CBSE
Class IX Science
Sample Paper - 5

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 capable of nitrogen fixation in the root nodules of legumes. (1)

2. A farmer grows gram crop between two cereal crops. What agricultural practice is he following? (1)

Section B

3. State Newton's third law of motion and gravitation. (2)

OR

Name the physical quantity whose unit is

(i) $kg\ ms^{-2}$

(ii) Nm^2kg^{-2}

4. What are nucleons? How many nucleons are present in sodium?

5. Why do animals in colder regions have a thicker layer of subcutaneous fat on their body? (2)

Section C

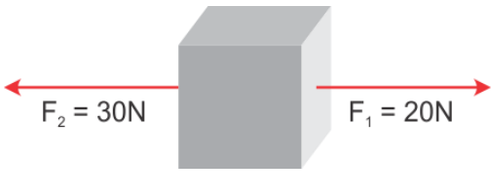
6. Name the following: (3)
(a) Storage sac of the cell
(b) Packaging and dispatching unit of the cell
(c) Powerhouse of the cell

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 act 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 mass of the object is 10 kg, then what will be the acceleration produced in it?

9. Define reflection of sound and state its laws. (3)

OR

What is SONAR? For what is it used? Explain its working in brief.

10.
(a) List any two factors which need to be considered for fish culture. (1)
(b) Explain composite fish culture with the help of an example. (2)

11. Snakes and turtles are so different in their behaviour. Snakes are often poisonous, while turtles are harmless. Yet why are they grouped in the same class? (3)

12. Calculate the number of aluminium ions in 0.051 g of Al_2O_3.
(Atomic mass of Al = 27 u, O = 16 u, Avogadro's No. = 6.022×10^{23} mol^{-1}) (3)

OR

Give the names of the elements present in the following compounds:
(a) Quick lime
(b) Hydrogen bromide
(c) Baking powder
(d) Potassium sulphate

13. What will happen to the object in the following cases? (3)
(i) If a block of wood is thrown into water. Give reason for the same.
(ii) If an object of the same density as that of water is thrown into water.
(iii) If a glass piece is thrown into water. Give reason for the same.

14. Sheetal and Sneha were asked to take 4.5 g of sodium carbonate and 5.5 g of ethanoic acid to make 1.5 g of carbon dioxide, 0.9 g of water and 8.2 g of sodium ethanoate. Sheetal followed the instructions, but Sneha took the chemicals without measuring their amounts. (3)

(a) Whose activity do you think will be in agreement with the law of conservation of mass?
(b) State the law of conservation of mass.
(c) Whose method do you like and why?

15. Compare Dalton's atomic theory with the Modern atomic theory.

Section D

16. (5)

(a) State three features of the nuclear model of an atom put forward by Rutherford.

(b) Explain the rule according to which electrons are filled in the various energy levels.

17. (5)

(a) What would be the impact of an increase in the concentration of carbon dioxide in the atmosphere?

(b)

(i) What do you mean by biogeochemical cycles? Name any two biogeochemical cycles.

(ii) Nitrogen cycle is called a perfect cycle in nature. Explain.

18. (5)

(i) A girl weighing 500 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 are covered 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. (5)

(a) Name a non-metallic element found in (i) liquid and (ii) gaseous states.

(b) Pick the metalloid from the following: Carbon, silicon, phosphorus and gold.

(c) Which two properties of metals enable us to give metals the desired shape?

(d) Name a metal which is liquid at room temperature.

OR

How are the following mixtures separated?

(b) Coloured dyes in black ink
(c) Salt solution
(d) Iron and sulphur
(e) Carbon tetrachloride and water

21. (5)

(a) Under which of the following conditions is a person most likely to fall sick and why?
(i) When a person is recovering from malaria
(ii) When a person has recovered from malaria and is taking care of someone suffering from chicken pox
(iii) When a person is on a four-day fast after recovering from malaria and is taking care of someone suffering from chicken pox

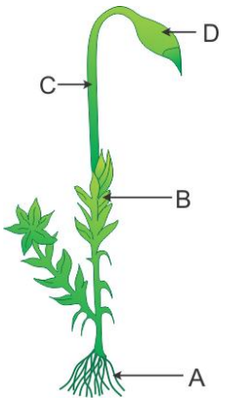
(b) Why do antibiotics not work against viruses?

