CBSE
Class IX Science

Time: 3 hrs **Total Marks: 80**

General Instructions:

1. The question paper comprises **two sections, A and B**. You are to attempt both sections.
2. There is no overall choice. However, an internal choice will be provided in two questions of 3 marks and one question of 5 marks.
3. All the questions of **Section A** and **Section B** are to be attempted separately.
4. Question numbers **1** and **2** in **Section A** are **one mark** questions. These are to be answered in one word or one sentence.
5. Question numbers **3** to **5** in **Section A** are **two marks** questions to be answered in about **30 words each**.
6. Question numbers **6** to **15** in **Section A** are **three marks** questions to be answered in about **50 words**.
7. Question numbers **16** to **21** in **Section A** are **five marks** questions to be answered in about **70 words**.
8. Question numbers **22** to **27** in **Section B** are questions based on practical skills and are **two marks** questions.

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)

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

4. The distance of the gunman from a cliff is 720 metres. How much time will he take to hear an echo of the gunshot fired by him? (Speed of sound=330m/s) (2)

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

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

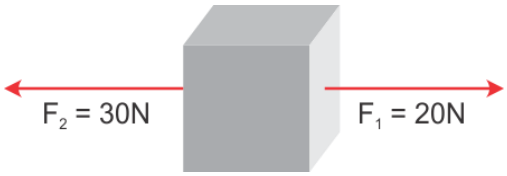
(b) Locomotion by setae

(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 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) andif 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, No = 6.022 x 1023 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 the water. Give reason for the same.

(ii) If an object of the same density as that of water is thrown into the water.

(iii) If a glass piece is thrown into the water. Give reason for the same.

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

(a) Name 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.

When thrown vertically downwards, a box covers a distance of 19.6 m. Find the initial velocity of the box, time taken by it to reach the ground and its final velocity. (3)

16. (5)

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

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

17.

(a) What would be the impact of an increase in the concentration of carbon dioxide in the atmosphere? (2)

(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. (3)

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 40m/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 kmat a speed of 30km/h,the next 60 km are covered at 36 km/hand the final 80kmat 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 temperature.

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 personhas recovered from malaria and is taking care of someone suffering from chicken pox

(iii) When a personis 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

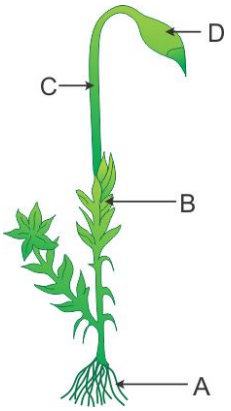
(c) Tendon and ligament

(d) Areolar and adipose tissue

(e) Xylem and phloem tissue.

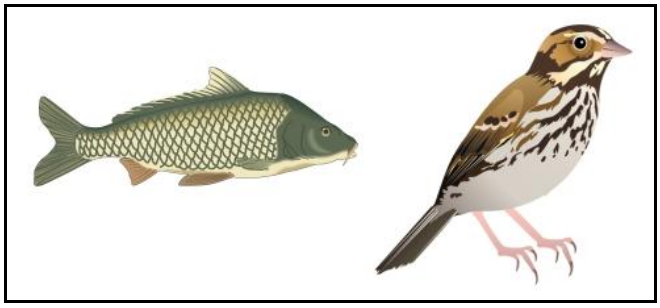
Section B

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)



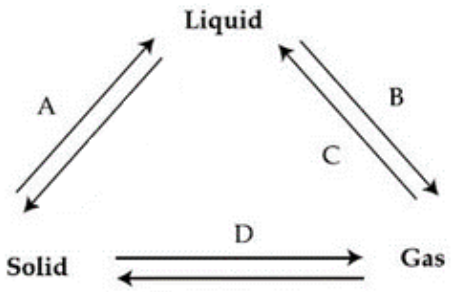
(a) Which striking feature enables both of them to be placed in the same phylum?
(b) List any one important adaptation in case of birds and fish.

