NCERT Solutions for Class 9th Science http://freehomedelivery.net/: Chapter 1 Matter in Our Surroundings

Question 1:

Which of the following are matter? Chair, air, love, smell, hate, almonds, thought, cold, cold drink, smell of perfume.

Answer:

Anything that occupies space and has mass is called matter. Matter can exist in three physical states—solid, liquid, and gaseous.

Chair and almond are forms of matter in the solid state.

Cold drink is a liquid state of matter.

Air and smell of perfume are gaseous states of matter.

Note: The sense of smell is not matter. However, the smell or odour of a substance is Classified as matter. The smell of any substance (say, perfume) is the gaseous form of that substance which our olfactory system can detect (even at very low concentrations). Hence, smell of perfume is matter.

Question 2:

Give reasons for the following observation: The smell of hot sizzling food reaches you several metres away, but to get the smell from cold food you have to go close.

Answer:

Solids diffuse at a very slow rate. But, if the temperature of the solid is increased, then the rate of diffusion of the solid particles into air increases. This is due to an increase in the kinetic energy of solid particles. Hence, the smell of hot sizzling food reaches us even at a distance, but to get the smell from cold food we have to go close.

Question 3:

A diver is able to cut through water in a swimming pool. Which property of matter does this observation show?

Answer:

The ability of a diver to cut through water in a swimming pool shows that matter is made up of particles.

Question 4:

What are the characteristics of particles of matter?

Answer:

The characteristics of particles of matter are:

(i) Particles of matter have spaces between them.

(ii) Particles of matter are continuously moving.

(iii) Particles of mater attract each other.

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Question 1:

The mass per unit volume of a substance is called density (density = mass/volume). Arrange the following in order of increasing density − air, exhaust from chimney, honey, water, chalk, cotton, and iron.

Answer:

The given substances in the increasing order of their densities can be represented as:

Air < Exhaust from chimney < Cotton < Water < Honey < Chalk < Iron

Question 2:

(a) Tabulate the differences in the characteristics of states of matter.

(b) Comment upon the following: rigidity, compressibility, fluidity, filling a gas container, shape, kinetic energy, and density.

Answer:

(a) The differences in the characteristics of states of matter are given in the following table.

S. No.	Solid state	Liquid state	Gaseous state
1.	Definite shape and volume.	No definite shape. Liquids attain the shape of the vessel in which they are kept.	Gases have neither a definite shape nor a definite volume.
2.	Incompressible	Compressible to a small extent.	Highly compressible
3.	There is little space between the particles of a solid.	These particles have a greater space between them.	The space between gas particles is the greatest.
4.	These particles attract each other very strongly.	The force of attraction between liquid particles is less than solid particles.	The force of attraction is least between gaseous particles.
5.	Particles of solid cannot move freely.	These particles move freely.	Gaseous particles are in a continuous, random motion.

(b) Rigidity can be expressed as the tendency of matter to resist a change in shape. Compressibility is the ability to be reduced to a lower volume when force is applied. Fluidity is the ability to flow. By filling a gas container we mean the attainment of shape of the container by gas.
Shape defines a definite boundary.
Kinetic energy is the energy possessed by a particle due to its motion.
Density is mass per unit volume.

Question 3:

Give reasons:
(a) A gas fills completely the vessel in which it is kept.
(b) A gas exerts pressure on the walls of the container.
(c) A wooden table should be called a solid.
(d) We can easily move our hand in air, but to do the same through a solid block of wood, we need a karate expert.

Answer:

(a) There is little attraction between particles of gas. Thus, gas particles movefreely in all directions. Therefore, gas completely fills the vessel in which it is kept.
(b) Particles of gas move randomly in all directions at high speed. As a result, theparticles hit each other and also hit the walls of the container with a force. Therefore, gas exerts pressure on the walls of the container.
(c) A wooden table has a definite shape and volume. It is very rigid and cannot be compressed i.e., it has the characteristics of a solid. Hence, a wooden table should be called a solid.
(d) Particles of air have large spaces between them. On the other hand, wood has little space between its particles. Also, it is rigid. For this reason, we can easily move our hands in air, but to do the same through a solid block of wood, we need a karate expert.

Question 4:

Liquids generally have lower density as compared to solids. But you must have observed that ice floats on water. Find out why.

Answer:

The mass per unit volume of a substance is called density (density = mass/volume). As the volume of a substance increases, its density decreases. Though ice is a solid, it has large number of empty spaces between its particles. These spaces are larger as compared to the spaces present between the particles of water. Thus, the volume of ice is greater than that of water. Hence, the density of ice is less than that of water. A substance with lower density than water can float on water. Therefore, ice floats on water.

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Question 1:

Convert the following temperature to Celsius scale:

(a) 300 K

(b) 573 K

Answer:

(a) 300 K = (300 − 273)°C = 27°C

(b)573 K = (573 − 273)°C = 300°C

Question 2:

What is the physical state of water at:

(a) 250°C

(b) 100°C

Answer:

(a) Water at 250°C exists in gaseous state.

(b) At 100°C, water can exist in both liquid and gaseous form. At this temperature, after getting the heat equal to the latent heat of vaporization, water starts changing from liquid state to gaseous state.

Question 3:

For any substance, why does the temperature remain constant during the change of state?

Answer:

During a change of state, the temperature remains constant. This is because all the heat supplied to increase the temperature is utilised in changing the state by overcoming the forces of attraction between the particles. Therefore, this heat does not contribute in increasing the temperature of the substance.

Question 4:

Suggest a method to liquefy atmospheric gases.

Answer:

By applying pressure and reducing the temperature, atmospheric gases can be liquefied.

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Question 1:

Why does a desert cooler cool better on a hot dry day?

Answer:

When a liquid evaporates, the particles of the liquid absorb energy from the surroundings to compensate the loss of energy during evaporation. This makes the surroundings cool. In a desert cooler, the water inside it is made to evaporate. This leads to absorption of energy from the surroundings, thereby cooling the surroundings. Again, we know that evaporation depends on the amount of water vapour present in air (humidity). If the amount of water vapour present in air is less, then evaporation is more. On a hot dry day, the amount of water vapour present in air is less. Thus, water present inside the desert cooler evaporates more, thereby cooling the surroundings more. That is why a desert cooler cools better on a hot dry day.

Question 2:

How does water kept in an earthen pot (matka) become cool during summers?

Answer:

There are some pores in an earthen pot through which the liquid inside the pot evaporates. This evaporation makes the water inside the pot cool. In this way, water kept in an earthen pot becomes cool during summers.

Question 3:

Why does our palm feel cold when we put some acetone or petrol or perfume on it?

Answer:

When we put some acetone or petrol or perfume on our palm, it evaporates. During evaporation, particles of the liquid absorb energy from the surrounding or the surface of the palm to compensate for the loss of

energy, making the surroundings cool. Hence, our palm feels cold when we put some acetone or petrol or perfume on it.

Question 4:

Why are we able to sip hot tea or milk faster from a saucer than a cup?

