CBSE
Class IX Science

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

General Instructions:
1. The question paper comprises of two **Sections, A** and **B**. You are to attempt both the sections.
2. All questions are compulsory.
3. All questions of **Section A** and **Section B** are to be attempted separately.
4. There is an internal choice in **three** questions of **three** marks each, **two** questions of **five** marks each in Section A and in **one** question of **two** marks in Section B.
5. Question numbers **1** and **2** in **Section A** are **one mark** questions. These are to be answered in one word or in **one** sentence.
6. Question numbers **3** to **5** in **Section A** are **two marks** questions. These are to be answered in about **30 words each**.
7. Question numbers **6** to **15** in **Section A** are **three marks** questions. These are to be answered in about **50 words each**.
8. Question numbers **16** to **21** in **Section A** are **five marks** questions. These are to be answered in about **70 words each**.
9. Question numbers **22** to **27** in **Section B** are based on practical skills. Each question is a **two** marks question. These are to be answered in brief.

Section A

1. What is intercropping?   (1)

2. Define biogeochemical cycle.   (1)

3. List any three human activities which could lead to an increase in carbon dioxide content of air.   (2)

4. A car from rest moves with a uniform acceleration of 2 m/s² for 10 minutes. Calculate the acquired speed and the distance travelled in this time.   (2)

5. Which of the following situations indicates Newton's first law of motion:
(a) A ball thrown upwards reaches a point and then starts falling.
(b) Passengers of the car feel a jerk when the driver applies emergency brakes.
(c) A gunman moving backwards as soon as the gun shoots a bullet.
(d) Formation of ripples on the surface of the lake when a stone is thrown into it.   (2)

6. State the observations from the α-particle scattering experiment which led Rutherford to make the following conclusions: (3)
a. Most of the space in an atom is empty.
b. Entire mass of an atom is concentrated in its centre.
c. Centre is positively charged.

7. Explain any three methods of weed control. (3)

<center>**OR**</center>

What is green manuring? List two commonly used green manure crops and name two macronutrients provided by green manure.

8. Give reasons: (3)
(a) A gas completely fills the vessel in which it is kept.
(b) A gas exerts pressure on the walls of the container.
(c) A wooden table should be called a solid.

9. Define and explain the difference between (3)
(a) Distance and Displacement
(b) Speed and Velocity

10. Although a stone and the Earth attract each other with equal force, why do we observe that only the stone falls towards the Earth but not the Earth rising towards the stone? Explain. (3)

11. A wooden cuboid has mass of 8 kg. The length, breadth and height of this wooden cuboid are 100 cm, 50 cm and 20 cm, respectively. Find the pressure on the floors on which this block is kept. (3)

<center>**OR**</center>

Calculate the force of gravitation due to the Earth on a ball of 2 kg mass lying on the floor. Consider the mass of Earth = 6×10^{24} kg, radius of Earth = 6400 km and universal gravitation constant G = 6.7×10^{-11} Nm^2/kg^2. (3)

12. A silver ornament of mass 'm' gram was polished with gold equivalent to 1% of the mass of silver. Calculate the ratio of the number of atoms of gold and silver in the ornament. (3)

<center>**OR**</center>

Write the chemical formula of the following using the criss-cross method: (3)
   a. Ammonium sulphate
   b. Magnesium bicarbonate
   c. Barium nitrate

13. The doctor diagnosed that Lata has lost the power of fighting any infection.   (3)
   (a) Name the disease Lata is suffering from.
   (b) Name the pathogen responsible for the cause of the disease.
   (c) Mention any two modes of transmission of the disease from one person to another.

14. Why does the skin of your fingers shrink when you wash clothes for a long time?   (3)

15. We know that carbon dioxide is essential for plants for photosynthesis. Yet, why do we consider it a pollutant?   (3)

16. (a) Define the terms and give one example of each: (3)
       (i) Bilateral symmetry
       (ii) Coelom
       (iii) Diploblastic
   (b) Identify the group of animals with   (2)
       (i) Spiny body and radial body symmetry
       (ii) Four pairs of jointed legs and no wings

17. (a) Work done by a force is given by the equation $W = F \cos \theta \times s$. Determine and explain the effect of work done due to a gradually increasing angle 'θ'.   (3)
   (b) A car is being driven by a force of 5×10^{10} N. It takes two minutes with the speed of 10 m/s for this car to reach the river side. Calculate the work done.   (2)
OR
   (a) Explain the work done by a person in the following conditions.
       i.   When he is standing at a place holding a suitcase in his hand.
       ii.   When he is moving, holding the suitcase in his hands.
   (b) A certain household has consumed 250 unit of energy during a month. How much the energy is consumed in joules?

