CBSE
Class IX Science
Sample Paper – 9 Solution

Section A

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

2.

Macronutrients: Nitrogen, phosphorus (any one)
Micronutrients: Iron, manganese (any one)

3. Noble gases such as helium, neon, argon and krypton are chemically unreactive and exist in the free state as single atoms, i.e. they have one atom each in their molecules. Examples: He, Ne, Ar and Kr. So, the atomicity of noble gases is 1.

OR

i. Ammonium sulphate: $(NH_4)_2SO_4$
ii. Magnesium carbonate: $MgCO_3$

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.

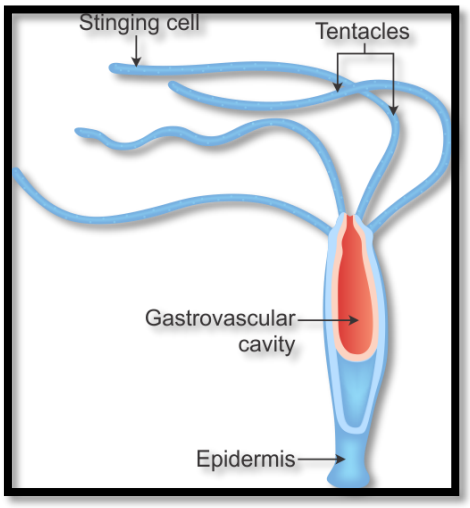
(a) Collenchyma, a mechanical tissue, provides mechanical support and elasticity.
(b) It provides tensile strength with flexibility to plant parts such as the stem, branches and leaves which allow their easy bending without breaking them.
(c) Therefore, branches of a tree are able to move and bend freely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

Section C

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 g= $\frac{400}{1000} = 0.4kg$

The initial velocity of the ball is 12 m/s

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

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

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

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

OR

Assuming 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.

$$m_1u_1 + m_2u_2 = (m_1 + m_2)v$$

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

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

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) Despite a four-chambered heart, the 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 × 6.022 × 1023

Number of atoms present in 50 g of sodium = 2.17 × 6.022 ×1023

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

OR

$CuSO_4$ + NaOH → $Cu(OH)_2$ + $NaSO_4$

(15.95 g) (8 g) (9.75 g) (14.2 g)

Clearly, in this case,

Total mass of reactants = (15.95 g + 8 g) = 23.95 g

Total mass of products = (9.75 g + 14.2 g) = 23.95 g

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

13.

(a) Difference between Evaporation and Boiling

Evaporation	Boiling
It is a surface phenomenon.	It is a bulk phenomenon.
It is a slow process.	It is a rapid process.
It takes place at all temperatures but below the boiling point.	It takes place at a definite and constant temperature.

(b) The four factors affecting the rate of evaporation are:

- Surface area: Evaporation is a surface phenomenon. If the surface area is increased, the rate of evaporation increases.
- Temperature: With the increase of temperature, more number of particles gets enough kinetic energy to go into the vapour state and hence the rate of evaporation increases.
- Humidity: If the humidity of air is high, then the rate of evaporation decreases.
- Wind speed: With the increase in wind speed, the particles of water vapour move away with the wind, decreasing the amount of water vapour in the surroundings hence the rate of evaporation increases.

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°.

$W = F \cos \theta \times s = F \cos 90° \times s = 0$

Hence, we say that even though the body is doing work against the frictional forces, the man does no work against gravity, as the 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

$\therefore$ distance travelled $= \frac{1}{2} \times OC \times OB$

$= \frac{1}{2} \times 30 \times 12 = 180$ metres.

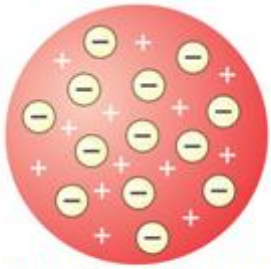
Section D

16.

According to Thomson's model of an 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.