Answer:

A liquid has a larger surface area in a saucer than in a cup. Thus, it evaporates faster and cools faster in a saucer than in a cup. For this reason, we are able to sip hot tea or milk faster from a saucer than a cup.

Question 5:

What type of clothes should we wear in summers?

Answer:

We should wear cotton clothes in summers. During summers, we sweat more. On the other hand, cotton is a good absorber of water. Thus, it absorbs sweat from our body and exposes the liquid to the atmosphere, making evaporation faster. During this evaporation, particles on the surface of the liquid gain energy from our body surface, making the body cool.

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Question 1:

Convert the following temperatures to Celsius scale.

(a) 300 K

(b) 573 K

Answer:

Kelvin is an SI unit of temperature, where 0°C = 273.16 K (approximately 273 K)

(a) 300 K = (300 − 273) °C = 27 °C

(b) 573 K = (573 − 273) °C = 300 °C

Question 2:

Convert the following temperatures to Kelvin scale.

(a) 25°C

(b) 373°C

Answer:

Kelvin is an SI unit of temperature, where 0°C = 273.16 K (approximately 273 K)

(a) 25 °C = (25 + 273) K = 298 K

(b) 373 °C = (373 + 273) K = 646 K

Question 3:

Give reason for the following observations.

(a) Naphthalene balls disappear with time without leaving any solid.

(b) We can get the smell of perfume sitting several metres away.

Answer:

(a) Naphthalene undergoes sublimation easily i.e., the change of state of naphthalene from solid to gas takes place easily. Thus, naphthalene balls disappear with time without leaving any solid.

(b) Gaseous particles possess high speed and large spaces between them. Particles of perfume diffuse into these gaseous particles at a very fast rate and reach our nostrils. This enables us to smell the perfume from a distance.

Question 4:

Arrange the following substances in increasing order of forces of attraction between particles−− water, sugar, oxygen.

Answer:

Sugar is a solid; the forces of attraction between the particles of sugar are strong. Water is a liquid; the forces of attraction here are weaker than sugar. Oxygen is a gas; the forces of attraction are the weakest in gases. Thus, the increasing order of forces of attraction between the particles of water, sugar and oxygen is Oxygen < Water < Sugar

Question 5:

What is the physical state of water at−−

(a) 25°C

(b) 0°C

(c) 100°C

Answer:
(a) Water at 25°C is present in the liquid state.
(b) At 0 °C, water can exist as both solid and liquid. At this temperature, after getting the heat equal to the latent heat of fusion, the solid form of water i.e., ice starts changing into its liquid form i.e., water.
(c) At 100 °C, water can exist as both liquid and gas. At this temperature, after getting the heat equal to the latent heat of vaporization, water starts changing from its liquid state to its gaseous state, i.e., water vapours.

Question 6:
Give two reasons to justify−
(a) water at room temperature is a liquid.
(b) an iron almirah is a solid at room temperature.

Answer:
(a) At room temperature (25 °C), water is a liquid because it has the following characteristic of liquid:
(i) At room temperature, water has no shape but has a fixed volume that is, it occupies the shape of the container in which it is kept.
(ii) At room temperature, water flows.
(b) An iron almirah is a solid at room temperature (25 °C) because:
(i) it has a definite shape and volume like a solid at room temperature.
(ii) it is rigid as solid at room temperature.

Question 7:
Why is ice at 273 K more effective in cooling than water at the same temperature?

Answer:
Ice at 273 K has less energy than water (although both are at the same temperature). Water possesses the additional latent heat of fusion. Hence, at 273 K, ice is more effective in cooling than water.

Question 8:
What produces more severe burns, boiling water or steam?

Answer:
Steam has more energy than boiling water. It possesses the additional latent heat of vaporization. Therefore, burns produced by steam are more severe than those produced by boiling water.

Question 9:

Name A, B, C, D, E and F in the following diagram showing change in its state.

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3.	There is little space between the particles of a solid.	These particles have a greater space between them.	The space between gas particles is the greatest.
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5.	Particles of solid cannot move freely.	These particles move freely.	Gaseous particles are in a continuous, random motion.

NCERT Solutions for Class 9th Science http://freehomedelivery.net/: Chapter 2 Is Matter Around Us Pure

Question 1:
What is meant by a pure substance?
Answer:
A pure substance is the one that consists of a single type of particles, i.e., all constituent particles of the substance have the same chemical nature. Pure substances can be Classified as elements or compounds.
Question 2:
List the points of differences between homogeneous and heterogeneous mixtures.
Answer:
A homogeneous mixture is a mixture having a uniform composition throughout the mixture. For example: salt in water, sugar in water, copper sulphate in water A heterogeneous mixture is a mixture having a non-uniform composition throughout the mixture. For example: sodium chloride and iron fillings, salt and sulphur, oil and water

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Question 1:
Differentiate between homogeneous and heterogeneous mixtures with examples.
Answer:
A homogeneous mixture is a mixture having a uniform composition throughout the mixture. For example, mixtures of salt in water, sugar in water, copper sulphate in water, iodine in alcohol, alloy, and air have uniform compositions throughout the mixtures.
On the other hand, a heterogeneous mixture is a mixture having a non-uniform composition throughout the mixture. For example, composition of mixtures of sodium chloride and iron fillings, salt and sulphur, oil and water, chalk powder in water, wheat flour in water, milk and water are not uniform throughout the mixtures.
Question 2:
How are sol, solution and suspension different from each other?
Answer:
Sol is a heterogeneous mixture. In this mixture, the solute particles are so small that they cannot be seen with the naked eye. Also, they seem to be spread uniformly throughout the mixture. The Tyndall effect is observed in this mixture. For example: milk of magnesia, mud Solution is a homogeneous mixture. In this mixture, the solute particles dissolve and spread uniformly throughout the mixture. The Tyndall effect is not observed in this mixture. For example: salt in water, sugar in water, iodine in alcohol, alloy Suspensions are heterogeneous mixtures. In this mixture, the solute particles are visible to the naked eye, and remain suspended throughout the bulk of the medium. The Tyndall effect is observed in this mixture. For example: chalk powder and water, wheat flour and water
Question 3:
To make a saturated solution, 36 g of sodium chloride is dissolved in 100 g of water at 293 K. Find its concentration at this temperature.
Answer:
Mass of solute (sodium chloride) = 36 g (Given)
Mass of solvent (water) = 100 g (Given)
Then, mass of solution = Mass of solute + Mass of solvent
= (36 + 100) g
= 136 g

Therefore, concentration (mass by mass percentage) of the solution

S. No.	Solid state	Liquid state	Gaseous state
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Question 1:

How will you separate a mixture containing kerosene and petrol (difference in their boiling points is more than 25°C), which are miscible with each other?

Answer:

A mixture of two miscible liquids having a difference in their boiling points more than 25°C can be separated by the method of distillation. Thus, kerosene and petrol can be separated by distillation.

S. No.	Solid state	Liquid state	Gaseous state
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5.	Particles of solid cannot move freely.	These particles move freely.	Gaseous particles are in a continuous, random motion.