18. Distinguish between true solution and colloid.   (5)
**OR**
   (a) What is an octet? How does an element reach an octet state?   (3)
   (b) Draw a schematic atomic structure of magnesium and phosphorus (Number of protons of magnesium = 12, phosphorus = 15).   (2)

19. (a) A man weighs 300 N on the surface of the Earth. If he were taken to the Moon, his weight would be 50 N. Calculate the mass of this man on the Moon ($g = 10$ m/s^2).   (3)
   (b) A man hears an echo of thunder 2 seconds after lightning strikes. Calculate the distance of lightning from the man (Speed of sound in air = 330 m/s).   (2)
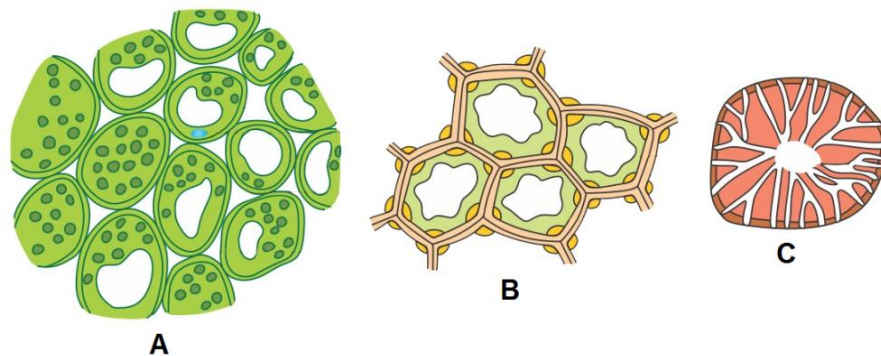
20. (a) How does cork act as a protective tissue? (5)
   (b) Observe the figure carefully and label the parts marked A and B.
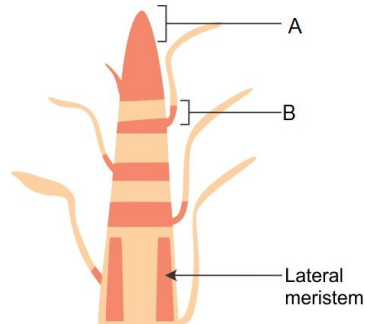
21. What happens when sugar is dissolved in water? Where does the sugar go? What information do you get about the nature of matter from the dissolution of sugar in water? (5)

Section B

22. Observe the figures A, B and C. (2)

   (a) Which of these tissues provide both mechanical strength and flexibility?
   (b) Which of these tissues can be modified to form air cavities in aquatic plants?

**23.** Rishi observed a permanent slide of *Spirogyra*. (2)

   (a) Which cell organelles can be clearly seen and labelled from this slide?
   (b) To which group of plants does *Spirogyra* belong?

24. Identify two clear and transparent solutions from the following:
    (a) Milk and water
    (b) Sugar and water
    (c) Starch and water
    (d) Alum in water
    (e) Egg albumin and water
    (f) Chalk powder and water   (2)

25. What happens when solutions of sodium sulphate and barium chloride are mixed? Give the reaction.   (2)

26. While performing an experiment based on Archimedes principle, the following changes were observed. What will be the volume of the stone immersed in the liquid?   (2)
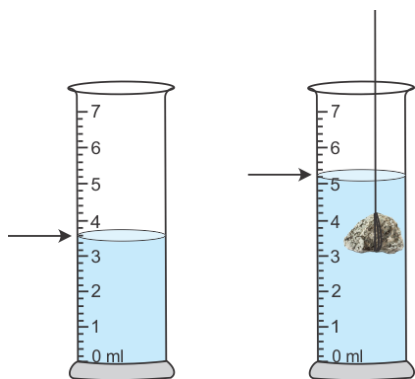
    (a) 3.6 ml
    (b) 1.5 ml
    (c) 2 ml
    (d) 5.1 ml

