Sample Paper 2 Solutions

Class IX 2022-23

Science (086)

Time: 3 Hours **Max. Marks: 80**

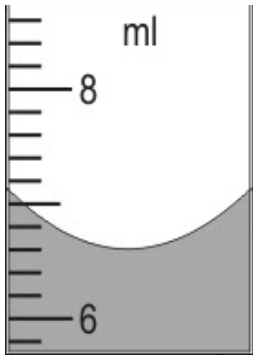
General Instructions:

1. This question paper consists of 39 questions in 5 sections.
2. All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.
3. Section A consists of 20 Objective Type questions carrying 1 mark each.
4. Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should in the range of 30 to 50 words.
5. Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should in the range of 50 to 80 words.
6. Section D consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.
7. Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

SECTION-A

Select and write one most appropriate option out of the four options given for each of the questions 1 – 20.

1. The figure shows the amount of water in a graduated test-tube. The curved surface shown is called the meniscus. What is the correct reading of the volume of liquid?



(a) 7.1 ml
(b) 7.2 ml
(c) 6.8 ml
(d) 6.6 ml

Ans : (d) 6.6 ml

In the shown diagram the upper level of water touches point 6.6ml and the bottom of meniscus touches point 6.4ml .Therefore the correct reading of the volume of liquid of water is 6.6ml.thus option (d) is correct.

2. If the component of the substance can be separated by a chemical change only then it is

(a) element (b) compound
(c) mixture (d) both (a) and (b)

Ans : (b) compound

A compound can be separated into its components by chemical means while an element cannot be further separated. A mixture can be separated by physical means.

3. A sample of pure water, irrespective of its source contains 11.1% hydrogen and 88.9% oxygen. The data supports

(a) law of constant proportions
(b) law of conservation of mass
(c) law of reciprocal proportions
(d) law of multiple proportions

Ans : (a) law of constant proportions

Water obtained from any source contains hydrogen and oxygen in the same proportion by mass. Hence, the data supports the law of constant proportions.

4. Atoms consist of electrons, protons and neutrons. Isotopes of an element show similar chemical properties, but have different atomic weights. Thus they are likely to have:

(a) same number of electrons, protons and neutrons

(b) same number of electrons and neutrons; different number of protons

(c) same number of neutrons and protons; different number of electrons

(d) same number of electrons and protons; different number of neutrons

Ans : (d) same number of electrons and protons; different number of neutrons

Isotopes of an element have similar chemical but different physical properties. Isotopes of an element have same atomic number but different mass number. Hence, they have same number of electrons. Chemical properties are related to the number of valence electrons. Thus, isotopes have similar chemical properties. Physical properties are related to atomic mass. Isotopes of an element have different mass number. Hence, they have different physical properties.

5. A plant cell placed in a hypo-tonic solution will not burst because of presence of

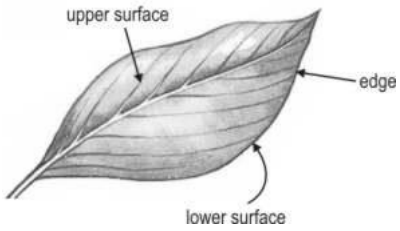
(a) plasma membrane (b) cell wall

(c) chloroplast (d) cytoplasm

Ans : (b) cell wall

Cell walls permit the cells of plants, fungi and bacteria to withstand very dilute (hypo-tonic) external media without bursting. In such media the cells tend to take up water by osmosis. The cell swells, building up pressure against the cell wall. The wall exerts an equal pressure against the swollen cell. Because of their walls, such cells can withstand much greater changes in the surrounding medium than animal cells.

6. In a leaf, chloroplast-containing cells are known to be the sites of photosynthesis. In which part of the leaf are the majority of chloroplast-bearing cells likely to be found?



