CLASS IX (2019-20)
SCIENCE (CODE 086)
SAMPLE PAPER-4

Time : 3 Hours **Maximum Marks : 80**

General Instructions :

(i) The question paper comprises of three sections-A, B and C. Attempt all the sections.
(ii) All questions are compulsory.
(iii) Internal choice is given in each sections.
(iv) All questions in Section A are one-mark questions comprising MCQ, VSA type and assertion-reason type questions. They are to be answered in one word or in one sentence.
(v) All questions in Section B are three-mark, short-answer type questions. These are to be answered in about 50-60 words each.
(vi) All questions in Section C are five-mark, long-answer type questions. These are to be answered in about 80-90 words each.
(vii) This question paper consists of a total of 30 questions.

SECTION -A

1. Which of the following solution scatter light ? [1]
(a) Suspension (b) Colloidal solution
(c) Both (a) and (b) (d) None of them

Ans : (c) Both (a) and (b)

DIRECTION : For question numbers 2 and 3, two statements are given- one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below

(a) Both A and R are true and R is correct explanation of the A.
(b) Both A and R are true but R is not the correct explanation of the A.
(c) A is true but R is false.
(d) Both A and R are false.

2. Assertion (A) : A body thrown vertically up with a velocity u reaches the maximum height h after T seconds. At a time 2T seconds its velocity be u.
Reason (R) : A particle thrown vertically up with a velocity comes back to its initial position with same magnitude of velocity but in opposite direction. [1]

Ans : (a) Both A and R are true and R is correct explanation of the A.

3. Assertion (A) : The growth of plants occurs only in certain specific regions. [1]
Reason (R) : Meristematic tissue is located only at certain points in a plant.

Ans : (a) Both A and R are true and R is correct explanation of the A.

4. Oxygen is : [1]
(a) Monovalent (b) Bivalent
(c) Trivalent (d) None of these

Ans : (b) Bivalent

5. The SI unit of force is similar to the SI unit of : [1]
(a) Power (b) Mass
(c) Weight (d) Energy

Ans : (c) Weight.

6. What is the gravitational force between the two objects ? [1]
(a) Attractive at large distances only.
(b) Attractive at small distances only.
(c) Attractive at all distances.
(d) Attractive at large distances but repulsive at small distances.

Ans : (c) Attractive at all distances.

7. In a salt-water solution : [1]
(a) Water is solvent and salt is solute.
(b) Water is solute and salt is solvent.
(c) Water and salt both are solvent.
(d) Water and salt both are solute.

Ans : (a) Water is solvent and salt is solute.

or

Which one of the following methods would you use to separate cream from milk ?
(a) Fractional distillation (b) Distillation
(c) Centrifugation (d) Filtration

Ans : (c) Centrifugation

8. If a body is stored at a height h = 0 m, then the energy possessed by it is : [1]
(a) Kinetic energy (b) Potential energy
(c) Both (a) and (b) (d) None of these

Ans : (d) None of these

or

How are Joule (J) and ergs (erg) related ?
(a) 1 J $=10^7$ erg (b) 1 erg $=10^7$ J
(c) 1 J $=10^{-7}$ erg (d) None of these

Ans : (c) 1 J $=10^{-7}$ erg

9. The fertility of soil is lost due to : [1]
(a) Strip cropping (b) Afforestation
(c) Soil erosion (d) Crop rotation

Ans : (c) Soil erosion

10. What is the process of growing two or more crops in a definite pattern ? [1]
(a) Crop rotation (b) Inter-cropping

(c) Mixed cropping (d) Organic cropping

Ans : (b) Inter-cropping

or

Which of the following species is an Indian cow ?

(a) Bos indicus (b) Bos domestica

(c) Bos bubalis (d) Bos vulgaris

Ans : (a) Bos indicus

11. What is the audible range of the average human ear? [1]

Ans :

The average audible for human is 20 Hz to 20,000 Hz

12. Which division among plants has the simplest organisms ? [1]

Ans : Thallophyta

13. Answer question numbers 13.1–13.4 on the basis of your understanding of the following paragraph and the related studied concepts.

Plant Cell

Ravi was travelling to his school to give his final exams. Today it was the science exam and he was nervous. The teacher had told that there will be a surprise element in the exam that he didn't know of. When he reached the school, he found out that there will be a viva-voce exam for each of the student. When his turn came, he was given a very small task. First he was shown the above two images.