27. A student has set up a slinky on a smooth table top in the manner shown below. How can he produce transverse waves in the slinky by moving its free end Q?   (2)
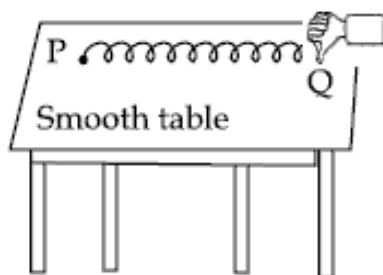
    (a) At an angle of 45° with the table top
    (b) Backward and forward along the length of the slinky
    (c) Up and down
    (d) Left and right

OR

(a) If we place the porous surface at the back of the hollow tubes in the experimental setup of the reflection of sound then
    (A) Sound will be heard with greater intensity than the incident sound.
    (B) Sound will be heard with lesser intensity than the incident sound.
    (C) Reflection of sound does not take place.
    (D) Reflected sound will remain the same as incident sound.
(b) Explain why.

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Solution

Section A

1. The practice of growing two or more crops simultaneously in the same field in a definite row pattern is called intercropping.

2. Movement of nutrient elements through the living and non-living components of the biosphere is called a biogeochemical cycle.

3. Human activities which could lead to an increase in carbon dioxide content of air:
    (a) Burning of fossil fuels such as coal and petroleum
    (b) Deforestation
    (c) Burning associated with agricultural practices

4. When a car is moving from rest, its initial velocity (u) is zero.
    The distance travelled (s) by this car can be found by using the second equation of motion.
    u = 0 m/s
    a = 2 m/s
    t = 10 min = 600 secs
    To find the distance we use
    $$s = ut + \frac{1}{2}at^2$$
    $$\therefore s = (0).600 + \frac{1}{2}(2).(600)^2$$
    s = 360000 m = 360 km.
    Therefore, the distance travelled by this car is 360 km.
    Calculating the speed of this car,
    $$\text{Speed} = \frac{\text{Distance}}{\text{time}} = \frac{360000}{600} = 600 \text{ m/s}$$
    The speed of this car is 600 m/s.

5. Newton's first law of motion is the law of inertia which states that a body at rest will continue to stay at rest and a body in motion will continue to be in the state of motion until an external force is applied to it.
    Therefore, case (ii) indicates Newton's first law.

6.

  (a) Most of the rays passed through thin gold foil undeviated.
  (b) Very few rays returned in the same path.
  (c) Some rays deflected through larger angles.

7. Methods of weed control:

  (a) **Mechanical method**: It involves methods such as uprooting weeds manually, weeding with a trowel, hand hoeing, ploughing and burning.
  (b) **Chemical method**: It involves the use of chemical weed killers called herbicides or weedicides to kill or destroy weeds.
  (c) **Biological method**: It involves the deliberate use of insects or some other organisms which consume and specifically destroy weed plants.

<div align="center">**OR**</div>

Green manuring is the practice of ploughing green plants into the soil for improving its fertility. Green manure provides organic matter and nutrients such as nitrogen and phosphorus to the soil.
Commonly used green manure crops: Guar and Sunn hemp
Macronutrients provided by green manure: Nitrogen and phosphorus

8.

  (a) Because the attraction force between particles of a gas is negligible that means less. So, the particles freely move/flow in all possible directions, as a result gas completely fills the vessel in which it is kept.
  (b) Freely moving particles of a gas hit the walls of its container continuously and randomly. Hence, such random and erratic motion of gas particles exerts pressure on the walls of the container.
  (c) Particles of a wooden table are rigid and have a fixed location. They also possess a definite shape and volume. Because of these properties, we should call a wooden table a solid substance.

9. (i) **Distance**: It is the actual length covered by a body during the course of motion.
    As the distance only indicates the magnitude of the length covered without any element of the direction of the motion, it is a scalar quantity. The distance covered cannot be negative.

  (ii) **Displacement**: Displacement is the change in position made by the body during the course of motion. Direction of the movement along with the magnitude of the change of position determines the value of displacement; therefore, it is a vector quantity.