(a) upper surface of the leaf

(b) lower surface of the leaf

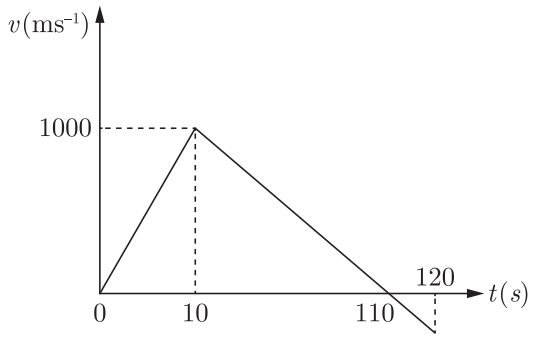
(c) equally throughout the leaf

(d) edges of the leaf

Ans : (a) upper surface of the leaf

Upper surface of the leaf are the majority of chloroplast-bearing cells likely to be found. In plants, chloroplasts are concentrated particularly in the parenchyma cells of the leaf mesophyll.

7. The graph shows the variation of velocity of a rocket with time. Then, the maximum height attained by the rocket is



(a) 1.1 km (b) 5 km

(c) 55 km (d) none of these

Ans : (c) 55 km

$$\text{Maximum height} = \frac{1}{2} \times 110 \times 1000 = 55\,\text{km}$$

8. Identify the correct statement(s).

1. To accelerate the motion of an object, a balanced force is required.
2. Balanced forces do not change the state of rest or of motion of an object.
3. Balanced forces do not produce any acceleration, they can change the shape or size of the body.

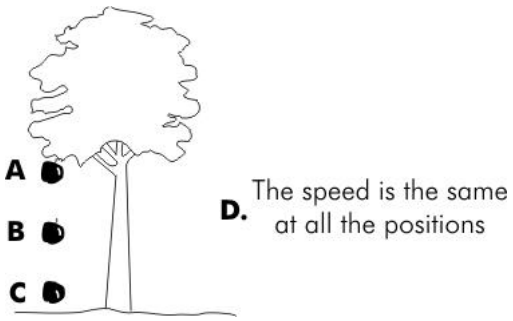
(a) 1 and 2 (b) 2 and 3

(c) 1 and 3 (d) None of these

Ans : (b) 2 and 3

To accelerate the motion of an object, an unbalanced force is required.

9. An apple falling from a tree is an example of _____ motion.

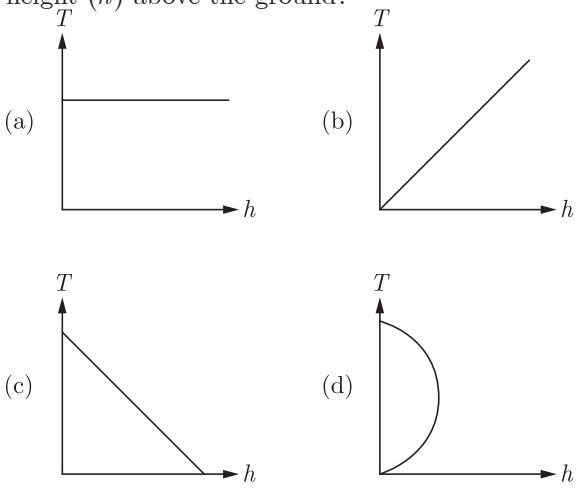


(a) Rectilinear
(b) Oscillatory
(c) Periodic
(d) Rotational

Ans : (a) Rectilinear

Apple falling from a tree falls under gravity. Hence according to Newton's laws of motion, the path of the object will be rectilinear or straight line path.

10. Which of the following graph best represents the total energy (T) of a freely falling body and its height (h) above the ground?



Ans : (a)

According to the law of conservation, the total energy of a system is always conserved. Therefore option (a) is correct.

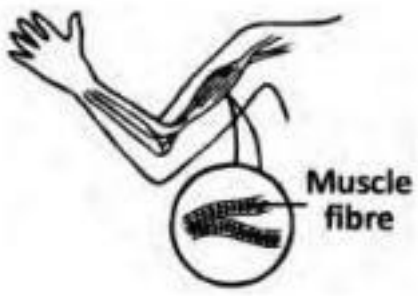
11. When a sound wave travels in air, the physical quantity which is transferred from one place to the other is

(a) mass (b) force
(c) air particle (d) energy

Ans : (d) energy

Basically sound is mechanical energy which is passed on from one to another particle.

