CBSE
Class IX Science
Sample Paper - 2

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. Name the bacterium responsible for denitrification in nature. (1)

2. Which method is the most effective for destroying insects in stored grains—spraying or fumigation? (1)

Section B

3. Explain any two factors affecting the value of g. (2)

OR

Can a body have mass but no weight? Give reasons.

4. How do cathode rays differ from anode rays? (2)

5. Why do we get a crunchy and granular feeling when we chew pears? (2)

Section C

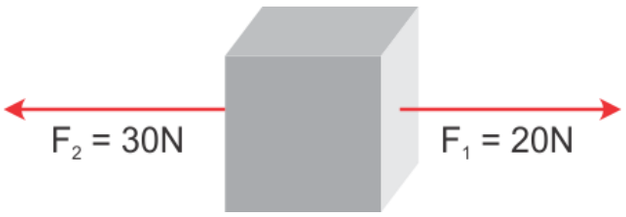
6. Name the following: (3)
(a) Cell organelle which synthesises proteins.
(b) Type of plastid which stores food.
(c) Site for ribosome formation.

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

OR

How are amphibians different from reptiles? List any three points of differences.

8. Two forces F_1 and F_2 act on an object as shown. (3)



(i) What is the net force acting on the object?
(ii) What is the direction of the net force acting on the object?
(iii) If the mass of the object is 10 kg, then what will be the acceleration produced in it?

9. Explain why the Tyndall effect can be observed when light passes through a canopy of a dense forest. (3)

10. Explain the advantages and disadvantages of mixed cropping. (3)

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

12. Calculate the number of atoms in 125 g of calcium and 130 g of iron. Which one has more number of atoms and how much is the difference? (3)
(Given atomic mass of calcium = 40 μ, iron = 56 μ)

OR

In a reaction, 5.6 g of sodium carbonate reacted with 7 g of ethanoic acid. The products were 2.8 g of carbon dioxide, 0.7 g of water and some sodium ethanoate. What is the expected weight of sodium ethanoate?

13. A man gets into a boat floating in water. (3)

(i) What happens to the boat?

(ii) What happens to the weight of water displaced by the submerged part of the boat?

(iii) Does the buoyant force acting on the boat increase or decrease? Justify your answer.

14. Rohini's mother squeezes water from wet clothes in the spinner of the washing machine and then uses this water to clean the floor. (3)

(a) Write the principle of the technique used in the above process.

(b) Write another application of this technique.

(c) What value do you learn from Rohini's mother?

15. An object of mass 20 kg is dropped from a height 'h' metres as shown in the tables. ($g = 10\ m/s^2$) (3)

Table A

Height from which an object is dropped 'h' (m)	**Velocity of an object falling from the height 'v^2' (m/s^2)**
10	0
2	80

Table B

Height from which an object is dropped 'h' (m)	**Velocity of an object falling from the height 'v^2' (m/s^2)**
10	0
2	40

Which of the above tables has wrong data in terms of the law of conservation of energy of an object falling from height 'h' metres?

OR

A ball thrown vertically upwards returns to the thrower after 6 s. Find

(a) The velocity with which it was thrown up.

(b) The maximum height it reaches.

Its position after 4 s.

16. (5)

(a) Mention the postulates of Bohr's theory.

(b) What are the failures of Thomson's atomic model?

OR

(a) Why do $^{35}_{17}Cl$ and $^{37}_{17}Cl$ have the same chemical properties? In what respect do these atom differ?

(b) Explain: Actual atomic mass is greater than mass number.

17. (5)

(a) With the help of a neat and labelled diagram show the cycling of carbon 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 50 N at an angle of 60° above the horizontal. How much work is done by applying force in pulling the box to a distance of 6 m?

(ii) Two spheres of the same size but of different materials, rubber and iron, are kept on the smooth floor of a moving train. The driver suddenly applies brakes and the train stops. Will the spheres start rolling? If so, in which direction? Will they move with the same speed? Give reasons for your answer.

19. (5)

(i) What is retardation? Write its formula. Give an example where it acts on a body.

(ii) A train starting from rest attained a velocity of 30 m/s in 30 minutes. What is its acceleration?