10. Force (F) acting between the Earth (mass M) and the stone of mass (m) separated by the distance (r) by universal law of gravitation is given by the equation $F = G \times \dfrac{M.m}{r^2}$.

The mass of stone is too less (negligible) when compared to the mass of the Earth which is 6×10^{24} kg. Thus, the stone falls on the Earth and the Earth does not rise towards the Sun.

11. The pressure is the ratio of force (F) exerted by a body to the area (A) upon which the body is exerting the force. Also, weight (W) is the force exerted by a body due to the earth's gravitational pull, i.e. F = W.

$W = mg$

Acceleration due to gravity $(g) = 10 \text{ m}/\text{s}^2$

$\therefore W = 8 \times 10 = 80$ N

Pressure $(P) = \dfrac{\text{Force (F)}}{\text{Area (A)}}$

Area of the surface of the cuboid $(A) = \ell \times b$

Assuming the surface of 50×20 cm to be in contact with the floor.

$A = 50 \times 20 = 1000 \text{ cm}^2 = 0.1 \text{ m}^2$

$\therefore P = \dfrac{80}{0.1} = 800 \text{ N}/\text{m}^2$

The pressure exerted by the block on the floors is 800 N/m².

OR

The force of gravitation is calculated by using the equation

$F = G \times \dfrac{M.m}{r^2}$

Gravitation constant $G = 6.7 \times 10^{-11} \text{ Nm}^2/\text{kg}^2$

Mass of the Earth $= 6 \times 10^{24}$ kg

Mass of ball = 2 kg

As the ball is lying on the floor, the distance between the ball and the Earth is equal to the radius of the Earth.

Substituting all the relevant values in the above equation

$F = 6.7 \times 10^{-11} \times \dfrac{6 \times 10^{24} \times 2}{(6400)^2}$

$F = 19.6$ N

$\therefore F = 19.6$ N

12. Mass of silver in the ornament = m gram

$$\text{Mass of gold in the ornament} = m \times \frac{1}{100} = 0.01\,m\,\text{gram}$$

108 g of Ag contains 6.022×10^{23} atoms

m gram of Ag contains $(6.022 \times 10^{23}/108) \times m/100$ atoms
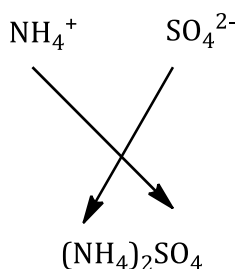
ratio of number of atoms of gold and silver = Au : Ag

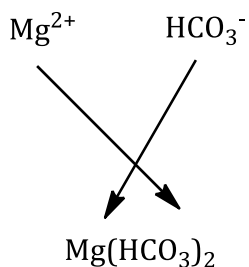$= (6.022 \times 1023/197) \times m/100 : (6.022 \times 1023 \times m)/108$
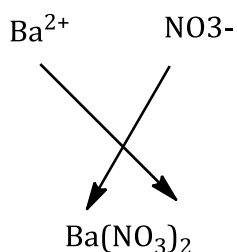
$= 108 : 19700$

$= 1 : 182.41$

OR

(a)

$$NH_4^+ \qquad SO_4^{2-}$$

$$(NH_4)_2SO_4$$

(b)

$$Mg^{2+} \qquad HCO_3^-$$

$$Mg(HCO_3)_2$$

(c)

$$Ba^{2+} \qquad NO3-$$

$$Ba(NO_3)_2$$

13.

(a) AIDS (acquired immunodeficiency syndrome)

(b) Retrovirus called HIV (human immunodeficiency virus)

(c) <u>Modes of transmission of the disease:</u>

    (i) Unprotected sexual contact with an HIV-infected person

    (ii) Transfusion of blood contaminated with HIV

14.

(a) Clothes are washed with soap or detergent solution. This solution is hypertonic because it contains low water concentration as compared to the osmotic concentration of our skin cells.

(b) Therefore, when skin cells come in contact with the detergent solution, they begin to lose more water by exosmosis after some time.

(c) As a result, the skin over the fingers shrinks while washing clothes for a long time.

15.

(a) Carbon dioxide is required by plants to make food by photosynthesis.

