modern periodic law it is stated that the chemical and physical properties of elements are the periodic functions of their atomic number.

THE FIRST PERIOD:

It contains only two elements i.e. H and He. This period signifies the completion of K-shell or first orbit. It is the shortest period with two elements.

THE SECOND AND THIRD PERIOD (SHORT PERIODS);

Each of these periods contains 8 elements. They signify the filling up of L-shell and M-shell respectively.

The second period starts with Li and ends up with Ne; whereas the third period starts with Na and ends at Ar.

THE FOURTH AND FIFTH PERIOD (LONG PERIOD):

Each of these periods contains 18 elements. In these periods the electrons fill M and N shells. Fourth period starts from K and ends at Kr. Fifth period starts from Rb and ends at Xe.

THE SIXTH PERIOD (LONGEST PERIOD):

It contains 32 elements. It starts from Cs and ends with Rn. Besides, fourteen elements called Lanthanides, are placed at the bottom of periodic table.

THE SEVENTH PERIOD (INCOMPLETE PERIOD):

It starts with Francium (Fr). This period is incomplete as to date about 109 elements have been discovered.

This period also includes a group of fourteen elements starting from Actinium (Ac). These elements are called Actinides. They are also placed at the bottom of the table.

GROUPS:

The vertical columns are called groups. Basically there are eight groups (I to VIII) but each group is further sub-divided into "A" and "B" sub-groups.

The elements of sub-group "A" are called "Main" or "Representative Elements", as the properties of these elements are represented by valency electrons.

The elements of sub-group "B" are called Transition Elements, because the properties of these elements show a gradual change or transition between the two sets of representative elements, on either side of them.

The group number indicates the total number of electrons in valency shell of that element.

**GROUP-IA (THE ALKALI METALS)
OR (LITHIUM FAMILY)**

This group includes Lithium (Li), Sodium (Na), Potassium (K), Rubidium (Rb), Caesium (Cs) and Francium (Fr). Their valence shell contains one electron only, and on reaction they lose the electron and form univalent positive ions (M^{1+}). They are highly reactive metals with low melting points. Fr is radioactive.

**GROUP-IIA (THE ALKALINE EARTH METALS);
(BERYLLIUM FAMILY)**

It includes Beryllium (Be), Magnesium (Mg), Calcium (Ca), Strontium (Sr), Barium (Ba) and Radium (Ra).

Their valence shell contains two electrons. On reaction they lose their two electrons and form divalent positive ions (M^{2+}). Ra is radioactive.

GROUP-IIIA (THE BORON FAMILY)

It includes Boron (B); Aluminium (Al); Gallium (Ga); Indium (In) and Thallium (Tl). Their valency shell contains three electrons. They exhibit a valency of 3+ and

form M^{3+} ions.

GROUP-IVA (CARBON FAMILY)

It includes Carbon (C); Silicon (Si); Germanium (Ge), Tin (Sn) and Lead (Pb).

Their valence shell contains four electrons. C, Si and Ge form covalent compounds whereas Sn and Pb exhibit a variable valence of 2 and 4.

GROUP-VA (NITROGEN FAMILY)

It includes Nitrogen (N), Phosphorus (P), Arsenic (As), Antimony (Sb) and Bismuth (Bi).

GROUP-VIA (OXYGEN FAMILY)

It includes oxygen (O); Sulphur (S); Selenium (Se), Tellurium (Te) and Polonium (Po).

GROUP-VIIA (THE HALOGENS)

It includes Fluorine (F); Chlorine (Cl); Bromine (Br); Iodine (I) and Astatine (At).

GROUP-VIIIA (INERT OR NOBLE GASES)

It includes Helium (He) Neon (Ne); Argon (Ar), Krypton (Kr); Xenon (Xe) and Radon (Rn).

GROUP-IB TO VIII B (TRANSITION ELEMENTS)

These are metals. In these elements, besides the valence shell is also incomplete. In chemical reactions they show more than one valencies. These elements in compounds having characteristics colours.

CHAPTER-10 STUDY OF MATTER AND ENERGY (PHYSICS)

MCQ's

(MULTIPLE CHOICE QUESTIONS)

A: CHOOSE THE CORRECT ANSWER.