12. The muscle fibre shown in the diagram is:



(a) involuntary
(b) voluntary
(c) voluntary and involuntary
(d) none of these

Ans : (b) voluntary

The muscle fibre in hand are voluntary muscles.

13. What type of mixtures are separated by crystallisation?

(a) A mixture in which one component is soluble in a solvent.
(b) A mixture in which impurities are soluble in a solvent.
(c) A mixture in which both the components are soluble in a solvent.
(d) A mixture in which both the components are insoluble in water.

Ans : (a) A mixture in which one component is soluble in a solvent.

Crystallisation is a process that separates a pure solid in the form of its crystals from a solution.

14. All samples of carbon-dioxide contain carbon and oxygen in the mass ratio 3 : 8. This is in agreement with the law of

(a) conservation of mass

(b) constant proportions

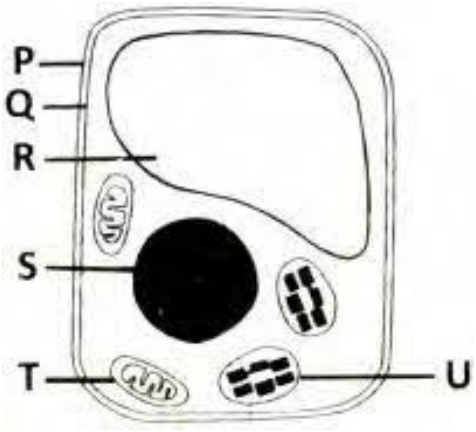
(c) multiple proportions

(d) gaseous volumes

Ans : (b) constant proportions

Law of constant proportions states that a chemical compound is always made up of the same elements combined together in the same fixed proportion by mass.

15. Which labelled organelles helped a student to conclude that it is a plant cell?



(a) P and R only (b) P and S only

(c) P, R and T only (d) P, R and U only

Ans : (d) P, R and U only

In the given figure P is cell wall, R is vacuole and U is chloroplast are characteristic features of a plant cell.

16. There are specific regions of plant body that constantly remain in the state of division. What are they?

(a) Perisperm (b) Endosperm

(c) Meristem (d) Stele

Ans : (c) Meristem

A meristem is a tissue in plants consisting of undifferentiated cells (meristematic cells). It is found in specific regions of a plant body where constant cell division takes place.

Question no. 17 to 20 are Assertion-Reasoning based questions.

17. **Assertion :** The graph between two physical quantities P and Q is straight line, when P/Q is constant.

Reason : The straight line graph means that P is proportional to Q or P is equal to constant multiplied by Q.

(a) Both assertion and reason are true and reason is the correct explanation of assertion.

(b) Both assertion and reason are true but reason is not the correct explanation of assertion.

(c) Assertion is true but reason is false.

(d) Both assertion and reason are false.

Ans : (a) Both assertion and reason are true and reason is the correct explanation of assertion.

According to statement of reason, as the graph is a straight line, $P \propto Q$, or, $P =$ constant $\times Q$

$P/Q =$ constant

Equation of a straight line is $y = mx + c$

18. **Assertion :** A boy facing forward in a moving bus throws a ball straight up. At the same instant the bus begins to accelerate. The ball goes up and falls in front of the boy.

Reason : As the ball rises, velocity remains constant.

(a) Both assertion and reason are true and reason is the correct explanation of assertion.

(b) Both assertion and reason are true but reason is not the correct explanation of assertion.

(c) Assertion is true but reason is false.

(d) Both assertion and reason are false.

Ans : (d) Both assertion and reason are false.

Only the horizontal component of velocity of the ball remains unchanged. When the ball rises the vertical component of velocity keeps on decreasing. During this time the bus accelerates out under the ball. To the boy the ball appears to go over his head. The ball, therefore, falls behind him.

19. **Assertion :** The density of a liquid depends upon the nature and temperature of the liquid.
Reason : The volume of the liquid depends upon temperature.
(a) Both assertion and reason are true and reason is the correct explanation of assertion.
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

Ans : (a) Both assertion and reason are true and reason is the correct explanation of assertion.

Density = mass/volume
The density of a liquid depends on the kind of liquid and its temperature. Volume increases with increase in temperature and vice-versa. The density decreases with increase in temperature.

