

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.
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Section A

1. What is leghaemoglobin? (1)
2. Name one macronutrient and micronutrient which plants absorb from the soil. (1)
3. Is the value for g constant at all places on the surface of the Earth? Give reason for your answer. (2)
4. If 10 sound waves are produced per second, what is the time period in seconds? (2)
5. Why are branches of a tree able to move and bend freely in spite of high winds? (2)
6. Name the following: (3)
 - (a) Cell organelle which permits selective entry and exit of materials in the cells.
 - (b) Solution in which solute concentration is more than that inside the cell.
 - (c) Fibrous polysaccharide which constitutes the cell wall.

7. Draw a diagram of *Hydra* and label the following parts: (3)
Tentacles, stinging cells, gastrovascular cavity, epidermis

OR

List in tabular form three distinguishing features of gymnosperms and angiosperms.

8. A man throws a ball weighing 400 g in the upward direction:
i) What will be its initial momentum?
ii) What will be its momentum at the highest point of its flight? (3)

OR

A girl of mass 40 kg jumps with a horizontal velocity of 5 ms^{-1} onto a stationary cart with frictionless wheels. The mass of the cart is 3 kg. What is her velocity as the cart starts moving? (3)

9. Explain why an alloy is considered a mixture. (3)

10. List some factors for which variety improvement is performed in crops. (3)

11. Give reasons: (3)
(a) *Echidna* and *Platypus* lay eggs but are still considered mammals.
(b) Crocodile has a four-chambered heart but is still a reptile.
(c) Birds have pneumatic bones.

12. Which has lesser number of atoms and moles, 50 g of iron or 50 g of sodium? (3)

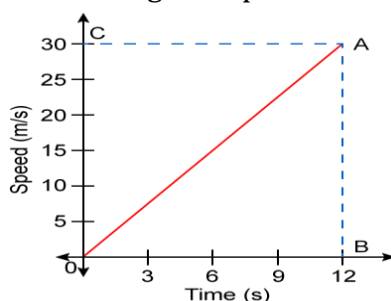
OR

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.

13. State Archimedes' principle and give one example based on it. (3)

14. Why is it said that a man carrying a suitcase is not doing any work with respect to gravity? (3)

15. Answer the following questions from the given speed–time graph: (3)



- i) What type of motion is represented by OA?
- ii) Find the acceleration of the body.
- iii) Distance travelled in 12 seconds.

16. (5)

- (a) List the postulates of Thomson's model of atom.
- (b) What are the properties of electrons?

OR

The atomic number of Chlorine is 17 and its mass number is 35.

- (i) What is the electronic configuration of a negatively charged chlorine ion, Cl^- ?
- (ii) What is the atomic number and mass number of Cl^- ?
- (iii) Define valency, and calculate the valency of Cl^- .

17. (5)

- (a) Describe the oxygen cycle with the help of a diagram.
- (b) How does depletion of the ozone layer take place?

18. (5)

- (i) A box is pulled across a floor by applying a force of 36 N at an angle of 45° above the horizontal. How much work is done by applying force in pulling the box to a distance of 30 m? (given: $\sqrt{2} = 1.414$)
- (ii) What happens to an inflated balloon whose mouth is untied and is released from the right side?

19. (5)

- (i) Define acceleration. Write the expression for it.
- (ii) A bus increases its speed from 10 m/s to 30 m/s in 15 seconds. What is its acceleration?
- (iii) What is positive and negative acceleration?

OR

A cyclist goes around a semi-circular track in 50 seconds. If the radius of the track is 150 metres, calculate his speed. Also calculate the acceleration of the cycle if he starts from rest.

- 20.**Pragya tested the solubility of three different substances at different temperatures and collected the data as given below (results are given in the following table, as grams of substance dissolved in 100 grams of water to form a saturated solution). (5)

Substance dissolved	Temperature (in K)				
	283	293	313	333	353
Potassium nitrate	21	32	62	106	167
Sodium chloride	36	36	36	37	37
Potassium chloride	35	35	40	46	54
Ammonium chloride	24	37	41	55	66

- (a) What mass of potassium nitrate would be needed to produce a saturated solution of potassium nitrate in 50 grams of water at 313 K?
- (b) Pragya makes a saturated solution of potassium chloride in water at 353 K and leaves the solution to cool at room temperature. What would she observe as the solution cools? Explain.
- (c) Find the solubility of each salt at 293 K. Which salt has the highest solubility at this temperature?
- (d) What is the effect of change of temperature on the solubility of a salt?