Or

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

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

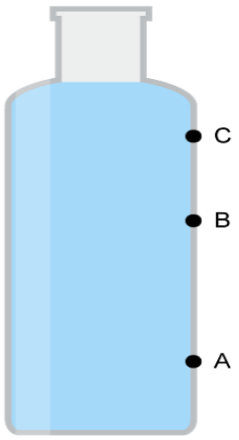
(2)



25. Element A has valency one and element B has valency 2. Diagrammatically show how the compound formed by element A and B respectively and give the formula of the compound.(2)

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=1500m/s) (2)

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.



CBSE
Class IX Science
Solution

Section A

1. Rhizobium leguminosarum

2. Crop rotation

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.

4. Here, the speed of sound, v =330 m; d=720 m
Since the total distance covered by sound is two times the distance between the gunman and the cliff d, we have

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

$t = \frac{720 \times 2}{330} = 4.36s$

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.

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=40N
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 equalto 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 of 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.

(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, catlafeed on the surface of water, rohuare middle zone feeders, mrigaland 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 animals

(e) Hard-shelled eggs

(f) Embryo protected by extra embryonic membranes

Sincesnakes and turtles share the above common features, they are both grouped under the same Class Reptilia of Phylum Chordata.

12.

StepI:

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

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

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

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

StepII:

1 mole of Al_2O_3 contains Al atom = 2 x N0

So, 0.0005 mole of Al_2O_3 will contain = 2 x 0.005 x 6.022 x 1023

= 6.022 x 1020 atoms of Al

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

∴ No. of Al^{+3} ions = 6.022 x 1020 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) Centrifugation 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. h= 19.6 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

$h = ut + \frac{1}{2}gt^2$

$t^2 = \frac{19.6 \times 2}{9.8} = 4. \Leftrightarrow t = 2s$

Final velocity is given by

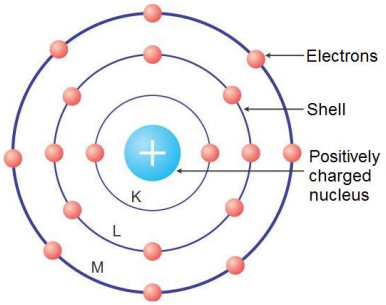
$v = u + gt$

$v = 0 + 9.8 \times 2 = 19.6$ m/s

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.
- The 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

- 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) 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.

17.

(a) An increase in the concentration of carbon dioxide in the atmosphere would cause the average temperature of the world to go up, 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 girl is F= 500 N
Work done above a certain height is given by W=mgh
F=m × g= 500N
Thus, work done= 500 × 3= 1500 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.

(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 liquid at room temperature.

21.

(a) A person is most likely to fall sick 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, and then we have to work against our body or the host cell.

Or

(a)

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

(b)

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

(c)

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

(d)

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

(e)

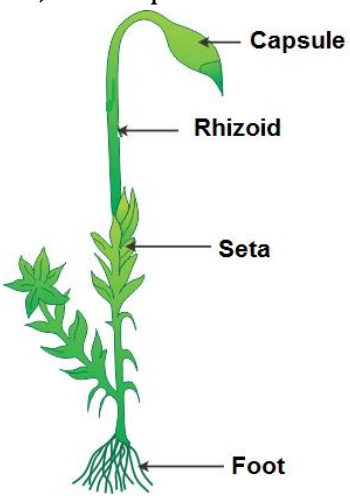
Xylem	Phloem
Xylem is made up of dead cells which conduct water and minerals prepared	Phloem has living cells which conduct food from leaves to other parts of the plant.

Section B

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.

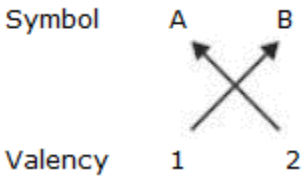
Or

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

25.



Formula: A_2B

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.