



Chemical Reactions and Equations

1

NCERT SOLUTIONS



What's inside

- In-Chapter Q's (solved)
- Textbook Exercise Q's (solved)

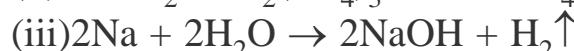
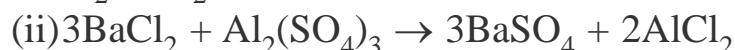
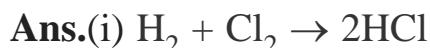
IN-CHAPTER QUESTIONS

Test Yourself

1. Why should a magnesium ribbon be cleaned before burning in air?

Ans. Upon oxidation, magnesium is layered with magnesium oxide. Hence, it is cleaned using sandpaper, before use.

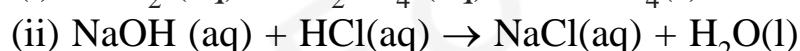
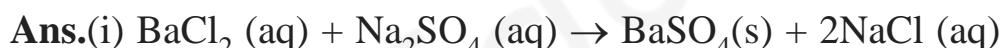
2. Write the balanced equation for the following chemical reactions :



3. Write a balanced chemical equation with state symbols for the following reactions:

(i) Solutions of barium chloride and sodium sulphate in water react to give insoluble barium sulphate and the solution of sodium chloride.

(ii) Sodium hydroxide solution (in water) reacts with a hydrochloric acid solution (in water) to produce sodium chloride solution and water.



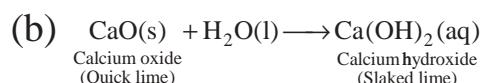
Test Yourself

1. A solution of a substance 'X' is used for white washing.

(a) Name the substance 'X' and write its formula.

(b) Write the reaction of the substance 'X' named in (a) above with water.

Ans. (a) The substance whose solution in water is used for whitewashing is calcium oxide (or quicklime). Its formula is CaO.

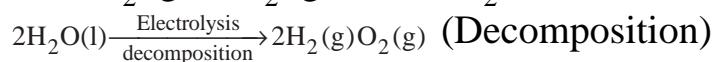
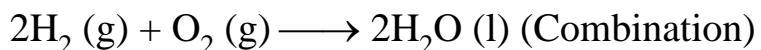


2. Why is the amount of gas collected in one of the test tubes in text book Activity 1.7 (i.e., electrolysis of water) double of the amount collected in the other? Name this gas.

Ans. Since water is made up of two hydrogen atoms and one oxygen atom, the amount of gas collected in one test tube is twice that of the other. The name of the first gas

is hydrogen gas and the name of the second gas is oxygen gas.

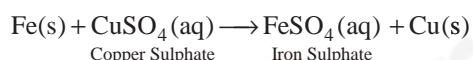
A decomposition reaction is the exact opposite of a combination reaction. As hydrogen reacts with oxygen to form water and an electric current is passed through water, the electrolysis of water produces hydrogen and oxygen.



Test Yourself

1. Why does the colour of copper sulphate solution change when an iron nail is dipped in it?

Ans. Because iron is a more reactive element than copper in this reaction. For this reason, they displace copper from its compound. Therefore, the color of the iron nail becomes brown and the color of the solution of copper sulphate becomes light blue.

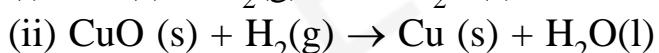
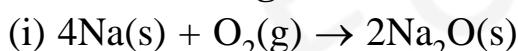


2. Give an example of a double displacement reaction other than the one given in Activity 1.10 (NCERT).

Ans. When a solution of sodium chloride is added to a solution of silver nitrate, a white precipitate of silver chloride is formed.



3. Identify the substances that are oxidised and the substances which are reduced in the following reactions:

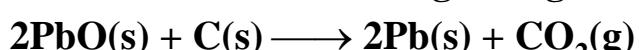


Ans. In reaction (i) Na is being changed from Na to Na_2O so sodium is oxidised to form Na_2O and oxygen is reduced.

In reaction (ii) CuO is oxidised to form Cu because oxygen is being lost from CuO. H_2 gets oxidised to H_2O because O₂ is increasing.

NCERT EXERCISES

1. Which statement is false regarding the reaction given below?

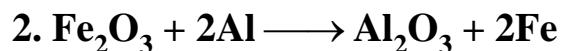


- (a) Lead is reducing.
- (b) Carbon dioxide is getting oxidised.
- (c) Carbon is getting oxidised.

(d) Lead oxide is getting reduced.

- (i) (a) and (b)
- (ii) (a) and (c)
- (iii) (a), (b) and (c)
- (iv) All

Ans. (i) (a) and (b)



What type of reaction is given above?

- (a) Combination reaction
- (b) Double displacement reaction.
- (c) Decomposition reaction.
- (d) Displacement reaction

Ans.(d) Displacement reaction

3. What happens when dilute hydrochloric acid is added to iron filings?

- (a) Hydrogen gas and iron chloride are produced.
- (b) Chlorine gas and iron hydroxide are produced.
- (c) No reaction takes place.
- (d) Iron salt and water are produced.

Ans.(a) Hydrogen gas and iron chloride are produced.

4. What is a balanced chemical equation? Why should chemical equations be balanced?

Ans. A chemical equation in which the number of atoms of different elements is equal on both sides is called a balanced chemical equation. It is necessary to balance it because it gives the correct information about the equation as well as the correct number of reactants and products.

5. Translate the following statements into chemical equations and then balance them.

- (a) Hydrogen gas combines with nitrogen to form ammonia.
- (b) Hydrogen sulfide gas burns in the air to give water and sulfur dioxide.
- (c) Barium chloride reacts with aluminum sulphate to give aluminum chloride and a precipitate of barium sulphate.
- (d) Potassium metal reacts with water to give potassium hydroxide and hydrogen gas.

Ans.(a) $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2 \text{NH}_3(\text{g})$

(b) $2\text{H}_2\text{S}(\text{g}) + 3\text{O}_2(\text{g}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + 2\text{SO}_2(\text{g})$

(c) $3\text{BaCl}_2(\text{aq}) + \text{Al}_2(\text{SO}_4)_3(\text{aq}) \rightarrow 2\text{AlCl}_3(\text{aq}) + 3\text{BaSO}_4 \downarrow(\text{s})$

(d) $2\text{K}(\text{s}) + 2\text{H}_2\text{O}(\text{l}) \rightarrow 2\text{KOH}(\text{aq}) + \text{H}_2(\text{g})$

6. Balance the following chemical equations:

- (a) $\text{HNO}_3 + \text{Ca}(\text{OH})_2 \rightarrow \text{Ca}(\text{NO}_3)_2 + \text{H}_2\text{O}$
- (b) $\text{NaOH} + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + \text{H}_2\text{O}$
- (c) $\text{NaCl} + \text{AgNO}_3 \rightarrow \text{AgCl} + \text{NaNO}_3$
- (d) $\text{BaCl}_2 + \text{H}_2\text{SO}_4 \rightarrow \text{BaSO}_4 + \text{HCl}$

Ans.(a) $2\text{HNO}_3 + \text{Ca}(\text{OH})_2 \rightarrow \text{Ca}(\text{NO}_3)_2 + 2\text{H}_2\text{O}$

- (b) $2\text{NaOH} + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$
- (c) $\text{NaCl} + \text{AgNO}_3(\text{g}) \rightarrow \text{AgCl} + \text{NaNO}_3$
- (d) $\text{BaCl}_2 + \text{H}_2\text{SO}_4 \rightarrow \text{BaSO}_4 + 2\text{HCl}$