20. **Assertion :** When the force retards the motion of a body, the work done is zero.
Reason : Work done depends on angle between force and displacement.
(a) Both assertion and reason are true and reason is the correct explanation of assertion.
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Assertion is false but reason is true.

Ans : (d) Assertion is false but reason is true.

Work done, $W = \vec{F}.\vec{s}$ For retarding, the force $\vec{F}$ should be inclined to $\vec{s}$ at angle θ such that $\frac{\pi}{2} < \theta < \pi$. For this angle $\cos\theta$ is negative, so work done is negative. Here negative work done implies that some external force is applied to change the state of a body.

SECTION-B

Question no. 21 to 26 are very short answer questions.

21. What makes water as a universal solvent ?

Ans :

Water acts as a universal solution due to :
(i) The polar nature of its molecules.
(ii) Its ability to produce soluble salt on interaction with a large number of substances.

or

Identify the following as physical or chemical changes:
(a) Formation of cloud
(b) Magnetizing a iron nail
(c) Water boils to form steam
(d) An almirah gets rusted

Ans :

(a)	Formation of cloud	Physical change
(b)	Magnetizing a iron nail	Physical change
(c)	Water boils to form steam	Physical change
(d)	An almirah gets rusted	Chemical change

22. How can Dalton's atomic theory explain the Law of Constant Proportions ?

Ans :

According to Dalton's atomic theory, atoms of the same elements are same. Also atoms combine in whole number. This means that the atoms can combine with each other in a simple fixed ratio to form molecules.

23. State the difference between smooth endoplasmic reticulum and rough endoplasmic reticulum.

Ans :

The difference between smooth endoplasmic reticulum and rough endoplasmic reticulum are following :

	Smooth endoplasmic reticulum	**Rough endoplasmic reticulum**
(i)	It looks smooth.	It looks rough.
(ii)	SER helps in the manufacturing of fat molecules or lipids.	Ribosomes are attached to RER which synthesize proteins.

24. Write four phenomenons which were successfully explained using universal law of gravitation.

Ans :

Many unconnected phenomenon can be explained by gravitational law successfully.
(i) Force bind us with Earth
(ii) Motion of Moon around Earth
(iii) Motion of planet around Sun
(iv) Tides due to the Moon and Su

25. Explain, why can echoes not be heard in a small room?

Ans :

For hearing echo, there should be at least a distance of 17 m between the source of sound and the body from which sound is reflected. In small rooms this is not the case, hence, echoes are not heard.

or

Sound is produced due to a vibratory motion, then why a vibrating pendulum does not produce sound?

Ans :

The frequency of the vibrating pendulum does not lie within the audible range (20 Hz to 20,000 Hz) and hence, it does not produce audible sound.

26. What are the different ways/methods of hybridisation?

Ans :

Hybridisation can be :

(i) **Intervarietal :** between different varieties of crops
(ii) **Interspecific :** between two species of same genus
(iii) **Intergeneric :** between two different genera

SECTION-C

Question no. 27 to 33 are short answer questions.

27. Two cubes of ice are pressed hard between two palms and after releasing the pressure, the cubes join together. Why ?

Ans :

Pressure is directly proportional to temperature when we apply pressure, temperature increases then the ice in contact melts and it turns into water. When pressure is removed, the temperature decreases again and melted ice again freezes. Hence, cubes join together.

28. Why is water considered as compound ?

Ans :

Water is considered as compound because :

(i) Water is composed of two elements : hydrogen and oxygen.
(ii) The ratio of hydrogen and oxygen by mass in any sample of pure water is the same.
(iii) The properties of water are different from its constituent elements hydrogen and oxygen.
(iv) Water can be decomposed by chemical means only (e.g. electrolytically) into hydrogen and oxygen.

29. What is the difference in chromatin, chromosomes and gene?

Ans :

The difference in chromatin, chromosomes and gene are as follows :

Chromatin	**Chromosomes**	**Genes**
It is a fine network of thread-like structure made up of DNA or RNA. It gets condensed to form chromosomes.	The chromosomes are made from chromatin material and are located in the cell.	Genes are found in chromosomes.

or

List any six functions of nucleus of a cell.