(iii) What is the distance travelled during this time?

OR

A train travels the first 10 km at a uniform speed of 25 km/h; the next 70 km at a uniform speed of 35 km/h and the final 20 km at a uniform speed of 20 km/h. What is the average speed attained by the train over the entire journey?

20. 100 ml of water at room temperature of 25°C is taken in a beaker and a little of solid S is dissolved in it by stirring to obtain a solution X. More of solid S is added to the solution with constant stirring while keeping the temperature of the solution constant at 30°C. After some time, it is observed that no more solid dissolves in water, and at the same time, some solid is also left undissolved at the bottom of the beaker. The contents of the beaker are filtered through a filter paper to obtain solution Y in the form of a filtrate. (5)

(a) What is a solution like X called?

(b) What is a solution like Y called?

(c) What will you observe if the solution Y at 30°C is cooled down to 10°C by keeping the beaker in crushed ice? Why?

(d) What term is used to denote the solid dissolved in 100 grams of water in a solution like Y?

21. (a) It was diagnosed that Kiran has hepatitis. (5)

(i) Which organ of Kiran's body is affected?

(ii) How are antibiotics effective in the treatment of some diseases?

(iii) Will they help in curing Kiran's disease? Why?

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

OR

(a) What is coelom? State its significance.

(b) Pick out the organisms which have a pseudocoelom from the following: earthworm, pinworm, tapeworm and roundworm.

(c) What is peculiar about the coelom of Arthropods? What is such a condition called? Explain.

(d) To which phylum of Animalia do octopus, pila, chiton and unio belong? Comment on their coelom.

Section E

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

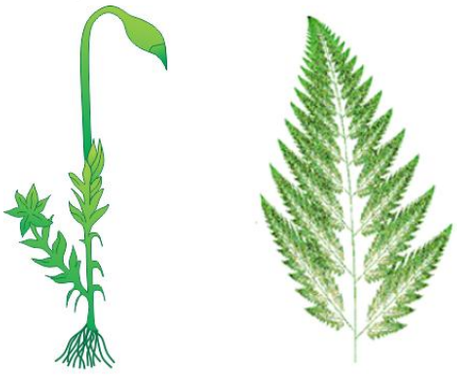
(a) To which phylum does earthworm belong?

(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 microscope.

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

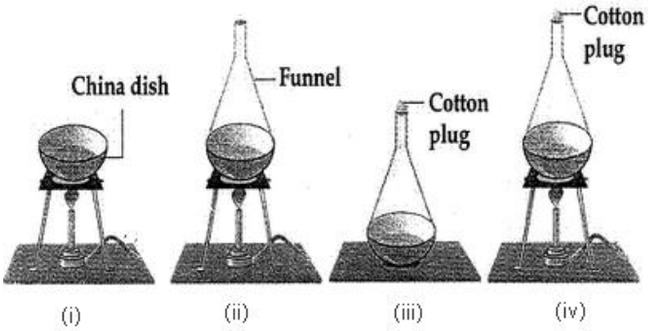


A B

(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. Which is the correct setup for sublimation and why? (2)



OR

While separating the components of a mixture of sand, camphor and common salt, Mohan added water to the mixture in a beaker and stirred it well. Which component will dissolve in water? Suggest the method for separation of the other two components.

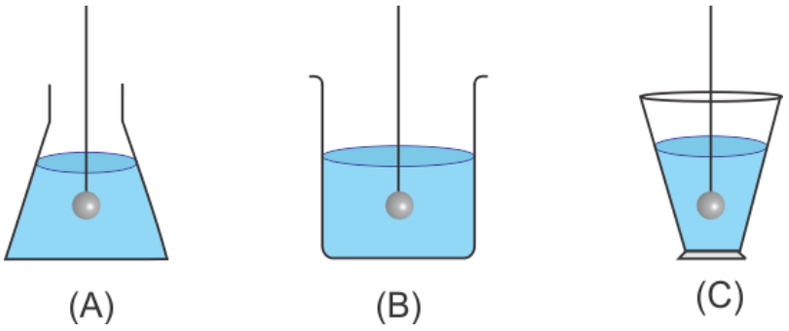
25. In an experiment, 18.5 g of copper sulphate reacted with 11.0 g of sodium hydroxide to form 10.0 g of copper hydroxide and 19.5 g of sodium sulphate. Which law of chemical combination is illustrated by this data? Give reason for your choice. (2)

26. While verifying the laws of reflection of sound, a student measured the angle between the incident sound wave and reflected sound wave as 100°. What will be the angle of reflection? (2)

OR

By which method is sound produced in musical instruments like *sitar*, flute and *tabla*?