7. Write the balanced chemical equations for the following reactions:

- (a) Calcium hydroxide + Carbon dioxide \rightarrow Calcium carbonate + Water
- (b) Zinc + Silver nitrate \rightarrow Zinc nitrate + Silver
- (c) Aluminium + Copper chloride \rightarrow Aluminium chloride + Copper
- (d) Barium chloride + Potassium sulphate \rightarrow Barium sulphate + Potassium chloride

Ans.(a) $\text{Ca}(\text{OH})_2 + \text{CO}_2 \rightarrow \text{CaCO}_3 + \text{H}_2\text{O}$

- (b) $\text{Zn} + 2\text{AgNO}_3 \rightarrow \text{Zn}(\text{NO}_3)_2 + 2\text{Ag}$
- (c) $2\text{Al} + 3\text{CuCl}_2 \rightarrow 2\text{AlCl}_3 + 3\text{Cu}$
- (d) $\text{BaCl}_2 + \text{K}_2\text{SO}_4 \rightarrow \text{BaSO}_4 + 2\text{KCl}$

8. Write the balanced chemical equation for the following and identify the type of reaction in each case:

- (a) Potassium bromide (aq) + Barium iodide (aq) \rightarrow Potassium iodide (aq) + Barium
- (b) Zinc carbonate(s) \rightarrow Zinc oxide (s) + Carbon dioxide (g) bromide(s)
- (c) Hydrogen (g) + Chloride (g) \rightarrow Hydrogen chloride (g)
- (d) Magnesium (s) + Hydrochloric acid (aq) \rightarrow Magnesium chloride (aq) + Hydrogen (g)

Ans.(a) $2\text{KBr}(\text{aq}) + \text{BaI}_2(\text{aq}) \rightarrow 2\text{KI}(\text{aq}) + \text{BaBr}_2(\text{s})$

Type: Double displacement reaction

(b) $\text{ZnCO}_3(\text{s}) \rightarrow \text{ZnO}(\text{s}) + \text{CO}_2(\text{g})$

Type: Decomposition reaction

(c) $\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightarrow 2\text{HCl}(\text{g})$

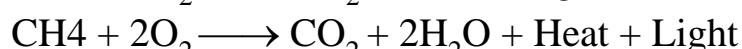
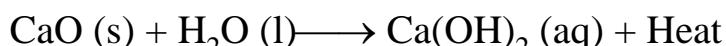
Type: Combination reaction

(d) $\text{Mg}(\text{s}) + 2\text{HCl}(\text{aq}) \rightarrow \text{MgCl}_2(\text{aq}) + \text{H}_2(\text{g})$

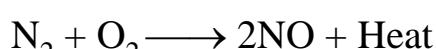
Type: Displacement reaction

9. What is meant by exothermic and endothermic reaction? Give an example.

Ans. The reaction in which heat is produced is called an exothermic reaction. Such as the burning of natural gas.

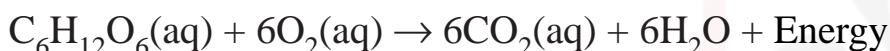


The reaction in which heat is absorbed is called endothermic reaction. For example :



10. Why is respiration considered an exothermic reaction? Explain.

Ans. We need the energy to survive. This energy is obtained from food. When we breathe, the food item *i.e.*, food gets metabolized by oxygen. Energy is released in this process. Hence respiration is called an exothermic reaction.



11. Why are decomposition reactions called the opposite of combination reactions?

Write equations for these reactions.

Ans. A reaction in which a single reactant breaks down to give smaller products is called dissociation reaction.

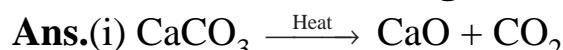


The reactions in which two or more elements or compounds combine to form a single product are called combination reactions.

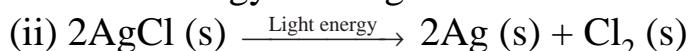


Equations (i) and (ii) the reactions are the same but opposite. Eq. (i) is dissociation of CaCO_3 while Eq. (ii) is the combination (or formation) of CaCO_3 .

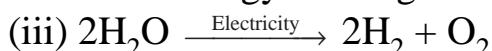
12. Write one equation each for the decomposition reactions where energy is supplied in the form of heat, light or electricity.



In this energy is being used in the form of heat.



In this energy is being used as light energy.



In this, energy is being used in the form of electricity.

13. What is the difference between displacement and double displacement reactions?

Write equations for these reactions.

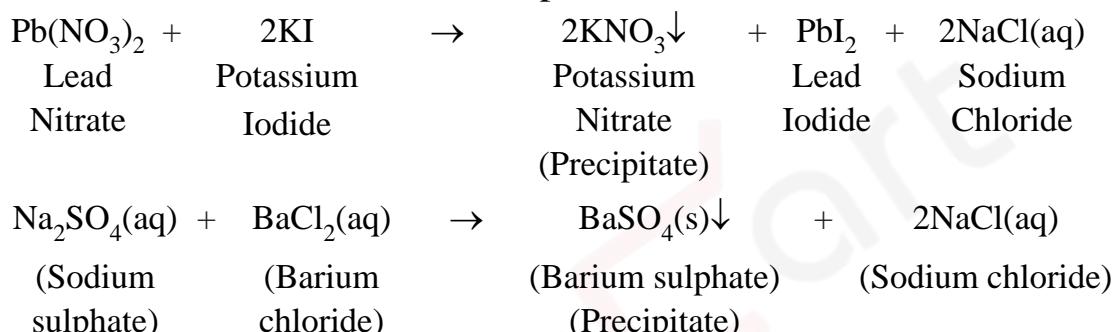
Ans. Refer Text

14. In the refining of silver, the recovery of silver from silver nitrate solution involved displacement by copper metal. Write down the reaction involved.

Ans. When copper is added to a solution of silver nitrate, it displaces silver because copper is more reactive than silver.

15. What do you understand by precipitation reaction? Explain with examples.

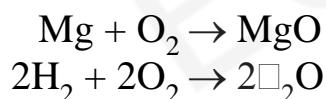
Ans. The reaction in which substances react to form insoluble salt is called a precipitation reaction and the formed substance is called a precipitate. The precipitate formed is indicated with an \downarrow arrow. Example :



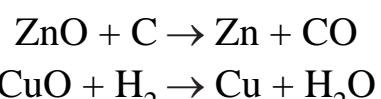
16. Explain the following in terms of gain or loss of oxygen with two examples each:

- (a) Oxidation
- (b) Reduction

Ans.(a) Oxidation: The addition of oxygen to a substance is called oxidation.



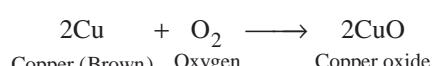
(b) Reduction: The removal of oxygen from a substance is called reduction.



17. A shiny brown coloured element 'X' on heating in air becomes black in colour.

Name the element 'X' and the black coloured compound formed.

Ans. The shiny brown colored element X is called copper which when heated in air forms copper oxide. It is of black colour.



18. Why do we apply paint on iron articles?

Ans. We apply paint on iron articles to prevent them from rusting. Paint breaks the contact

of the iron surface with moisture or air so that they do not rust

19. Oil and fat-containing food items are flushed with nitrogen. Why?

Ans. Because oils and fatty substances come in contact with the air, they become oxidized and give off a bad smell. Along with their smell, their taste also changes. For this reason, oily and fatty foods are flushed with nitrogen so that they do not spoil.

Nitrogen, being a non-reactive gas, prevents the unwanted oxidation of the food.

20. Explain the following terms with one example each

(a) **Corrosion**, (b) **Rancidity**.

Ans.(a) Corrosion: Corrosion is a chemical reaction in which metals react with air, moisture or acids to form undesirable substances.

Example: Rusting of iron

(b) Rancidity: The production of unpleasant smells and tastes in fatty and oily food due to the process of their natural oxidation is called rancidity.

Example: air is replaced by nitrogen gas inside the manufactured chips packets.