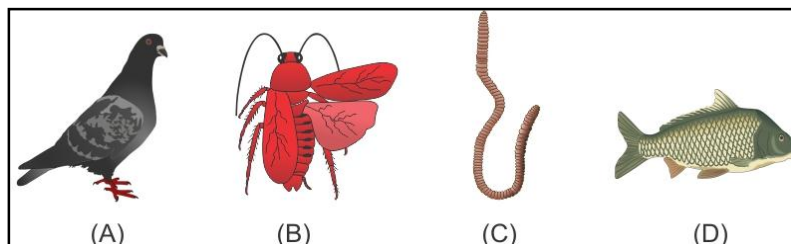
- 21.**Prerna came to school one day with a running nose and reddish and watery eyes. She also kept coughing. She met Vidhi during the morning assembly who advised her to sit at a separate desk in the classroom till she recovers. (5)

- (a) Name the disease which Prerna is suffering from.
- (b) Name the causal organism.
- (c) List any two preventive measures for the disease.
- (d) What is your viewpoint on Vidhi's advice?

Section B

22. Observe the figure carefully.

(2)

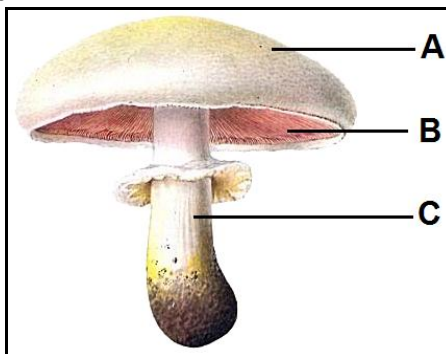


(a) Which of these organisms belong to Phylum Arthropoda?

(b) Write any two striking features of Phylum Arthropoda.

23. Observe the figure carefully.

(2)



(a) Identify the given specimen and the kingdom to which it belongs.

(b) Label A, B and C.

24. State the correct method of separation for the following:

- (i) Mixture of nitre and common salt
- (ii) Mixture of camphor and salt
- (iii) Mixture of alcohol and water
- (iv) Cream from milk

OR

What happens when barium chloride and sodium sulphate solutions are mixed? Give the chemical reaction.

25. When 3.0 g of carbon is burnt in 8.0 g of oxygen 11.0 g of CO_2 is formed.

What mass of carbon dioxide will be formed when 3.0 g of carbon is burnt in 50.0 g of oxygen? (2)

26. Consider a person is sitting in a room adjacent to the school auditorium. The person can only listen to the musicians but cannot see them. He can also differentiate between the sound produced by a sitar and a guitar. Which characteristic of sound helps him to do so? (2)

27. A volume of solid of mass 2 kg is 500cm^3 . Find the density of the solid. (2)

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Solution

Section A

1. Leghaemoglobin is a pink-coloured protein present inside the root nodules of leguminous plants.

2.

Macronutrient: Nitrogen, phosphorus (any one)

Micronutrient: Iron, manganese (any one)

3. No, the value of g does not remain constant at all places on the surface of the Earth. The acceleration due to gravity g is inversely proportional to the square of the distance from the centre of the Earth. As the radius of the Earth at the poles is minimum, the value of g is maximum at the poles. As the radius of the Earth is maximum at the equator, the value of g is minimum at the equator.

4. Sound waves produced per second is the frequency of the sound wave. As 10 waves are produced per second, the frequency is 10 Hz. The time period of a wave is the reciprocal of the frequency.

$$T = \frac{1}{f}$$

$$\therefore T = \frac{1}{10} = 0.1 \text{ seconds}$$

So, the time period of a sound wave is 0.1 seconds.

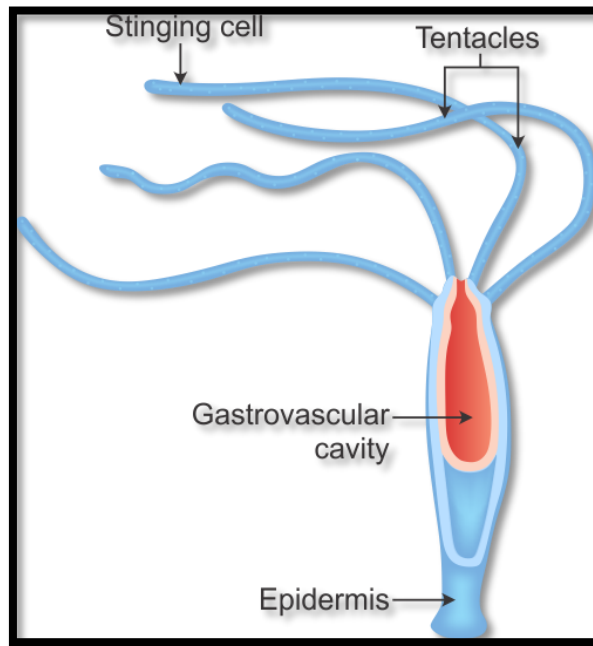
5.