OR

State one point of difference between
(a) Blood and lymph
(b) Bone and cartilage
(c) Tendon and ligament
(d) Areolar and adipose tissues
(e) Xylem and phloem tissues

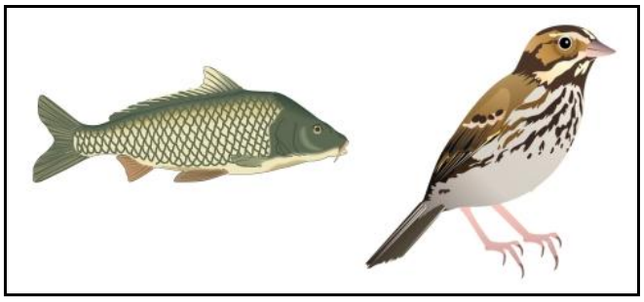
Section E

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)



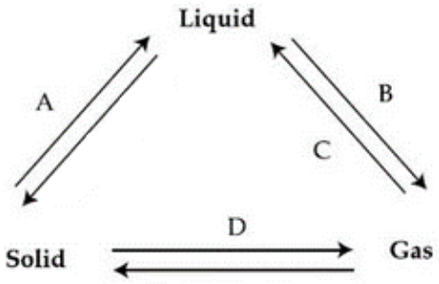
(a) Which striking feature enables both of them to be placed in the same phylum?
(b) List any one important adaptation in case of birds and fish.

OR

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

24. The following triangle exhibits interconversion of the three states of matter. Complete the triangle by labelling the arrows marked A, B, C and D.

(2)



OR

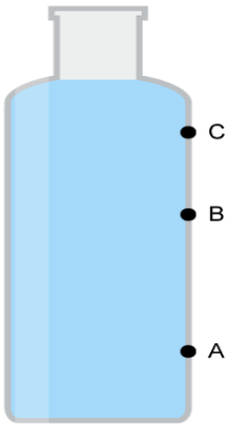
Element A has valency 1 and element B has valency 2. Diagrammatically show how a compound is formed by elements A and B, and give the formula of the compound. (2)

25. 10 g of iron filings are mixed with 6 g of sulphur and strongly heated in a test tube. (2)
The substance formed is ground in a pestle and mortar.
What will be the appearance of the substance formed?
Is it possible to separate the constituents of the new substance by physical means?

26. Time taken by ultrasonic sound to reach a SONAR receiver is 3 seconds. What is the depth of the sea in this region? (Speed of sound in water = 1500 m/s) (2)

OR

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 highest? Give reason for the same.



OR

A chef is provided with two knives. Knife A has an edge of surface area of 0.25 cm^2 and knife B has an edge of surface area 0.30 cm^2. Which of these knives make the work easier for the chef while cutting the vegetables? Why?

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Section A

1. *Rhizobium leguminosarum*

2. Crop rotation

Section B

3. i) When an object exerts a force on another object, the second object exerts an equal and opposite force on the first object.
ii) The third law of motion also holds true for the force of gravitation, i.e. when the Earth exerts a force of attraction on an object, the object exerts the same force on the Earth in the opposite direction.

OR

(i) Force constant

(ii) Gravitational

4. Particles which constitute the nucleus are called nucleons.
Protons and neutrons are the nucleons.
Atomic number of sodium is 11.
Atomic mass of sodium is 23.
No. of neutrons = 23 – 11 = 12
No. of nucleons = 23

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) Vacuole
(b) Golgi apparatus/Golgi body
(c) Mitochondria

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.
20 N + 10 N = 30 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 40 N.
(iii) After carrying out the condition given in question (ii),
F = 40 N
So, net force = F = $F_1 - F_2$ = 40 N − 30 N = 10 N.
Acceleration F = ma
$\rightarrow F = 10$ N

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

9. The bouncing back of sound when it strikes a hard surface is called reflection of sound.
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

SONAR stands for Sound Navigation And Ranging.
It is a device used to measure the distance, the direction and the speed of the objects lying under water using ultrasonic waves.
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 waves,
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.