“ I relied on NCERT as the bible. But I also referred different difficulty level Q's like from PYQs and new pattern Q's that my teachers recommended. It's a must! ”

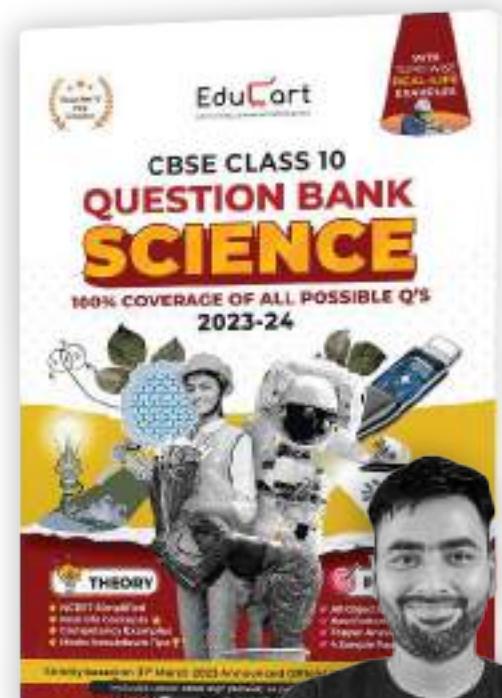
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Acids, Bases and Salts

2

NCERT SOLUTIONS



What's inside

- *In-Chapter Q's (solved)*
- *Textbook Exercise Q's (solved)*

IN-CHAPTER QUESTIONS

Test Yourself

1. You have been provided with three test tubes. One of them contains distilled water and the other two contain an acidic solution and a basic solution, respectively. If you are given only red litmus paper, how will you identify the contents of each test tube?

Ans. Red litmus paper is kept alternately in three test tubes. The solution which turns red litmus paper blue is an alkaline solution. Now put each end of blue litmus paper in the remaining two test tubes separately. The solution which turns blue litmus paper red is an acidic solution. If there is no effect on red and blue litmus paper, then the solution is distilled water.

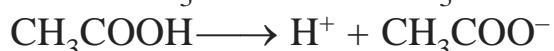
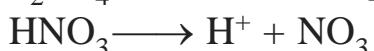
Test Yourself

1. Why do HCl , HNO_3 , etc., show acidic characters in aqueous solutions while solutions of compounds like alcohol and glucose do not show acidic character?

Ans. Since in aqueous solutions acids dissociate in water to form H^+ ions and get separated. This shows the acidic character of the compounds. Alcohol and glucose solution do not dissociate to form H^+ ions. Therefore, they do not show acidic character.

2. Why does an aqueous solution of an acid conduct electricity?

Ans. Acids dissolve in water to form ions (positive and negative), so aqueous solutions of acids conduct electricity.



3. Why does dry HCl gas not change the colour of the dry litmus paper?

Ans. Dry hydrochloric gas does not contain free hydrogen ions. Hence it does not show acidic character. Due to this it does not change the colour of litmus paper.

4. While diluting an acid, why is it recommended that the acid should be added to water and not water to the acid?

Ans. When acid is mixed with water, a lot of heat is generated. Thus, the acid should always be added to the water slowly and with continuous stirring. On adding water to the concentrated acid, the heat generated may cause the mixture to spill

and can burn the person. Therefore, utmost care should be taken while adding concentrated nitric acid or sulfuric acid to water.

5. How is the concentration of hydronium ions (H_3O^+) affected when a solution of an acid is diluted?

Ans. The concentration of hydronium ions (H_3O^+) decreases on diluting the acid.

6. How is the concentration of hydroxide ions (OH^-) affected when excess base is dissolved in a solution of sodium hydroxide?

Ans. The concentration of hydroxide ions (OH^-) increases.

Test Yourself

1. You have two solutions, A and B. The pH of solution A is 6 and pH of solution B is 8. Which solution has more hydrogen ion concentration? Which of this is acidic and which one is basic?

Ans. pH of solution A is 6, while pH of solution B is 8. Thus, the hydrogen ion concentration is more in solution A than B. Solution A is acidic and solution B is basic.

2. What effect does the concentration of H^+ (aq) ions have on the nature of the solution?

Ans. As the concentration of H^+ (aq) ions increases, acidic character increases and basic character decreases.

3. Do basic solutions also have H^+ (aq) ions? If yes, then why are these basic?

Ans. Yes, all basic solutions have H^+ ions. They are basic because the concentration of hydrogen ions is much less than that of hydroxide ions.

4. Under what soil condition do you think a farmer would treat the soil of his fields with quick lime (calcium oxide) or slaked lime (calcium hydroxide) or chalk (calcium carbonate)?

Ans. When the soil becomes acidic, farmers add the given bases to neutralise the soil.

Test Yourself

1. What is the common name of the compound $CaOCl_2$?

Ans. Bleaching powder.

2. Name the substance which on treatment with chlorine yields bleaching powder.

Ans. Slaked lime $[Ca(OH)_2]$.

3. Name the sodium compound which is used for softening hard water.

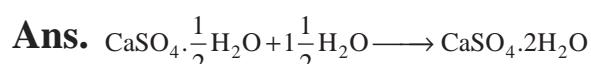
Ans. Sodium carbonate (Na_2CO_3).

4. What will happen if a solution of sodium hydrogen carbonate is heated? Give the equation of the reaction involved.

Ans. On heating sodium hydrogen carbonate, sodium carbonate and water and carbon dioxide are formed. The chemical reactions is written as :



5. Write an equation to show the reaction between Plaster of Paris and water.



NCERT EXERCISES

1. A solution turns red litmus blue, its pH is likely to be :

- (a) 1 (b) 4
(c) 5 (d) 10

Ans. (d) 10

2. A solution reacts with crushed egg-shells to give a gas that turns lime-water milky. The solution contains :

- (a) NaCl (b) HCl
(c) LiCl (d) KCl

Ans. (b) HCl

3. 10 mL of a solution of NaOH is found to be completely neutralised by 8 mL of a given solution of HCl. If we take 20 mL of the same solution of NaOH, the amount HCl solution (the same solution as before) required to neutralise it will be :

- (a) 4 ml (b) 8 ml
(c) 12 ml (d) 16 ml

Ans. (b) 8 ml

4. Which one of the following types of medicines is used for treating indigestion?

- (a) Antibiotic (b) Analgesic
(c) Antacid (d) Antiseptic

Ans. (c) Antacid

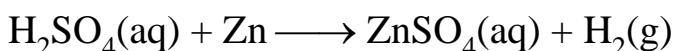
5. Write word equations and then balanced equations for the reaction taking place when :

- (a) dilute sulphuric acid reacts with zinc granules.
(b) dilute hydrochloric acid reacts with magnesium ribbon.

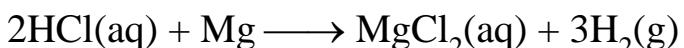
(c) dilute sulphuric acid reacts with aluminium powder.

(d) dilute hydrochloric acid reacts with iron filings.

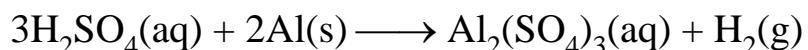
Ans. (a) Dil. Sulphuric acid + Zinc \rightarrow Zinc sulphate + hydrogen gas



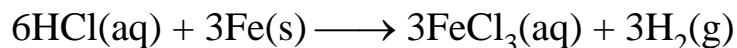
(b) Dil. hydrochloric acid + Magnesium \rightarrow Magnesium chloride + hydrogen gas



(c) Dil. Sulphuric acid + aluminium \rightarrow Aluminium sulphate + hydrogen gas



(d) Dil. hydrochloric acid + Iron \rightarrow Ferrous chloride + hydrogen gas



6. Compounds such as alcohols and glucose also contain hydrogen but are not categorised as acids. Describe an Activity to prove it.