- The word "Physics" is come _____ word physikos, meaning natural.
(Latin, Greek, French)
- The branch of science that deals with properties of matter and energy is called _____.
(Biology, Chemistry, Physics)
- Newton made a hypothesis about the nature of _____.
(Heat, Sound, Light)
- This error arises due to a fault in the measuring instrument.
(Personal Error, Systematic Error, Random Error)
- This error arises due to tendency of a person who takes reading.
(Personal Error, Systematic Error, Random Error)
- The formula of volume of a rectangular box is _____.
($V = l \times b \times h$, $l = w \times v \times h$, $v = w + l + h$)
- The formula of volume of a sphere is:
($V = \frac{4}{3}\pi r^3$, $V = \frac{6}{5}\pi r^3$, $V = \frac{3}{4}\pi r^3$)
- Kitabul-Manazir was famous of _____ an optics.
(Ibn -al-Haitham, Al-Kindi, Al-Beruni)
- Ibne Al-Haitham contributed toward _____ physics.
(Nuclear, Optical, Thermal)
- He discovered that nature of light and told that it is a kind of energy.
(Ibn-al-Haitham, Al-Kindi, Al-Beruni)
- He invented a pin hole camera and with this he obtained an

image of sun eclipse:

(Ibn-al-Haitham, Al-Kindi, Al-Beruni)

12. He gave laws of reflection:

(Ibn-al-Haitham, Al-Kindi, Al-Beruni)

13. He measure circumference of earth:

(Ibn-al-Haitham, Al-Kindi, Al-Beruni)

14. The name Muslim scientist who was born in Basra and made several discoveries on music was:

(Ibn-al-Haitham, Al-Kindi, Al-Beruni)

15. Dr. Abdus Salam was awarded Nobel Prize for his work on _____.

(Electronics, Radiation, Grand Unification Theory)

ANSWER KEY

01	Greek	02	Physics	03	Light
04	Systematic Error	05	Personal Error	06	$V=1 \times b \times h$
07	$V=4/3 \pi r^3$	08	Ibn-al-Haitham	09	Optical
10	Ibn-al-Haitham	11	Ibn-al-Haitham	12	Ibn-al-Haitham
13	Al-Beruni	14	Al-Kindi	15	Radiation

SHORT ANSWER QUESTIONS.

Q1: What are Laws of nature?

Ans: LAW OF NATURE:

Almighty Allah created this universe billions of years ago with a single word "be" and at once it came into being. He inducted several principles and laws in it to sustain its function. Now from the day of their creation every particle of the universe is following these laws. These laws are called laws of nature.

Q2: What is Physics?

Ans: PHYSICS:

The word Physics comes from a Greek word "Physikos" meaning "natural". It is defined as branch of

science which deals with the interaction of matter and energy.

Q3: Name the branch of Physics.

Ans: BRANCH OF PHYSICS:

- (1) Mechanics
- (2) Electricity
- (3) Electromagnetism
- (4) Solid State Physics
- (5) Atomic Physics
- (6) Nuclear Physics
- (7) Plasma Physics
- (8) Bio Physics
- (9) Astro Physics

Q4: Define importance of Physics.

Ans: IMPORTANCE OF PHYSICS:

In our daily life we use many things as a routine. But we seldom think how they are made. We use several electric appliances in our homes. For example, Electric fan, electric bulb, refrigerator, air conditioner, juicer, grinder etc. They all use power. We use buses, cars, railway carriages, aeroplanes etc. For long distance. These are run by engines. All these are wonder of Physics.

Q5: What is scientific method?

Ans: SCIENTIFIC METHOD:

It is the systematic method to solve any scientific problems. It is used for search of the truth.

Q6: Name the steps of scientific method.

Ans: STEPS OF SCIENTIFIC METHOD:

It consists of the following steps.

- (1) Observation
- (2) Hypothesis
- (3) Experiment
- (4) Theory
- (5) Prediction
- (6) Law

Q7: Define Errors and Accuracy.

Ans: ERRORS:

In an experiment certain errors may arise due to experimenter, or to the instrument used or due to both.

ACCURACY:

Accuracy means correctness of reading by carrying experiment. Simply it can be defined as chances of correctness in experimental reading.

Q8: Name types of Errors.**Ans: TYPES OF ERRORS:**

Errors are divided into three types namely.

- (a) Personal Error.
- (b) Systematic Error.
- (c) Random Error.

Q9: Write a short note on Ibn-al-Haitham.**Ans: IBN-AL-HAITHAM:**

Ibn-al-Haitham was born in Basra, a renowned city of Iraq. He was a great scholar of physics, mathematics, engineering, astronomy and medicine. He wrote many books on various subjects. His book Kitab-ul-Manazir, gained great reputation among scholars. He gave a theory about nature of light. He invented pinhole camera.

Q10: Write a short note on Dr. Abdul Qadeer Khan.**Ans: DR. ABDUL QADEER KHAN:**

He was born on 1st April, 1936 at Bhopal in India. He obtained M.Sc: Metallurgy degree from Holand. He obtained Ph.D degree from the university of Leaven Belgium. He worked as an expert at Urenco Enrichment plant in Holand as a joint venture of the government of Holand. When he imbued with the supreme spirit of Patriotism he returned to Pakistan to serve his motherland (Pakistan). He has been awarded Hilal-i-Imtiaz by the government of Pakistan.