13.1 Help Ravi to correlate between these two images. [1]

Ans : Mitochondria inside the plant cells are called the powerhouse of a cell.

13.2 What is the reason behind that correlation? [1]

Ans : Mitochondria are tiny organelles inside cells that are involved in releasing energy from food, that's why they are known as powerhouse of the cell.

13.3 Mark the solution to the above two questions in the given image. [1]

Ans :

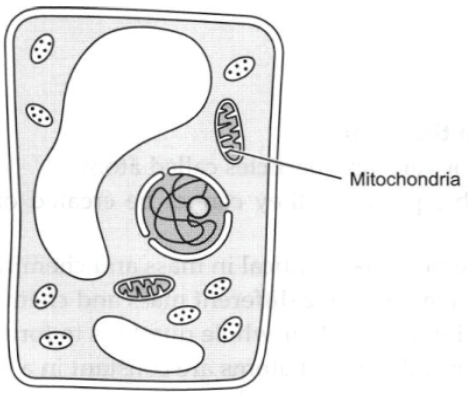


Fig: Plant cell

13.4 Name two other cell organelles in a plant cell. [1]

Ans : Golgi apparatus, Lysosomes.

14. Questions 14.1 to 14.4 are based on the Table A. Study this table and answer the following questions.

Table A : Atomic Number and Valency

Element	Atomic Number	Valency
Beryllium	4	2
Boron	5	3
Carbon	6	4
Nitrogen	7	3
Oxygen	8	2
Fluorine	9	1

14.1 In the Table A, find out which element's atom has to gain or lose the highest number of electrons to complete its octet ? [1]

Ans : Carbon

14.2 Nitrogen atom's outermost shell has 5 electrons. Then how is its valency 3, not 5? [1]

Ans : Nitrogen will gain 3 electrons to achieve its octet, therefore its valency is 3.

14.3 Which is more reactive among Oxygen and Fluorine? [1]

Ans : Oxygen, because its valency is higher.

14.4 In what ways can an atom achieve an octet? [1]

Ans : An atom can achieve an octet by sharing, gaining or losing electrons from its outermost shell.

SECTION - B

15. Calculate the work required to be done to stop a car of 1500 kg moving at a velocity of 50 km/h. [3]

Ans :

Initial velocity of the car

$$(u) = 50\,\text{km/h}$$
$$= (50 \times 1000)/(60 \times 60)$$
$$= \frac{125}{9}\text{m/s}$$

Final velocity of the car

$$(v) = 0 \text{ (object has to be stopped)}$$

$$\text{Initial Kinetic energy} = \frac{1}{2} \times m \times v^2$$
$$= \frac{1}{2} \times 2000 \times (125/9)^2$$
$$= 192901.2\,\text{J}$$

$$\text{Final Kinetic energy} = \frac{1}{2} \times 2000 \times (0)^2 = 0$$

$$\text{Therefore,work done} = \text{Change in Kinetic energy}$$
$$= 192901.2 - 0 = 192901.2\,\text{J}$$

16. Draw the diagrams of the following cells

(a) Fat cell

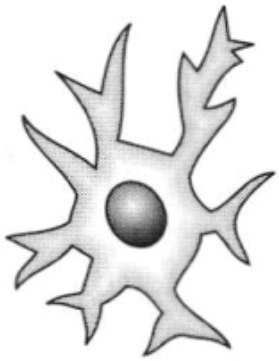
(b) Bone cell

(c) Smooth muscle cell. [3]

Ans :

(a) Fat cell

(b) Bone Cell



(c) Smooth muscle cell

17. Mention the postulates of Dalton theory of atomic model. [3]

Ans :

The postulates of Dalton theory are :

(a) All matter is made of very tiny particles called atom.
(b) Atoms are indivisible particles; they cannot be created or destroyed during a chemical reaction.
(c) Atoms of a given element are identical in mass and chemical properties.
(d) Atoms of different elements have different mass and chemical properties.
(e) Atom combines in the ratio of their whole numbers to form compounds.
(f) The relative number and kinds of atoms are constant in a compound.