Ans. Insert two nails on the wooden or rubber cork and place them on a beaker as shown in figure. Connect iron nail to a bulb, 6-volt battery and a wire connected to switch. Pour some alcohol or glucose so as to dip the nails in glucose or alcohol. Turn the switch on and we will observe that the bulb does not glow. Now empty the beaker and add HCl or H_2SO_4 solution. This time bulb glows. This proves acid can conduct electricity but alcohol and glucose does not conduct electricity.

7. Why does distilled water not conduct electricity, whereas rain water does?

Ans. Distilled water is a pure form of water which does not contain any solute (ions salts) in it therefore it cannot conduct electricity while rain water contains dissolved salts and acids which dissociates in ions and conducts electricity.

Acids do not dissociate in the presence of water. Therefore it does not show acidic properties.

8. Why do acids not show acidic behaviour in the absence of water?

Ans. The acidic behaviour of acid is due to the presence of hydrogen ions H^+ . In the absence of water, an acid will not show its acidic behaviour because acids do not dissociate to produce $\text{H}^+(\text{aq})$ ions. Water, a polar solvent assists in the dissociation of acids into their respective ions.

9. Five solutions A, B, C, D and E when tested with universal indicator showed pH as 4, 1, 11, 7 and 9, respectively. Which solution is :

(a) Neutral? (b) Strongly alkaline?

(c) Strongly acidic? (d) Weakly acidic?

(e) Weakly alkaline?

Arrange the pH in increasing order of hydrogen-ion concentration.

Ans. (a) – D, (b) – C, (c) – B, (d) – A, (e) – E

Increasing order of hydrogen-ion concentration :

$$C < E < D < A < B$$

10. Equal lengths of magnesium ribbons are taken in test tubes A and B. Hydrochloric acid (HCl) is added to test tube A, while acetic acid (CH_3COOH) is added to test tube B. Amount and concentration taken for both the acids are same. In which test tube will the fizzing occur more vigorously and why?

Ans. Magnesium metal when reacts with an acid gives off hydrogen gas in the reaction.

In test tube A fizzing occurs more vigorously because HCl is stronger acid than acetic acid. Hence, HCl liberates hydrogen gas more vigorously, which causes fizzing more vigorously.

11. Fresh milk has a pH of 6. How do you think the pH will change as it turns into curd? Explain your answer.

Ans. The pH value of fresh milk is 6. When it turns into curd, it becomes sour due to formation of lactic acid and hence its pH decreases below 6.

12. A milkman adds a very small amount of baking soda to fresh milk.

(a) Why does he shift the pH of the fresh milk from 6 to slightly alkaline?

(b) Why does this milk take a long time to set as curd?

Ans. (a) The milkman shifts the pH of the fresh milk from 6 to slight alkalinity because in the alkaline condition the milk will not become sour or curdle due to the formation of lactic acid.

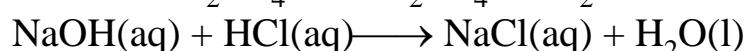
(b) The milk takes time to set as curd because the addition of baking soda has made the milk basic and the acids produced will take a longer time to neutralize the base.

13. Plaster of Paris should be stored in a moisture-proof container. Explain why?

Ans. The plaster of Paris absorbs water to form hard gypsum. For this reason, Plaster of Paris is kept in a moisture-proof container so that it does not harden and is saved from spoilage.

14. What is a neutralisation reaction? Give two examples.

Ans. A reaction in which an acid and a base react to form a salt and water is a neutralization reaction.



15. Give two important uses of washing soda and baking soda.

Ans. Use of washing soda :

- (i) It is used in homes for cleaning cotton clothes.
- (ii) It is used in glass, soap and paper industries.

Use of baking soda :

- (i) It is used in making soda acid and in fire extinguishing.
- (ii) It is used for making bread, cake, spongy etc.

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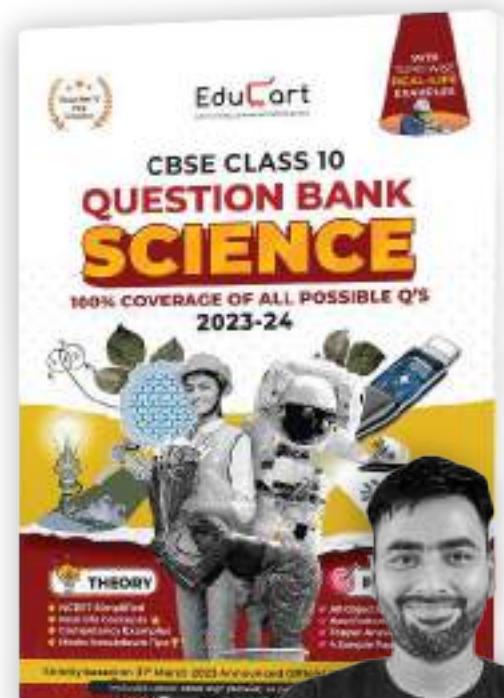
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Arun Sharma

Regional Topper
CBSE 2022-23



Metals and Non-Metals

3

NCERT SOLUTIONS



What's inside

- *In-Chapter Q's (solved)*
- *Textbook Exercise Q's (solved)*

EduCart

IN-CHAPTER QUESTIONS

Test Yourself

1. Give an example of a metal which.

- (i) is a liquid at room temperature.
- (ii) can be easily cut with a knife.
- (iii) is the best conductor of heat.
- (iv) is a poor conductor of heat.

Ans.(i) Mercury, (ii) Sodium, (iii) Silver, (iv) Lead.

2. Explain the meanings of malleable and ductile.

Ans. The property of metals due to which they can be converted into sheets by beating them with a hammer is called malleability. Example - gold, silver, aluminium, copper etc.

The property of metals due to which they can be drawn into wire is called ductility. Example - gold, silver, aluminium, copper.

Test Yourself

1. Why is sodium kept immersed in kerosene oil?

Ans. Since sodium reacts rapidly with water and oxygen at room temperature, but it does not react with kerosene. Thus, sodium is kept immersed in kerosene oil.

2. Write equations for the reactions of :

- (i) iron with steam
- (ii) calcium and potassium with water

Ans.(i) $2\text{Fe} + 3\text{H}_2 \longrightarrow \text{Fe}_2\text{O}_3 + 3\text{H}_2$

(ii) $\text{Ca} + 2\text{H}_2\text{O} \longrightarrow \text{Ca}(\text{OH})_2 + \text{H}_2$

(iii) $2\text{K} + 2\text{H}_2\text{O} \longrightarrow 2\text{KOH} + \text{H}_2 + \Delta$

3. Samples of four metals A, B, C and D were taken and added to the following solution one by one. The results obtained have been tabulated as follows.

Metal	Iron(II) sulphate	Copper(II) sulphate	Zinc sulphate	Silver nitrate
A	No reaction	Displacement	No reaction	Displacement
B	Displacement	No reaction	No reaction	No reaction
C	No reaction	No reaction	No reaction	
D	No reaction			

Use the Table above to answer the following questions about metals A, B, C and D :

- (i) Which is the most reactive metal?
(ii) What would you observe if B is added to a solution of Copper (II) sulphate?
(iii) Arrange the metals A, B, C and D in the order of decreasing reactivity.

Ans.(i) Metal B is most reactive.

- (ii) When metal B is added to copper (II) sulphate solution, displacement reaction occurs.



- (iii) Metal B > Metal A > Metal C > Metal D

4. Which gas is produced when dilute hydrochloric acid is added to a reactive metal? Write the chemical reaction when iron reacts with dilute H_2SO_4 .

Ans. Hydrogen gas is released, along with the formation of metal salt solution.



5. What would you observe when zinc is added to a solution of iron (II) sulphate? Write the chemical reaction that takes place.