LONG ANSWER QUESTIONS.**Q1: Describe various branches of Physics.****Ans: (1) MECHANICS:**

It deals with the motion of objects with or without references of force.

(2) Electricity:

It is concerned with the phenomena and effects of related to electric charge.

(3) Electromagnetism:

It deals with observations, principles, laws and methods that relate electricity and magnetism.

(4) Solid State Physics:

It is concerned with the structure and properties of solid materials.

(5) Atomic Physics:

It is concerned with the structure and properties of the atom.

(6) Nuclear Physics:

This branch is concerned with the structure, properties and reactions of the nuclei of atoms.

(7) Plasma Physics:

It is concerned with the properties of highly ionized atoms forming a mixture of bare nuclei (nuclei without electrons) and electrons.

(8) Bio Physics:

It is concerned with the application of physical methods and explanation to bio-physical systems and structures.

(9) Astro Physics:

It is concerned with the study of the physics of astronomical bodies.

Q2: Describe Scientific method with respect to its steps.

Ans: SCIENTIFIC METHOD:

In a scientific work the most important thing is observation. Observations are taken very carefully and systematically. In this way all possible information are gathered about a physical phenomenon under investigation. Keeping these observations in mind a scientist makes some hypothesis or postulate to explain the phenomenon. A hypothesis is a notion of a scientist on which he tries to explain the phenomenon. He designs a theory on the basis of hypothesis and gives an elaborated explanation about the phenomenon. The theory is checked by experiments. If theoretical and experimental results agree with each other, the theory is regarded correct otherwise it is discarded. This is one way of investigation of a problem in physics. Some times a scientist presents a theory on the basis of rational reasoning and predicts some phenomena to take place under certain conditions. Experiments are designed to test this theory. Again if predicted results are obtained, the theory is supposed to be correct and then this theory becomes a law. The law is such a statement regarding the behaviour of nature which explains the observations and experiments of the past and can predict about other aspects of nature.

Q3: Describe Errors and its Types.

Ans: ERRORS: In an experiment certain errors may arise due to experimenter, or to the instrument used or due to both. We divide these errors into three categories, namely personal error, systematic error and random error.

(a) Personal Error: This error arises due to tendency of a person who takes reading in favour of particular reading. Such procedure produces errors in taking observations. This type of error can be removed by avoiding this bias.

(b) Systematic Error: This type of error arises due to a

fault in the measuring instrument. This is called the zero error of the instrument. This error can be overcome by adopting the relevant zero error correction.

(c) Random Error: This type of error may arise due to external conditions which are at a certain time beyond the control of the experimenter. This error can be minimized by maintaining certain conditions in the laboratory. For example, changes in temperature, humidity and voltage etc. may be controlled.

Q4: Write a detail note on the contribution of the Muslim Scientists.**Ans: CONTRIBUTION OF MUSLIM AND PAKISTANI SCIENTISTS:**

In Abbasid period Baghdad was a great centre of learning and knowledge. Scientists and intellectuals from all over the world came here to quench their thirst for knowledge. Caliph was a lover of knowledge and he encouraged learners and scholars for their remarkable achievements in the field of science.

ABU ALI HASSAN IBN-AL-HAITHAM (965-1039 A.D)

Abu Ali Hassan Ibn-al-haitham was born in Basra, a renowned city in Iraq. He was a great scholar of physics, mathematics, engineering, astronomy and medicine. He wrote many books on various subjects. His book on optics, Kitabul Manazir, gained great reputation among scholars. In this book he criticised the theory about the nature of light, presented by the great philosophers of the past such as Ptolemy and Euclid. It was his courage that he refused this theory on practical ground.

According to this theory first light enters the eye then emits in the form of rays from the eye. These rays fall on the object and make it visible. But Al-Haitham pointed out that when light is incident on an object some

of it is reflected back and enters the eye. As a result the object becomes visible to the eye. He discovered the nature of light and told that it is a kind of energy. He gave formal definition of ray of light. He invented a pin hole camera and with this he obtained an image of sun eclipse. He gave two laws of reflection and carried out research on the formation of images by spherical mirrors. In his book the chapter on human eye is still a remarkable collection of information on this topic.

YAKUB IBNE ISHAQ ALKINDI (800-873 A.D)

Yaqub Kindi (800 A.D) was born in Basra. He produced several research monographs on meteorology, specific gravity and on tides. His most important work was in sound and optics. He explained musical notes on scientific ground and discovered a method to express the notes in terms of frequencies and used it to fix the order of various notes according to their frequency. He also discussed the nature of sound. He worked in geometrical optics which was translated in Latin. He was a man of diverse fields of science and promoted new thoughts in many disciplines of learning.