- (a) Collenchyma, a mechanical tissue, provides mechanical support and elasticity.
(b) It provides tensile strength with flexibility to plant parts such as the stem, branches and leaves which allow their easy bending without actually breaking them.
(c) Therefore, branches of a tree are able to move and bend freely in spite of high winds.

6.

- (a) Cell membrane/Plasma membrane
- (b) Hypertonic solution
- (c) Cellulose

7.



Hydra

OR

Differences between gymnosperms and angiosperms:

Gymnosperms	Angiosperms
1. Plants bear naked seeds.	1. Plants bear seeds which develop inside the fruit.
2. Endosperm cells are haploid.	2. Endosperm cells are triploid.
3. Sporophylls aggregate to form cones.	3. Sporophylls aggregate to form flowers.
4. Examples: Pine, spruce, fir	4. Examples: Sunflower, oak, lily

8. The mass of the ball is $(m) = 400 \text{ g} = \frac{400}{1000} = 0.4 \text{ kg}$

The initial velocity of the ball is 12 m/s

i) Thus initial momentum $p = m \times u$

$$\therefore p = 0.4 \times 12 = 4.8 \text{ kg m/s.}$$

ii) \therefore the velocity of the ball at the highest point $(v) = 0$

The momentum at the highest point of its flight will be zero

OR

Assume that there is no external unbalanced force working in the horizontal direction.

The momentum of the girl and the cart before the jump is equal to the momentum of the girl and the cart after the jump. After the jump, the cart and girl travel with the same velocity v .

$$m_1 u_1 + m_2 u_2 = (m_1 + m_2) v$$

$$40 \times 5 + 0 = (40 + 3) \times v$$

$$\therefore v = \frac{200}{43} = 4.65 \text{ m/s}$$

9. Alloys are homogeneous mixtures of metals and cannot be separated into their components by physical methods. But still, an alloy is considered a mixture because it shows the properties of its constituents and can have variable composition. For example, brass is a mixture of approximately 30% zinc and 70% copper.

10. Factors for crop variety improvement:

- (a) Higher yield
- (b) Improved quality
- (c) Photo-sensitivity and thermo-sensitivity
- (d) Disease resistance
- (e) Pest resistance
- (f) Desirable agronomic characters

11.

- (a) Although *Echidna* and *Platypus* lay eggs, they are warm blooded and feed their young ones with milk. Hence, they are considered mammals.
- (b) In spite of a four-chambered heart, crocodile is a cold-blooded animal. Hence, it is considered a reptile.
- (c) Birds have pneumatic bones which make their body light for flight.

- 12.** Number of moles of iron present in 50 g of iron = $50/55.84 = 0.895$ moles

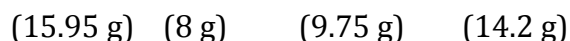
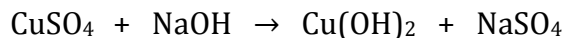
Number of moles of sodium present in 50 g of sodium = $50/23 = 2.17$ moles

Number of atoms present in 50 g of iron = $0.895 \times 6.022 \times 10^{23}$

Number of atoms present in 50 g of sodium = $2.17 \times 6.022 \times 10^{23}$

Thus, 50 g iron has less number of atoms and moles than 50 g sodium.

OR



Clearly, in this case,

Total mass of reactants = $(15.95 \text{ g} + 8 \text{ g}) = 23.95 \text{ g}$

Total mass of products = $(9.75 \text{ g} + 14.2 \text{ g}) = 23.95 \text{ g}$

Hence, the law of conservation of mass is valid here.

13.

When an object is wholly or partially immersed in a liquid, it experiences an upthrust which is equal to the weight of liquid displaced by the object.

Buoyant force acting on an object = weight of liquid displaced by that object

Example:

When the stone thrown in water displaces 20 N weight of water, water exerts 20 N buoyant force on the stone.

14. If the force is acting perpendicular to the direction of motion of a body, then the angle between displacement of the body and the force applied is 90° .

$$W = F \cos \theta \times s = F \cos 90^\circ \times s = 0$$

Hence, we say that even though the body is doing work against the frictional forces, the man does no work against gravity, as force of gravity acts vertically downwards and the angle between displacement of the suitcase and the force is 90° .