27. A solid is weighed in air using a spring balance. It is then weighed by immersing it fully in water in each of three vessels containing water as shown. What will be the apparent weight of the solid? (2)



(A) (B) (C)

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Section A

1. *Pseudomonas*

2. Fumigation is the most effective method for destroying insects in stored grains.

Section B

3. Factors which affect the value of g: (any two)

(i) Shape of the Earth: The Earth is not perfectly spherical. It is slightly flattened at the poles and bulgy towards the equator. The value of g is maximum (9.83 m/s^2) at the poles as the polar radius is minimum, while it is minimum (9.78 m/s^2) at the equator as the equatorial radius is maximum.

(ii) Altitude: As the height (h) above the Earth's surface increases, the value of g decreases. It varies by a value of $\frac{1}{(R+h)^2}$, where R is the radius of the Earth.

(iii) Depth: In the interior of the Earth, on an average, the value of g is less than that at the Earth's surface. As the depth below the Earth's surface increases, the value of g decreases, and finally, it becomes zero at the centre of the Earth.

OR

(i) Mass is the amount of matter contained in a body. So, it can never be zero.

(ii) Weight is the force with which the body is attracted towards the centre of the Earth.

(iii) Mathematically, weight is the product of mass (m) and acceleration due to gravity (g). At the centre of the Earth, g is zero.

(iv) Hence, weight is zero. This shows that a body can have mass but no weight.

4.

Cathode rays	Anode rays
These rays travel from the cathode to the anode.	These rays travel from the anode to the cathode.
They are made of negatively charged particles.	They are made of positively charged particles.
They produce a greenish yellow fluorescence on a soda-glass screen.	They produce fluorescence on a zinc sulphide screen.
They are affected by an electric field, i.e. they are inflected towards a positive field and deflected towards a negative field.	They are deflected by electric and magnetic fields but in a direction opposite to that of cathode rays.

5.

(a) Pear consists of sclereids or stone cells.

(b) They form the gritty part of most ripe fruits and contribute hardness to the seed coat and nutshell.

(c) Therefore, when we chew a pear, we get a crunchy and granular feeling due to the presence of sclereids.

Section C

6.

(a) Ribosome

(b) Leucoplast

(c) Nucleolus

7.

(a) Arthropoda: Jointed legs or appendages

(b) Annelida: Metamerically segmented body

(c) Porifera: Body perforated with numerous pores

OR

Differences between amphibians and reptiles:

Amphibians	Reptiles
1. Skin is glandular, smooth and moist.	1. Skin is non-glandular, dry and keratinised.
2. Have a three-chambered heart.	2. Have an incomplete four-chambered heart.
3. Fertilisation is external.	3. Fertilisation is internal.
4. Examples: Frog, toad	4. Examples: Snake, lizard

8.

(i) Net force $F = F_2 - F_1 = 30 - 20 = 10$ N

(ii) Net force acts along the direction of F_2.

(iii) Acceleration F = ma

$$\rightarrow a = \frac{10}{10} = 1\ ms^{-2}$$

9. There are colloidal particles of mist in the forest.

When light passes through the canopy of the forest, these colloidal particles are scattered and we observe the Tyndall effect.

Smoke and milk also show the Tyndall effect.

10. Advantages of mixed cropping:

(a) Risk of total crop failure because of an uncertain monsoon is reduced.
(b) Yield of crops is increased because of the complementary effect of component crops.
(c) Soil fertility is improved by growing two crops simultaneously.
(d) Chances of pest infection are greatly reduced.

Disadvantages of mixed cropping:

(a) There is a difficulty in fertiliser application and spraying of pesticides to individual crops.
(b) Separate harvesting and threshing of crops is not possible.
(c) Marketing and consumption of only mixed produce are possible.