(b) It is also a greenhouse gas which traps the heat reflected by the Earth's surface and keeps the atmosphere warm.

(c) However, when the concentration of CO_2 rises above normal levels, it traps more heat resulting in heating of the Earth's atmosphere and an increase in the Earth's temperature causing global warming.

(d) Global warming is dangerous because it tends to melt polar ice and glaciers on mountains. This causes a rise in the water level of oceans and submerges several coastal areas and islands.

(e) Therefore, although carbon dioxide is essential for plants, it can act as a pollutant in case of excess concentrations.

16. (a)

(i) **Bilateral symmetry**: The type of body symmetry in which the two sides of the body are mirror images of one another is called bilateral symmetry.
Example: Earthworm

(ii) **Coelom**: Body cavity lined with an epithelium derived from the mesoderm is called coelom.
Example: Spider

(iii) **Diploblastic**: Animals which have two germ layers—outer ectoderm and inner endoderm—in the embryo are said to be diploblastic.
Example: *Hydra*

(b)

(i) Echinodermata

(ii) Arachnida

17. (a)

Work (W) done by a force (F) is given by

W = F×s Cosθ

The range of angle 'θ' in simple trigonometry is from 0° to 90°

Cos0=1 and Cos90=0

Therefore, as the angle between directon of force and direction of motion

increases, the work done by a force reduces.

(b)

Work (W) = Force (F)×Displacement (s) ...(1)

Force (F)= $5×10^{10}$ N

In this case of motion, the displacement of the car

is equal to the distance travelled by the car.

$$\text{Speed (s)}=\frac{\text{Distance}}{\text{time}}=\frac{\text{Displacement}}{\text{time}}$$

Speed (s) = 10 m/s

Time of motion (t) = 2 min = 120 secs

∴ Displacement (s) = 1200 m

Substituting the above value of displacement in equation (1)

Work done = $5×10^{10} ×1200 = 6×10^{13}$ J

Therefore, work done by the car to reach the river side is $6×10^{13}$ joules.

OR

(a)

i. When the person is standing at a place holding a suitcase, there is no change in the position of the man or the suitcase.
   Therefore, displacement (s) = 0
   W = F × s = F × 0 = 0

ii. When the person is moving holding the suitcase in his hand, he applies force in upward direction and the displacement of suitcase is in the forward direction, i.e. perpendicular to the direction of the force applied.
   Therefore, θ = 90°
   Since, W = F × s cosθ
   W = F × s cos90° = 0
   Hence, work done on the suitcase is zero.

(b) Energy consumed = 250 units = 250 kWh

   1 kWh = 3.6 × 10⁶ J

   ∴ Energy consumed = 250 × 3.6 × 10⁶ J = 9 x 10⁸ J

18.

| True Solution	Colloid
1. A true solution is a homogeneous mixture of two or more substances.	1. A colloidal solution is a heterogeneous mixture of two substances.
2. Size of the particles is less than one nanometre.	2. Range of particle size is from 1 to 100 nanometre.
3. It is always transparent.	3. It is translucent.
4. Particles cannot be seen even with a microscope.	4. Particles of a colloidal solution can be seen with a microscope.
5. It does not show Tyndall effect.	5. It shows Tyndall effect.

OR

(a) An atom has an octet when it has 8 electrons in the outermost shell. An element can attain its octet by losing, gaining or sharing electrons.

(b) Magnesium atom: 12 n, 12 p, 12 e
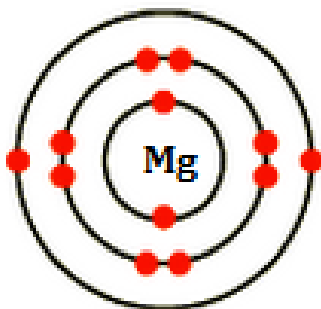
Phosphorus atom: 16 n, 15 p, 15 e
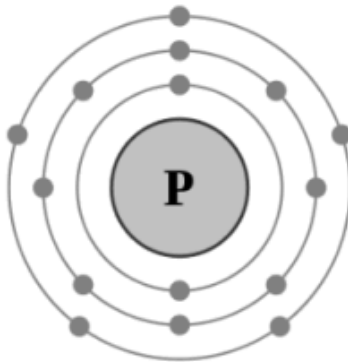
19. (a)