ABU REHAN MUHAMMAD BIN AHMED AL-BERUNI:

Al-Beruni was born in a small town Berun in present Afghanistan in 973 A.D. He was a great scholar of his time. He wrote more than one hundred and fifty books on various subjects, such as, mathematics, physics, cosmology, geography, history, culture and civilization, archaeology, comparative religions, geology, chemistry and biology etc.

He told that the earth is floating in space just like a grape floats in water. He rejected the notion that earth was stationary body in the universe. It was he who disclosed that Indus Valley was once the basin of an ocean. It was gradually filled up by mud. Now it has been

confirmed by modern geologists.

DR. ABDUS SALAM:

Dr. Abdus Salam was born in Jhang, a small city in Pakistan, in 1926. He was very intelligent from his very childhood. He passed every examination with distinction. Because of his good performance in education he was awarded scholarship for higher studies in U.K. He came back in Pakistan in 1950.

He was awarded Nobel Prize in physics in 1979 for his work on Grand Unification Theory (GUT). He established International Centre for Theoretical Physics at Trieste, Italy where scientists from the developing countries are provided opportunities to augment their research work in which they are engaged in their own countries by joining with elites of physics. Of course, he was an asset of Pakistan and will remain in the hearts of learning circle.

DR. ABDUL QADEER KHAN:

He was born on 1st April, 1936 at Bhopal in India, He obtained M.Sc. Metallurgy degree from Holland. He was selected as research Assistant in the same University. He obtained Ph.D degree from the University of Leaven Belgium. He worked as an expert at Urenco Enrichment Plant in Holland as a Joint Venture of the Government of Holland. When Dr. Abdul Qadeer imbued with the supreme spirit of patriotism, he returned to Pakistan to serve his motherland. To honour him, the former Engineering Research Laboratories has now been named as A.Q Khan Research Laboratories. He has been awarded Hilal-i-Imtiaz by the Government of Pakistan. He contributed in making Pakistan a nuclear state.

CHAPTER-11

MEASUREMENT

MCQ's

(MULTIPLE CHOICE QUESTIONS)

A: CHOOSE THE CORRECT ANSWER.

01. A set of fundamental and derived units is known as _____.
(System of units, System of matrix, System of quantity)
02. _____ system of units is convenient for scientific work.
(SI, CGS, BE)
03. _____ system is an old system.
(SI, CGS, BE)
04. The S.I unit of time _____.
(Second, Kilogram, Metre)
05. The fundamental unit of length in SI system is _____.
(Kilometre, Centimetre, Metre)
06. The standard meter is made of _____ and is placed at the international Bureau of weights and measures in seven, near Paris.
(Platinum & Copper, Iron and Iridium, Platinum and Iridium)
07. One metre is equal to _____.
(10^4 mm, 10^3 mm, 10^2 mm)
08. 10^{-9} second is called a _____.
(decisecond, millisecond, nanosecond)
09. The value of Pi is _____.
(3.14, 3.15, 3.16)
10. The number 2009 has _____ significant figures.
(Two, Three, Four)
11. 1 metre = _____ cm.
(10, 100, 1000)

12. 1 kilogram = _____ gm.
(10, 100, 1000)
13. The S.I unit of temperature is _____.
(Second, Mole, Kelvin)
14. An instrument which can measure length correct up to 0.1 mm.
(Vernier Callipers, Screw Gauge, Physical Balance)
15. Length, Mass, Time, Temperature, Electric current and light tendency are _____.
(Base, Derived, None of these)

ANSWER KEY

01	System of units	02	SI	03	CGS
04	Second	05	Metre	06	Platinum and Iridium
07	10^3	08	nano second	09	3.14
10	Four	11	100	12	1000
13	Kelvin	14	Vernier Callipers	15	Base

B: SHORT ANSWER QUESTIONS.

Q1: What is measurement?

Ans: MEASUREMENT:

The comparison of Physical quantities with standard units is called measurement.

Q2: Write importance of measurement.

Ans: IMPORTANCE OF MEASUREMENT:

Measurement is the common practice of every day life. This routine work starts from morning till late hours in the night. Every morning a milk man comes and gives a measured volume of milk to the house hold with the help of his measuring cylinder. If one goes to purchase sugar,

the shopkeeper will weigh the required amount of sugar by his common balance. To purchase cloth one goes to the shop and shopkeeper will measure the required length of the cloth by his metre scale.

Q3: What are fundamental quantities?

Ans: FUNDAMENTAL QUANTITIES:

In Physics length, mass and time are supposed to be the main fundamental quantities since scientists all over the world have recognized that all Physical quantities in mechanics can be expressed in term of fundamental quantities.

Q4: What are derived quantities?

Ans: DERIVED QUANTITIES:

All physical quantities derived from the fundamental quantities are known as derived quantities.

Q5: What is system of units?

Ans: SYSTEM OF UNITS:

A set of fundamental and derived units is known as system of units.

