CLASS IX (2019-20)
SCIENCE (CODE 086)
SAMPLE PAPER-9

Time : 3 Hours   **Maximum Marks : 80**

General Instructions :
(i) The question paper comprises of three sections-A, B and C. Attempt all the sections.
(ii) All questions are compulsory.
(iii) Internal choice is given in each sections.
(iv) All questions in Section A are one-mark questions comprising MCQ, VSA type and assertion-reason type questions. They are to be answered in one word or in one sentence.
(v) All questions in Section B are three-mark, short-answer type questions. These are to be answered in about 50-60 words each.
(vi) All questions in Section C are five-mark, long-answer type questions. These are to be answered in about 80-90 words each.
(vii) This question paper consists of a total of 30 questions.

SECTION -A

DIRECTION : For question numbers 1 and 2, two statements are given– one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d)as given below :

(a) Both A and R are true and R is correct explanation of the assertion.
(b) Both A and R are true but R is not the correct explanation of the assertion.
(c) A is true but R is false.
(d) Both A and R are false.

1. Assertion (A) : If a light body and a heavy body possess the same momentum, the lighter body will possess more kinetic energy. [1]
   Reason (R) : The kinetic energy of a body varies as the square of its velocity.

   Ans : (b) Both A and R are true but R is not the correct explanation of the assertion.

2. Assertion (A) : All molecules in a gas travel in same speed.
   Reason (R) : Gas contain molecules of different shape and size. [1]

   Ans : (d) Both A and R are false.

3. Nitrogen, hosphorous and otassium are examples of : [1]
   (a) Macro–nutrients   (b) Fertilizers
   (c) Both (a) and (b)   (d) None of these

   Ans : (a) Macro-nutrients

4. A rider on a horseback falls back when horse starts running all of a sudden because of : [1]
   (a) Pressure   (b) Gravitational force
   (c) Inertia   (d) None of the above

   Ans : (c) Inertia

   or

   Newton's law of gravitation applies to ....
   (a) Small bodies only
   (b) Plants only
   (c) All bodies irrespective of their size
   (d) For solar system

   Ans : (c) All bodies irrespective of their size

5. The components of the water can be separated by : [1]
   (a) Physical methods
   (b) Chemical methods
   (c) Both (a) and (b)
   (d) They can't be separated

   Ans : (b) Chemical methods

   or

   Brass is a solution of molten copper in :
   (a) Solid zinc   (b) Molten zinc
   (c) Gaseous zinc   (d) Molten tin

   Ans : (b) Molten zinc

6. Cartilage and bone are the types of : [1]
   (a) Muscular tissue   (b) Connective tissue
   (c) Meristematic tissue   (d) Epithelial tissue

   Ans : (b) Connective tissue

7. Which of the following pairs are isotopes ? [1]
   (a) H and O   (b) O and N
   (c) H and deuterium   (d) Ice and steam

   Ans : (c) H and deuterium

8. Where do we found areola connective tissue in our body? [1]
   (a) Cortex   (b) Skin and Muscles
   (c) Blood Vessel   (d) Muscles

   Ans : (b) Skin and Muscles

   or

   Ribosomes are the site of :
   (a) Photosynthesis   (b) Respiration
   (c) Protein synthesis   (d) Absorption

   Ans : (c) Protein synthesis

9. A stone is dropped into a lake from a tower 500 m high. The sound of the splash will be heard by a man on the tower after a time of (velocity of sound in air = 350 m/s) [1]
   (a) 21 s   (b) 10 s
   (c) 11.4 s   (d) 1 s

Ans : (c) 11.4 s

$$t_1 = \text{Time for the stone to reach the lake}$$

$$t_2 = \text{Time taken for the sound of splash to}$$

each the man

$$t = \text{Total time} = t_1 + t_2$$

From second equation of motion

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

$$560\,s = 0 + \frac{1}{2} \times 10 \times (t_2)^2$$

$$t_2 = 10\,s$$

Let t_2 be the time taken sound to reach the surface

$$t_2 = \frac{h}{v} = \frac{500}{350} = 1.43\,s \approx 1\,s$$

$$\text{Total time} = t_1 + t_2 = 10 + 1.45 = 11.45 \approx 11.4\,s$$

10. What does the slope of velocity–time graph give? [1]
(a) Acceleration (b) S peed
(c) Displacement (d) Distance

Ans : (a) Acceleration.

11. What are the characteristics of a sound wave? [1]

Ans :

Sound wave can be described by its :
(a) Frequency,
(b) Amplitude, and
(c) Speed.

