CBSE
Class IX Science
Sample Paper - 12

Time: 3 hrs   **Total Marks: 80**

General Instructions:
- The question paper comprises five sections – A, B, C, D and E. You are to attempt all the sections.
- All questions are compulsory.
- Internal choice is given in sections B, C, D and E.
- Question numbers 1 and 2 in Section A are one mark questions. They are to be answered in one word or in one sentence.
- Question numbers 3 to 5 in Section B are two marks questions. These are to be answered in about 30 words each.
- Question numbers 6 to 15 in Section C are three marks questions. These are to be answered in about 50 words each.
- Question numbers 16 to 21 in Section D are five marks questions. These are to be answered in about 70 words each.
- Question numbers 22 to 27 in Section E are based on practical skills. Each question is a two marks question. These are to be answered in brief.

Section A

1. Which cycle is known as the perfect cycle in the biosphere? Why? (1)

2. What are layers and broilers? (1)

Section B

3. If bodies A and B of different masses are dropped at the same time from the same height, which object will reach the ground initially? Explain. (2)

4. What is Tyndall effect?

OR

What will be the effect of heating and cooling on a saturated solution?

5. How do cells of the cuboidal epithelium differ from those of the ciliated epithelium? (2)

Section C

6. Name the following: (3)
   (a) Cell organelle which synthesises lipids
   (b) Fluid content of cell containing cell organelles
   (c) Site for ribosome formation

7. Write the most striking feature of the following phyla: (3)
   (a) Arthropoda
   (b) Annelida
   (c) Porifera

   OR

   Identify the genus and species name in the scientific name of coconut, *Cocos nucifera*. How is identification done?

8. (3)
   a) Define momentum.
   b) A man of mass 70 kg is walking with a velocity of 2 m/s. Find the momentum of the person.

9. (3)
   (a) What are pure substances?
   (b) Give two examples of pure substances.
   (c) Which of the following are pure substances?
       Ice, Milk, Iron, Hydrochloric acid, Calcium oxide, Mercury, Brick, Wood, Air

10. What are the advantages of bee-keeping? (3)

11. Whales and fish resemble each other and both swim in water. Yet, why are whales not grouped with fish? (3)

12. A 0.24 g sample of a compound of oxygen and boron was found by analysis to contain 0.096 g of boron and 0.144 g of oxygen. Calculate the percentage composition of the compound by weight. (3)

    OR

    In a reaction, 6.9 g of sodium carbonate reacted with 9 g of ethanoic acid. The products were 3.2 g of carbon dioxide, 1.2 g of water and some sodium ethanoate. What is the expected weight of sodium ethanoate?

13. A person stands and lies flat on the surface of sand. (3)
  (i) How is the pressure on the surface of the sand when the person is standing on one leg as compared to the pressure when he is lying flat on the surface of sand?
  (ii) Give reason for your answer to the above question.
 (iii) What will be the force applied if the pressure acting on the area of 20 m² is 100 Pa?

14. Siva is depressed and is unable to focus on studies. His friend Abhijeet observed this and asked Siva what was wrong. Siva told Abhijeet that his younger brother is not keeping well. His neck has swollen. The fact that Siva's family was not including iodised salt in their diet came to light. Abhijeet immediately suggested certain measures and insisted that Siva's brother must see the doctor without any delay. (3)
  (a)   What values are displayed by Abhijeet?
  (b)   What can be the possible disease from which Siva's brother is suffering?
  (c)   Name the element whose isotope is used in the treatment of the disease.

15. An object 'O' of mass 20 kg is dropped from a building of height 10 metres. (g = 10 m/s²).
  A is the point from where the object is dropped. B is the midpoint. C is the point on the surface of the ground. (3)
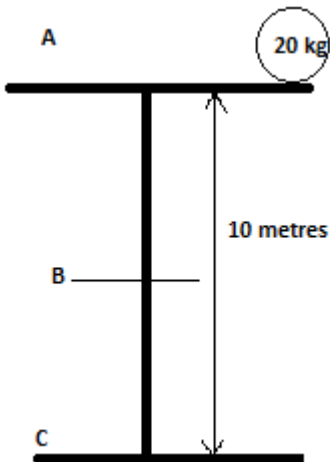
  a) What is the potential energy at point A?
  b) What is the relation between the potential energy and kinetic energy when the object reaches point B?
  c) What is the final velocity of the object at point C?