Q6: Name the seven fundamental units.

Ans: SEVEN FUNDAMENTAL UNITS:

S.#	Quantities	Units	Symbols
01	Time	Second	S
02	Length	Metre	m
03	Mass	Kilogram	kg
04	Amount of Substance	Mole	mol
05	Temperature	Kelvin	K
06	Electric Current	Ampere	A
07	Luminous Intensity	Candela	Cd

Q7: Name Seven Derived Units.

Ans: SEVEN DERIVED UNITS:

S.#	Quantities	Units	Symbols
01	Speed	meter / second	M/s
02	Acceleration	meter / second ²	M/S ²
03	Volume	Cubic Meter	m ³
04	Force	Newton	N
05	Pressure	Pascal	Pa
06	Work	Joule	J
07	Charge	Coulomb	C

Q8: Define Significant figure.

Ans: SIGNIFICANT FIGURE:

The significant figures in a number are the digit which are known with certainty.

Q9: With what instrument can you find Length, mass and time?

Ans: LENGTH:

Length is measured out by metre scale, measuring tape, measuring ruler etc.

MASS:

Mass is measured by physical and electronic balance.

TIME:

Time is measured by watch, clock etc.

Q10: Define:

(a) Standard of Length:

The standard unit of length is metre. "The metre is the length of the path travelled by light in vacuum during a time interval of $\frac{1}{299,792,458}$ of a second.

$\frac{1}{299,792,458}$

(b) Standard of Time:

The standard unit of time is second. A second is

defined to be exactly equal to the time interval of 9,192,631,770 vibrations of atoms of cesium 133.

LONG ANSWER QUESTIONS.

Q1: What is vernier caliper? Describe its structure and working.

Ans: VERNIER CALIPER:

A metre stick is graduated in millimetres, hence it can measure a distance up to 1mm. To measure distances smaller than this other instruments are used. Vernier Callipers is one of such instruments that can be used to measure a distance up to 0.05 mm.

A vernier callipers consists of a rectangular steel bar whose one side is graduated in millimetres. This scale is known as main scale (MS). A small scale usually consisting of 10 divisions which slides over the main scale is known as vernier scale (VS) (20 division vernier scale is also in use).

The instrument has two jaws called callipers, which enables it to measure the internal as well as the external diameter of a cylindrical object. A relatively thin flat rod is attached to the sliding scale on its back which enables it to measure the inner depth of the hollow cylinder:

VERNIER CONSTANT (VC) OR LEAST COUNT (LC):

Vernier Constant (VC) or Least Count (LC) is the minimum distance that can be measured with the help of vernier callipers.

$$\begin{aligned} 10 \text{ vernier division} &= 9 \text{ main scale division} \\ &= 9 \text{ mm} \end{aligned}$$

$$1 \text{ vernier division} = \frac{9\text{mm}}{10} = 0.9 \text{ mm}$$

$$1 \text{ main scale division} = 1 \text{ mm}$$

$$\text{Least count} = \text{difference between 1 MS division and 1 VS}$$

$$\begin{aligned} &= 1 \text{ mm} - 0.9 \text{ mm} = 0.1 \text{ mm} \\ &= 0.01 \text{ cm} \end{aligned}$$

The least count can also be calculated as follows:

LC = Value of the smallest division on MS

Total number of division on the VS

$$\begin{aligned} &= 1 \text{ mm} \\ &10 = 0.1\text{mm} = 0.01 \text{ cm} \end{aligned}$$

Q2: What is screw Gauge? Describe its structure and working.

Ans: MICROMETRE SCREW GAUGE:

A vernier callipers can measure up to $\frac{1}{100\text{th}}$ or $\frac{1}{200\text{th}}$ of a centimetre.

For more precise measurement micrometre screw gauge is used. A micrometre screw gauge consists of U-shaped solid metal frame F. At one end of this frame a stud C with round end and flat face is fixed at A. A fine and accurately cut screw S having flat round end D passes through the other end B. On the outer surface of the nut of the screw a scale is graduated in millimetres. This is parallel to the length of the screw and is called the main scale which is linear. A drum fits on the screw which moves on the nut as it is rotated. This drum has a circular scale at one end with 50 or 100 divisions on it. At the other end the screw has a head is known as ratchet to avoid under pressure on the object held between the studs C and D.

PITCH OF THE SCREW:

It is the distance between the two consecutive threads of the linear screw. It is measured by the distance travelled by the circular scale on the main scale during one complete rotation of the circular scale. The least count of the screw gauge is given as,

$$\text{Least Count} = \frac{\text{Pitch}}{\text{Number of divisions on the circular scale}}$$

If the pitch of the screw is 1mm and the number of divisions on the circular scale is 100, then

$$\text{LC} = \frac{1\text{mm}}{100} = 0.01 \text{ mm} \\ = 0.001 \text{ cm}$$

Q3: Write a note on any two of the followings.

