Class IX Science
Sample Paper - 15

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. Define eutrophication. (1)

2. What are the components of cattle feed? (1)

Section B

3. Explain the law of constant proportion by taking ammonia as an example.

OR

Give an example each of a monatomic, diatomic and polyatomic element.

4. The distance of the gunman from a cliff is 560 metres. How much time will he take to hear an echo of the gunshot fired by him? (Speed of sound = 340 m/s) (2)

5. Why do animals in colder regions have a thicker layer of subcutaneous fat on their body?

Section C

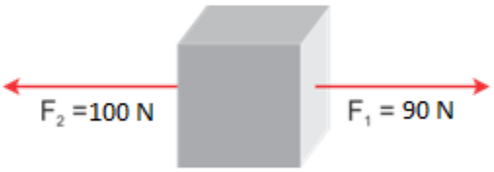
6. Name the following: (3)
(a) Suicidal bag of the cell
(b) Transporting channel of the cell
(c) Brain of the cell

7. Identify the phyla based on the characteristics stated below. (3)
(a) Jointed appendages
(b) Locomotion by setae
(c) Body perforated with numerous pores

OR

How are bony fish different from cartilaginous fish? List any three points of differences.

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



(i) What must be the force added to F_2 or F_1 so as to make the net force the balanced force?
(ii) How much force is required to be exceeded on F_1 so that the net force will act along the direction of F_1?
(iii) After exceeding the force F_1 as per the condition mentioned in question (ii) and if the mass of the object is 10 kg, what will be the acceleration produced in it?

9. State the law of reflection of sound. (3)

OR

What are reverberations? Which type of material should be used to avoid reverberations? Give two examples of these materials.

10. What is the need of crop improvement? What are the desirable agronomic characteristics for crop improvement? (3)

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

12. Calculate the number of molecules of sulphur (S_8) present in 16 g of solid sulphur. (3)
(Atomic weight of sulphur = 32 g)

OR

State the number of atoms present in each of the following chemical species:

(a) CO_3^{2-}

(b) PO_4^{3-}

(c) P_2O_5

(d) CO

13. When do we use the process of centrifugation? State the principle involved in this process. List any two of its applications in daily life.

14. Harsh and Jay were performing an activity in the chemistry lab of their school. They add a solution of barium chloride to the sulphuric acid taken in the test tube. Harsh suggested that as they already knew the amount of both compounds taken by them, they need not measure the amount of the final solution. On the contrary, Jay insisted on measuring the amount of the final solution, which had barium sulphate and hydrochloric acid.
Atomic mass of ions:
Ba^{2+} = 137 units, Cl^- = 35.5 units, H^+ = 1 unit, S^{2-} = 32 units, O^{2-} = 16 units
Determine the molecular mass of
a) Barium chloride
b) Barium sulphate
c) Hydrochloric acid
d) Sulphuric acid
Comment on Jay's insistence to complete the activity.

15. When thrown vertically downwards, a box covers a distance of 30 m. Find the initial velocity of the box, time taken by it to reach the ground and its final velocity. (g = 10 m/s^2) (3)

Section D

16. An atom contains 20 protons, 20 electrons and 20 neutrons. Mention the following details of that atom: (5)

(a) Atomic number

(b) Mass number

(c) Electronic configuration

(d) Valency

OR

Compare the characteristics of an electron, proton and neutron. (5)

17. (5)

(a) What is the role of photosynthesis in plants to maintain the biogeochemical cycle?

(b) The nitrogen cycle is called a perfect cycle in nature. Explain.

18. (5)

(i) A girl weighing 300 N climbs a vertical ladder. Calculate the work done by her after climbing 3 m.($g = 10\ m/s^2$)

(ii) Name the effect of force which occurs when

a) A moving ball is hit by a bat

b) A dough ball is pressed by a rolling pin (*belan)*

c) Breaks are suddenly applied to a moving car

19. (5)

(i) What is retardation also called? Why is it called so? State whether it is a scalar or vector quantity.

(ii) The speed of a bike decreases from 40 m/s to 30 m/s in 5 seconds. Calculate the acceleration of the bike.

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

OR

A car travels the first 40 km at a speed of 30 km/h, the next 60 km at 36 km/h and the final 80 km at 40 km/h. What is the average speed attained by the car over the entire journey?

20. List three characteristics of particles of matter. Describe one example for each characteristic to illustrate it.

Name the characteristics which are responsible for

(a) spreading of smell of scent in a room

(b) water taking the shape of the vessel in which it is poured (5)

21. Give reasons: (5)

(a) Majority of children in many parts of India are already immune to Hepatitis A.