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 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 both resemble each other and swim in water, whales cannot be grouped with fish.
(g) Whales belong to Class Mammalia, whiles fish are included in Class Pisces.

12. 1 mole of Ca = 40 g

No. of atoms of calcium = no. of moles × 6.022×10^{23}

= (Given Mass/Molar Mass) × 6.022×10^{23}

= $(125/40) \times 6.022 \times 10^{23}$

= 1.88×10^{24} atoms

No. of atoms of iron = (Given Mass/Molar Mass) × 6.022×10^{23}

= $(130/56) \times 6.022 \times 10^{23}$

= 1.39×10^{24} atoms

Calcium has more number of atoms.

Difference in number of atoms = $1.88 \times 10^{24} - 1.39 \times 10^{24}$

= $10^{24}(1.88 - 1.39)$

= 0.49×10^{24}

= 4.9×10^{23} atoms

OR

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

5.6 g + 7.0 g = x + 2.8 + 0.7 g

x = 12.6 − 3.5 = 9.1 g

13.

(i) The boat floats lower in water, that is, it sinks a little more in water.

(ii) Weight of water displaced by the submerged part of the boat increases.

(iii) Because of the greater weight of water displaced, the buoyant force acting on the boat increases. This greater buoyant force enables the extra weight of the man in the boat.

14.

(a) The centrifugation technique is used in the process.

(b) The same technique is used to extract cream from milk.

(c) Rohini's mother teaches us the value of saving water.

15. <u>Table A</u>

Height from which an object is dropped 'h' (m)	**Velocity of an object falling from the height 'v²' (m/s²)**	**Potential energy mgh (J)**	**Kinetic energy ½mv² (J)**	**TE = PE + KE**
10	0	20 × 10 ×10 = 2000	½ × 20 × 0 = 0	2000
2	80	20 × 10 ×2 = 400	½ × 20 × 80 = 800	1200

<u>Table B</u>

Height from which an object is dropped 'h' (m)	**Velocity of an object falling from the height 'v²' (m/s²)**	**Potential energy mgh (J)**	**Kinetic energy ½mv² (J)**	**TE = PE + KE**
10	0	20 × 10 ×10 = 2000	½ × 20 × 0 = 0	2000
2	40	20 × 10 ×2 = 400	½ × 20 × 40 = 400	800

According to the law of conservation of energy, the sum of potential energy and kinetic energy of the object should remain the same at every point during its fall.

OR

Time of ascent = Time of descent = 6/2 = 3 s

(a) $v = 0, a = -g = -9.8\ m/s^2$

According to the first equation of motion, we have

$$v = u + at$$

$$0 = u - 9.8 \times 3$$

$$u = 29.4\ m/s$$

Hence, the ball was thrown up with a speed of 29.4 m/s.

(b) According to the second equation of motion, we have

$$v^2 = u^2 + 2as$$

$$0 = 29.4^2 - 2 \times 9.8 \times h$$

$$h = \frac{29.4^2}{19.6} = 44.1\ m$$

Hence, the ball reaches a maximum height of 44.1 m.

(c) After the first three seconds, the ball is moving downwards.

Hence, 4 s after launch means 1 s after reaching the maximum height.

Thus, according to the third equation of motion, we have

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

$$h = 0 + \frac{1}{2} \times 9.8 \times 1^2$$

$$h = 4.9\ m$$

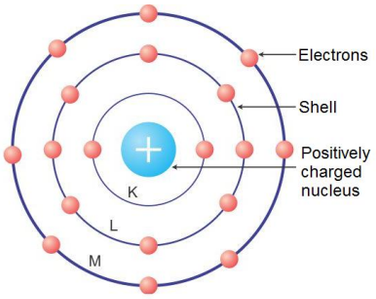
Hence, its position after 4 s is 44.1 – 4.9 = 39.2 m from the ground.

Section D

16.

(a) Niels Bohr revised Rutherford's atomic model and put forth the following suggestions:

- Niels Bohr proposed that the electrons possess a specific amount of energy which allows them to revolve around the nucleus.
- An atom contains discrete orbits which correspond to specific amount of energy. Hence, these orbits are also known as energy levels.
- Energy levels of an atom are represented as **K, L, M, N** and so on or the numbers n = **1, 2, 3, 4** and so on.