In this method, the mixture of kerosene and petrol is taken in a distillation flask with a thermometer fitted in it. We also need a beaker, a water condenser, and a Bunsen burner. The apparatus is arranged as shown in the above figure. Then, the mixture is heated slowly. The thermometer should be watched simultaneously. Kerosene will vaporize and condense in the water condenser. The condensed kerosene is collected from the condenser outlet, whereas petrol is left behind in the distillation flask.

Question 2:

Name the technique to separate
(i) butter from curd
(ii) salt from sea-water
(iii) camphor from salt

Answer:

(i) Butter can be separated from curd by centrifugation.
(ii) Salt can be separated from sea-water by evaporation.
(iii) Camphor can be separated from salt by sublimation.

Question 3:

What type of mixtures is separated by the technique of crystallization?

Answer:

By the technique of crystallization, pure solids are separated from impurities. For example, salt obtained from sea is separated from impurities; crystals of alum (Phitkari) are separated from impure samples.

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Question 1:

Classify the following as chemical or physical changes:

- Cutting of trees
- Melting of butter in a pan
- Rusting of almirah
- Boiling of water to form steam

- Passing of electric current through water, and water breaking down into hydrogen and oxygen gas
- Dissolving common salt in water
- Making a fruit salad with raw fruits
- Burning of paper and wood

Answer:

- Cutting of trees → Physical change
- Melting of butter in a pan → Physical change
- Rusting of almirah → Chemical change
- Boiling of water to form steam → Physical change
- Passing of electric current through water, and water breaking down into hydrogen and oxygen gas → Chemical change
- Dissolving common salt in water → Physical change
- Making a fruit salad with raw fruits → Physical change
- Burning of paper and wood → Chemical change

Question 2:

Try segregating the things around you as pure substances or mixtures.

Answer:

Pure substance: Water, salt, sugar Mixture: Salt water, soil, wood, air, cold drink, rubber, sponge, fog, milk, butter, clothes, food

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Question 1:

Which separation techniques will you apply for the separation of the following?
(a) Sodium chloride from its solution in water.
(b) Ammonium chloride from a mixture containing sodium chloride and ammonium chloride.
(c) Small pieces of metal in the engine oil of a car.
(d) Different pigments from an extract of flower petals.
(e) Butter from curd.
(f) Oil from water.
(g) Tea leaves from tea.
(h) Iron pins from sand.
(i) Wheat grains from husk.
(j) Fine mud particles suspended in water.

Answer:

(a) Sodium chloride from its solution in water → Evaporation
(b) Ammonium chloride from a mixture containing sodium chloride and ammonium chloride → Sublimation
(c) Small pieces of metal in the engine oil of a car → Centrifugation or filtration ordecantation
(d) Different pigments from an extract of flower petals → Chromatography
(e) Butter from curd → Centrifugation
(f) Oil from water → Using separating funnel
(g) Tea leaves from tea → Filtration
(h) Iron pins from sand → Magnetic separation
(i) Wheat grains from husk → Winnowing
(j) Fine mud particles suspended in water → Centrifugation

Question 2:

Write the steps you would use for making tea. Use the words: solution, solvent, solute, dissolve, soluble, insoluble, filtrate and residue.

Answer:

First, water is taken as a solvent in a saucer pan. This water (solvent) is allowed to boil. During heating, milk and tea leaves are added to the solvent as solutes. They form a solution. Then, the solution is poured through a strainer. The insoluble part of the solution remains on the strainer as residue. Sugar is added tothe filtrate, which dissolves in the filtrate. The resulting solution is the required tea.

Question 4:
Explain the following giving examples:
(a) Saturated solution
(b) Pure substance
(c) Colloid
(d) Suspension
Answer:
(a) Saturated solution
A saturated solution is a solution in which the maximum amount of solute has been dissolved at a given temperature. The solution cannot dissolve beyond that amount of solute at that temperature. Any more solute added will settle down at the bottom of the container as a precipitate.
Suppose 500 g of a solvent can dissolve a maximum of 150 g of a particular solute at 40°C. Then, the solution obtained by dissolving 150 g of that solute in 500 g of that solvent at 300 K is said to be a saturated solution at 300 K.
(b) Pure substance
A pure substance is a substance consisting of a single type of particles i.e., all constituent particles of the substance have the same chemical properties. For example, salt, sugar, water are pure substances.
(c) Colloid
A colloid is a heterogeneous mixture. The size of the solutes in this mixture is so small that they cannot be seen individually with naked eyes, and seems to be distributed uniformly throughout the mixture. The solute particles do not settle down when the mixture is left undisturbed. This means that colloids are quite stable. Colloids cannot be separated by the process of filtration. They can be separated by centrifugation. Colloids show the Tyndall effect. For example, milk, butter, foam, fog, smoke, clouds.
(d) Suspension
Suspensions are heterogeneous mixtures. The solute particles in this mixture remain suspended throughout the bulk of the medium. The particles can be seen with naked eyes. Suspension shows the Tyndall effect. The solute particles settle down when the mixture is left undisturbed. This means that suspensions are unstable. Suspensions can be separated by the method of filtration. For example, mixtures of chalk powder and water, wheat flour and water.
Question 5:
Classify each of the following as a homogeneous or heterogeneous mixture. Soda water, wood, air, soil, vinegar, filtered tea
Answer:
Homogeneous mixtures: Soda water, air, vinegar
Heterogeneous mixtures: Wood, soil, filtered tea
Question 6:
How would you confirm that a colourless liquid given to you is pure water?
Answer:
Every liquid has a characteristic boiling point. Pure water has a boiling point of 100°C (373 K) at 1 atmospheric pressure. If the given colourless liquid boils at even slightly above or below 100°C, then the given liquid is not pure water. It must boil at sharp 100°C. Thus, by observing the boiling point, we can confirm whether a given colourless liquid is pure water or not.
Question 7:
Which of the following materials fall in the category of a “pure substance”?
(a) Ice
(b) Milk
(c) Iron
(d) Hydrochloric Acid
(e) Calcium oxide
(f) Mercury
(g) Brick
(h) Wood
(i) Air
Answer:

The following materials fall in the category of a “pure substance”:
(a) Ice
(c) Iron
(d) Hydrochloric acid
(e) Calcium oxide
(f) Mercury

Question 8:

Identify the solutions among the following mixtures:
(a) Soil
(b) Sea water
(c) Air
(d) Coal
(e) Soda water

Answer:

The following mixtures are solutions:
(b) Sea water
(c) Air
(e) Soda water

Question 9:

Which of the following will show the “Tyndall effect”?
(a) Salt solution
(b) Milk
(c) Copper sulphate solution
(d) Starch solution

Answer:

Milk and starch solution will show the “Tyndall effect”.