12. Common fungi used in preparing the bread are .... [1]

Ans : Yeast.

13. Questions 13.1 to 13.4 are based on the Table A and B. Study this table and answer the following questions.[1]

Table A : Thickness of epidermis

Plant	Thickness of epidermis (mm)
A	0.05
B	2.3
C	0.02
D	1.9
E	2.7
F	0.1

Table B : Terrains and thickness of the epidermis of the plants found in that terrain

Terrains	Thickness of epidermis (mm)
Desert	> 2.0
Grasslands	1.0> x >0.5
Forests	< 0.5

13.1 Which plants (from Table A) can be found in desert ? [1]

Ans : B and E.

13.2 What is the reason they have a thicker epidermis than the plants found in grasslands or forests ? [1]

Ans : Due to the scarcity of water in deserts, the plants need to hold enough amount of water inside their leaves. To avoid the transpiration of this water, they have a thicker epidermis in their leaves.

13.3 What is the name of the thick waxy coating found on the leaves of the plants found in desert ? [1]

Ans : Cutin.

13.4 Give one example of a desert plant. [1]

Ans : Cactus.

14. Answer question numbers 14.1 to 14.4 on the basis of your understanding of the following paragraph and the related studied concepts.

Keith and his friends visit the chemical laboratory in their school to know the difference between elements and compounds. They asked the lab assistant about the same but the assistant did not respond to them directly but instead told them to do an experiment. The lab assistant divided them in two groups, A and B. Both the groups were told to take 5 g of iron filings and 3 g of Sulphur powder in a china dish. Group A has to mix and crush the iron filings and sulphur. Group B has to do the same and then heat the china dish till the mixture becomes red hot and then remove from flame and let it cool. To one part of both the mixtures, they added carbon disulphide and stirred well and filtered. To another part, they added dilute sulphuric acid.

14.1 What gas is obtained by Group A ? [1]

Ans : Hydrogen.

14.2 What gas is obtained by Group B and how is it identified ? [1]

Ans : Hydrogen sulphide; it can be identified by its smell of rotten eggs.

14.3 What is the difference between material obtained by Group A and Group B ? [1]

Ans : The material obtained by group A is a mixture, while the material obtained by group B is a compound.

14.4 Give one property of mixtures. [1]

Ans : The properties of a mixture are the same as the properties of constituents.

SECTION -B

15. Derive the second equation of motion numerically. [3]

Ans :

Let u be initial velocity at time $t = 0$
Let v be final velocity at time $t = t$
Let s be the distance travelled in time t

Total distance travelled $=$ Average velocity

$$\times \text{ time}$$

$$\text{Average velocity} = \frac{\text{Initial velocity} + \text{Final velocity}}{2}$$

$$= \frac{v + u}{2}$$

Total distance, $s = \dfrac{v + u}{2} \times t$

$$2s = (v + u) \times t \qquad \qquad ...(i)$$

From first equation of motion

$$v = u + at \qquad \qquad ...(ii)$$

Substitute the value of v from (ii) into (i) equation

$$2s = (u + at + u) \times t$$
$$2s = (2u + at)\,t$$
$$2s = 2ut + at^2$$
$$s = ut + \frac{1}{2}at^2$$

16. (a) How can you show that evaporation causes cooling ?

(b) What are heterogeneous mixtures ? [3]

Ans :

(a) Evaporation is the process of conversion of water (liquid) to the water vapor (gaseous state). When liquid changes to gaseous state it absorbed some heat or energy from surrounding that decrease the temperature of surrounding and causes cooling effect. One of the live example is sweating. In hot summer days, sweat evaporates causes cooling effect that balance the temperature of body. Hence, evaporation is effective processes that balance our body temperature in hot sunny days.

(b) A heterogeneous mixture is a mixture having a non-uniform composition. The composition varies from one region to another with at least two phases that remain separate from each other, with clearly identifiable properties. If you examine a sample of a heterogeneous mixture, you can see the separate components.

17. (a) How are simple tissues different from complex tissues ?

(b) What happens to the plants if their tips are removed ? [3]

Ans :

(a) Simple tissues are made up of only one type of cells, which look like each other. On the other hand, complex tissues are made up of more than one type of cells. Parenchyma, collenchyma and schlerenchyma are the examples of simple plant tissue whereas xylem and phloem are complex tissue.