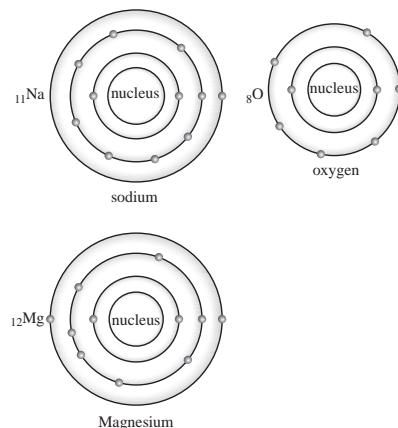
Ans. When zinc is added to a solution of iron (II) sulphate, iron is displaced from iron (II) sulphate because Zn is more reactive than Fe.



Test Yourself

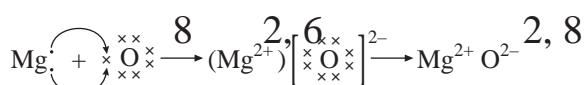
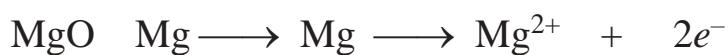
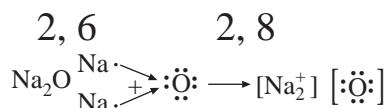
- 1.(i)** Write the electron-dot structures for sodium, oxygen and magnesium.
(ii) Show the formation of Na_2O and MgO by the transfer of electrons.
(iii) What are the ions present in these compounds?

Ans. (i)



2, 8, 1 2, 8





(iii) In Na_2O , Na^+ and O^{2-} ions are present.

In MgO , Mg^{2+} and O^{2-} ions are present.

2. Why do ionic compounds have high melting points?

Ans. The structure of ionic compounds is solid and hard. In this state the force of attraction between the ions is very strong. To overcome (break) such strong forces, a high amount of energy is required. Thus, ionic compounds have high melting points.

Test Yourself

1. Define the following terms.

(i) Mineral (ii) Ore (iii) Gangue

Ans.(i) Minerals : The elements or compounds found naturally in the earth's crust are called minerals.

(ii) Ore : At some places, a particular metal is found in abundance in minerals, from which metals are obtained at low cost and easily. Such minerals are called ores.

(iii) Gangue : The minerals or ores are mixed with many impurities such as clay and sand called gangue.

2. Name two metals which are found in nature in the free state.

Ans. Gold and platinum.

3. What chemical process is used for obtaining a metal from its oxide?

Ans. Carbon reduction method.

Test Yourself

1. Metallic oxides of zinc, magnesium and copper were heated with the following metals :

Metal	Zinc	Magnesium	Copper
Zinc oxide			
Magnesium oxide			
Copper oxide			

In which cases will you find displacement reactions taking place?

Ans.

Metal	Zinc	Magnesium	Copper
Zinc oxide	No	Yes	No
Magnesium oxide	No	No	No
Copper oxide	Yes	No	Yes

2. Which metals do not corrode easily?

Ans. Gold and silver metals do not corrode easily because they are least reactive in nature.

3.What are alloys?

Ans. A homogenous mixture of two or more metals or a metal and non-metal is called an alloy. An alloy of copper and zinc is brass, an alloy of tin and copper is bronze. Their alloys have lower electrical conductivity and melting points than pure metals.

IN-CHAPTER QUESTIONS

1. Which of the following pairs will give displacement reactions?

- (a) NaCl solution and copper metal
- (b) MgCl₂ solution and aluminium metal
- (c) FeSO₄ solution and silver metal
- (d) AgNO₃ solution and copper metal.

2. Which of the following methods is suitable for preventing an iron frying pan from rusting?

- (a) Applying grease
- (b) Applying paint
- (c) Applying a coating of zinc
- (d) All of the above.

3. An element reacts with oxygen to give a compound with a high melting point. This compound is also soluble in water. The element is likely to be

- (a) calcium
- (b) carbon
- (c) silicon
- (d) iron.

4. Food cans are coated with tin and not with zinc because

- (a) zinc is costlier than tin.

- (b) zinc has a higher melting point than tin.
(c) zinc is more reactive than tin.
(d) zinc is less reactive than tin.
5. You are given a hammer, a battery, a bulb, wires and a switch.
(a) How could you use them to distinguish between samples of metals and non-metals?
(b) Assess the usefulness of these tests in distinguishing between metals and non-metals.
6. What are amphoteric oxides? Give two examples of amphoteric oxides.
7. Name two metals which will displace hydrogen from dilute acids, and two metals which will not.
8. In the electrolytic refining of a metal M, what would you take as the anode, the cathode and the electrolyte?
9. Pratyush took sulphur powder on a spatula and heated it. He collected the gas evolved by inverting a test tube over it, as shown in figure below.
(a) What will be the action of gas on
(i) dry litmus paper?
(ii) moist litmus paper?
(b) Write a balanced chemical equation for the reaction taking place.
10. State two ways to prevent the rusting of iron.
11. What type of oxides are formed when non-metals combine with oxygen?
12. Give reasons
(a) Platinum, gold and silver are used to make jewellery.
(b) Sodium, potassium and lithium are stored under oil.
(c) Aluminium is a highly reactive metal, yet it is used to make utensils for cooking.
(d) Carbonate and sulphide ores are usually converted into oxides during the process of extraction.
13. You must have seen tarnished copper vessels being cleaned with lemon or tamarind juice. Explain why these sour substances are effective in cleaning the vessels.
14. Differentiate between metal and non-metal on the basis of their chemical properties.
15. A man went door to door posing as a goldsmith. He promised to bring back the glitter of old and dull gold ornaments. An unsuspecting lady gave a set of gold bangles to him which he dipped in a particular solution. The bangles

sparkled like new but their weight was reduced drastically. The lady was upset but after a futile argument the man beat a hasty retreat. Can you play the detective to find out the nature of the solution he had used?

16. Give reasons why copper is used to make hot water tanks and not steel (an alloy of iron).

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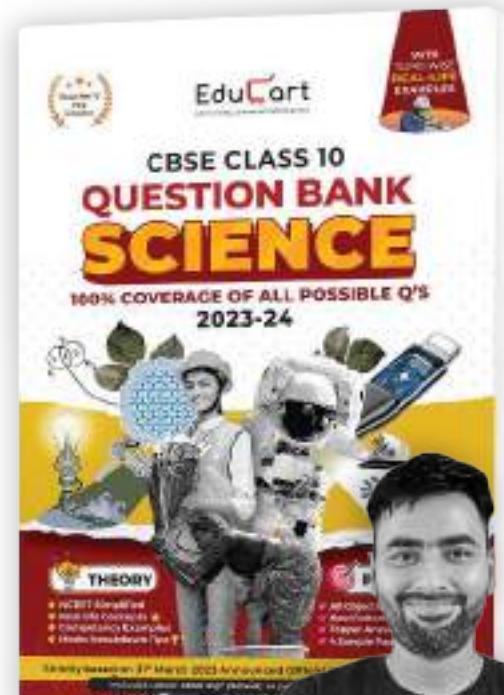
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Regional Topper
CBSE 2022-23



Carbon and its Compounds

4

NCERT SOLUTIONS



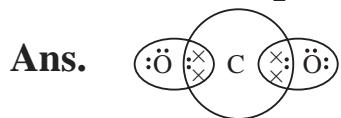
What's inside

- *In-Chapter Q's (solved)*
- *Textbook Exercise Q's (solved)*

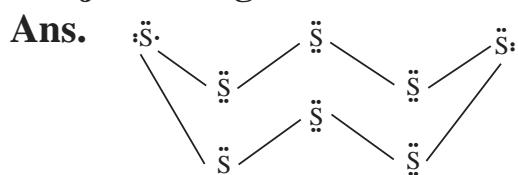
IN-CHAPTER QUESTIONS

Test Yourself

1. What would be the electron dot structure of carbon dioxide which has the formula CO_2 ?



2. What would be the electron dot structure of a molecule of sulphur which is made up of eight atoms of sulphur? (Hint : The eight atoms of sulphur are joined together in the form of a ring.)