(a) The following factors need to be considered for fish culture:

- Topography or location of the pond
- Water resources and quality
- Soil quality
- Water temperature

(b) In composite fish culture, five or six different species of fish are grown together in a single fishpond. Fish with different food habitats are chosen so that they do not compete for food among themselves. For example, catla feed on the surface of water, rohu are middle zone feeders, mrigal and common carp are bottom feeders, and grass carp feed on weeds. This ensures complete utilisation of food resources in the pond. Such a system increases the fish yield.

11. Snakes and turtles possess the following common features:
(a) Skin without glands
(b) Three-chambered heart
(c) Respiration through lungs
(d) Cold-blooded
(e) Hard-shelled eggs
(f) Embryo protected by extra embryonic membranes
Since snakes and turtles share the above common features, they are both grouped under the same Class Reptilia of Phylum Chordata.

12.

Step I:

Gram molecular weight of Al_2O_3 = 2 × 27 + 3 × 16 = 102 g

Hence, 102 g of Al_2O_3 contains = 1 mole of Al_2O_3

$$0.051 \text{ g of } Al_2O_3 \text{ will contain } = \frac{1}{102} \times 0.051$$

$$= 0.0005 \text{ mole of } Al_2O_3$$

Step II:

1 mole of Al_2O_3 contains Al atom = 2 × N0

So, 0.0005 moles of Al_2O_3 will contain = 2 × 0.005 × 6.022 × 1023

$$= 6.022 \times 10^{20} \text{ atoms of Al}$$

The number of (Al^{3+}) ions present is the same as the number of Al atoms.

$\therefore$ Number of Al^{3+} ions = 6.022×10^{20} ions

OR

(a) Calcium and oxygen
(b) Hydrogen and bromine
(c) Sodium, hydrogen, carbon and oxygen
(d) Potassium, sulphur and oxygen

13.

(i) The block of wood will float on water and a portion of it will remain submerged in water as wood has less density than water.
(ii) The object just floats in water in such a way that its entire portion remains submerged in it.
(iii) The glass piece sinks in water as it has more density than water.

14.

(a) Sheetal's activity is in agreement with the law of conservation of mass.
(b) Law of conservation of mass:
The law of conservation of mass states that mass can neither be created nor be destroyed in a chemical reaction. That is the mass of the product formed is equal to the mass of the reactants.
(c) I like Sheetal's method. As this method is in accordance with the law and will give accurate results.

15.

Dalton's atomic theory	Modern atomic theory
(i) Atoms are indivisible particles.	(i) Atoms are divisible into sub-atomic particles like protons, neutrons and electrons.
(ii) Atoms can neither be created nor destroyed.	(ii) Atoms can be created and destroyed by nuclear fusion and fission.
(iii) The atoms of an element are alike in all respect and differ from atoms of other elements.	(iii) The atoms of an element may not be alike in all respects, as it is seen in the case of isotopes. Isotopes which are atoms of the same element having the same atomic number but different mass numbers.

Section D

16.

(a) Features of the nuclear model of an atom by Rutherford:

- There is a positively charged centre in an atom called the nucleus. Nearly all the mass of an atom resides in the nucleus.
- The electrons revolve around the nucleus in well-defined orbits.
- The size of the nucleus is very small as compared to the size of the atom.

(b) The maximum capacity of a shell to accommodate electrons is given by the general formula $2n^2$, where n is the number of a shell.
The maximum number of electrons possible in the outermost shell is 8 and that in the penultimate shell is 18.
It is not necessary for an orbit to be completed before another is formed. In fact, a new orbit is formed when the outermost shell attains 8 electrons.

17.

(a) An increase in the concentration of carbon dioxide in the atmosphere would cause the average temperature of the Earth to increase, leading to global warming.