(b) Chronic diseases cause more harm to the body than acute diseases.

(c) A balanced diet is necessary for maintaining a healthy body.

(d) Social harmony and good economic conditions are necessary for good health.

(e) Infectious diseases are called communicable diseases.

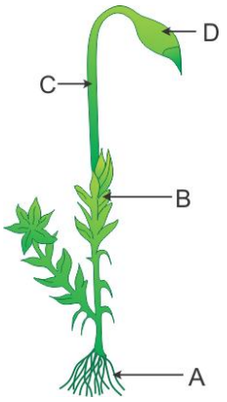
OR

(a) List any six characteristics of parenchyma tissue.

(b) Compare the three types of epithelial tissues. (any two parameters)

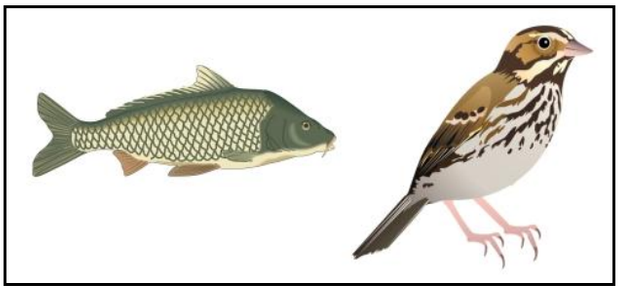
Section E

22. Observe the figure carefully. (2)



(a) Which plant is shown in the figure? Write its classification.
(b) Identify the parts A, B, C and D.

23. Observe this picture of a fish and a bird. (2)

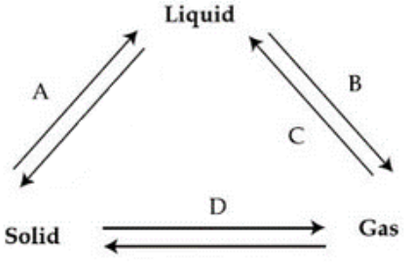


(a) Which striking feature enables both of them to be placed in the same phylum?
(b) List any one important adaptation in case of birds and fish.

OR

Give any two features to categorise a plant into monocot or dicot.

24. A mixture consists of an insoluble substance P and a soluble substance Q. The mixture is dissolved in water and filtered. What does the collected filtrate contain? (2)



25. Explain what is observed when a strong beam of light is focused on a colloidal solution of starch in water. State your observation on light. (2)

OR

Can the two components of a mixture that are soluble in water be separated by any technique? Justify.

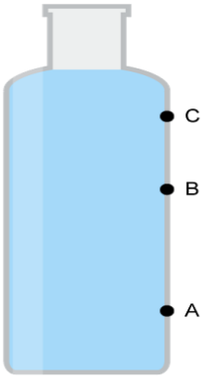
26. Time taken by ultrasonic sound to reach the seabed and return to a SONAR receiver is 3 seconds. At some point the engineer notes that the time of ultrasound reaching the receiver is 2 seconds. What does this situation mean? Calculate the depth from which the obstacle reaches the receiver at 2 s. (Speed of sound in water = 1500 m/s)

(2)

OR

Which of the following instruments produces sound due to vibrating membranes?
i) Sitar
ii) Drum
iii) Flute
iv) *Tabla*
v) Guitar

27. Three pinholes A, B and C are made in a plastic bottle. At which of the three holes is the pressure of the liquid the lowest? Give reason for the same.



CBSE
Class IX Science
Sample Paper –15 Solution

Section A

1. The excessive richness of nutrients in a lake or other body of water, frequently due to runoff from the land, which causes a dense growth of plant life and death of animal life from lack of oxygen is called eutrophication.

2. Cattle feed contains two types of substances—roughage and concentrates—in the form of fodder and grain along with a lot of water.

Section B

3. In a pure chemical compound, elements are always present in a definite proportion by mass. For example, in ammonia, nitrogen and hydrogen are always present in the ratio 14:3 by mass, whatever the method or source from which it is obtained.

OR

Monoatomic elements: Carbon, Helium
Diatomic elements: Hydrogen, Oxygen
Polyatomic elements: Sulphur, Phosphorus

4. Here, the speed of sound, v = 340 m; d = 560 m
Since the total distance covered by sound is two times the distance between the gunman and the cliff d, we have

$d = \frac{v \times t}{2}$

$t = \frac{560 \times 2}{340} = 3.29$ s

5.

- In animals, subcutaneous fat functions as an insulating layer which prevents heat loss from the body in the cold environment.
- So, animals in colder regions possess a thicker layer of adipose tissue to insulate their body against the extreme cold.
- Fat also acts as a source of reserve food during periods of food scarcity.