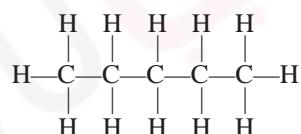


Test Yourself

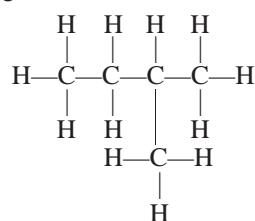
1. How many structural isomers can you draw for pentane?

Ans. 3 isomers can be drawn for pentane :

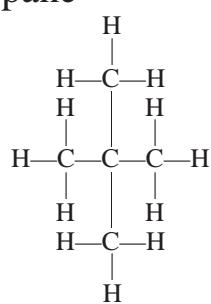
(a) normal pentane



(b) Isopentane or 2-methylpentane



(c) Neopentane or 2,2 dimethylpropane



2. What are the two properties of carbon which lead to the huge number of carbon compounds we see around us?

Ans.(i) Catenation property and valency of carbon is 4.

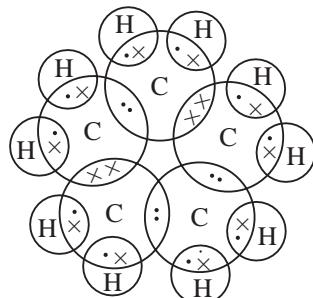
(ii) Due to these properties, carbon forms straight, branched and cyclic chains.

Due to valency 4, they form single, double and triple bonds.

Using these properties, carbon forms a large number of compounds. Hence, we can see carbon compounds in large numbers around us.

3. What will be the formula and electron dot structure of cyclopentane?

Ans. C_5H_{10}



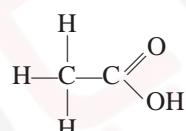
4. Draw the structures for the following compounds :

(i) Ethanoic acid (ii) Bromopentane*

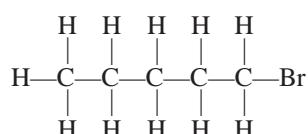
(iii) Butanone (iv) Hexanal.

*Are structural isomers possible for bromopentane.

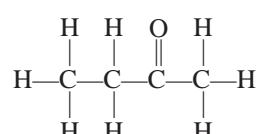
Ans.(i) Ethanoic acid (CH_3COOH)



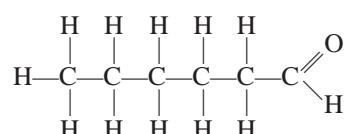
(ii) Bromopentane ($C_5H_{11}Br$)



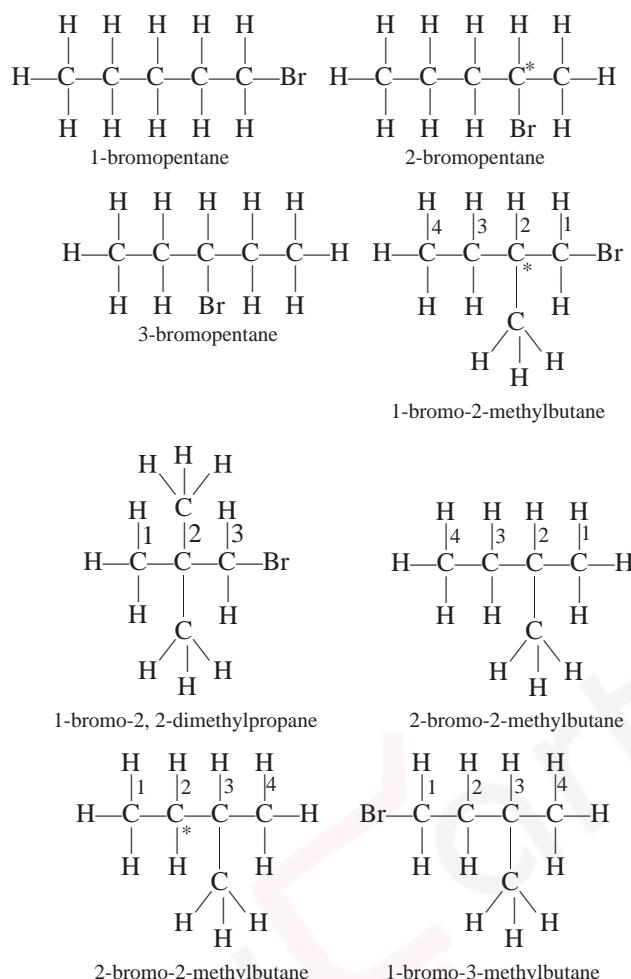
(iii) Butanone ($C_3H_6COCH_3$)



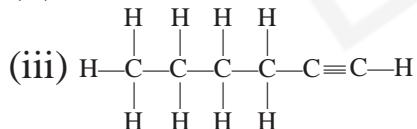
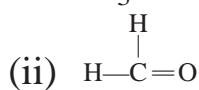
(iv) Hexanal (C_5H_9CHO)



Yes structural Isomers are possible for Bromopentane :



5. How would you name the following compounds?



Ans.(i) Bromoethane

(ii) Methanal

(iii) Hexene

Test Yourself

1. Write two properties of covalent compounds.

Ans. Properties : (i) They have high boiling and melting points.

(ii) They are bad conductors of electricity.

2. A mixture of oxygen and ethyne is burnt for welding. Can you tell why a mixture of ethyne and air is not used?

Ans. When ethyne is burnt in air, it gives a sooty flame due to incomplete combustion

in limited supply of air. But, if ethyne is burnt with oxygen only, a clean flame with temperature above 3000°C is obtained because of complete combustion. Such flame is used for welding. It is impossible to attain such a high temperature without mixing oxygen. This is the reason why a mixture of ethyne and air is not used.

Test Yourself

1. How would you distinguish experimentally between an alcohol and a carboxylic acid?

Ans.(i) Alcohol has no effect on litmus acid whereas carboxylic acid turns blue litmus paper red.

(ii) Alcohol does not react with Na_2CO_3 , while carboxylic acid reacts with Na_2CO_3 to form CO_2 gas.

2. What are oxidising agents?

Ans.An oxidising agent is a chemical substance that decomposes itself to oxidise another.

Test Yourself

1. Would you be able to check if water is hard by using a detergent?

Ans. No, since detergent gives forms lather with both hard and soft water. So using it, we cannot tell whether water is hard or not. But we can check whether water is hard or not using soap. Soap gives lather with soft water, but forms scum with hard water.

2. What are functional groups?

Ans. The heterogeneous atoms or their groups, which replace one or more hydrogen atoms in a hydrocarbon chain to form a new compound. are called functional groups.

NCERT EXERCISES

1. Ethane, with the molecular formula C_2H_6 has

- (a) 6 covalent bonds.
- (b) 7 covalent bonds.
- (c) 8 covalent bonds.
- (d) 9 covalent bonds.

Ans.(b) 7 covalent bonds.

2. Butanone is a four-carbon compound with the functional group :

- (a) carboxylic acid (b) aldehyde

(c) ketone

(d) alcohol

Ans.(c) ketone

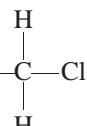
3. While cooking, if the bottom of the vessel is getting blackened on the outside, it means that

- (a) the food is not cooked completely.
- (b) the fuel is not burning completely.
- (c) the fuel is wet.
- (d) the fuel is burning completely.

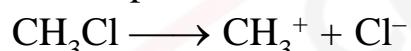
Ans.(b) the fuel is not burning completely.