Ans :

The functions of nucleus of a cell are as follows:

(i) Nucleus plays a central role in cellular reproduction.
(ii) It plays an important role in determining the way the cell will develop.
(iii) It also determines what form the cell will exhibit at maturity.
(iv) It contains chromosome thus inherits characters.
(v) It is the control centre of the cell.
(vi) It directs chemical activities of the cell.

30. Differentiate between collenchyma, parenchyma and sclerenchyma.

Ans :

Collenchyma	**Parenchyma**	**Sclerenchyma**
Cells are living.	Cells are living.	Cells are dead.
They are elongated.	They are spherical, oval or polygonal.	They are narrow and long.
They are thick at corners.	They are thin walled.	They have a thick wall because of lignin deposition.
They have very less inter-cellular space	They have large inter-cellular space.	They do not have inter-cellular space.

31. What is the difference between uniform linear motion and uniform circular motion?

Ans :

When a body is moving with a uniform speed along a straight line, its motion is called linear uniform motion. The uniform linear motion is an accelerated motion.
When a body is moving with a constant speed along a circular path, the direction of motion of body changes continuously with time.
We know that a change in the direction of motion implies a change in velocity. Thus, uniform circular motion is an accelerated motion even though the speed of the body remains constant.

32. When a constant force is applied to a body moving with constant acceleration, is the power of the force constant? If not, how would force have to vary with speed for the power to be constant?

Ans :

We know that,

$$\text{Power (p)} = \text{force (f)} \times \text{velocity (v)}$$

Since the body is moving with acceleration, V changes and as a result of that P also changes, F being constant. For P to be constant, FV = constant or $F \propto \frac{1}{V}$.

Thus, as V increases, F should decrease to keep P constant.

or

(a) An arrow moves forward when released from a stretched bow. Explain the transformation of energy in the process.
(b) A boy of mass 50 kg climbs up a vertical height of 100 m. Calculate the amount of potential energy he gains.

Ans :

(a) When the bow is stretched it stores potential energy. When the arrow is released the potential energy stored in the bow gets transformed into the kinetic energy of the arrow.

(b) Given, $m = 50$ kg, $h = 100$ m,
$g = 10$ ms^{-1}, PE = ?
$PE = mgh$
$= 50 \times 10 \times 100 = 5000$ J

33. A person fires a gun standing at a distance of 55 m from a wall. If the speed of sound is 330 ms^{-1}, find the time for an echo to be heard.

Ans :

Given, distance, d = 55 m,
Speed of sound $v = 330$ ms^{-1}, t = ?
As we know that,

$$2d = v \times t$$

or $$t = \frac{2d}{v} = \frac{2 \times 55}{330} = 0.3 \text{ s}$$

SECTION-D

Question no. 34 to 36 are Long answer questions.

34. Give the number of electron, proton and neutron in $_{59}CO^{27}$ and $_{108}Ag^{47}$.

Ans :

(i) Number of protons in CO = 27
(ii) Number of electrons in CO = 27
(iii) Number of neutrons in CO = 59 – 27 = 32
(iv) Number of protons in Ag = 47
(v) Number of electrons in Ag = 47
(vi) Number of neutrons in Ag = 108 – 47 = 61

or

Give the postulates of Dalton's atomic theory.

Ans :

(i) Every element is composed of extremely small particles called atoms.
(ii) Atoms of a given element are identical, both in mass and properties. Different chemical elements have different kinds of atoms; in particular, their atoms have different masses.
(iii) Atoms cannot be created, destroyed or transformed into atoms of other elements.
(iv) Compounds are formed when atoms of different elements combine with each other in small whole number ratios.
(v) The relative number and kinds of atoms in a given compound are constant.

35. Explain connective tissue along with its types.

Ans :

Connective tissue consists various types of cells which perform the same function. These are of three types :
(i) Proper connective tissue
(ii) Fluid tissue
(iii) Skeletal tissue
Proper connective tissue : These are of four types–

Areolar and ligament connective tissue : It is present between muscles and skin and in the bone marrow. It is also present around nerves and blood vessels. They fill the space inside the organ. They also provide strength to internal organs and helps in repair of tissues.