Niels Bohr's Atomic Model

- The electrons are confined to these energy levels. While revolving in these discrete orbits, the electrons do not radiate energy. Hence, these orbits are also known as **stationary orbits** or **stationary shells**. Smaller the size of the orbit, smaller is its energy.
- As we move away from the nucleus, the energy of the orbit increases progressively.
- The transfer of an electron from one orbit to another is always accompanied with the absorption or emission of energy.
- When an electron jumps from a lower energy level to a higher energy level, it **absorbs energy**.
- When an electron returns from a higher energy level to a lower energy level, it **emits energy**.

(b) Failures of Thomson's atomic model:

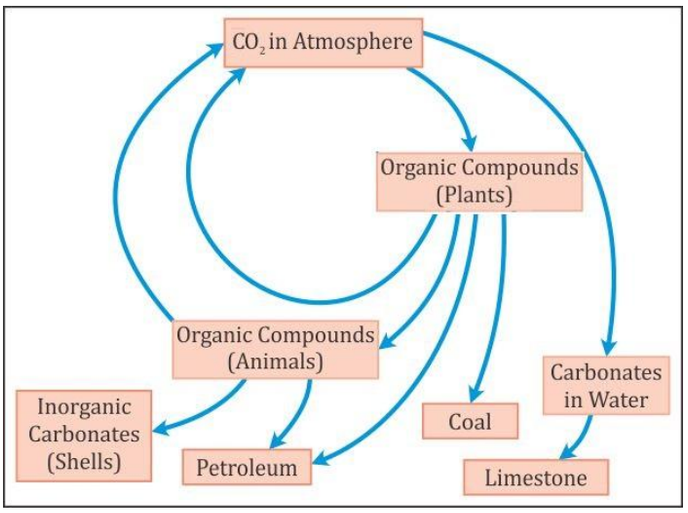
- Although Thomson's atomic model explained why an atom is electrically neutral, it could not explain the distribution of electrons in the atom.
- If we accept that electrons are embedded in the positive charge, then the opposite electric charges should cancel each other out and the charged sphere would become chargeless.
- Thomson's model could not explain why different elements have different chemical properties.

OR

(a) Only electrons take part in chemical reactions. Chemical properties depend on the electronic configuration. Isotopes of the element Cl $^{35}_{17}Cl$ and $^{37}_{17}Cl$ have the same atomic number, and hence, the same configuration. So, they have the same chemical properties. These differ only in physical contents and weights because neutrons contribute to the mass of an atom. $^{35}_{17}Cl$ and $^{37}_{17}Cl$ have different number of neutrons 18 and 20, respectively.

(b) Actual atomic mass is greater than the mass number because the mass number is a whole number approximation of atomic mass unit. In fact, neutrons are slightly heavier than protons, and an atom has over 200 subatomic particles.

17. (a) Carbon cycle



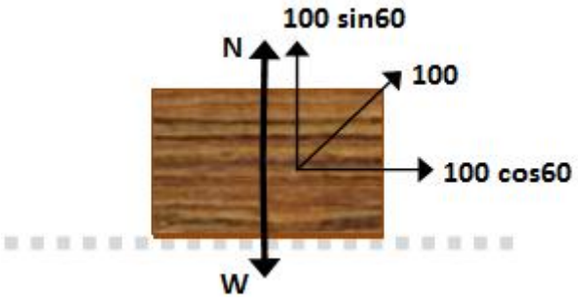
(b) <u>Two modes of carbon dioxide fixation:</u>

(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 50 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 $W = F\cos\theta \times s$

$\therefore W = 50 \cos 60° \times 6$

$\therefore W = 50 \times 0.5 \times 6$

$W = 150$ J

(ii) Yes. The two spheres will start rolling in the direction in which the train was moving. Due to the application of the brakes, the train comes to rest, but due to inertia, the spheres try to remain in motion; so, they begin to roll. Because the masses of the spheres are not the same, the inertial forces are also not the same on both. Thus, the spheres will move with different speeds.

19.