Ans: PHYSICAL BALANCE:

This is a device commonly used to find the mass of an object. It consists of a horizontal beam resting at its middle point on a central knife edge. Two similar pans are suspended on two more knife edges near each end of the beam. A long pointer capable of swinging on a scale is attached to the middle of the beam. The physical balance is levelled on a table by means of levelling screws. The beam is set free by rotating the arresting knob at the front of the balance. The pointer is brought at the middle of the scale by means of two adjusting screws provided at each end of the beam.

The arresting knob is turned to rest the beam. The balance pans are cleaned. The object is placed on the left pan and the standard masses on the right pan. The beam is set free by turning the arresting knob. The pointer moves towards the side of smaller mass. The standard mass in the pan is adjusted to find the mass of the object.

STOP WATCH:

To measure time interval or to find instantaneous time we use a wrist watch or a clock and to keep its record we use a special watch known as a stop watch. Scales of minutes hand and seconds hand in it are on a circular dial.

To note the time both hands of the stop watch are set at zero by pressing and releasing the knob B. As the knob B is pressed and again released the watch starts. When the second's hand completes one rotation of sixty

seconds, the minutes' hand advances by one division. When we want to stop the watch, the knob B is pressed and released again. The new position of the hands gives the time interval for which the watch was in operation.

MEASURING CYLINDER:

It is a glass cylinder with a scale graduated in cubic centimetres or millilitres (ml). It is used to find the volume of liquids. When a liquid is poured, it rises to a certain height in the cylinder. The level of liquid in the cylinder is noted and the volume of the liquid is obtained.

Q4: What is Physical Quantity? Discuss in detail.

Ans: PHYSICAL QUANTITIES:

A physicist is largely involved in discovering the law of nature through precise measurement of various physical quantities. Scientists have divided all physical quantities into two groups,

(a) fundamental quantities, (b) derived quantities. In physics length, mass and time are supposed to be the main fundamental quantities since scientists all over the world have recognized that all physical quantities in mechanics can be expressed in terms of these fundamental quantities. To measure a physical quantity we need a certain unit. So the units to express fundamental quantities are known as FUNDAMENTAL UNITS, and the units used to express other physical quantities that are derived from fundamental units are called DERIVED UNITS.

A set of fundamental and derived units is known as a SYSTEM OF UNITS. There are three systems of units being used in scientific work. In the CGS system, centimetre, gram and second are the fundamental units for length, mass and time respectively. International system of units is abbreviated as SI from the French "The

System International units". In this system seven quantities have been accepted as fundamental quantities. They are length, mass, time, electric current, amount of substance, thermodynamic temperature and luminous intensity. Units of these quantities are metre for length, kilogram for mass, second for time, ampere for electric current, mole for amount of substance, kelvin for thermodynamic temperature and candela for luminous intensity.

SI system of units is convenient for scientific work and provides a simple method for calculations.

Q5: Define significant figure. Describe its rule.

Ans: SIGNIFICANCE UNITS:

The measured value of a physical quantity is always a number usually a decimal number. Let this physical quantity be the length of a rod which is measured by a scale graduated in centimetres. We take a large number of readings on the given rod. The average value of the length calculated on the basis of these readings will be more accurate. Let this value be 320.5 cm. In this number (320.5) the digit on the extreme right to the decimal point which is (5) is uncertain. It is just an estimated value. The reason of uncertainty is that scale can read correctly upto units placed of a number where this as the digit (5) lies on the first place of decimal point and hence uncertain. The remaining digits, 3, 2, 0 are known with certainty.

The digits 3, 2, 0, 5 in the number are significant figures. Thus the significant figures in a number are the digits which are known with certainty.

RULES FOR FINDING SIGNIFICANT FIGURES:

- (1) All non zero digits are significant, For example the number 239 has three significant figures 2, 3, 9.
- (2) Zero lying between non zero digits are significant, for

example the number 2009 has four significant figures.

- (3) All the zeros which locate the decimal point in number less than (one) are not significant. For example the number 0.00786 has only three significant figures that is 7, 8, 6.
- (4) The zeros which are located immediately to the right of the decimal point are significant. For example the number 78.000 has five significant figures.
- (5) Zeros locating the decimal point in a number greater than 1 (one) are not necessarily significant. For example, the number 500 has only one significant figure.

CHAPTER-12

FORCE AND FRICTION

MCQ's

(MULTIPLE CHOICE QUESTIONS)

A: CHOOSE THE CORRECT ANSWER.