Adipose tissue : It is found below the skin and also between internal organs. It stores fat and due to this fat storage, it behaves as an insulator.

Tendon : It is fibrous, strong and flexible and joins muscles with bone.

Ligament : It is elastic and strong and joins bone with bone.

Fluid tissue consists of :

Blood : It is a liquid tissue called plasma which has RBCs, WBCs, plasma and blood platelets. It helps to transport substances like gases, hormones, digested food and waste material.

Lymph : It transports digested fat and white blood cells in plasma.

Skeletal tissue is made up of :

Bone : It is a hard tissue which helps in the movement and support of our body.

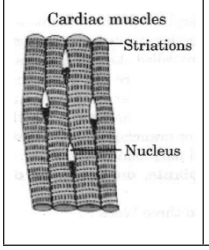
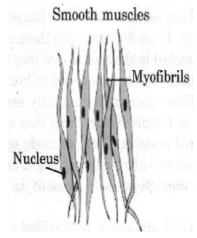
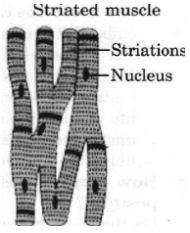
Cartilage : It softens the bone surface at joints. It is found in our ear, nose, trachea and larynx.

or

Give the difference between the types of muscle fibres diagrammatically.

Ans :

The difference between the type of muscle fires are following :

Cardiac muscles	Smooth muscles	Striated muscles
They are present in the heart.	They are present in lungs and alimentary canal.	Connected with bones.
They are involuntary.	They are involuntary.	They are voluntary.
They have one nucleus.	They have one nucleus.	They have many nuclei.
They are branched.	They are spindle shaped.	They are long and cylindrical.
		

36. Large amount of food grains get spoiled every year in India due to improper storage of food grains. How can this be avoided?

Ans :

Food grains get spoiled by insects, fungi, rodents, bacteria, moisture at the place of storage.

Storage losses can be reduced by taking some preventive and control measures.

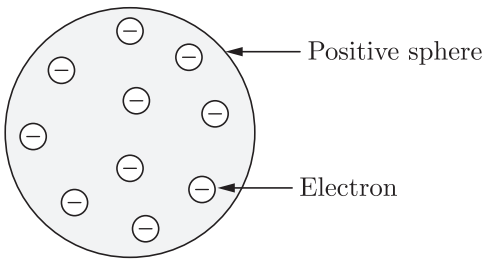
(i) The seeds that are to be stored should be dry.
(ii) The grains should be cleaned.
(iii) The grains should be fumigated using chemicals that kills pest.
(iv) The storage houses should be waterproof.
(v) The grains should be stored in sealed gunny bags.
(vi) The bags should be kept few centimetres away from the wall.
(vii) The walls and the floor should be water-proof with no holes in it, to avoid rodents, pests.

SECTION-E

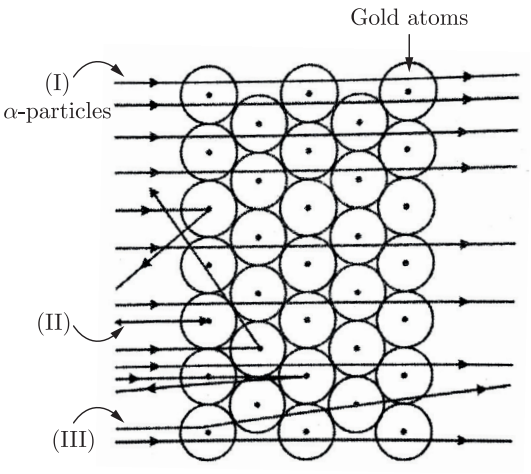
Question no. 37 to 39 are case-based/data-based questions with 2 to 3 short sub-parts. Internal choice is provided in one of these sub-parts.

37. The atom is divisible and contains three smaller particles in it. On the basis of experimental observations, different models have been proposed for the structure of an atom. Firstly Thomson's gives the atomic model which is known as raisin pudding model. According to this model atom can be considered as a large sphere of uniform positive charge with a number of small negatively charged electrons scattered throughout it. After the Thomson model, Rutherford discover the nucleus of atom in our experiment.