Section C

6.

(a) Lysosome
(b) Endoplasmic reticulum
(c) Nucleus

7.

(a) Jointed appendages: Phylum Arthropoda
(b) Locomotion by setae: Phylum Annelida
(c) Body perforated with numerous pores: Phylum Porifera

OR

Differences between bony fish and cartilaginous fish:

Bony fish	Cartilaginous fish
1. Bony endoskeleton	1. Cartilaginous endoskeleton
2. Contain four pairs of gill slits	2. Contain five–seven pairs of gill slits
3. Mouth is terminal	3. Mouth is ventral
4. Caudal fin is homocercal	4. Caudal fin is heterocercal
5. Air bladder is present	5. Air bladder is absent
6. Examples: Sea horse, carp	6. Examples: Electric ray, sting ray

8.

(i) To make the net force a balanced force, 10 N must be added to F_1.
90 N + 10 N = 100 N

(ii) To move the object along the direction of F_1, it has to be exceeded by 20 N so that it becomes greater than F_2. So now F_1 becomes 110 N.

(iii) After carrying out the condition given in question (ii),
F = 110 N
So, net force = F = $F_1 - F_2$ = 110 N − 100 N = 10 N.
Acceleration F = ma
$\rightarrow F = 10\ N$

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

9.

Laws of reflection:
i) The incident wave, reflected wave and normal all lie in the same plane.
ii) The angle of incidence is always equal to the angle of reflection.

OR

(i) The persistence of sound in a big hall due to repeated reflections from the walls, ceiling and floors of the hall is called reverberations.

(ii) Soft and porous materials like cloth and cork are good absorbers of sound and can be used to avoid reverberations.

It comprises a transmitter and a receiver. Powerful pulses of ultrasound waves are sent out at regular intervals from a transmitter mounted on a ship. When these pulses are intercepted by submerged objects, they are reflected. The reflected sound or echo is detected by an underwater receiver, which is also mounted on the ship.
If t = time interval between transmission and reception of reflected ultrasound wave,
v = speed of sound through water,
d = distance of the object that reflected the ultrasound, then
Distance = speed × time
In time interval 't', the sound waves travel twice, i.e. 2d
$2d = vt$
$\Rightarrow d = v\,t\,/2$
This gives the distance of the object lying under water.

10. Crop improvement is to develop superior plants having following characteristics like
a) High yield
b) Varieties with produce of better quality
c) Disease-resistant varieties
d) Varieties with desirable agronomic characteristics like
(i) Dwarfness in cereals so that less nutrients are consumed
(ii) Tallness and profuse branching in case of fodder crops

11.
(a) Echidna and platypus lay eggs but are warm blooded and feed their young ones with milk.
(b) Despite a four-chambered heart, crocodile is a cold-blooded animal so it is considered a reptile.
(c) Birds have pneumatic bones which make their body light for flight.

12.
1 mole of $S_8 = 8 \times 32 = 256$ g
1 mole of S_8 contains 6.023×10^{23} molecules
256 g of S_8 contains 6.023×10^{23} molecules
16 g of S_8 contains $\frac{6.023 \times 10^{23}}{256} \times 16 = \frac{60.23 \times 10^{22}}{16} = 3.76 \times 10^{22}$ molecules

OR

(a) 1 carbon atom + 3 oxygen atoms = Total 4 atoms
(b) 1 phosphorus atom + 4 oxygen atoms = Total 5 atoms

(c) Sodium, hydrogen, carbon and oxygen
(d) Potassium, sulphur and oxygen

13. Centrifugation is used for separating components of a mixture in which the solid particles in a liquid are so small that they cannot be separated by the filtration process.

Principle: Denser particles are forced to the bottom and lighter particles stay at the top when spun rapidly.

Applications:
1. Used in diagnostic laboratories for blood and urine tests.
2. Used in dairies and home to separate the butter from the cream.

14.

a) Barium chloride
$BaCl_2$
[137 + (2×35.5)] = 208 units
b) Barium sulphate
$BaSO_4$
[137 + 32 +(4×16)] = 233 units
c) Hydrochloric acid
HCl
(1+35.5) 36.5
d) Sulphuric acid
H_2SO_4
[2+32 + (4×16)] = 98 units
Jay shows the scientific value to complete the activity.