Weight of man on the Earth (W_{Earth}) = 300 N

acceleration due to gravity (g_{Earth})= 10 m/s^2

Weight α acceleration due to gravity

$W_{Earth} = m_{Earth} \times g_{Earth}$

$\therefore m_{Earth} = \dfrac{300}{10} = 30$ kg

Weight of man on the moon (W_{moon}) = 50 N

$\therefore \dfrac{W_{Moon}}{W_{Earth}} = \dfrac{50}{300} = \dfrac{1}{6}$

$\therefore \dfrac{m_{moon}}{m_{Earth}} = \dfrac{1}{6}$

$\dfrac{m_{moon}}{30} = \dfrac{1}{6}$

$\therefore m_{moon} = 5$ kg

Therefore, the mass of the man on the Moon is 5 kg.

(b) We know that

Speed of sound in air $(v) = \dfrac{\text{Distance}}{\text{time}}$

$330 = \dfrac{\text{Distance}}{2}$

$\therefore \text{Distance} = 660$ m

Therefore, the distance between the man and the point of lightning is 660 m.

20. (a)
  (i) Cork cells are dead and compactly arranged without intercellular spaces.
  (ii) Cell walls are coated with an organic substance called suberin which makes these cells impermeable to water and gases.
  (iii) As a result, the cork cells prevent desiccation, infection and mechanical injury to the plant body.
  (iv) Cork is light and does not catch fire easily because of which it is used as an insulator, shock absorber, in linoleum and in making of sports goods.
  (b) A – Apical meristem; B – Intercalary meristem
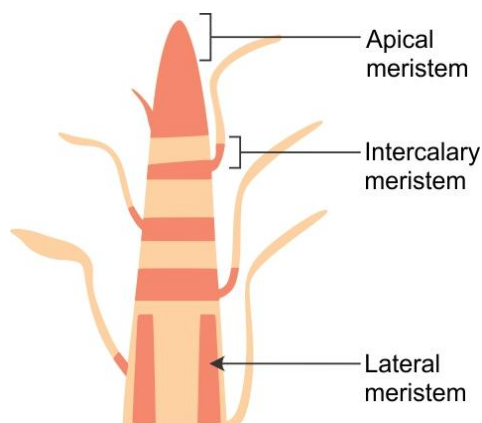
21. When sugar is dissolved in water, its crystals break down into tiny particles. The sugar particles go into the spaces between the particles of water and mix with them to form sugar solution. Sugar particles occupy the space between water particles.
From the dissolution of sugar in water, we can infer
 (i) Matter (consisting of sugar and water) is made of small particles.
 (ii) Particles of matter have spaces between them.

Section B

22. A – Parenchyma, B – Collenchyma, C – Sclerenchyma
   (a) Tissue B or collenchyma provides both mechanical strength and flexibility.
   (b) Tissue A or parenchyma can be modified to aerenchyma with air cavities in aquatic plants.

23.
   (a) A permanent slide of *Spirogyra* shows a nucleus, ribbon-shaped chloroplast, cell wall and pyrenoids.
   (b) *Spirogyra* belongs to Division Thallophyta.

24. Two clear and transparent solutions are (b) sugar and water, (d) alum and water.

25. When solutions of sodium sulphate and barium chloride are mixed, a white-coloured precipitate of barium sulphate is formed along with sodium chloride solution.
$Na_2SO_4 + BaCl_2 \rightarrow 2NaCl + BaSO_4\downarrow$
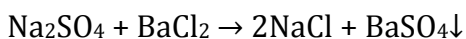
26. According to the Archimedes principle, the volume of the stone is equal to the volume of liquid displaced due to the immersion of that stone. The volume of liquid displaced can be found by calculating the difference between the original volume of liquid before immersion of the stone and the changed volume of the liquid after immersion of the stone. So,
5.1 – 3.6 = 1.5 ml

27. A student can produce transverse waves by vibrating the freely moving end 'Q' of the slinky in the 'up and down' direction.

OR

(a) No reflection of sound takes place.

(b) No reflection of sound will take place from the porous surface as it absorbs the sound.