18. Why is the weight of an object on moon 1/6th its weight on earth? [3]

Ans :

We know that weight of a body = mg. Now the mass of a body is constant irrespective of whether it is on earth or moon. But the acceleration due to gravity on moon is 1/6th the value of acceleration due to gravity on earth. Because of this, the weight of an object on moon is 1/6th its weight on earth.

or

Why will a sheet of paper fall slowly in comparison to one that is crumpled into a ball ?

Ans :

A greater surface area offers greater resistance and buoyancy. Same is true in the case of a sheet of paper that has a larger surface area as compared to a crumpled ball of paper. So a sheet of paper falls slower.

19. Name the two main types of plant tissues. [3]

Ans :

Plant tissues are mainly divided into two types:

(a) **Merismatic tissue** — It consists of undifferentiated actively dividing cells.
(b) **Permanent tissue** — It consists of differentiated cells which have lost the ability to divide.

20. How do biotic and abiotic factors affect crop production ? [3]

Ans :

The biotic factors include living organisms like honey bees and earthworms who help in better crop production while pests (insects and rodents) and microbes that produce bad effect on crop production.

The biotic factors are the climatic conditions and non-living natural resources like soil, water and air. They also affect crop production since favourable conditions of temperature; humidity and mineral nutrition improve crop production.

21. Differentiate between mass and weight. [3]

Ans :

S.No.	Mass	Weight
1.	It is the matter contained by a body.	It is the force which the body exerts on the ground.
2.	It always remains constant.	It changes with a change in acceleration due to gravity.
3.	It is always positive.	It can be positive and zero.
4.	It is a scalar quantity.	It is a vector quantity.
5.	Its S.I. unit is kg.	Its S.I. unit is Newton.

22. Give three examples of the range of variations that you see in life forms around you. [3]

Ans :

(a) **Number and type of cells :** Some organisms have

a prokaryotic cell like bacteria and that single cell performs all the required functions while others have eukaryotic cells organised into tissue, organ and even organ systems like human beings.

(b) **Mode of nutrition :** Some organisms are autotrophic, i.e., capable of making their own food, e.g. plants while other organisms are heterotrophic, i.e., they are dependent on other organisms for their food supply.

(c) **Life forms vary in their size :** Some organisms are too small and cannot be seen with naked eyes like micro organisms while others are too big like the biggest animal which is the blue whale.

or

Why do we classify organisms ?

Ans :

A large number of organisms exist on this earth. We cannot study such an enormous biodiversity one by one, i.e., studying the variety of life forms individually is an impossible task.

Hence, we make groups or categories of organisms depending upon their similarities and dissimilarities with other organisms. This allows an easier and systematic study of the life forms.

23. Define latent heat of vaporisation. What is the value of latent heat of vaporization for water ? [3]

Ans :

Latent heat of vaporisation is the amount of heat required to change 1 kg of a liquid completely to its gaseous state at atmospheric pressure. The latent heat of vaporisation of water is 2260 kJ/kg.

or

Write the steps you would use for making tea. Use the words solution, solvent, solute, dissolve, soluble, insoluble, filtrate and residue.

Ans :

Take some amount of solvent (water) in a pan and after heating it add little amount of solute (sugar). Solute will dissolve completely in the solvent forming true solution. Now add tea leaves, that are insoluble along with the other solute milk. After boiling, allow filtration with a sieve. The filtrate you obtain is tea, while the residue have tea leaves that are thrown away.

24. How do you describe a motion ? [3]

Ans :

First of all, we describe the location of an object by specifying a reference point. Let us understand this by an example. Let us assume that a school in a village is 2 km north of the railway station. We have specified the position of the school with respect to the railway station. In this example, the railway station is the reference point. We could have also chosen other reference points according to our convenience. Therefore, to describe the position of an object we need to specify a reference point called the origin.

SECTION - C

25. Differentiate vertebrates and invertebrates. [5]

Ans :

S.No.	Vertebrates	Invertebrates
1.	Internal skeleton present.	Internal skeleton absent.
2.	Vertebral column (backbone) present.	Vertebral column (backbone) absent.
3.	Two pairs of limbs present.	Three or more pairs of limbs are present
4.	A tail is usually present.	A tail absent.
5.	Body is covered by hair.	Body is not covered by hair.
6.	Nerve cord is dorsally located.	Nerve cord is ventrally located.