(b) Xylem is a water conducting tissue in plants. It transports water from the roots to the different parts of the plant. If the xylem of the plant is removed, upward movement of water will stop leading to wilting of leaves and ultimately causes the death of a plant. In the absence of water, the plant will not be able to prepare food and also perform other essential activities.

18. "According Newton's Third law of motion, For every action force there is an equal and opposite reaction force." Keeping this law in mind, explain how a horse pulls a cart. [3]

Ans :

According Newton's third law of motion, for every action force there is an equal and opposite reaction force.

$$\text{Action} = -\text{Reaction.}$$

Action force is exerted by horse on cart when horse pulls the cart. Reaction force which will be equal and opposite force will be exerted by the cart on the horse. If we have a look at forces acting on horses, horse will exert action force on the ground by its feet whereas reaction force exerted by ground on horse makes the horse move forward. Here frictional force plays a very important role. Frictional force should be more than action force.

Let F be the force applied by horse.

$$f = \text{frictional force. than}$$
$$F_{net} = F - f \qquad \qquad ...(i)$$

From Newton's second law

$$F_{net} = ma \qquad \qquad ...(ii)$$

From equation

so, $\qquad \qquad ma = F - f$

So acceleration will be produced. This makes the cart move.

or

Take two eggs, a raw egg and a hard boiled egg. Try to spin both the eggs with the same force on the same surface. Which one will spin for more time? You can see that the hardboiled egg spins for more time than the raw egg. What made the boiled egg spin for more time? Can you explain?

Ans :

When we spin two eggs, one raw and the other a hardly boiled egg, with the same force on the same surface, we observe that the hard-boiled egg spins for more time than the raw egg. The reason is as follows : The hard boiled egg spins more because the egg white and egg yolk are in solid state, just. That is, the hard boiled egg is totally in a solid state. So they spin together. The inertia of motion keeps the hard-boiled egg spinning longer until an external force is applied on it, or resistance of the table or air against the egg, stops it. The raw egg spins for less time because inside the raw egg, the state of egg-white and the egg-yolk are different from the outside solid shell. Since liquids have more inertial drag than that of a solid. So, inside the raw egg it is liquid and moves very little when compared to the outside solid shell. The shell is forced to stop spinning because of the motion of the liquid inertia inside (egg-white or egg-yolk).

19. What are the main practices involved in keeping of animals or animal husbandry ? [3]

Ans :

Main practices involved in animal husbandry are:

(a) **Breeding :** It is done to obtain animals with desired characters. Breeding can develop high milk yielding and high meat yielding animals.

(b) **Feeding :** It deals with the study of proper food (called feed), mode and time of feeding for different animals.

(c) **Weeding :** It is the elimination of uneconomical animals.

(d) **Heeding :** It means the proper care and management of the animals.

20. A student weighs 30 kg. Suppose his body is entirely made up of electrons. How many electrons are there in his/her body. (Mass of an electron is 9.1×10^{-31} Kg)   [3]

Ans :

Given,   Mass of electron $= 9.1 \times 10^{-31}$ kg

Number of electron in the body of student

$\qquad$ = total mass/mass of each electrons

$\qquad = 30 \text{ kg}/9.1 \times 10^{-31} \text{ kg}$

Therefore, the student is made up of approximately 3.29×10^{31} electrons

Suppose, the population of a country is considered as 100 Crore.

$\qquad (3.29 \times 10^{31})/10^{9} = 3.29 \times 10^{22}$

So, the number of electrons in the body of the student is 3.29×10^{22} times the population of that particular country.

or

(a) How would you confirm that a colorless liquid given to you is pure water ?

(b) What is meant by a substance ?

Ans :

(a) If we allow the given liquid to evaporate by heating it as in a china dish, then
  (i) Any residue remaining in the china dish will indicate that the water is not pure but contains impurities.
  (ii) No residue in the china dish will indicate that water is pure.

(b) Substance can be defined as that kind of matter where constituent particles cannot be separated from each other by any physical process since they all are similar in chemical properties.

21. A car falls of a ledge and drops to the ground in 0.5s. Let $g = 10 \text{ms}^{-2}$

(a) What is its speed on touching the ground ?

(b) What is its average speed during 0.5 s ?