Question 10:

Classify the following into elements, compounds and mixtures:
(a) Sodium
(b) Soil
(c) Sugar solution
(d) Silver
(e) Calcium carbonate
(f) Tin
(g) Silicon
(h) Coal
(i) Air
(j) Soap
(k) Methane
(l) Carbon dioxide
(m) Blood

Answer:

Elements
(a) Sodium
(d) Silver
(f) Tin
(g) Silicon
(e) Calcium carbonate
(k) Methane
(l) Carbon dioxide
Mixtures
(b) Soil
(c) Sugar solution
(h) Coal

(i) Air
(j) Soap
(m) Blood

Question 11:

Which of the following are chemical changes?
(a) Growth of a plant
(b) Rusting of iron
(c) Mixing of iron fillings and sand
(d) Cooking of food
(e) Digestion of food
(f) Freezing of water
(g) Burning of candle

Answer:

The following changes are chemical changes:
(a) Growth of a plant
(b) Rusting of iron
(d) Cooking of food
(e) Digestion of food
(g) Burning of candle

NCERT Solutions for Class 9th Science http://freehomedelivery.net/: Chapter 4 Structure of the Atom

Question 1:
What are canal rays?
Answer:
Canal rays are positively charged radiations. These rays consist of positively charged particles known as protons. They were discovered by Goldstein in 1886.
Question 2:
If an atom contains one electron and one proton, will it carry any charge or not?
Answer:
An electron is a negatively charged particle, whereas a proton is a positively charged particle. The magnitude of their charges is equal. Therefore, an atom containing one electron and one proton will not carry any charge. Thus, it will be a neutral atom.
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Question 1:
On the basis of Thomson's model of an atom, explain how the atom is neutral as a whole.
Answer:
According to Thomson's model of the atom, an atom consists of both negatively and positively charged particles. The negatively charged particles are embedded in the positively charged sphere. These negative and positive charges are equal in magnitude. Thus, by counterbalancing each other's effect, they make an atom neutral.
Question 2:
On the basis of Rutherford's model of an atom, which subatomic particle is present in the nucleus of an atom?
Answer:
On the basis of Rutherford's model of an atom, protons (positively-charged particles) are present in the nucleus of an atom.
Question 3:
Draw a sketch of Bohr's model of an atom with three shells.

Answer:

S. No.	Solid state	Liquid state	Gaseous state
1.	Definite shape and volume.	No definite shape. Liquids attain the shape of the vessel in which they are kept.	Gases have neither a definite shape nor a definite volume.
2.	Incompressible	Compressible to a small extent.	Highly compressible
3.	There is little space between the particles of a solid.	These particles have a greater space between them.	The space between gas particles is the greatest.
4.	These particles attract each other very strongly.	The force of attraction between liquid particles is less than solid particles.	The force of attraction is least between gaseous particles.
5.	Particles of solid cannot move freely.	These particles move freely.	Gaseous particles are in a continuous, random motion.

Question 4:

What do you think would be the observation if the α-particle scattering experiment is carried out using a foil of a metal other than gold?

Answer:

If the α-scattering experiment is carried out using a foil of a metal rather than gold, there would be no change in the observation. In the α-scattering experiment, a gold foil was taken because gold is malleable and a thin foil of gold can be easily made. It is difficult to make such foils from other metals.

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Question 1:

Name the three sub-atomic particles of an atom.

Answer:

The three sub-atomic particles of an atom are:
(i) Protons
(ii) Electrons, and
(iii) Neutrons

Question 2:

Helium atom has an atomic mass of 4 u and two protons in its nucleus. How many neutrons does it have?

Answer:

Helium atom has two neutrons. The mass of an atom is the sum of the masses of protons and neutrons present in its nucleus. Since helium atom has two protons, mass contributed by the two protons is (2 × 1) u = 2 u. Then, the remaining mass (4 − 2) u = 2 u is contributed by 2u/1u = 2 neutrons.

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Question 1:

Write the distribution of electrons in carbon and sodium atoms?

Answer:

Thetotal number of electrons in a carbon atom is 6. The distribution of electrons in carbon atom is given by:
First orbit or K-shell = 2 electrons

Second orbit or L-shell = 4 electrons
Or, we can write the distribution of electrons in a carbon atom as 2, 4.
The total number of electrons in a sodium atom is 11. The distribution of electrons in sodium atom is given by:
First orbit or K-shell = 2 electrons
Second orbit or L-shell = 8 electrons
Third orbit or M-shell = 1 electron
Or, we can write distribution of electrons in a sodium atom as 2, 8, 1.

Question 2:
If K and L shells of an atom are full, then what would be the total number of electrons in the atom?

Answer:
The maximum number of electrons that can occupy K and L-shells of an atom are 2 and 8 respectively. Therefore, if K and L-shells of an atom are full, then the total number of electrons in the atom would be (2 + 8) = 10 electrons.

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Question 1:
How will you find the valency of chlorine, sulphur and magnesium?

Answer:
If the number of electrons in the outermost shell of the atom of an element is less than or equal to 4, then the valency of the element is equal to the number of electrons in the outermost shell. On the other hand, if the number of electrons in the outermost shell of the atom of an element is greater than 4, then the valency of that element is determined by subtracting the number of electrons in the outermost shell from 8. The distribution of electrons in chlorine, sulphur, and magnesium atoms are 2, 8, 7; 2, 8, 6 and 2, 8, 2 respectively. Therefore, the number of electrons in the outer most shell of chlorine, sulphur, and magnesium atoms are 7, 6, and 2 respectively.
Thus, the valency of chlorine = 8 −7 = 1
The valency of sulphur = 8 − 6 = 2
The valency of magnesium = 2

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Question 1:
If number of electrons in an atom is 8 and number of protons is also 8, then (i) what is the atomic number of the atom and (ii) what is the charge on the atom?

Answer:
(i) The atomic number is equal to the number of protons. Therefore, the atomic number of the atom is 8.
(ii) Since the number of both electrons and protons is equal, therefore, the charge on the atom is 0.

Question 2:
With the help of Table 4.1, find out the mass number of oxygen and sulphur atom.

Answer:
Mass number of oxygen = Number of protons + Number of neutrons
= 8 + 8
= 16
Mass number of sulphur = Number of protons + Number of neutrons
= 16 +16
= 32

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2.	Incompressible	Compressible to a small extent.	Highly compressible
3.	There is little space between the particles of a solid.	These particles have a greater space between them.	The space between gas particles is the greatest.
4.	These particles attract each other very strongly.	The force of attraction between liquid particles is less than solid particles.	The force of attraction is least between gaseous particles.
5.	Particles of solid cannot move freely.	These particles move freely.	Gaseous particles are in a continuous, random motion.