OR

  A ball is thrown up with a velocity of 20 m/s (Given: g = 10 m/s²). Find the
  (a) Velocity when it reaches the maximum height
  (b) Maximum height it reaches

Section D

16. The electronic configuration of an element Z is 2, 8, 8.   (5)
    (a) What is the atomic number of the element?
    (b) State whether element Z is a metal or a non-metal.
    (c) What type of ion (if any) will be formed by an atom of element Z? Why?
    (d) Give the name and symbol of element Z.
    (e) Name the group of the element to which Z belongs.

OR

Explain the formation of protons from a gas discharge tube as stated by Goldstein.

17.   (5)
    (a) With the help of a neat and labelled diagram show the cycling of nitrogen in nature.
    (b) What are the two ways in which carbon dioxide is fixed in the environment?

18.   (5)
    (i) A box is pulled across a floor by applying a force of 100 N at an angle of 60° above the horizontal surface. How much work is done by applying force in pulling the box to a distance of 10 m?
    (ii) State the transformation of energy in the following cases:
        a) Radio
        b) Car engine
        c) Electric bulb

19.   (5)
    (i)   What is acceleration? Write the formula for acceleration. Give an example where it acts on a body.
    (ii) A car starting from rest attained a velocity of 10 m/s in 15 minutes. What is its acceleration?
    (iii) What is the distance travelled during this time?

OR

A train travels a distance of 250 km from Delhi to Jaipur towards the west in 4 hours in the evening and returns to Delhi in the morning covering a distance of 250 km in 4 hours. Find (a) average speed and (b) average velocity.

20. There are three liquids A, B and C, all having different densities and different boiling points. Liquids A and C are organic in nature, whereas liquid B is considered inorganic. When liquids A and B are put together in a container, they form a single layer. On the other hand, when liquids B and C are mixed, they form two separate layers.

(a) Which process will you use to separate a mixture of A and B?

(b) Which method will you use to separate a mixture of B and C?

(c) Name the liquids which would behave like (i) A, (ii) B and (iii) C.

21. (5)

(a) Define extrinsic factors of disease. Give examples of two diseases which are caused by extrinsic factors.

(b) 'Prevention of a disease is more desirable than its treatment'. Justify this statement.

OR

(a) Give any three differences between bony and cartilaginous fish.

(b) What are cold-blooded animals?

(c) Name the excretory organs of (i) Sponges and (ii) Annelids.

Section E

22. A diagram of earthworm is shown below. (2)
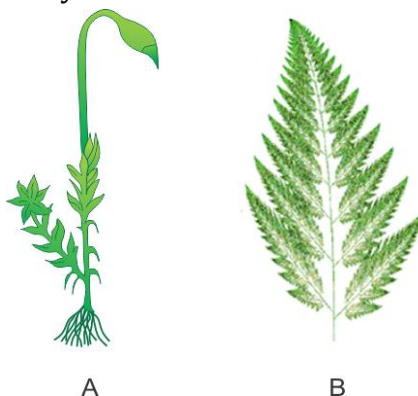

(a) To which phylum does earthworm belong?
(b) Which feature needs to be labelled for placing the earthworm in its phylum?

OR

Name two structures which you would see in cheek cells if you were using a very high magnifying power of a microscope.

23. Observe figures A and B carefully. (2)

A   B

(a) Which of the plants shown above have a well-developed vascular system for the conduction of water and other substances?
(b) Which of the plants shown above are also called amphibians of the plant kingdom?