4. Explain the nature of the covalent bond using the bond formation in CH_3Cl .

Ans. Covalent bond formation in CH_3Cl



In this structure three hydrogen atoms are linked to carbon by covalent bond and there is also covalent bond between carbon and chlorine, but chlorine is more negative than carbon so it forms a polar covalent bond.



5. Draw the electron dot structures for :

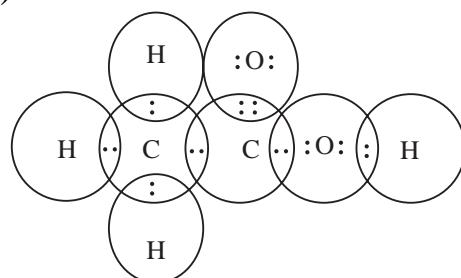
(a) ethanoic acid

(b) H_2S

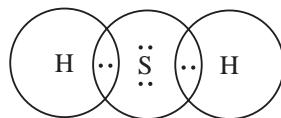
(c) propanone

(d) F_2

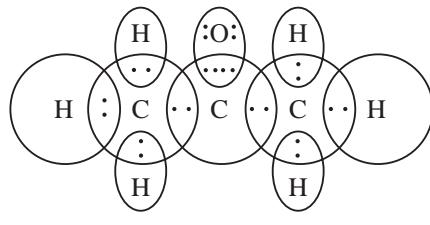
Ans. (a) CH_3COOH (Ethanoic acid)



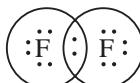
(b) H_2S (Hydrogen sulphide)



(c) CH_3COCH_3 (Propanone)



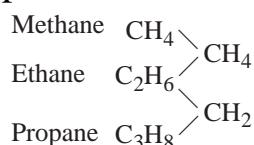
(d) F_2 (Fluorine)



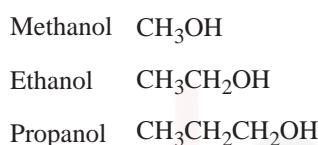
6. What is homologous series? Explain with an example.

Ans. A group of compounds having the same general formula and functional group is called a homologous series. Example :

(i)



(ii)



7. How can ethanol and ethanoic acid be differentiated on the basis of their physical and chemical properties?

Ans. Difference in physical properties :

Ethanol		Ethanoic acid	
(i)	It has specific smell.	(i)	It smells like vinegar.
(ii)	Its boiling point is 351 K.	(ii)	Its boiling point is 391 K.
(iii)	Its melting point is 150K.	(iii)	Its melting point is 290 K.

Difference in chemical properties :

Ethanol		Ethanoic acid	
(i)	It does not react with sodium carbonate.	(i)	It reacts with sodium carbonate and form sodium salt and CO_2 gas.
(ii)	In presence of basic $KMnO_4$, it forms ethanoic acid, due to which $KMnO_4$ becomes colourless. $C_2H_5OH \xrightarrow{KMnO_4} CH_3COOH$	(ii)	It does not react in presence of basic $KMnO_4$, Due to which $KMnO_4$ retains its original colour.

8. Why does micelle formation take place when soap is added to water? Will a micelle be formed in other solvents such as ethanol also?

Ans. Soap molecule has two parts - one which is soluble in water is called hydrophilic and the other which is soluble in hydrocarbon is called hydrophobic. When soap

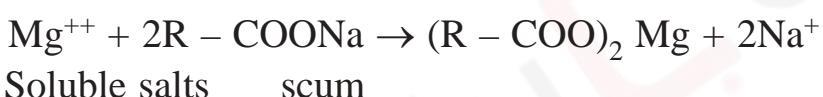
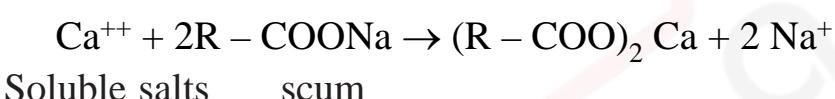
is on the surface of water, its molecules arrange themselves in such a way that its ionic end is inside the water. In contrast, the hydrocarbon tail is outside the water. There is a special arrangement of these molecules inside water, due to which its hydrocarbon end is protudes out of water. This happens due to the formation of a large clusters of molecules in which the hydrophobic tail is on the inner side, while its ionic end is on the surface. Such arrangement are called called micelles. Ethanol is a non-polar solvent. Therefore, it also does not have attracts to the hydrophilic part, hence micelles are not form when soap is dissolved in ethanol.

9. Why are carbon and its compounds used as fuels for most applications?

Ans.Carbon compounds are used as fuel because they burn with a clean flame and no smoke is produced. Carbon compounds have high calorific values, maximum ignition temperature and their combustion can be controlled. Hence, carbon and its compounds are a great source of fuel.

10. Explain the formation of scum when hard water is treated with soap.

Ans.Since hard water contains soluble salts of Ca and Mg, which react with soap to form an insoluble salt called scum.

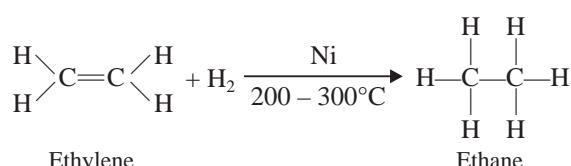


11. What change will you observe if you test soap with litmus paper (red and blue)?

Ans.Soap turns red litmus blue. Therefore, it is alkaline.

12. What is Hydrogenation? What is its industrial application?

Ans.The process of addition of hydrogen to an unsaturated hydrocarbon chain is called hydrogenation.



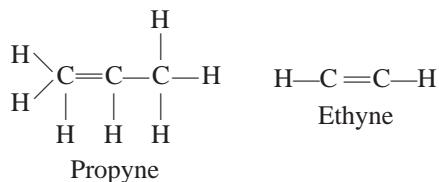
Hydrogenation is used to convert fat into saturated fat.

Edible oil (unsaturated) → saturated fat (ghee)

13. Which of the following hydrocarbons undergo addition reactions:

C_2H_6 , C_3H_8 , C_3H_6 , C_2H_2 and CH_4

Ans. C_2H_2 and C_3H_6 shows addition reactions, because they have triple and double bonds respectively.



14. Give a test that can be used to differentiate between saturated and unsaturated hydrocarbons

Ans.

Saturated hydrocarbon	Unsaturated hydrocarbon
When butter is heated and some bromine water is added to it, its colour does not fade. This shows that butter is a saturated compound.	When some bromine water is added to edible oil, after a short time the colour of the bromine water becomes colourless. This suggests that the edible oil is an unsaturated compound.

15. Explain the mechanism of the cleaning action of soaps.

Ans. A soap molecule consists of two parts - one part is long chain of hydrocarbon and the other part is of $-\text{COONa}$ group. Hydrocarbons are hydrophobic. The scum sticks to the hydrocarbon part of the soap molecule. The $-\text{COONa}$ part sticks to the water and removes the dirt from the surface of the cloth. This cleanses the cloth. When soap is dissolved in water, it forms micelles, in which the soap molecules are arranged in a cluster form. The hydrocarbon part of the soap towards the center and the hydrophilic part faces outward. These micelles are formed around the particles of scum present on the surface of the soap-soaked cloth.