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Question 2:
What are the limitations of J.J. Thomson's model of the atom?
Answer:
According to J.J. Thomson's model of an atom, an atom consists of a positively charged sphere with electrons embedded in it. However, it was later found that the positively charged particles reside at the centre of the atom called the nucleus, and the electrons revolve around the nucleus.
Question 3:
What are the limitations of Rutherford's model of the atom?
Answer:
According to Rutherford's model of an atom, electrons revolve around the nucleus in fixed orbits. But, an electron revolving in circular orbits will not be stable because during revolution, it will experience acceleration. Due to acceleration, the electrons will lose energy in the form of radiation and fall into the nucleus. In such a case, the atom would be highly unstable and collapse.
Question 4:
Describe Bohr's model of the atom.
Answer:
Bohr's model of the atom Niels Bohr proposed the following postulates regarding the model of the atom.
(i) Only certain orbits known as discrete orbits of electrons are allowed inside the atom.
(ii) While revolving in these discrete orbits, the electrons do not radiate energy. These discrete orbits or shells are shown in the following diagram.

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The first orbit (i.e., for n = 1) is represented by letter K. Similarly, for n = 2, it is L − shell, for n = 3, it is M − shell and for n = 4, it is N − shell. These orbits or shells are also called energy levels.

Question 5:

Compare all the proposed models of an atom given in this chapter

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Question 7:

Define valency by taking examples of silicon and oxygen.

Answer:

The valency of an element is the combining capacity of that element. The valency of an element is determined by the number of valence electrons present in the atom of that element. If the number of valence electrons of the atom of an element is less than or equal to four, then the valency of that element is equal to the number of valence electrons. For example, the atom of silicon has four valence electrons. Thus, the valency of silicon is four. On the other hand, if the number of valence electrons of the atom of an element is greater than four, then the valency of that element is obtained by subtracting the number of valence electrons from eight. For example, the atom of oxygen has six valence electrons. Thus, the valency of oxygen is (8 − 6) i.e., two.

Question 8:

Explain with examples (i) Atomic number, (ii) Mass number, (iii) Isotopes and (iv) Isobars. Give any two uses of isotopes.

Answer:

(i) Atomic number

The atomic number of an element is the total number of protons present in the atom of that element. For example, nitrogen has 7 protons in its atom. Thus, the atomic number of nitrogen is 7.

(ii) Mass number

The mass number of an element is the sum of the number of protons and neutrons present in the atom of that element. For example, the atom of boron has 5 protons and 6 neutrons. So, the mass number of boron is 5 + 6 = 11.

(iii) Isotopes

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And, the percentage of isotope is (100 − 10) % = 90%.

Question 12:
If Z = 3, what would be the valency of the element? Also, name the element.
Answer:
By Z = 3, we mean that the atomic number of the element is 3. Its electronic configuration is 2, 1. Hence, the valency of the element is 1 (since the outermost shell has only one electron).
Therefore, the element with Z = 3 is lithium.
Question 13:
Composition of the nuclei of two atomic species X and Y are given as under X Y
Protons = 6 6
Neutrons = 6 8
Give the mass numbers of X and Y. What is the relation between the two species?
Answer:
Mass number of X = Number of protons + Number of neutrons
= 6 + 6
= 12
Mass number of Y = Number of protons + Number of neutrons
= 6 + 8
= 14
These two atomic species X and Y have the same atomic number, but different mass numbers. Hence, they are isotopes.
Question 14:
For the following statements, write T for 'True' and F for 'False'.
(a) J.J. Thomson proposed that the nucleus of an atom contains only nucleons.
(b) A neutron is formed by an electron and a proton combining together. Therefore, it is neutral.
(c) The mass of an electron is about 1/2000 times that of proton.
(d) An isotope of iodine is used for making tincture iodine, which is used as a medicine.
Answer:
(a) J.J. Thomson proposed that the nucleus of an atom contains only nucleons. (F)
(b) A neutron is formed by an electron and a proton combining together. Therefore, it is neutral. (F)
(c) The mass of an electron is about 1/2000 times that of proton. (T)
(d) An isotope of iodine is used for making tincture iodine, which is used as a medicine. (T)
Question 15:
Put tick (–) against correct choice and cross (x) against wrong choice in the following question:
Rutherford's alpha-particle scattering experiment was responsible for the discovery of
(a) Atomic nucleus
(b) Electron
(c) Proton
(d) Neutron
Answer:
Rutherford's alpha-particle scattering experiment was responsible for the discovery of
(a) Atomic nucleus (–)
(b) Electron (x)
(c) Proton (x)
(d) Neutron (x)
Question 16: Put tick (–) against correct choice and cross (x) against wrong choice in the following question: Isotopes of an element have
(a) the same physical properties
(b) different chemical properties
(c) different number of neutrons
(d) different atomic numbers
Answer:
Isotopes of an element have
(a) the same physical properties (x)
(b) different chemical properties (x)

(c) different number of neutrons (–)
(d) different atomic numbers (x)

Question 17: Put tick (–) against correct choice and cross (x) against wrong choice in the following question:
Number of valence electrons in Cl^- ion are:
(a) 16
(b) 8
(c) 17
(d) 18

Answer:
Number of valence electrons in Cl^- ion are:
(a) 16 (x)
(b) 8 (–)
(c) 17 (x)
(d) 18 (x)

Question 18:
Which one of the following is a correct electronic configuration of sodium?
(a) 2, 8
(b) 8, 2, 1
(c) 2, 1, 8
(d) 2, 8, 1

Answer:
(d) The correct electronic configuration of sodium is 2, 8, 1.

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Question 1:
Who discovered cells and how?
Answer:
Cells were discovered in 1665 by an English Botanist, Robert Hooke. He used a primitive microscope to observe cells in a cork slice.

Question 2:
Why is the cell called the structural and functional unit of life?
Answer:
Cells constitute various components of plants and animals. A cell is the smallest unit of life and is capable of all living functions. Cells are the building blocks of life. This is the reason why cells are referred to as the basic structural and functional units of life. All cells vary in their shape, size, and activity they perform. In fact, the shape and size of the cell is related to the specific functions they perform.
—
Question 1:
How do substances like CO2 and water move in and out of the cell? Discuss.
Answer:
The cell membrane is selectively permeable and regulates themovement of substances in and out of the cell. Movement of CO2:
CO2 is produced during cellular respiration. Therefore, it is present in high concentrations inside the cell. This CO2 must be excreted out of the cell. In the cell's external environment, the concentration of CO2 is low as compared to that inside the cell. Therefore, according to the principle of diffusion, CO2 moves from a region of higher concentration (inside the cell) towards a region of lower concentration (outside the cell). Similarly, O2 enters the cell by the process of diffusion when the concentration of O2 inside the cell is low as compared to its surroundings.
Movement of water:
Water moves from a region of high concentration to a region of low concentration through the plasma membrane. The plasma membrane acts as a semi-permeable membrane, and this movement of water is known as osmosis. However, the movement of water across the plasma membrane of the cell is affected by the amount of substance dissolved in water.
Question 2:
Why is the plasma membrane called a selectively permeable membrane?
Answer:
Thecell membraneor the plasma membraneis known as a selectively permeable membrane because it regulates the movement of substances in and out of the cell. This means that the plasma membrane allows the entry of only some substances and prevents the movement of some other materials.
—

Question 1:
Fill in the gaps in the following table illustrating differences between prokaryotic and eukaryotic cells.