(c) How high is the ledge from the ground ?   [3]

Ans :

Given,   initial velocity, $u = 0$

$\qquad\qquad\qquad$ time, $t = 0.5 \text{ s}$

(a) $\qquad$ As we know that, $v = u + gt$

$\qquad\qquad\qquad v = 0 + 10 \times 0.5$

$\qquad\qquad\qquad v = 5 \text{ ms}^{-1}$

(b) $\qquad$ Average speed = total distance /total time

So, $\qquad\qquad s = ut + \frac{1}{2} gt^2$

$\qquad\qquad s = 0 \times 1.25 + \frac{1}{2} 10 (0.5)^2$

$\qquad\qquad s = 1.25 \text{ m}$

So,   average speed $= \dfrac{1.25}{0.5} = 2.5 \text{ ms}^{-1}$

(c) $\qquad\qquad\qquad$ Height $= 2.5 \text{ m}$

22. Differentiate between monocot and dicot plants.   [3]

Ans :

S. No.	Character	Monocots (Monocotyle-don)	Dicots (Dicotyledon)
1.	Seed-cotyledons	One	Two
2.	Seed-germination	Hypogeal	Epigeal or hypogeal
3.	Root	Primary root short lived, adventitious fibrous root system present	Primary root present (forming tap root system)
4.	Leaf	Isobilateral– Parallel ventilation	Dorsiventral-Reticulate venation
5.	Stem–cambium	Absent	Present

or

Define (a) Bilateral symmetry, (b) Coelom and (c) Triptoblastic.

Ans :

(a) **Bilateral symmetry :** Body can be divided into two similar halves only by one plane that passes through the central or median axis e.g., tortoise, humans.

(b) **Coelom :** It is the body cavity which is lined externally as well as by regular layer of mesoderm.

(c) **Triploblastic :** When the body of an animal develops three germ layers: ectoderm, mesoderm and endoderm, it is called triploblastic.

23. (a) Under what conditions work is said to be done ?

(b) A porter lifts a luggage of 1.5 kg from the ground and puts it on his head 1.5 m above the ground. Calculate the work done by him on the luggage.[3]

Ans :

(a) (i) Force should be applied.
  (ii) Body should move in the line of action of force.
  (iii) Angle between force and displacement should not be 90 degree.

(b) Mass of luggage, $m = 15$ kg and displacement, $s = 1.5$ m

$\qquad$ Work done, $W = F \cdot s$

$\qquad\qquad\qquad = mg \times s = 15 \times 10 \times 1.5$

$\qquad\qquad\qquad = 225 \text{ J}.$

24. Which type of plastids help in photosynthesis? Draw its diagram.   [3]

Ans :

The type of plastids which help in photosynthesis is called chloroplasts. The plastic which helps in photosynthesis is called as chloroplasts. It is one of the most known of the plastids found in leaves of plants. Chloroplasts are responsible for the photosynthesis process and they are mainly filled with thylakoids. Thylakoids are the place of photosynthesis. So we can say that they are the place for the pigments to be stored and synthesized in the plant.
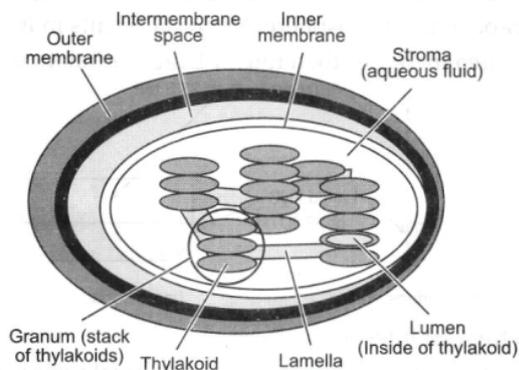
SECTION -C

25. What is SONAR? Write its working in brief.   [5]

Ans :

SONAR stands for Sound Navigation and Ranging. It uses ultrasonic waves. Working it consists of a transmitter which produces and transmits ultrasonic waves. These waves travel through water and after striking the object on the sea bed, get reflected back and are sensed by a detector. The waves are then converted to electrical signals by detector. The time taken by wave to reach detector is recorded. Now, distance of the object from the ship is calculated by the following formula.

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

or

(a) Define frequency and amplitude of a wave.

(b) Define wavelength and time period of a wave

Ans :

(a) (i) **Frequency :** The number of vibrations or oscillations per second is called frequency, i.e. it is the number of complete waves or cycles produced in one second.

   (ii) **Amplitude :** It is the maximum displacement of the particleof the medium from their mean/ original position at rest.

(b) (i) **Wavelength :** For a sound wave, the combined length of a compression and an adjacent rarefaction is called its wavelength. Even the distance between centers of two consecutive compressions or two consecutive rarefactions is also equal to wavelength.