01. _____ is defined as a push or a pull acting on objects.
(Force, Power, Pressure)
02. Force is measured in _____.
(Kelvin, Newton, Candela)
03. An object that is moving is said to be in _____.
(Force, Motion, Rest)
04. _____ can cause an object at rest to motion.
(Force, Motion, Rest)
05. _____ can bring a moving object to rest.
(Force, Motion, Rest)
06. It is the push or pull exerted by a machine to move the body or to bring it rest.
(Mechanical Force, Elastic Force, Magnetic Force)
07. The force of _____ is defined as the force that offers resistance to motion.
(Gravitation, Magnetism, Friction)
08. It is the force of attraction or repulsion between two charged bodies.
(Electrical Force, Elastic Force, Magnetic Force)
09. It is the force with which the earth pulls all objects towards its centre.
(Electrical Force, Mechanical Force, Gravitational Force)
10. The unit of force is _____ named after sir Isaac Newton, a great scientist.
(Pascal, Joule, Newton)
11. Water flows down the hills due to _____.
(Gravitational Force, Elastic Force, Frictional Force)

12. _____ friction is far less than the sliding friction.
(Static, rolling, Fluid)
13. Walking is possible because of the _____ between our shoes or feet and the floor.
(Friction, Power, Pressure)
14. _____ reduces the speed of moving vehicles to a great extent.
(Friction, Power, Pressure)
15. To _____ friction, machine parts which rub against each other are lubricated using suitable oil or grease.
(Increase, Reduce, Maintain)

ANSWER KEY

01	Force	02	Newton	03	Motion
04	Force	05	Force	06	Force
07	Gravitation	08	Electrical Force	09	Gravitational Force
10	Newton	11	Gravitational Force	12	Rolling
13	Friction	14	Friction	15	Reduce

SHORT ANSWER QUESTIONS.**Q1: What is force?****Ans: FORCE:**

Force is defined as a push or a pull acting objects.

Q2: What is motion?**Ans: MOTION:**

An object that is moving is said to be in motion.

Q3: What is relation between force and motion?**Ans: RELATION BETWEEN FORCE AND MOTION:**

Force and motion are closely related. We use force to perform different action i.e Motion of Objects. Actions such as turning on a tap. Picking up a school bag or opening a door all require force.

Q4: Define any three effects of force.

Ans: AFFECTS OF FORCE:

- (1) Force can cause an object at rest to move.
- (2) Force can bring a moving object to rest.
- (3) Force can change the direction of motion of an object.

Q5: Name of types of force.

Ans: TYPES OF FORCE: There are various types of forces. These are as follows.

- (1) Muscular Force. (2) Mechanical Force.
- (3) Elastic Force. (4) Frictional Force.
- (5) Electrical Force. (6) Gravitational Force.

Q6: What is force of Friction?

Ans: FORCE OF FRICTION: The force of friction is defined as the force that offers resistance to motion. This force comes into existence only when the surfaces of two objects in contact move with each other.

Q7: What is gravitational force?

Ans: GRAVITATIONAL FORCE:

It is the force with which the earth pulls all objects towards its centre e.g a mango falls down towards the ground from the tree. This force enables the earth to move around the sun and the moon.

Q8: Distinguish between mass and weight.

Ans:

MASS	WEIGHT
Mass is the amount of material in something. We say mass of 1 litre water is 1 kilogram. We measure mass with physical balance and electronic balance.	The weight of a body is the force with which it is pulled towards the earth. We also measure weight with physical balance and electronic balance.

Q9: Define static and dynamic friction.

Ans: STATIC FRICTION:

If the body does not move, it would mean that an equal and opposite force come into being. This opposing force is the force of friction. This friction is called static friction.

DYNAMIC FRICTION:

If the body moves and in contact with the other body is called dynamic friction.

Q10: Write factors on which friction depends.

Ans: FACTORS ON WHICH FRICTION DEPENDS:

- (1) The nature of surfaces in contact.
- (2) Weight of the body sliding over the surface.

Q11: Give two advantages and two disadvantages of friction.

Ans: ADVANTAGES OF FRICTION:

- (1) Walking is possible because of the friction between our shoes and the floor.
- (2) Driving would not be possible if there is no friction between the tyres and the road.

DISADVANTAGES OF FRICTION:

- (1) Due to friction between the sole of the shoe and the floor, the sole wears out.
- (2) Machine parts which rub together wear out.

LONG ANSWER QUESTIONS.

Q1: Describe in detail the effects of force.

Ans: AFFECTS OF FORCE:

A force can affect an object in different ways. In order to understand the effects of force, we have to see what a push or pull will do to an object.

- (1) Force can cause an object at rest to move, e.g, you can move a heavy box by pushing it from corner of the room to another.

A stool can be made to move by giving it a gentle push. When you pull a chair, it starts moving. However, it is not necessary that a force can always cause an object at rest to move. If you try to push a very heavy stone in the garden, it may not move. The force applied by you may not be enough to move it.