26. Describe Bohr's atomic model. [5]

Ans :

Rutherford's atomic models had certain drawbacks. Bohr proposed his atomic model in 1912, that had some special features and also an explanation to the previous model's drawbacks. The special features of Bohr's atomic model are :

(a) An electron revolves in an orbit with a well defined energy. Only certain special orbits known as discrete orbits of electrons are allowed inside the atom.

(b) While revolving in discrete orbits the electrons do not radiate energy.

(c) Energy of orbits increases from inner shells to the outer shells, i.e., energy for orbit nearest to the nucleus is lowest.

(d) If energy is supplied to an electron, it moves from a lower orbit to a higher orbit and if an electron jumps from a higher orbit to a lower orbit, it radiates energy that is equal to the energy difference of those two particular orbits.

or

Explain with examples.

(a) Atomic number (b) Mass number

(c) Isotopes (d) Isobars

Give two uses of isotopes.

Ans :

(a) Atomic number is the number of protons inside the nucleus of an atom. It is represented by the letter Z. For example: Hydrogen Z = 1; this means that inside the nucleus of a hydrogen atom, one proton is present.

(b) Mass number is the total number of protons and neutrons inside the nucleus of an atom. It is represented by A = P + N. For example, mass number of carbon is 12 units because it has 6 protons and 6 neutrons.

(c) **Isotopes:** They are the elements that have the same atomic number but different mass number. For example: carbon 12 and carbon 14. Both have the same number of protons, 6 but carbon 12 has 6 neutrons and carbon 14 has 8 neutrons.

Two uses of isotopes :

(i) An isotope of uranium is used in nuclear reactors.

(ii) An isotope of cobalt is used in treatment of cancer.

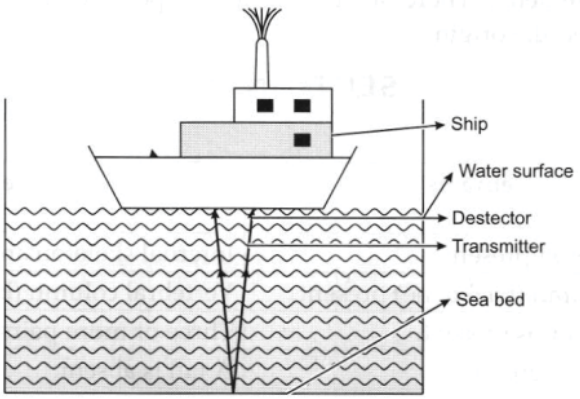
(d) **Isobars:** They are the elements that have the same mass number but different atomic number. Basically they are two different elements. For example: calcium, Z = 20 and argon, Z = 18, but the mass number of both the elements is 40. It means that calcium has 20 neutrons while argon has 22 neutrons.

27. Explain SONAR and its working with the help of a diagram. [5]

Ans :

SONAR stands for Sound Navigation and Ranging. It runs on ultrasonic waves. It consists of a transmitter which produces and transmits ultrasonic waves. These waves travel through water and after striking the object on the sea bed gets reflected back and are sensed by detector. The waves are then converted to electrical signals by detector. The time taken by the wave to reach the detector is recorded. Now, the distance of that object from the ship is calculated by the relation

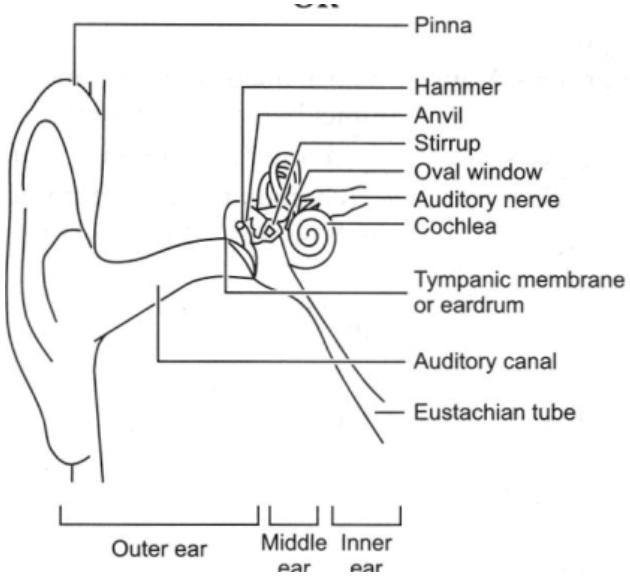
$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$



or

Describe the structure and working of the human ear with the help of a rough diagram.