24. What is the first step involved in the separation of a mixture of sand, common salt and ammonium chloride?

OR

If in the first step the mixture of sand, common salt and ammonium chloride is dissolved in water. What would be the difficulty in separation?

25. In an experiment, 18.5 g of copper sulphate reacted with 11.0 g of sodium hydroxide to form 10.0 g of copper hydroxide and 19.5 g of sodium sulphate. Which law of chemical combination is illustrated by this data? Give reason for your choice. (2)

26. Can ultrasonic waves be used to detect flaws in the metal blocks on the Moon? Give reason. (2)

27. A man weighs 650 N on the Earth. What will be his mass on the Moon?
Consider acceleration due to gravity on the Earth (g) = 10 m/s^2 (2)

OR

'The relative density of silver is 10.8.' What does this statement mean?

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Sample Paper – 12 Solution

Section A

1. The nitrogen cycle is known as the perfect cycle in the biosphere as it maintains the overall amount of nitrogen in the atmosphere, water and soil.

2. The egg-laying poultry bird is called an egg layer, whereas the bird reared for obtaining meat is called a chicken or broiler.

Section B

3. When bodies of different masses are dropped at the same time from the same height, they will reach the ground at the same time. It is because the acceleration due to gravity does not depend on the mass of an object. It only depends on the gravitational constant, mass of the Earth and square of the radius of the Earth.

4. Particles in a colloid scatter light. If a beam of light is passed through a colloid, light is scattered by colloidal particles and the path of light is illuminated as a blue cone called a Tyndall cone. This is known as the Tyndall effect.
Example: Scattering of light by particles of dust and smoke in air

OR

If a saturated solution is heated, then it becomes unsaturated because the solubility of a solute increases on heating.
If a saturated solution is cooled, then some of its dissolved solute will separate out in the form of solid crystals.

5. Cells of cuboidal epithelium are cube-shaped. On the other hand, the cells of ciliated epithelium are tall and pillar-like, with hair-like cilia on their outer surfaces.

Section C

6.
(a) Smooth endoplasmic reticulum
(b) Cytoplasm
(c) Nucleolus

7.

(a) <u>Arthropoda</u>: Jointed legs or appendages

(b) <u>Annelida</u>: Metamerically segmented body

(c) <u>Porifera</u>: Body perforated with numerous pores

OR

Scientific name of coconut is *Cocos nucifera*. The genus is Cocos and the species is nucifera. The genus name is written first in binomial nomenclature starting with a capital letter, whereas the species name comes second and it starts with a small letter.

8.

a) Momentum is defined as the product of mass and velocity.

b) m = 70 kg, v = 2 m/s

p = m x v = 70 x 2 = 140 kg m/s

Thus, the momentum of the person is 140 kg m/s.

9.

(a) A pure substance is one which is made of only one kind of atoms or molecules.

(b) Examples: Oxygen and sugar

(c) Ice, iron, hydrochloric acid, calcium oxide and mercury are pure substances.

10. Advantages of bee-keeping:

a) It requires low investments and provides additional income to the farmer.

b) It also provides other products such as wax, royal jelly and bee venom.

c) Bees help in cross pollination.

11.

(a) Whales and fish are aquatic animals and belong to Phylum Chordata. However, they both differ in several basic characters.

(b) Whales are warm-blooded, while fish are cold-blooded animals.

(c) Whales respire through the lungs, while fish breathe through the gills.

(d) Whales possess mammary glands which are absent in fish.

(e) Whales have a four-chambered heart, while fish have a two-chambered heart.

(f) Therefore, although whales and fish resemble each other and can swim in water, whales cannot be grouped with fish.

(g) Whales belong to Class Mammalia, while fish are included in Class Pisces.

12.