(b)

(i) A biogeochemical cycle or nutrient cycle is the pathway by which a chemical element or molecule moves through both biotic (biosphere) and abiotic (lithosphere, atmosphere and hydrosphere) components of the Earth.
Examples of biogeochemical cycles are water cycle, nitrogen cycle, carbon cycle, sulphur cycle and phosphorous cycle. **(Any two)**

(ii) 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 = 500 N
Work done above a certain height is given by W = mgh
F = m × g = 500 N
Thus, work done = 500 × 3 = 1500 joule

(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 = 30 m/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.

(a) (i) Bromine
(ii) Oxygen
(b) Metalloid: Silicon
(c) Malleability and ductility are properties which enable us to give metals the desired shape.
(d) Mercury is a liquid at room temperature.

OR

(a) By using a separating funnel
(b) Chromatography
(c) Evaporation
(d) Magnetic separation
(e) By using a separating funnel

21.

(a) A person is most likely to fall ill under condition (iii) because after recovering from malaria, the person is on a four-day fast. Fasting weakens the body's immune system and the person is likely to contract chicken pox as chicken pox is a contagious disease which spreads through direct contact with the patient.

(b) Viruses have different cell pathways as compared to bacteria. Therefore, they cannot be killed by antibiotics. Viruses have few biochemical mechanisms of their own. They enter the host cell and use their machinery for their life processes. If we have to reduce the severity of the disease, then we have to work against our body or the host cell.

OR

(a)

Blood	**Lymph**
It is a red-coloured connective tissue that flows from the organs to the heart and from the heart to the organs.	Lymph is a pale yellow fluid that flows from the organs to the heart.

(b)

Bone	**Cartilage**
It is a strong, non-flexible tissue and has a matrix made of calcium and phosphorus.	It is a strong, flexible tissue and has a matrix made of proteins and sugars.

(c)

Tendon	**Ligament**
It is a strong but less elastic tissue that connects the muscles to the bones.	It is a strong but highly elastic tissue that connects bone to bone.

(d)

Areolar	Adipose
It connects the skin to the lower muscles and fills the space in between the organs.	It contains fat globules, lies below the skin, absorbs external shocks and injuries, and acts as an insulator.

(e)

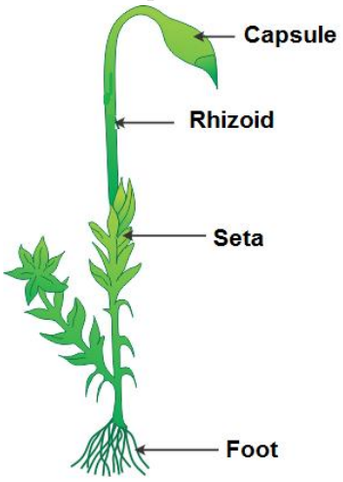
Xylem	Phloem
Xylem is made of dead cells which conduct water and minerals in plants.	Phloem has living cells which conduct food from leaves to other parts of the plant.

Section E

22.

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

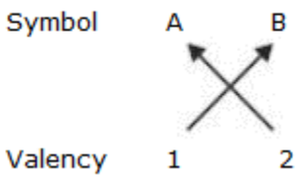
OR

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) Melting
(B) Vaporisation
(C) Condensation
(D) Sublimation

OR



Formula: A_2B

25. Iron filings and sulphur on heating form a compound iron sulphide.
Iron sulphide is grey.
The constituents of the compound cannot be separated by physical methods.

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) = $\frac{\text{speed of sound in water} \times \text{time taken to reach the receiver}}{2}$

$\Leftrightarrow$ Depth (d) = $\frac{1500 \times 3}{2}$ =2250 metres

27. The pressure of water will be the highest at point A as the pressure of water is directly proportional to the depth of the container.
Hence, as the depth of the container containing water increases, the pressure also increases.

OR

Knife A will make work easier while cutting vegetables because the surface area of the edge is lesser than knife B, i.e. knife A is sharper than knife B. Also, lesser the surface area, more is the pressure and less is the force required to be applied on the object by the chef.

$$P = \frac{F}{A}$$

Where,
P = Pressure
F= Force
A= Surface area