(i) What is relation between the mass number A, atomic number Z and number of neutrons n?
(ii) Who was the first one to propose a model for the structure of an atom?
(iii) Which model of an atom is depicted by the given figure ?



(iv) What is the observation of the given figure?



or

(v) Who was known as the 'Father' of nuclear physics?

Ans :

(i)

Mass number (A)= Atomic number (Z)
+ Number of neutrons (n)

Number of neutrons (n) = Mass number(A)
−Atomic number (z)

(ii) J. J. Thomson

(iii) Thomson's model of an atom

According to Thomson's model of the atom, an atom consists of a sphere of positive charge with negatively charged electrons embedded in it. An atom is electrically neutral as both the positive and negative charges are equal in magnitude.

(iv) The observation of given figure are as follows :

1 Most of the fast moving α-particles passed straight through the gold foil.

2 Some of the α-particles were deflected by the foil by small angles.

3 Surprisingly one out of every 12000 particles appeared to rebound..

or

(v) E. Rutherford

38. The cells of connective tissue are loosely spaced and embedded in an inter-cellular matrix. The nature of matrix differs in concordance with the function of the particular connective tissue. Blood is a type of connective tissue. Blood flows and transports gases, digested food, hormones and waste materials to different parts of the body. Bone is another example of a connective tissue. It is a strong and non-flexible tissue. Two bones arc connected to each other by another type of connective tissue called the ligament. Another type of connective tissue, cartilage, has widely spaced cells. Areolar connective tissue is found between the skin and muscles, around blood vessels and nerves and in the bone marrow. It fills the space inside the organs, supports internal organs and helps in repair of tissues. Fat-storing adipose tissue is also a type of connective tissue.

(i) What are the three loose connective tissues?

(ii) What are areolar tissue junctions?

(iii) What is the function of fibroblast in areolar tissue?

(iv) What is present inside plasma?

or

(v) What is adipose tissue?

Ans :

(i) Loose and dense connective tissue are made up of the following three fibers: collagen fibers, reticular fibers, and elastin fibers.

(ii) Areolar connective tissues join integument or skin with muscles.

(iii) Fibroblasts are a type of cell found in areolar tissue involved in the production of protein fibers of the extracellular matrix.

(iv) Plasma contains 91% to 92% of water and 8% to 9% of solids. It mainly comprises of: Coagulants, mainly fibrinogen, aid in blood clotting.

or

(v) Adipose tissue, also known as fat tissue or fatty tissue, is a connective tissue that is mainly composed of fat cells called adipocytes

39. Basically momentum is a measure of quantity of motion possessed by a body. It helps to measure the impact of force exerted by a body on another. Consider an example a car and a bicycle are moving with same velocity. The impact of force exerted by this car on an object is much greater than that of bicycle. This is because car has greater mass than bicycle. Similarly, when two trucks of same mass, moving with velocity v_1 and $v_2(v_1 > v_2)$, strike a surface, the impact of force exerted by truck moving with greater velocity is more.

Both the above cases make it clear that the quantity

of motion possessed by a body is directly proportional to its mass as well as velocity. Momentum of a body is defined as the product of its mass and velocity.
The rate of change in momentum of a body is directly proportional to the unbalanced force acting on it, and the momentum change occurs in the direction of applied force.

(i) Which quantity is proportional to the momentum of a body of given mass ?
(ii) How much force acts on a body whose momentum (p) is constant with time (t)?
(iii) What happens if velocity is doubled?
(iv) Can objects with different masses have the same momentum?

or

(v) What is the mathematical expression of Newton's second law?

Ans :

(i) As $p = mV$,

for given mass $p \propto V$.

(ii) Force is the rate of change of momentum. So, momentum is constant when force is zero.
(iii) Momentum is directly proportional to the velocity, hence if velocity is doubled momentum will be doubled.
(iv) Objects with different masses can't have the same momentum because the momentum of a body is the product of mass and the velocity of object.

or

(v) According to Newton's second law of motion,

$$\text{Force} = \text{mass x acceleration}$$

$$f = m \times a$$

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