Thomson's model of an Atom

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

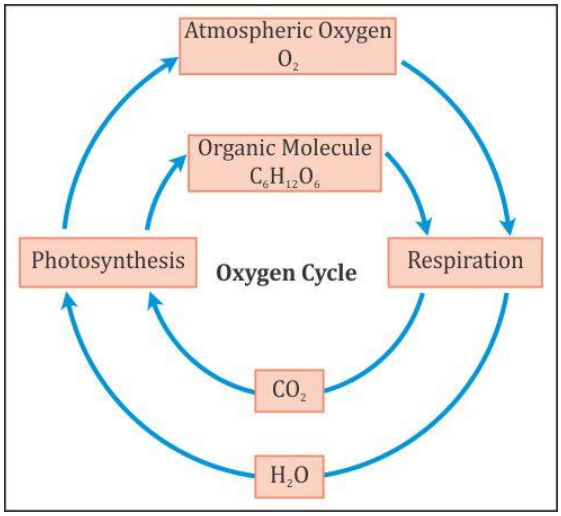
(i) Chlorine atom (Cl) has atomic number 17.
It contains 17 protons and 17 electrons.
Chlorine ion (Cl^-) is formed when Cl gains one electron.
So, Cl^- has 18 electrons and 17 protons.
Therefore, the electronic configuration of Cl^- is 2, 8, 8.

(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.



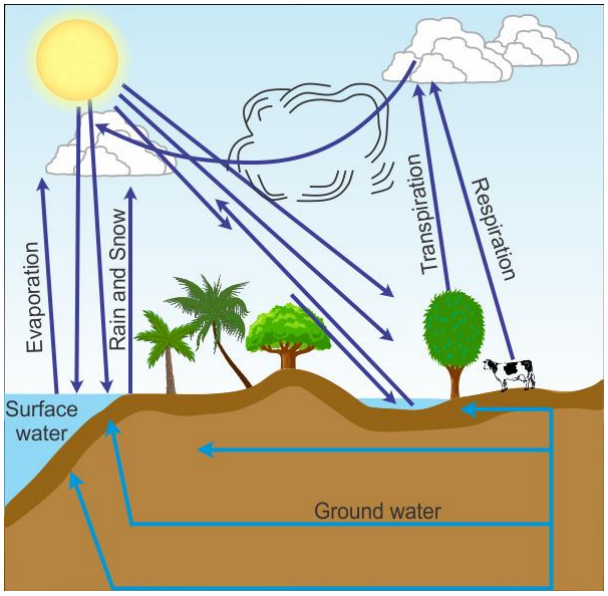
(b) Chlorofluorocarbons used as solvents, refrigerants, propellants and blowing agents for plastic foams are stable and persist in the atmosphere for years. These enter the upper layers of the atmosphere where with UV radiation they dissociate ozone into oxygen, thus depleting the ozone layer.

OR

(a) <u>Consequences of global warming:</u>

- Rise in temperature
- Melting of glacier

(b) <u>Water cycle in nature:</u>



(c) All life processes require water. Water is required for the transportation of substances from one part of the body to the other in the dissolved form. Therefore, water is essential for life.

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 $W = F \cos\theta \times s$
$\therefore W = 36 \cos 45° \times 30$

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

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

$W = 36 \times 0.707 \times 30 = 763.5$ 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 m/s
Final velocity, v = 30 m/s
Time, t = 15 seconds
v = u + at

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

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 or 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 metres.

t = 50 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

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

Thus the acceleration a= 0.18 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 E

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

OR

(a) *Spirogyra* shows the following features:
- Filamentous, unbranched, multicellular and thread-like structure.
- Presence of a large nucleus suspended in the centre of the cell by a number of cytoplasmic strands.

(b) The filament of *Spirogyra* bears chloroplasts which have small, round bodies called pyrenoids which store food.

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

OR

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

$$Na_2SO_{4(aq)} + BaCl_2 \rightarrow BaSO_{4(s)} + 2NaCl_{(aq)}$$

Sodium sulphate — Barium chloride — Barium sulphate — Sodium chloride

25. Carbon + Oxygen → CO_2

$C + O_2 \rightarrow CO_2$

12 grams: 32 grams

3 : 8

Carbon and oxygen combine in the fixed ratio of 3:8 to produce 11 g of CO_2. 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

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.

OR

(i) Soft and porous-like materials act like good absorbers of sound.

(ii) By using these materials, reverberations (or unwanted echoes) can be avoided.

27. Mass of the solid (M) = 2 kg = 2000 g
Volume of the solid (V) = 500 cm^3
Density of the solid = $\frac{M}{V} = \frac{2000}{500} = 4\ g/cm^3$