Total mass of compound = 0.24 g

Mass of boron in the compound = 0.096 g

Mass of oxygen in the compound= 0.144 g

Percentage of an element in a compound = $\dfrac{\text{Total mass of element}}{\text{Total mass of compound}} \times 100$

Therefore, percentage of boron in the compound by weight = $\dfrac{0.096}{0.24} \times 100 = 40\%$

And percentage of oxygen in the compound by weight = $\dfrac{0.144}{0.24} \times 100 = 60\%$

OR

Mass of sodium carbonate + mass of ethanoic acid = mass of sodium ethanoate + mass of water + mass of carbon dioxide

$6.9\ g + 9.0\ g = x + 3.2 + 1.2\ g$

$x = 15.9 - 4.4 = 11.5\ g$

13.

(i) Pressure on the surface of sand will be more when the person is standing on the sand with the force of one leg than when he is lying flat on the surface of sand.

(ii) Pressure on the surface of sand will be more when he is standing on one leg because the surface area of the foot is smaller than the surface area acquired by the flat back of the person. Area is inversely proportional to pressure. So, when the surface area increases, pressure decreases and *vice versa*.

(iii) Pressure, P = 100 Pa

Area, A = 20 m²

$P = \dfrac{F}{A}$

$100 = \dfrac{F}{20}$

$F = 2000\ N$

14.

(a) Caring for his friend, awareness, empathy.

(b) The disease from which Siva's brother is suffering is goitre.

(c) Iodine-131 is used to treat goitre.

15.

a) Potential energy at point A = m g h = 20 × 10 × 10 = 2000 J

b) As point B is the midpoint.
Potential energy of the body = Kinetic energy of the body

c) Kinetic energy at point C will be maximum. As all the potential energy of the body gets converted to kinetic energy when the object reaches the ground.
Thus, kinetic energy = 2000 J ... (from (a))

$$K.E = \frac{1}{2}mv^2$$

$$\therefore 2000 = \frac{1}{2} \times 20 \times v^2$$

$$\therefore v^2 = \frac{2000 \times 2}{20} = 200$$

$$\therefore v = \sqrt{200} \text{ m/s} = 14.14 \text{ m/s}$$

OR

The velocity of the ball when it reaches the maximum height is

v = 0 ... (ball stops at the maximum height)

u = 20 m/s
By the third law of the equation of motion,
$v^2 = u^2 + 2as$
As the ball is thrown upwards,
v = 0 m/s
a = g = −10 m/s^2 (ball is thrown against gravity) and s = h
Thus,
$(0) = (20)^2 + 2 (−10) (h)$
−400 = −20 h
h = 20 m

Section D

16.

(a) Atomic no. = 18

(b) Element Z is a non-metal.

(c) As the outermost shell of element Z is completely filled, it will not form any ion.

(d) Name of element 'Z' = Argon, and symbol is Ar.

(e) Z belongs to the group Noble gases.

OR

Discovery of the proton:

In 1886, the German scientist E. Goldstein modified the discharge tube and passed an electric current through it.

He found that the positively charged rays were emitted from the anode in the discharge tube. These rays were called canal rays.
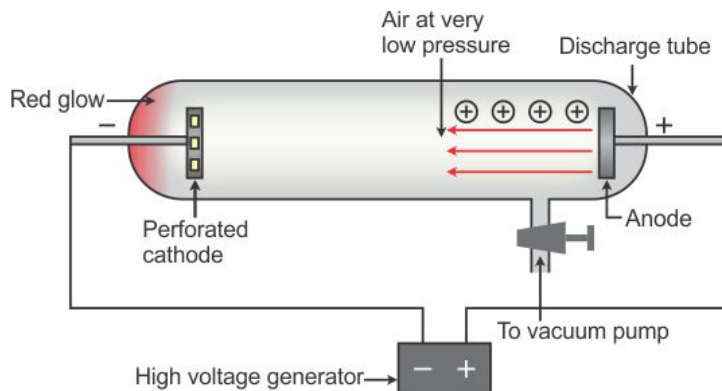

Production of anode rays

Anode Rays Discharge Tube

When an electric field was applied, these rays deflected towards the negatively charged plate. Thus, Goldstein concluded that an atom contains positively charged particles along with electrons.

These positively charged particles were named protons by the British scientist Ernest Rutherford.