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Question 1:
Can you name the two organelles we have studied that contain their own genetic material?
Answer:
Mitochondriaandplastids are the two organelles that contain their own genetic material. Both these organelles have their own DNA and ribosomes.
Question 2:
If the organisation of a cell is destroyed due to some physical or chemical influence, what will happen?
Answer:
Cell is the smallest unit of life, which is capable of all living functions. If the organisation of a cell is destroyed due to some physical or chemical influence, then the ability of the cell to perform all living functions such as respiration, nutrition, excretion, etc. would be affected.
Question 3:
Why are lysosomes known as suicide bags?
Answer:
Lysosomes are membrane-bound vesicular structures that contain powerful digestive enzymes. These enzymes are capable of breaking down any foreign food particle or microbes entering the cell. Sometimes, lysosomes can cause self-destruction of a cell by releasing these digestive enzymes within the cells. Hence, they are also known as ‘suicidal bags’.
Question 4:
Where are proteins synthesized inside the cell?
Answer:
Ribosomesare the site for protein synthesis. Ribosomes are very small structures found either in a free state, suspended in the cytoplasm, or attached to the surface of the endoplasmic reticulum. They are composed of ribonucleic acids and proteins.

—

Question 1:

Make a comparison and write down ways in which plant cells are different from animal cells.

Answer:

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Question 2:

How is a prokaryotic cell different from a eukaryotic cell?

Answer:

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Question 3:

What would happen if the plasma membrane ruptures or breaks down?

Answer:

If the plasma membrane of a cell is ruptured, then the cell will die. The plasma membrane regulates the movement of substances in and out of the cell by diffusion or osmosis. Thus, if the plasma membrane is ruptured, then the cell might leak out its contents.

Question 4:

What would happen to the life of a cell if there was no Golgi apparatus?

Answer:

If there was no Golgi apparatus in the cell, then most activities performed by the Golgi apparatus will not take place.

(i) Membranes of the Golgi apparatus are often connected to ER membranes. It collects simpler molecules and combines them to make more complex molecules. These are then packaged in small vesicles and are either stored in the cell or sent out as per the requirement. Thus, if the Golgi apparatus is absent in the cell, then the above process of storage, modification, and packaging of products will not be possible.

(ii) The formation of complex sugars from simple sugars will not be possible as this takes place with the help of enzymes present in Golgi bodies.

(iii) The Golgi apparatus is involved in the formation of lysosomes or peroxisomes. Thus, if the Golgi body is absent in a cell, the synthesis of lysosomes or peroxisomes will not be possible in the cell.

Question 5:

Which organelle is known as the powerhouse of the cell? Why?

Answer:

Mitochondriaare known as the powerhouse of cells. Mitochondria create energy for the cell, and this process of creating energy for the cell is known as cellular respiration. Most chemical reactions involved in cellular respiration occur in the mitochondria. The energy required for various chemical activities needed for life is released by the mitochondria in the form of ATP (Adenosine triphosphate) molecules. For this reason, mitochondria are known as the powerhouse of cells.

Question 6:
Where do the lipids and proteins constituting the cell membrane get synthesized?
Answer:
Lipids and proteinsconstituting the cell membrane are synthesized in the endoplasmic reticulum.
SER (Smooth endoplasmic reticulum) helps in the manufacturing of lipids.
RER (Rough endoplasmic reticulum) has particles attached to its surface, called ribosomes. These ribosomes are the site for protein synthesis.
Question 7:
How does an Amoeba obtain its food?
Answer:
Amoebaobtains its food through the process of endocytosis. The flexibility of the cell membrane enables the cell to engulf the solid particles of food and other materials from its external environment.

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Question 8:
What is osmosis?
Answer:
The movement of water molecules from a region of high concentration to a region of low concentration through a selectively permeable membrane is called osmosis. It is a special case of diffusion, where the medium is water.
For example, if the medium surrounding the cell has a higher water concentration than the cell i.e., if the solution is a dilute solution, then the cell will gain water by osmosis.

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Movement of water inside the cell

Question 9:

Carry out the following osmosis experiment: Take four peeled potato halves and scoop each one out to make potato cups. One of these potato cups should be made from a boiled potato. Put each potato cup in a trough containing water. Now,

(a) Keep cup A empty

(b) Put one teaspoon sugar in cup B

(c) Put one teaspoon salt in cup C

(d) Put one teaspoon sugar in the boiled potato cup D.

Keep these for two hours. Then observe the four potato cups and answer the following:

(i) Explain why water gathers in the hollowed portion of B and C.

(ii) Why is potato A necessary for this experiment?

(iii) Explain why water does not gather in the hollowed out portions of A and D.

Answer Discussion

Experimental set up

(i) Water gathers in the hollowed portions of set-up B and C because water enters the potato as a result of osmosis. Since the medium surrounding the cell has a higher water concentration than the cell, the water moves inside by osmosis. Hence, water gathers in the hollowed portions of the potato cup.

(ii) Potato A in the experiment acts as a control set-up. No water gathers in the hollowed portions of potato A.

(iii) Water does not gather in the hollowed portions of potato A because potato cup A is empty. It is a control set-up in the experiment. Water is not able to enter potato D because the potato used here is boiled. Boiling denatures the proteins present in the cell membrane and thus, disrupts the cell membrane. For osmosis, a semi-permeable membrane is required, which is disrupted in this case. Therefore, osmosis will not occur. Hence, water does not enter the boiled potato cup.

NCERT Solutions for Class 9th Science http://freehomedelivery.net/: Chapter 6 Tissues

Question 1:
What is a tissue?
Answer:
Tissue is a group of cells that are similar in structure and are organised together to perform a specific task.
Question 2:
What is the utility of tissues in multi-cellular organisms?
Answer:
In unicellular organisms, a single cell performs all the basic functions such as respiration, movement, excretion, digestion, etc. But in multicellular organisms, cells are grouped to form tissues. These tissues are specialised to carry out a particular function at a definite place in the body. For example, the muscle cells form muscular tissues which helps in movement, nerve cells form the nervous tissue which helps in transmission of messages. This is known as division of labour in multicellular organisms. It is because of this division of labour that multicellular organisms are able to perform all functions efficiently.

—
Question 1:
Name types of simple tissues.
Answer:
Simple permanent tissues are of three types: Parenchyma, Collenchyma, and Sclerenchyma. Parenchyma tissue is of further two types − aerenchyma and chlorenchyma.
Question 2:
Where is apical meristem found?
Answer:
Apical meristem is present at the growing tips of stems and roots. Their main function is to initiate growth in new cells of seedlings, at the tip of roots, and shoots.
Question 3:
Which tissue makes up the husk of coconut?
Answer:
The husk of a coconut is made up of sclerenchyma tissue.
Question 4:
What are the constituents of phloem?
Answer:
Phloem is the food conducting tissue in plants. It is made up of four components:
(i) Sieve tubes
(ii) Companion cells
(iii) Phloem parenchyma
(iv) Phloem fibres

—
Question 1:
Name the tissue responsible for movement in our body.
Answer:
Themuscular tissue is responsible for movement in our body.
Question 2:
What does a neuron look like?
Answer:
A neuron consists of a cell body witha nucleus and cytoplasm. It has two important extensions known as the axon and dendrites. An axon is a long thread-like extension of nerve cells that transmits impulses away from the cell body. Dendrites, on the other hand, are thread-like extensions of cell body that receive nerve impulses. Thus, the axon transmits impulses away from the cell body, whereas the dendrite receives nerve

impulses. This coordinated function helps in transmitting impulses very quickly.