Ans :



Outer ear is called pinna, followed by an auditory canal which ends in a tympanic membrane. The tympanic membrane is then connected to three bones, hammer, anvil and stirrup. Then there is cochlea connected to an auditory nerve.

Working of human ear : The pinna collects the sound and the collected sound passes through the auditory canal and reaches the auditory nerve. After that it reaches the eardrum (tympanic membrane), which vibrates. The vibrations are then amplified by the Three bones; hammer, anvil and stirrup and the pressure variations reach the inner ear where cochlea converts them to electrical signal. The auditory nerve carries the electrical signal to brain and the brain interprets them as sound.

28. (a) How does the factories around Taj Mahal affect it ? [5]

(b) Can you justify why dust is called as pollutant ?

Ans :

(a) The refineries releases acidic gases like sulphur dioxide and nitrogen dioxide into the air. Sulphur dioxide combines with the moisture present in the air and forms sulphuric acid and nitrogen oxide forms nitric acid. These acids reach the earth surface with rain water, which is also known as acid rain. These acids dissolve and corrode the white marbles of Taj Mahal.

(b) Dust consists of suspended particles. Inhalation of dust causes lots of discomfort including allergic asthma, bronchitis, cold or cough. Dust particles settle over leaf and can block stomata and reduce gaseous exchange in plants.

or

(a) Why cultivation of legumes improve soil fertility ?

(b) How living organisms assist in erosion of rocks ?

Ans :

(a) Leguminous plants bear nodules in their roots. These nodules contain nitrogen fixing bacteria, which converts atmospheric nitrogen into soluble form and adds it into the soil and thus, increases the soil fertility.

(b) Living organisms like lichens grow on rock surfaces and release certain substances that cause the rock surface to powder down and hence break rocks into fine particles.

29. Define chromatography. Underline the basic principle involved and mention its different applications. [5]

Ans :

Chromatography is a technique used for separation of those components whose solubility in the same solvent is different.

The basic principle in chromatography is based on the difference in movement of individual components of a mixture through stationary phase under the influence of a mobile phase.

Its various applications are:

(a) It is used to separate different colors in dye.

(b) It is used to separate pigments from natural colours.

(c) It is used to separate drugs from blood

30. (a) State the law of conservation of momentum. Write its mathematical derivation.

(b) Two objects of masses 50 g and 100 g are moving along the same line and direction with velocities of 5 m/s and 10 m/s respectively. They collide and after the collision, the second object moves at a velocity of 8 m/s. Determine the velocity of the first object. [5]

Ans :

(a) For two or more bodies in an isolated system acting upon each other, their total momentum remains constant unless an external force is applied. Therefore, momentum can neither be created nor destroyed.

Equation:

$$m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$$

Derivation of the equation:

Consider two colliding particles A and B whose masses are mi and m_2 with initial velocities and final velocities as v_1 and v_2. The time of contact between two particles is given as t.

$$A = m_1(v_1 - u_1)$$

(change in momentum of particle A)

$$B = m_2(v_2 - u_2)$$

(change in momentum of particle B)

$$F_{BA} = -F_{AB}$$

(from Newton's third law of motion)

$$F_{BA} = m_2 \times a_2 \frac{(v_2 - u_2)}{t}$$

$$F_{BA} = m_1 \times a_1 = m_1\frac{(v_1 - u_1)}{t}$$

$$m_2\frac{(v_2 - u_2)}{t} = -m_1\frac{(v_1 - u_1)}{t}$$

$$m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$$

(b) Given,

$$m_1 = 50\,\text{g} = 0.05\,\text{kg}$$

$$m_2 = 100\,\text{g} = 0.1\,\text{kg}$$

Velocity of the first object

$$v_1 = 5\,\text{m/s}$$

Velocity of the first object

$$v_2 = 10\,\text{m/s}$$

Momentum before the collision

$$= 0.05 \times 5 + 0.1 \times 10$$

$$= 1.25\,\text{kgm/s}$$

Since velocity of the second object after cellision $= 8\,\text{m/s}$

If we assume the velocity of first object after collision is v,

According to law of conservation of momentum,

$$m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$$

$$1.25 = 0.05 \times v + 0.1 \times 8$$

$$0.05 \times v_1 = 1.25 - 0.8$$

$$v_1 = 9\,\text{m/s}$$