Canal rays were also called anode rays since they were emitted from the anode (electrode connected to the positive terminal of a high voltage source) in the gas discharge experiments using a perforated cathode.

17. (a) Nitrogen cycle
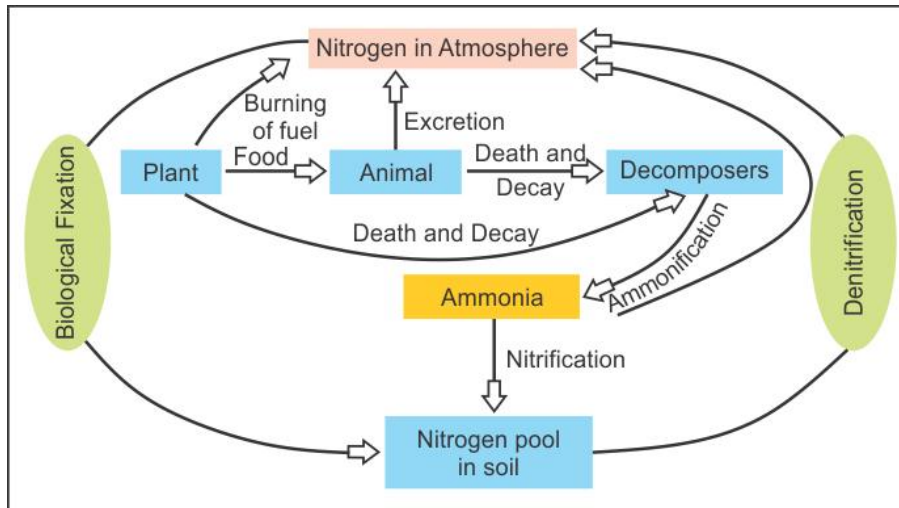
(b) <u>Two modes of carbon dioxide fixation:</u>
- (i) **Photosynthesis**: All producers absorb CO_2 from their surroundings and convert it to glucose and other organic compounds during photosynthesis.
- (ii) **Formation of shell and skeleton**: Aquatic animals absorb carbonates from water and use them to build their shell and skeleton.

18.

(i) Given that a force of 100 N is applied on a box of weight W.

Force applied to the box at an angle of 60 is a vector quantity which has two components—horizontal and vertical.
Because the force causes a displacement in the horizontal direction, its horizontal component is to be considered.
We know that $W = F \times s \cos\theta$
$\therefore W = 100 \times \cos 60° \times 10$
$\therefore W = 100 \times 0.5 \times 10$
$W = 500$ J

(ii) a) Electrical energy → kinetic energy → sound energy
b) Chemical energy → heat energy → kinetic energy
c) Electrical energy → heat energy → light energy

19.

(i) The rate of change of velocity with respect to time is called acceleration.

Formula: $a = \dfrac{v - u}{t}$

Example: When a body moves with a certain velocity at equal intervals of time, the body is said to be moving with uniform acceleration.

Final velocity, v = 10 m/s

Time, t = 30 minutes = 15 × 60 s = 900 s

v = u + at

$a = \dfrac{v - u}{t} = \dfrac{10 - 0}{900} = 0.011 \, m/s^2$

Acceleration of the train = 0.011m/s²

(iii) Distance travelled by the train within this time.

$s = ut + \dfrac{1}{2}at^2$

$s = 0 + \dfrac{1}{2} \times 0.011 \times (900)^2$

$s = \dfrac{1}{2} \times 51840 = 4455 \, m = 4.45 \, km$

OR

a) Total distance travelled = 250 km + 250 km = 500 km

Total time taken = 4 + 4 = 8 hr

$\text{Average Speed} = \dfrac{\text{Total distance travelled}}{\text{Total time taken}}$

$= \dfrac{500}{8} = 62.5 \, km/h$

Thus, the average speed is 62.5 km/h.

b) Total displacement = 250 km – 250 km = 0 km

Total time taken = 8 hr

$\text{Average velocity} = \dfrac{\text{Total displacement}}{\text{Total time taken}}$

$\therefore v_{av} = \dfrac{0}{8} = 0 \, km/h$

20.