   (ii) **Time period :** The time taken to complete one vibration/oscillation/complete wave is called time period. It is measured in seconds.

26. (a) What temperature in Kelvin scale is equal to 50°C ?

(b) Describe an activity to show that rate of evaporation increases with surface area (with a diagram).   [5]

Ans :

$$T_k = 273° + t°\text{C}$$

Temperature on $K = 273 + $ temperature on Celsius

$$T_k = 273 + 50°\text{C}$$

$$= 323\,\text{K}$$

So, $50°\text{C} = 323\,\text{K}$

(b) **Aim :** To prove that rate of evaporation increases with increase in surface area.

Apparatus required : Any liquid (water), Petridish and test tube.

Procedure :

(i) Take 10 ml of water in petridish and test tube and keep them under the fan.

(ii) Note down the time taken for evaporation in both the cases.

Observation :

(i) We observe that more amount of water is evaporated in case of petridish if a particular time is considered.

(ii) It takes more time for the water in test tube to evaporate than the water in petri dish, even though the quantity is same.

Since evaporation is a surface phenomenon, during evaporation process the particles escape from the surface of liquid. The increase in the surface area provides more scope for particles from the surface to escape to the atmosphere. Hence, it results in increase in rate of evaporation.

Conclusion : If surface area increases then rate of Evaporation increases.
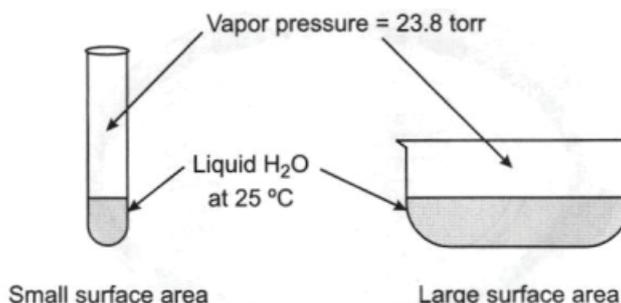
27. What are the two principles of treatment? Why is making anti-viral medicines harder than making anti-bacterial medicines?   [5]

Ans :

There are two ways to treat an infectious disease :

(a) **To reduce the effects of disease :** In other words, treatment is provided for the symptoms that are arising due to that particular disease. The symptoms are usually because of inflammation. For example, we can take medicines that bring down fever, reduce pain or loose motions. We can take bed rest so that we can conserve our energy. This will enable us to have more of it available to focus on healing. One problem that arises here is the type of treatment that will not cure by itself. For that we need to kill the microbes.

(b) **To kill the cause of the disease :** That is, we have to kill the disease causing microbes. One way to kill them is by using medicines. Microbes are also classified into different categories like virus, bacteria and protozoa. Each of these groups of organisms will have some essential biochemical life process which is peculiar to that group and not shared with the other groups. These processes may be pathways for the synthesis of

new substances or respiration.

One reason why making anti viral medicines is harder than making anti-bacterial medicines is that viruses have few biochemical mechanisms of their own. They enter our cells and use our machinery for our life processes. This means that there are relatively very few targets to attack. Despite this limitation, there are now effective anti viral drugs, for example, the drugs that keep HIV under control.

or

Explain how clouds are formed and result in rain.

Ans :

(a) When water bodies are heated during the day, a large amount of water evaporates and goes into the air.

(b) Some amount of water vapour also gets into the atmosphere because of various biological activities. This air also gets heated.

(c) The hot air rises up carrying the water vapour with it. As the air rises, it expands and cools.

(d) The cooling causes the water vapour in the air to condense in the form of tiny droplets.

(e) This condensation of water is facilitated if some particles could act as the 'nucleus' for these drops to form around. Normally dust and other suspended particles in the air perform this function.

(f) Once the water droplets are formed, they grow bigger by the condensation of these water droplets.

(g) When the drops become big and heavy they fall down in the form of rain.

(h) Sometimes when the temperature is low enough, precipitation may occur in the form of snow, sleet or hail.

28. An 8000 kg engine pulls a train of 5 wagons, each of 2000 kg, along a horizontal track. If the engine exerts a force of 40000 N and the track offers a friction force of 5000 N, then calculate: [5]

(a) The net accelerating force

(b) The acceleration of the train; and

(c) The force of wagon 1 on wagon 2.

Ans :

(a) Force exerted by the engine,
$$F = 40000 \, \text{N}$$

Frictional force offered by the track,
$$F_1 = 5000 \, \text{N}$$

Net accelerating force,
$$F_a = F - F_f = 40000 - 5000$$
$$= 35000 \, \text{N}$$

Hence, the net accelerating force is 35000 N.