(i) Retardation is a decrease in acceleration. This means that retardation is the rate of decrease in velocity. A positive sign of the magnitude of acceleration shows increase in velocity and a negative sign shows decrease in velocity.

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

Example: When the brakes are applied to a moving bicycle, there is retardation in its motion.

(ii) Initial velocity, u = 0 m/s

Final velocity, v = 30 m/s

Time, t = 30 minutes = 30 × 60 s = 1800 s

$v = u + at$

$a = \frac{v - u}{t} = \frac{30 - 0}{1800} = 0.016 \text{ m/s}^2$

Acceleration of the train = 0.016 m/s^2

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

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

$s = 0 + \frac{1}{2} \times 0.016 \times (1800)^2$

$s = \frac{1}{2} \times 51840 = 25920 \text{ m} = 25.92 \text{ km}$

OR

Total distance travelled by the train, d = 10 + 70 + 20 = 100 km

For the first 10 km journey:

Speed is 25 km/h.

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

$\therefore 25 = \frac{10}{t_1}$

$\therefore t_1 = \frac{10}{25} = 0.4 \text{ h}$

For the second 70 km journey:

Speed is 35 km/h.

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

$\therefore 35 = \frac{70}{t_2}$

$\therefore t_2 = \frac{70}{35} = 2 \text{ h}$

For the final 20 km journey:

Speed is 20 km/h.

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

$$\therefore 20 = \frac{20}{t_3}$$

$$\therefore t_3 = \frac{20}{20} = 1 \text{ h}$$

Hence, the total time taken by the train is

$$t = t_1 + t_2 + t_3$$

$$\therefore t = 0.4 + 2 + 1$$

$$\therefore t = 3.4 \text{ h}$$

Therefore, the average speed of the train is

$$\text{Average speed} = \frac{\text{Total distance travelled}}{\text{Total time taken}}$$

$$\therefore v_{av} = \frac{100}{3.4} = 29.1 \text{ km/h}$$

20.

(a) Solution like X is known as an unsaturated solution.

(b) Solution like Y is known as a saturated solution.

(c) If solution Y at 30°C is cooled down to 10°C by keeping the beaker in crushed ice, then some of the dissolved solid will separate out from the solution and settle at the bottom of the beaker as crystals. This is because the solubility of solid decreases on cooling.

(d) Solubility is the term used to denote the amount of solid dissolved in 100 gram of water in a solution.

21. (a)

(i) Liver

(ii) Antibiotics block the chemical pathways of bacteria such as synthesis of the cell wall and proteins, thereby killing the bacteria.

(iii) No, antibiotics will not help in curing Kiran's disease because hepatitis is a viral disease, while antibiotics are effective against bacteria.

(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 the disease is slow.

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

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

(a) The coelom is a fluid-filled cavity formed within the mesoderm of some animals.
(b) Pinworms and round worms.
(c)In Arthropods, the coelomic cavity is filled with blood. Such a condition is called haemocoel.
(d) In Mollusca, the body cavity is the haemocoel. The true coelom is reduced and restricted to the pericardial cavity and the lumen of the gonads and nephridia.

Section E

22.

(a) Earthworm belongs to Phylum Annelida.
(b) A prominent band called clitellum on the 14^{th}, 15^{th} and 16^{th} segments of 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. The last apparatus is the correct setup for sublimation. It has a flask, burner, wire gauze, China dish and cotton plug.

OR

Common salt will dissolve in water and can be separated by evaporation.
The remaining two components, sand and camphor, are separated by sublimation.
Camphor evaporates and settles at the top of the funnel and can then be scrapped off.

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. According to the law of reflection of sound, the angle of the incident sound wave is equal to the angle of the reflected sound wave.

$\rightarrow \angle i = \angle r$

Given that $i + r = 100$

or $2i = 100$

$\therefore \angle i = 50 = \angle r$

OR

In a sitar, sound is produced because of vibrating strings.

In a flute, sound is produced because of a vibrating air column.

In a tabla, sound is produced because of a vibrating membrane.

27. Apparent weight does not depend on the shape of the vessel. It depends on the liquid used. Thus, the apparent weight of the solid will be equal in all the three beakers.