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Question 3:
Give three features of cardiac muscles.
Answer:
Three features of cardiac muscles are:
(i) Cardiac muscles are involuntary muscles that contract rapidly, but do not get fatigued.
(ii) The cells of cardiac muscles are cylindrical, branched, and uninucleate
(iii) They control the contraction and relaxation of the heart.
Question 4:
What are the functions of areolar tissue?
Answer:
Functions of areolar tissue:
(i) It helps in supporting internal organs.
(ii) It helps in repairing the tissues of the skin and muscles.
—
Question 1:
Define the term “tissue”.
Answer:
Tissue is a group of cells that are similar in structure and are organized together to perform a specific task.
Question 2:
How many types of elements together make up the xylem tissue? Name them.
Answer:
There are four different types of cells that make up the xylem tissue. They are:
(i) Tracheids
(ii) Vessels
(iii) Xylem parenchyma
(iv) Xylem fibres

Question 3:

How are simple tissues different from complex tissues in plants?

Answer:

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Question 5:

What are the functions of the stomata?

Answer:

Functions of the stomata:

(i) They allow the exchange of gases (CO_2 and O_2) with the atmosphere.

(ii) Evaporation of water from the leaf surface occurs through the stomata. Thus, the stomata help in the process of transpiration.

Question 6:

Diagrammatically show the difference between the three types of muscle fibres.

Answer:

The three types of muscle fibres are:Striated muscles, smooth muscles (unstriated muscle fibre), and

cardiac muscles.

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Question 7:

What is the specific function of the cardiac muscle?

Answer:

The specific function of the cardiac muscle is to control the contraction and relaxation of the heart.

Question 8:

Differentiate between striated, unstriated and cardiac muscles on the basis of their structure and site/location in the body.

Answer:

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Question 10:

Name the following:

(a) Tissue that forms the inner lining of our mouth.

(b) Tissue that connects muscle to bone in humans.

(c) Tissue that transports food in plants.

(d) Tissue that stores fat in our body.

(e) Connective tissue with a fluid matrix.

(f) Tissue present in the brain.

Answer:

(a) Tissue that forms the inner lining of our mouth → Epithelial tissue

(b) Tissue that connects muscle to bone in humans → Dense regular connective tissue (tendons)

(c) Tissue that transports food in plants → Phloem

(d) Tissue that stores fat in our body → Adipose tissue

(e) Connective tissue with a fluid matrix → Blood

(f) Tissue present in the brain → Nervous tissue

Question 11:

Identify the type of tissue in the following: skin, bark of tree, bone, lining of kidney tubule, vascular bundle.

Answer:

Skin: Stratified squamous epithelial tissue

Bark of tree: Simple permanent tissue

Bone: Connective tissue

Lining of kidney tubule: Cuboidal epithelial tissue

Vascular bundle: Complex permanent tissue

Question 12:

Name the regions in which parenchyma tissue is present.

Answer:

Leaves, fruits, and flowers are the regions where the parenchyma tissue is present.

Question 13:

What is the role of epidermis in plants?

Answer:

Epidermisis present on the outer surface of the entire plant body. The cells of the epidermal tissue form a continuous layer without any intercellular space. It performs the following important functions:

(i) It is a protective tissue of the plant body

(ii) It protects the plant against mechanical injury

(iii) It allows exchange of gases through the stomata

Question 14:

How does the cork act as a protective tissue?

Answer:

The outer protective layer or bark of a tree is known as the cork. It is made up of dead cells. Therefore, it protects the plant against mechanical injury, temperature extremes, etc. It also prevents the loss of water by evaporation.

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NCERT Solutions for Class 9th Science http://freehomedelivery.net/: Chapter 7 Diversity in Living Organisms

Question 1:
Why do we Classify organisms?
Answer:
There are a wide range of life forms (about 10 million −13 million species) around us. These life forms have existed and evolved on the Earth over millions of years ago. The huge range of these life forms makes it very difficult to study them one by one. Therefore, we look for similarities among them and Classify them into different Classes to study these different Classes as a whole. Thus, Classification makes our study easier.

Question 2:
Give three examples of the range of variations that you see in life-forms around you.
Answer:
Examples of range of variations observed in daily life are:
(i) Variety of living organisms in terms of size ranges from microscopic bacteria to tall trees of 100 metres.
(ii) The colour, shape, and size of snakes are completely different from those of lizards.
(iii) The life span of different organisms is also quite varied. For example, a crow lives for only 15 years, whereas a parrot lives for about 140 years
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Question 1:
Which do you think is a more basic characteristic for Classifying organisms?
(a) The place where they live.
(b) The kind of cells they are made of. Why?
Answer:
The kind of cells that living organisms are made up of is a more basic characteristic for Classifying organisms, than on the basis of their habitat. This is because on the basis of the kind of cells, we can Classify all living organisms into eukaryotes and prokaryotes. On the other hand, a habitat or the place where an organism lives is a very broad characteristic to be used as the basis for Classifying organisms. For example, animals that live on land include earthworms, mosquitoes, butterfly, rats, elephants, tigers, etc. These animals do not resemble each other except for the fact that they share a common habitat. Therefore, the nature or kind of a cell is considered to be a fundamental characteristic for the Classification of living organisms.

Question 2:
What is the primary characteristic on which the first division of organisms is made?
Answer:
The primary characteristic on which the first division of organisms is made is the nature of the cell. It is considered to be the fundamental characteristic for Classifying all living organisms. Nature of the cell includes the presence or absence of membrane-bound organelles. Therefore, on the basis of this fundamental characteristic, we can Classify all living organisms into two broad categories of eukaryotes and prokaryotes. Then, further Classification is made on the basis of cellularity or modes of nutrition.

Question 3:
On what basis are plants and animals put into different categories?
Answer:
Plants and animals differ in many features such as the absence of chloroplasts, presence of cell wall, etc. But, locomotion is considered as the characteristic feature that separates animals from plants. This is because the absence of locomotion in plants gave rise to many structural changes such as the presence of a cell wall (for protection), the presence of chloroplasts (for photosynthesis) etc. Hence, locomotion is considered to be the basic characteristic as further differences arose because of this characteristic feature.
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Question 1:
Which organisms are called primitive and how are they different from the so-called advanced organisms?
Answer:
A primitive organism or lower organism is the one which has a simple body structure and ancient body design or features that have not changed much over a period of time. An advanced organism or higher organism has a complex body structure and organization. For example, an Amoeba is more primitive as compared to a starfish. Amoeba has a simple body structure and primitive features as compared to a starfish. Hence, an Amoeba is considered more primitive than a starfish.