15. h = 30 m
Initial velocity when the object is dropped from a height is zero.
Thus, u = 0 m/s.
Time taken to reach the ground is given by
$h = ut + \frac{1}{2}gt^2$
$t^2 = \frac{30 \times 2}{10} = 6 \Leftrightarrow t = 2.44$ s
Final velocity is given by
$v = u + gt$
$v = 0 + 10 \times 2 = 20$ m/s

Section D

16.

(a) Atomic number = Number of protons = 20
(b) Mass number = Number of protons + Number of electrons = 20 + 20 = 40
(c) Electronic configuration = 2, 8, 8, 2
(d) Valency = 2

OR

Sr. No.	Properties	Electrons	Protons	Neutrons
1.	Location	Electrons revolve around the nucleus in orbits.	Proton residues in the central part of the nucleus.	Neutrons reside in the nucleus.
2.	Charge	An electron possesses a unit negative charge of magnitude 1.602×10^{-19} coulomb.	A proton possesses a unit positive charge of the value 1.602×10^{-19} coulomb.	A neutron possesses zero charge. Hence, it is an electrically neutral particle.
3.	Mass	Electron has negligible mass. The mass of an electron is 1/1837 times the mass a hydrogen atom, i.e. 9.108×10^{-28}gm.	Mass of a proton is nearly the same as that of the hydrogen atom, i.e. 1 amu or 1.672×10^{-24} gm.	Mass of a neutron is slightly greater than that of a proton, i.e. 1.675×10^{-24} gm.
4.	Notation	An electron is represented as ${}^{0}_{-1}e$, where 0 indicates it has no mass and -1 indicates one unit of negative charge.	A proton is represented as ${}^{1}_{+1}P$ or ${}^{1}_{+1}H$, where 1 indicates it has 1 amu mass and +1 indicates one unit of positive charge.	A neutron is indicated by ${}^{1}_{0}n$, where 0 stands for zero charge and 1 stands for 1 amu mass.
5.	Reactions	Electrons take part in both chemical and nuclear reactions.	Protons only take part in nuclear reactions.	Neutrons only get exposed to nuclear reactions.

17.

(a) Photosynthesis along with cellular respiration forms the basis of the carbon cycle in nature. Carbon is found in all the major macromolecules (carbohydrates, nucleic acids, proteins and lipids) which are necessary for all living systems.
During photosynthesis, plants and other autotrophs use CO_2 along with water and solar energy to build organic molecules (carbohydrates), thus storing the carbon for themselves and other organisms.

(b) The nitrogen cycle is considered a perfect cycle in nature because the overall amount of nitrogen in the atmosphere and water bodies is always constant. The use of chemical fertilisers also maintains the nitrogen concentration in the biosphere.

18.

(i) Given: Weight of the girl is F = 300 N
Work done above a certain height is given by W = mgh.
F = m × g = 300 N
Thus, work done = 300 × 3 = 900 joules

(ii)
a) Direction of an object is changed by the applied force.
b) Size of an object is changed by the applied force.
c) Speed of an object is changed by the applied force.

19.

(i) Retardation is called deceleration or negative acceleration.
It is called negative acceleration when velocity goes on decreasing.
Retardation is a vector quantity.

(ii) Initial velocity, u = 40 m/s
Final velocity, v = 30m/s
v = u + at

$$a = \frac{v - u}{t} = \frac{40 - 30}{5} = 2\,m/s^2$$

Acceleration of the train = 2 m/s^2

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

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

$$s = 40 \times 5 + \frac{1}{2} \times 2 \times (5)^2$$

$$s = 200 + 25 = 225\,m$$

OR

Total distance travelled by the car, d = 40 + 60 + 80 = 180 km
For the first 40 km journey:
Speed is 30 km/h.

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

$$\therefore t_1 = \frac{40}{30}$$

$$\therefore t_1 = 1.3 \text{ h.}$$

For the second 60 km journey:

Speed is 36 km/h.

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

$$\therefore 36 = \frac{60}{t_2}$$

$$\therefore t_2 = \frac{60}{36} = 1.6 \text{ h}$$

For the next 80 km journey:

Speed is 40 km/h.

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

$$\therefore 40 = \frac{80}{t_3}$$

$$\therefore t_3 = \frac{80}{40} = 2 \text{ h}$$

Hence, the total time taken by the car is

$$t = t_1 + t_2 + t_3$$

$$\therefore t = 1.3 + 1.6 + 2$$

$$\therefore t = 4.9 \text{ h}$$

Therefore, the average speed of the car is

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

$$\therefore v_{av} = \frac{180}{4.9} = 36.73 \text{ km/h}$$

20. Three characteristics of particles of matter:

- Particles of matter have space between them.
  Example: When we make tea or coffee, the particles of one type of matter get into the spaces between the particles of the other. This shows that there is enough space between the particles of matter.
- Particles of matter are continuously moving.
  Example: When we light an incense stick, we can get the smell sitting at a distance indicating that the particles are continuously moving.