15.i) The speed-time graph is a straight line graph, which means that the speed changes in equal intervals of time. Thus, line OA represents uniform acceleration.

ii) We just saw that the graph OA represents acceleration. So, the slope of OA will give acceleration.

Acceleration = slope of OA

$$\therefore a = \frac{AB}{OB} = \frac{30 \text{ m/s}}{12 \text{ s}} = 2.5 \text{ m/s}^2$$

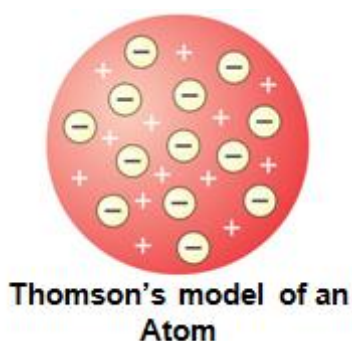
iii) the distance travelled = Area of ΔOAB

$$\begin{aligned} \therefore \text{distance travelled} &= \frac{1}{2} \times OC \times OB \\ &= \frac{1}{2} \times 30 \times 12 = 180 \text{ metres.} \end{aligned}$$

16.

According to Thomson's model of atom:

- (a) An atom consists of a positively charged sphere, and negatively charged electrons are embedded in it.
- (b) The negative and positive charges are equal in magnitude. Hence, the atom has no overall positive or negative charge.



Properties of Electrons

- An electron, denoted as e^- , is a fundamental particle with a negative charge.
- Its properties are independent of the gas in the discharge tube.
- Its charge is -1 .
- Mass of an electron is extremely small; it is $\frac{1}{1840}$ of the mass of a hydrogen atom (9.108×10^{-28} g). So, its mass is considered almost negligible. (Hydrogen is an atom of the lowest mass). Since the mass of a hydrogen atom is 1 u, we can say that the relative mass of an electron is $\frac{1}{1840}$ u.
- The absolute mass of an electron is 9×10^{-28} grams.
- Its charge is 1 unit negative charge, i.e. 1.602×10^{-19} coulombs.
- Tiny electrons revolve around the nucleus of the atom in specific orbits or shells.

OR

- (i) Chlorine atom (Cl) has atomic number 17.

It contains 17 protons and 17 electrons.

Chlorine ion (Cl^-) is formed when Cl gains one electron.

So, Cl^- has 18 electrons and 17 protons.

Therefore, the electronic configuration of Cl^- is 2, 8, 8.

- (ii) Atomic number of Cl^- = Number of protons = 17

Mass number of Cl^- will be the same as Cl, i.e. 35.

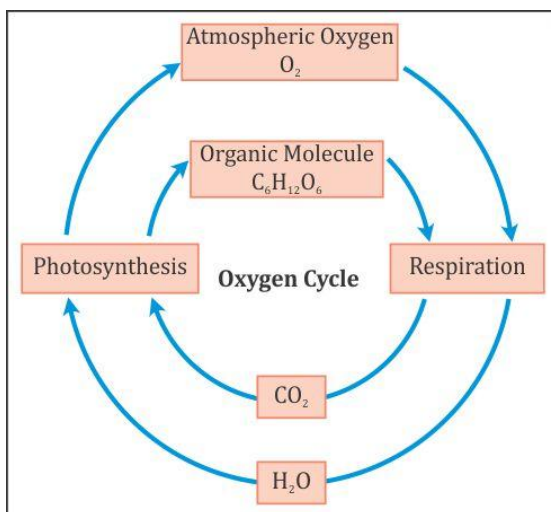
- (iii) Valency is the combining capacity of an atom.

For a non-metallic element, it is equal to eight minus the number of electrons present in the outermost shell.

Here, Cl^- has 8 electrons in the outermost shell; therefore, the valency of Cl^- is $8 - 8 = 0$.

17.

- (a) **Oxygen cycle:** Oxygen from the atmosphere is used up in combustion and respiration, and in the formation of oxides of nitrogen. It is returned to the atmosphere through photosynthesis.



- (b) Chlorofluorocarbons used as solvents, refrigerants, propellants and blowing agents for plastic foams are stable and persist in the atmosphere for years. These enter the upper layers of the atmosphere where with UV radiation they dissociate ozone into oxygen, thus depleting the ozone layer.

18.

- (i) Given that a force of 36 N is applied on a box of weight W .