Question 2:
Will advanced organisms be the same as complex organisms? Why?
Answer:
It is not always true that an advanced organism will have a complex body structure. But, there is a possibility that over the evolutionary time, complexity in body design will increase. Therefore, at times, advanced organisms can be the same as complex organisms.

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Question 1:
What is the criterion for Classification of organisms as belonging to kingdom Monera or Protista?
Answer:
The criterion for the Classification of organisms belonging to kingdom Monera or Protista is the presence or absence of a well-defined nucleus or membrane-bound organelles. Kingdom Monera includes organisms that do not have a well-defined nucleus or membrane-bound organelles and these are known as prokaryotes. Kingdom Protista, on the other hand, includes organisms with a well-defined nucleus and membrane-bound organelles and these organisms are called eukaryotes.
Question 2:
In which kingdom will you place an organism which is single-celled, eukaryotic and photosynthetic?
Answer:
Kingdom Protista includes single celled, eukaryotic, and photosynthetic organisms.

Question 3:
In the hierarchy of Classification, which grouping will have the smallest number of organisms with a maximum of characteristics in common and which will have the largest number of organisms?
Answer:
In the hierarchy of Classification,a species will have the smallest number of organisms with a maximum of characteristics in common, whereas the kingdom will have the largest number of organisms.

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Question 1:

What are the advantages of Classifying organisms?

Answer:

There are a wide range of life forms (about 10 million-13 million species) around us. These life forms have existed and evolved on the Earth over millions of years ago. The huge range of these life forms makes it very difficult to study them one by one. Therefore, we look for similarities among them and Classify them into different Classes so that we can study these different Classes as a whole. This makes our study easier.

Therefore, Classification serves the following advantages:

(i) It determines the methods of organising the diversity of life on Earth.

(ii) It helps in understanding millions of life forms in detail.

(iii) It also helps in predicting the line of evolution.

Question 2:

How would you choose between two characteristics to be used for developing a hierarchy in Classification?

Answer:

For developing a hierarchy of Classification, we choose the fundamental characteristic among several other characteristics. For example, plants differ from animals in the absence of locomotion, chloroplasts, cell wall, etc. But, only locomotion is considered as the basic or fundamental feature that is used to distinguish between plants and animals. This is because the absence of locomotion in plants gave rise to many structural changes such as the presence of a cell wall for protection, and the presence of chloroplast for photosynthesis (as they cannot move around in search of food like animals). Thus, all these features are a result of locomotion. Therefore, locomotion is considered to be a fundamental characteristic. By choosing the basic or fundamental characteristic, we can make broad divisions in living organisms as the next level of characteristic is dependent on these. This goes on to form a hierarchy of characteristics.

Question 3:

Explain the basis for grouping organisms into five kingdoms.

Answer:

R.H. Whittaker proposed a five kingdom Classification of living organisms on the basis of Linnaeus' system of Classification. The five kingdoms proposed by Whittaker are Monera, Protista, Fungi, Plantae, and Animalia.

The basis for grouping organisms into five kingdoms is as follows:

(i) On the basis of the presence or absence of membrane-bound organelles, all living organisms are divided into two broad categories of eukaryotes and prokaryotes. This division lead to the formation of kingdom Monera, which includes all prokaryotes.

(ii) Then, eukaryotes are divided as unicellular and multicellular, on the basis of cellularity. Unicellular eukaryotes form kingdom Protista, and multicellular eukaryotes form kingdom Fungi, Plantae, and Animalia.

(iii) Animals are then separated on the basis of the absence of a cell wall.

(iv) Since fungi and plants both contain a cell wall, they are separated into different kingdoms on the basis of their modes of nutrition. Fungi have saprophytic mode of nutrition, whereas plants have autotrophic mode of nutrition. This results in the formation of the five kingdoms.

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Question 4:

What are the major divisions in the Plantae? What is the basis for these divisions?

Answer:

The kingdom Plantae is divided into five main divisions: Thallophyta, Bryophyta, Pteridophyta, Gymnosperms, and Angiosperms.

The Classification depends on the following criteria:

- Differentiated/ Undifferentiated plant body
- Presence /absence of vascular tissues
- With/without seeds
- Naked seeds/ seeds inside fruits

(i) The first level of Classification depends on whether a plant body is well differentiated or not. A group of plants that do not have a well differentiated plant body are known as Thallophyta.
(ii) Plants that have well differentiated body parts are further divided on the basis of the presence or absence of vascular tissues. Plants without specialised vascular tissues are included in division Bryophyta, whereas plants with vascular tissues are known as Tracheophyta.
(iii) Tracheophyta is again sub-divided into division Pteridophyta, on the basis of the absence of seed formation.
(iv) The other group of plants having well developed reproductive organs that finally develop seeds are called Phanerogams. This group is further sub- divided on the basis of whether the seeds are naked or enclosed in fruits. This Classifies them into gymnosperms and angiosperms. Gymnosperms are seed bearing, non-flowering plants, whereas angiosperms are flowering plants in which the seeds are enclosed inside the fruit.

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Question 5:
How are the criteria for deciding divisions in plants different from the criteria for deciding the subgroups among animals?
Answer:
Criteria for deciding divisions in plants are:
(i) Differentiated/ Undifferentiated plant body
(ii) Presence/ absence of vascular tissues

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All members of the phylum chordate possess a notochord. However, some animals such as Balanoglossus, Amphioxus, Herdmania, etc. have a notochord, which is either absent or does not run the entire length of the animal's body. Therefore, these animals are kept in a separate sub-phylum called Protochordata, and the rest of the chordates are included in the sub-phylum vertebrata. The members of the subphylum vertebrata are advanced chordates. They are divided into five Classes: Pisces, Amphibian, Reptilia, Aves, and Mammalia.

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(i) Class Pisces: This Class includes fish such as Scoliodon, tuna, rohu, shark, etc. These animals mostly live in water. Hence, they have special adaptive features such as a streamlined body, presence of a tail for movement, gills, etc. to live in water.
(ii) Class Amphibia: It includes frogs, toads, and salamanders. These animals have a dual mode of life. In the larval stage, the respiratory organs are gills, but in the adult stage, respiration occurs through the lungs or skin. They lay eggs in water.
(iii) Class Reptilia: It includes reptiles such as lizards, snakes, turtles, etc. They usually creep or crawl on land. The body of a reptile is covered with dry and cornified skin to prevent water loss. They lay eggs on land.
(iv) Class Aves: It includes all birds such as sparrow, pigeon, crow, etc. Most of them have feathers. Their forelimbs are modified into wings for flight, while hind limbs are modified for walking and clasping. They lay eggs.
(v) Class Mammalia: It includes a variety of animals which have milk producing glands to nourish their young ones. Some lay eggs and some give birth to young ones. Their skin has hair as well as sweat glands to regulate their body temperature.