- Particles of matter attract each other.
  Example: If we try breaking the stream of water from a tap with our fingers, we are not able to cut the stream. This suggests that particles of matter have a force of attraction acting between them.
  Characteristics responsible for the following:

(a) Spreading of smell of scent in a room is due to diffusion.

(c) Being a fluid, it has no shape; hence, water takes the shape of the vessel in which it is poured.

21.

(a) Majority of children in India are exposed to Hepatitis A virus through water and thereby the body develops immunity against the virus.
(b) Chronic diseases last for a long time, even as long as a lifetime, and hence cause more harm to the body.
(c) A balanced diet provides energy in the appropriate amount which is needed for the substances such as carbohydrates, proteins and fats which are essential for proper growth and functioning of a healthy body.
(d) Human beings live in societies and localities like villages or cities which determine the social and physical environment. Hence, both are to be kept in harmony. Public cleanliness is important for individual health. We need good food for a healthy body for better living conditions and for the treatment of diseases.
(e) Infectious diseases are caused by microbes. Microbes can spread in the community and thereby spread the disease. Infectious diseases are hence called communicable diseases.

OR

(a)
(i) Parenchyma tissue is generally found in all plants.
(ii) Its cells are living.
(iii) Intercellular spaces are present.
(iv) The cell wall is thin and is formed of cellulose.
(v) A large vacuole is present in the centre of the cell.
(vi) Cells are generally rounded, oval or polygonal.

(b)

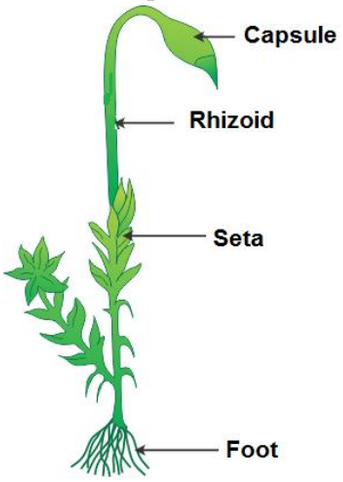
Parameter	Squamous	Cuboidal	Columnar
Structure	Thin flat cells with a centrally placed nucleus which are compactly arranged	Cube-like cells, central nucleus and appear hexagonal in surface view	Tall, pillar-like cells with a nucleus at the base
Location	Inner lining of the mouth, lungs and blood vessels	Kidney tubules, salivary glands and pancreatic duct	Lining of the stomach and intestine
Function	Protection and exchange of gases	Secretion, absorption and excretion	Secretion and absorption

Section E

22.

(a) The given figure is of Funaria, a moss plant. It belongs to Division Bryophyta under Kingdom Plantae.

(b) A → Foot; B → Seta; C → Rhizoid; D → Capsule



23.

(a) Birds and fish show the presence of a post anal tail which enables us to place them in the same phylum of vertebrates.

(b) Adaptation in birds: Forelimbs are modified into wings for flight.
Adaptation in fish: Streamlined body covered with scales.

OR

Two features that we can examine to categorise a plant into monocot and dicot are number of cotyledons in a seed and leaf venation.

24. A mixture consists of an insoluble substance P and a soluble substance Q. The mixture is dissolved in water and filtered. The filtrate so obtained contains the insoluble substance P only.

25. When a strong beam of light is focused on the colloidal solution of starch in water, scattering of light is observed. This scattering of light illuminates the path of the beam in the colloidal solution. This is known as the Tyndall effect.

OR

The separation of components of a mixture that are soluble in water can be based on the difference in boiling points where separation can be done by the process of distillation.

26. As SONAR sends ultrasonic waves through a transmitter and receives them through a receiver, the time taken to actually reach the seabed must be half of the total time taken to reach the receiver.

Hence,

Depth of sea (d) = $\frac{\text{speed of sound in water} \times \text{time taken to reach the receiver}}{2}$ ... (i)

As the sound reaches the receiver in 2 seconds, it means there is some obstacle between the SONAR equipment and seabed.

Thus, from equation (1), the obstacle is detected at the distance

$d = 1500 \times 2/2 = 1500$ m

OR

Instruments in which sound is produced due to vibrating membranes are drum and *tabla*.

27.

The pressure of water will be the lowest at point C as the pressure of water is directly proportional to the depth of the container.

Hence, as the depth of the container containing water decreases, the pressure also decreases.