Force applied to the box at an angle of 45° 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 $W = F \cos \theta \times s$

$$\therefore W = 36 \cos 45^\circ \times 30$$

$$\therefore W = 36 \times \frac{1}{\sqrt{2}} \times 30$$

$$W = 36 \times \frac{1}{1.414} \times 30$$

$$W = 36 \times 0.707 \times 30 = 763.5 \text{ Joules}$$

- (ii) When the inflated balloon with its untied mouth is released from the right side, it moves to the left side, i.e. in the opposite direction to that of the escaping air. The equal and opposite reaction of the right going air forces the balloon to the right side.

19.

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

$$a = \frac{v - u}{t}$$

- (ii) Initial velocity, $u = 10 \text{ m/s}$

Final velocity, $v = 30 \text{ m/s}$

Time, $t = 15 \text{ seconds}$

$$v = u + at$$

$$a = \frac{v - u}{t} = \frac{30 - 10}{15} = 1.33 \text{ m/s}^2$$

Acceleration of the train = 1.33 m/s^2

- (iii) When the velocity of the body goes on increasing, it is said to be experiencing positive acceleration. If the velocity of a body is decreasing, then it is called negative acceleration which is also called deceleration.

OR

We know that for a body moving in a circular path,

$$v = \frac{2\pi r}{t}$$

\therefore the velocity of body moving in the semi-circular path will be given by

$$v = \frac{\pi r}{t}$$

radius of circular track = $r = 150 \text{ metres}$.

$t = 50 \text{ seconds}$

$$v = 3.14 \times 150 \times \frac{1}{50} = 9.42 \text{ m/s}$$

if the cyclist start from rest the initial velocity is $(u) = 0$

$$v = u + at$$

$$\therefore 9.42 = 0 + a \times 50 = 0.18 \text{ m/s}^2$$

Thus the acceleration $a = 0.18 \text{ m/s}^2$

20.

- (a) 62 g of potassium nitrate is dissolved in 100 g of water to prepare a saturated solution at 313 K. So, 31 g of potassium nitrate should be dissolved in 50 g of water to prepare a saturated solution at 313 K.
- (b) Amount of potassium chloride which should be dissolved in water to make a saturated solution increases with temperature. Thus, as the solution cools, some of the crystals of potassium chloride will precipitate out of the solution.
- (c) Solubility of the salts at 293 K:
Potassium nitrate: 32 g
Sodium chloride: 36 g
Potassium chloride: 35 g
Ammonium chloride: 37 g
Ammonium chloride has the highest solubility at 293 K.
- (d) The rate of solubility of a salt increases with increase in temperature.

21.

- (a) Influenza
- (b) Influenza virus (*Myxovirus influenza*)
- (c) Preventive measures for influenza:
- Covering of mouth while coughing
 - Isolation of the flu patient
- (d) Vidhi showed awareness of the disease. She could identify that influenza is contagious and so advised her friend to sit separately. Also, she was caring and helpful and gave her friend the right advice.

Section B

22.A: Bird; B: Cockroach; C: Earthworm; D: Fish

(a) Cockroach belongs to Phylum Arthropoda.

(b) Striking features of Phylum Arthropoda:

- Jointed appendages
- Exoskeleton in the form of cuticle

23.

(a) The given specimen is of an edible mushroom *Agaricus*. It belongs to Kingdom Fungi.

(b) A → Pileus

B → Gills

C → Stipe

24.

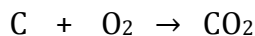
(i) Mixture of nitre and common salt: Fractional crystallisation

(ii) Mixture of camphor and salt: Sublimation

(iii) Mixture of alcohol and water: Fractional distillation

(iv) Cream from milk: Centrifugation

25. Carbon + Oxygen → CO₂



12 grams: 32 grams

3 : 8

Carbon and oxygen combine in the fixed ratio of 3:8 to produce 11 g of CO₂. So, even if the mass of oxygen available is 50 g, only 8 g of oxygen will react with 3 g of carbon.

So, out of 50 g, mass of oxygen reacted = 8 g

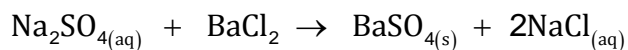
Mass of oxygen unreacted = 50 – 8 = 42 g

So, mass of carbon dioxide formed = 11 g

OR

Sodium sulphate reacts with barium chloride to form barium sulphate and sodium chloride solution.

Reaction equation:



Sodium	Barium	Barium	Sodium
sulphate	chloride	sulphate	chloride

26. The person can differentiate between the two sounds of a sitar and a guitar by a characteristic called quality or timbre. It is this characteristic which helps in differentiating the sound of the same pitch and loudness.

27. Mass of the solid (M) = 2kg = 2000g

Volume of the solid (V) = 500 cm³

Density of the solid = $\frac{M}{V} = \frac{2000}{500} = 4\text{g/cm}^3$