(a) We will use fractional distillation to separate a mixture of A and B.

(b) We will use a separating funnel to separate a mixture of B and C.

(c) (i) Alcohol would behave like A.

(ii) Water would behave like B.

(iii) Oil would behave like C.

21.

   (a) Disease-causing external agents which enter the human body from outside are called extrinsic factors. Diseases caused by extrinsic factors: Night blindness, malaria

   (b) There are several limitations confronted while treating an infectious disease.

      (i) When a person gets a disease, the body functions get disturbed and may never recover completely.

      (ii) Treatment of a disease is slow.

      (iii) A person suffering from an infectious disease can serve as a medium for further spread of infections to other people.

      Therefore, prevention of a disease is more desirable than its treatment.

OR

(a) Differences between bony and cartilaginous fish:

Bony Fish	Cartilaginous fish
(i) Bony fish are found in fresh water as well as in sea water.	(i) They are mostly marine.
(ii) Mouth is terminal in position.	(ii) Mouth is usually ventral.
(iii) Endoskeleton consists of bones.	(iii) Endoskeleton consists of cartilage.

(b) Animals whose body temperature does not remain constant but varies along with atmospheric temperature are called cold-blooded animals.

(c) Excretory organs of the following animals:

   (i) Sponges: General body surface

   (ii) Annelids: Nephridia

Section E

22.

(a) Earthworm belongs to Phylum Annelida.

(b) A prominent band called clitellum on the 14th, 15th and 16th segments of the earthworm needs to be labelled so as to place it in Phylum Annelida.

OR

Nucleus and cytoplasm can be seen in cheek cells with a high magnifying microscope.

23. A – Funaria (Bryophyte), B – Fern (Pteridophyte)

(a) Pteridophytes have a well-developed vascular system for the conduction of water and other substances.

(b) Bryophytes are also called amphibians of the plant kingdom.

24. To separate the mixture of sand, common salt and ammonium chloride, the first step should be the separation of ammonium chloride by sublimation because natural substances are not chemically pure. In the given mixture, ammonium chloride is the sublimating substance; hence, it gets separated easily from the salt and sand mixture.

OR

The given mixture is of sand, common salt and ammonium chloride. Common salt and ammonium chloride both dissolve in water. If the mixture had been dissolved in water, then the separation of the constituents would be difficult.

25. In an experiment, 18.5 g of copper sulphate reacted with 11.0 g of sodium hydroxide to form 10.0 g of copper hydroxide and 19.5 g of sodium sulphate.
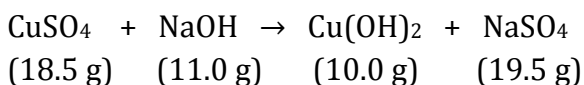
$CuSO_4$ + $NaOH$ → $Cu(OH)_2$ + $NaSO_4$
(18.5 g)   (11.0 g)   (10.0 g)   (19.5 g)
From the given data, we get
Total mass of reactants = (18.5 g + 11.0 g) = 29.5 g
Total mass of products = (10.0 g + 19.5 g) = 29.5 g
Hence, the law of conservation of mass is valid here.
It states that mass can neither be created nor destroyed in a chemical reaction.
Total mass of the reactant is equal to the total mass of the product.

26. No, ultrasonic waves cannot be used to detect flaws in metal blocks on the Moon because ultrasonic waves are a form of longitudinal waves which do not propagate in vacuum.

27. W = m × g

650 N = m ×10

Thus, m = 65 kg

Mass being a scalar quantity remains the same on the Earth and the Moon.

Thus, the mass of man on the Moon is 65 kg.

OR

Relative density of a substance is a number which tells how many times the substance is heavier than an equal volume of water. Thus, the line 'relative density of silver is 10.8' tells us that silver is 10.8 times heavier than an equal volume of water.