(b) Acceleration of the train $= a$

The engine exerts a force of 40000 N on all the five wagons.

Net accelerating force on the wagons,
$$F_a = 35000 \, \text{N}$$

Mass of the wagons,
$$m = \text{mass of a wagon} \times \text{number of wagons}$$

Mass of wagon $= 2000 \, \text{kg}$

Number of wagons $= 5$

Therefore, $m = 2000 \times 5 = 10000 \, \text{kg}$

Total mass, $M = m = 10000 \, \text{kg}]$

From Newton's second law of motion:
$$F_a = M \times a$$
$$a = \frac{F_a}{M} = \frac{35000}{10000} = 3.5 \, \text{ms}^{-2}$$

Hence, the acceleration of the wagons and the train is $3.5 \, \text{m/s}^2$

(c) Mass of all the wagons except wagon 1 is $4 \times 2000 = 8000 \, \text{kg}$

Acceleration of the wagons $= 3.5 \, \text{m/s}^2$

Thus, force exerted on all the wagons except wagon 1 $= 8000 \times 3.5 = 28000 \, \text{N}$

Therefore, the force exerted by wagon 1 on the remaining four wagons is 28000 N.

Hence, the force exerted by wagon 1 on wagon 2 is 28000 N.

29. State the following laws with examples.

(a) Law of conservation of mass.

(b) Law of constant proportion. [5]

Ans :

(a) The law of conservation of mass states that mass in an isolated system is neither. created nor destroyed by chemical reactions or physical transformations. According to this law, the mass of the products in a chemical reaction must equal the mass of the reactants. The law of conservation of mass is useful for a number of calculations and can be used to solve for unknown masses, such as the amount of gas consumed or produced during a reaction. Example : one common example you'll come across is the image of a bonfire or campfire. A molecule of water will always have two hydrogen atoms and one oxygen atom, meaning that in a bottle of pure water the hydrogen to oxygen atom ratio will always be 2 : 1. This seems very logical to us today.

(b) Law of constant proportions says that a chemical molecule will always contains the same elements in the same proportion.

There are two parts to the law of constant proportions:

(i) There will always be the same elements that make up a compound

(ii) The mass of these compounds will always be in the same proportion.

Example : In a compound such as water the ratio of mass of hydrogen to the mass of oxygen is always 1 : 8. Thus, if 9 grams of water is decomposed 1 gram of hydrogen and 8 grams of oxygen are always obtained

or

What is chromatography? What are its various applications and underline the basic principle involved.

Ans :

Chromatography is a technique used for separation of those components whose solubility in the same solvent is different. Its various applications are:

(a) It is used to separate different colors in dye.

(b) It is used to separate pigments from natural colors.

(c) It is used to separate drugs from blood.

Principle behind chromatography :

The preferential separation of the compounds is based on their different affinities towards stationary and mobile phase. After separation of the compounds, they are identified by suitable detection methods. The difference in affinity arises due to relative adsorption or partition coefficient between compounds towards both phases.

30. (a) Name the group of plants known as "Amphibians of plant world". Mention their four important characteristics.

(b) Give three points on how birds have adapted themselves to an aerial mode of life.

(c) Draw a labeled diagram of a bacteria.   [5]

Ans :

(a) Bryophytes are the plants that live on land and in water so they are called amphibians of plant kingdom. These plants show the following character :

(i) The plant body is either thallus like (thalloid) or leaf like (foliose).

(ii) True leaves and roots are lacking; the plants are anchored to the soil by means of filamentous rhizoids.

(iii) Plant body is green and autotrophic.

(iv) The vascular tissues are absent.

(b) Adaptations of birds to aerial mode of life:

(i) Their body is covered with feathers.

(ii) Forelimbs are modified into wings.

(iii) They have hollow bones which helps them during the flight .

Bacteria
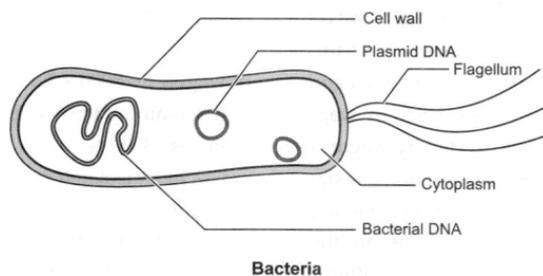
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