- (2) Force can bring a moving object to rest: e.g, you can stop a moving vehicle say a car, bus, truck, scooter etc, by applying breaks.
The boy is applying a force, which is stopping the dog.
- (3) Force can change the direction of motion of an object: e.g, in the game of cricket, a ball thrown at the batsman changes its direction when the batsman strikes the ball with his bat.
You can change the direction of your moving bicycle by applying force on its handle in the desired direction.
A football player changes the direction of a moving ball by angling his feet. When we play games like tennis we are constantly changing the direction of the ball by hitting it. It is a common experience that the smoke rising from an agarbatti changes its direction, if you gently blow air on it. The blow exerts force.
- (4) Force can change the speed of a moving object: e.g, if the force is applied in the direction of the movement, the object moves faster. If someone pushes the bicycle from behind, its speed increases.
If the force is applied in the opposite direction of motion, it slows down the speed of an object, e.g. If someone pulls the bicycle from behind, its speed decreases.
- (5) Force can change the shape or size of an object: This

happens when the object is not free to move, e.g., The rubber band loses its shape when stretched a person squeezes a toothpaste thereby deforming it.

Q2: Explain the various types of force.

Ans: TYPES OF FORCES:

There are various types of forces. They are as follows:

(a) Muscular Force:

It is the force exerted by our muscles e.g, a rikshaw driver uses his leg muscles to move the rikshaw, a labourer uses muscles of his arms and shoulders to lift the load.

The use of animals to carry load is an example of muscular force.

(b) Mechanical Force:

It is the push or pull exerted by a machine to move the body or to bring it to rest. Machines use energy from external sources for exerting the required force e.g., A car moves with the help of an engine. The engine uses the energy released by burning of petrol or diesel. So, the engine is the machine and the mechanical force is supplied by petrol.

(c) Elastic Force:

It is the force that is produced:

- (I) when the body is stretched and then released, e.g., A catapult causes a small stone to shoot out when it is stretched and then released.
- (II) when the body is compressed and then released e.g., Spring.
- (d) Frictional Force:
The force of friction is defined as the force that offers resistance to motion. This force comes into existence only when the surfaces of two objects in contact

move with respect to each other. If you roll a ball on the floor it will come to rest after some time because of friction. Friction slows down objects or stops them from moving. This force causes wear and tear of vehicle tyres, moving parts of machines, our shoes etc. It is the force of friction existing between the rim of a wheel and the brake shoes of a bicycle that it comes to rest when the brakes are applied.

(e) Electrical Force:

It is the force of attraction or repulsion between two charged bodies. A plastic pen rubbed with a piece of woollen cloth or dry uncoiled hair attracts tiny pieces of paper. An inflated balloon rubbed on woollen cloth will stick to any wall. When you put off pure synthetic clothes in dark, you can see tiny sparks. This is all electric force.

Tiny particles of dust and smoke can also be attracted by electrostatic force. This method is used for removing smoke particles from effluents coming out of a chimney, thus reducing air pollution.

(g) Gravitational Force:

It is the force with which the earth pulls all objects towards its centre, e.g., a ripe mango falls down towards the ground from the tree. If you release a ball from your hand it immediately starts falling towards the ground even though you did not push it. Water flows down the hill. It is the gravitational force that keeps us bound to the earth. Otherwise, we would all be floating. When a diver dives into a swimming pool it is the force of gravity which brings down the diver. This force enables the earth to move around the sun and the moon to move round the earth.

Q3: Describe the types of force of friction.

Ans: STATIC FRICTION AND DYNAMIC FRICTION:

For a stationary object lying flat on a surface, the

force of friction balances the applied force. Let us consider what happens when a small force is applied on an object resting on a table top. Let the direction of this force be parallel to the surface of the table. If you pull a block resting on the table top joined with a spring balance, the balance will tell the amount of applied force.

If the body does not move, it would mean that an equal and opposite force comes into being. This opposing force is the force of friction. This is called the static friction as the applied force is equal and opposite to the force of friction offered by the surface of wooden block in contact with table top.

Q: Compare the advantages and disadvantages of friction in detail.

Ans: ADVANTAGES OF FRICTION:

Friction is very important in our lives.

- (i) The friction between the head of the matchstick and the side of the matchbox makes it possible for us to light a matchstick.
- (ii) The friction between the pencil or the tip of the pen and the surface makes it possible to write and draw.
- (iii) Walking is possible because of the friction between our shoes or feet and the floor.
- (iv) Driving would not be possible if there was no friction between the tyres and the road. Worn out tyres produce less friction and therefore, are discarded.
- (v) It would be impossible to cut wood without friction between the saw and wood.
- (vi) The breaks of bicycles and other vehicles would not work without friction between the rim and the brake-shoe.
- (vii) The force of friction holds the screws and nails in the wood.