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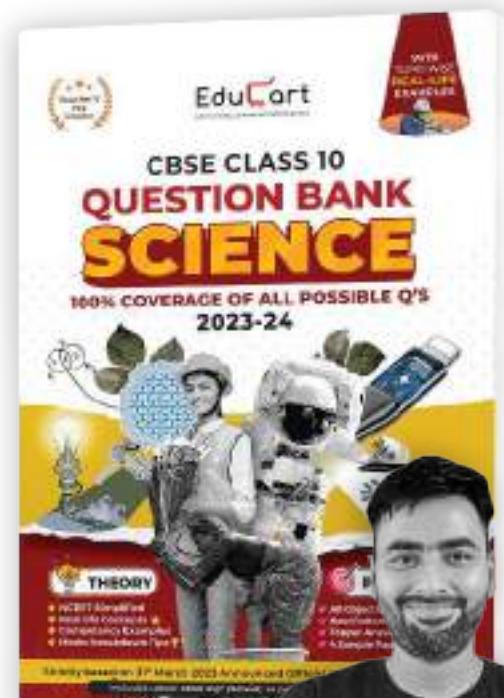
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Arun Sharma

Regional Topper
CBSE 2022-23



Life Processes

5

NCERT SOLUTIONS



What's inside

- *In-Chapter Q's (solved)*
- *Textbook Exercise Q's (solved)*

IN-CHAPTER QUESTIONS

Test Yourself

- 1. Why is diffusion insufficient to meet the oxygen requirement in multicellular organisms like us?**

Ans. Multicellular organisms such as humans possess complex body designs. They have specialised cells and tissues for performing various necessary functions of the body such as intake of food and oxygen. Unlike unicellular organisms, multicellular cells are not in direct contact with the outside environment. Therefore, diffusion cannot meet their oxygen requirements.

- 2. What criterion would we use to determine if an object is alive?**

Ans. Common proofs of being alive are breathing, growth, movement etc.

- 3. What raw materials are used by an organism?**

Ans. Oxygen, water and food are used by an organism as a raw material.

Food : Used by organisms as energy and sources of substances.

Oxygen: Organisms get energy from the breakdown of substances like food, for this they have to undergo respiration.

Water: Water is essential for the digestion of food and biological processes.

- 4. What processes would you consider essential for the maintenance of life?**

Ans. All those processes which together do the work of maintenance are called biological processes. In this, nutrition, respiration, transport, excretion are essential processes.

Test Yourself

- 1. What is the difference between autotrophic nutrition and heterotrophic nutrition?**

Ans.	Autotrophic nutrition	Heterotrophic nutrition
	1. Green plants make their own food in the presence of sunlight and chlorophyll to make carbohydrates using CO_2 and water, they prepare their own food.	Heterozygous organisms are unable to prepare their own food, they depend on the food prepared by others.
	2. They do not depend on anyone else	Heterotrophs depend on plants such as humans and fungi.

- 2. Where does the plant get the raw material needed for photosynthesis?**

Ans. Plants get the raw materials needed for photosynthesis from different sources :

(1)Chlorophyll : From chloroplast of leaf.

(2)Carbon dioxide: from the atmosphere.

(3)Water: From the soil.

3. What is the role of acid in our stomach?

Ans. Role of acid in our stomach :

- (1) The enzymes found in the stomach digest food in an acidic medium. The acid in the stomach makes the food acidic so that the enzymes found in the gastric juice can digest it.
- (2) Many germs also come with food, which are destroyed by the effect of acid.

4. What is the function of digestive enzymes?

Ans. Enzymes break down complex components of food into simpler parts by catalytic action, so that they become soluble and are absorbed in the body.

5. How is the small intestine designed to absorb digested food?

Ans. The small intestine has millions of tiny finger-like projections called villi. These villi increase the surface area for efficient food absorption. Within these villi, many blood vessels are present that absorb the digested food and carry it to the bloodstream. The absorbed food from the bloodstream is delivered to every cell of the body.

Test Yourself

1. How is a terrestrial organism advantageous over an aquatic organism in obtaining oxygen for respiration?

Ans. Organisms that live in water use oxygen dissolved in water because the amount of dissolved oxygen in water is very less, so the respiration rate of organisms is faster than that of terrestrial organisms. Terrestrial organisms use oxygen in the atmosphere for respiration. In different organisms, this oxygen is absorbed by different organs. All organs have a composition that increases the surface area. Terrestrial organisms are exposed to oxygen rich atmosphere.

2. What are the different ways in which glucose is oxidised to provide energy in various organisms?

Ans. There are several pathways for obtaining energy in organisms other than the oxidation of glucose:

Glycogenolysis : This is the breakdown of glycogen, a storage form of glucose, into glucose molecules. This process can occur in liver and muscle cells and provides a source of glucose for energy production.

Lipolysis : This is the breakdown of stored fats into fatty acids and glycerol. The fatty acids can then be used for energy production via beta-oxidation, a process that occurs in the mitochondria of cells.

Proteolysis : This is the breakdown of proteins into amino acids, which can then

be used for energy production via gluconeogenesis, a process that converts amino acids into glucose.

3. How is oxygen and carbon dioxide transported in humans?

Ans.(i) Transport of oxygen: Haemoglobin is found in red blood cells that carry oxygen from the air in the lungs to the tissues where there is a lack of oxygen.

(ii) Transport of carbon dioxide: Carbon dioxide is more soluble in water, so it is transported in a soluble state in our blood, it goes out through the nostrils.

4. How is the maximum area in the human lung envisaged for exchange of gases ?

Ans. There are innumerable alveoli in the human lung, if we calculate their combined area, then it will be equal to about 80 square metres, so it is the design of these alveoli that the area of our lungs becomes maximum.

Test Yourself

1. What are the components of the transport system in humans? What are the functions of these components?

Ans. The following are the components of the transport system in human :

(a) Heart

(b) Blood

(c) Blood vessels

(a) Work of heart : Heart is a muscular organ that is the size of our fist. It carries blood in the body, it receives deoxygenated blood from different parts of the body and on the other hand, oxygenated blood is pumped throughout the body.

(b) Blood : Blood is a fluid connective organ in which 1. Plasma 2. Red blood cells 3. white blood cells and platelets.

1. Plasma transports food, carbon dioxide and nitrogen containing excretory substances.

2. Red blood cells transport respiratory gases and hormones.

3. White blood cells protect the body from infections.

4. Platelets form a blood clot at the site of bleeding and block the passage in which the flow of blood stops.

(c) Blood vessels : Blood vessels carry blood from the heart to the different parts of the body, their walls are thick and flexible.

2. Why is it necessary to separate oxygenated and deoxygenated blood in mammals and birds ?

Ans. Separation of oxygenated and deoxygenated blood in mammals and birds is necessary because birds and mammals have high energy requirements. This is also

beneficial because they need constant energy to maintain their body temperature, hence they need oxygen continuously to get energy.

3. What are the components of the transport system in highly organized plants?

Ans. The transport system in highly organised plants has two components. 1. Xylem and 2. Phloem

1. Xylem : In the xylem tissue, the ducts and vessels of the roots, stems and leaves join together to form a continuous network of water conduction vessels. These are attached to all parts of the plant. Xylem transports water and salts from the soil to the leaves.

2. Phloem : Phloem consists of sieve and companion cells that transport food from leaves to different parts of plants.

4. How are water and minerals transported in plants?

Ans. In plants, water and minerals are transferred from the soil to the leaves by the xylem cells. Root cells obtain salts from the soil, this creates a difference in the concentration of soil and root salts, due to which there is a constant movement of water in the xylem. Due to transpiration, there is a continuous loss of water and there is suction, due to which the constant movement of water is maintained, thus water and minerals are transported.

5. How does food transfer in a plant?

Ans. The transport of food in plants starts from the leaves and takes place through the phloem ducts throughout the plant body. The flow of food from high concentration to low concentration through the sieve plate in the sieve tube of phloem vessels.

Test Yourself

1. Describe the structure and functioning of nephrons

Ans. Structure of nephron : Nephron is the constructive and functional unit of excretion, its main parts are

1. **Bowman capsule :** The tip of the nephron is cup-like.
2. **Cell bundle :** A clump of blood cells formed by the repeated division of the renal artery and renal vein.
3. **Renal vein :** Blood vessel carrying impure blood to the kidney.
4. **Renal artery :** Blood vessel carrying pure blood from Bowman's capsule.
5. **Tubular part of nephron :** The end of the nephron in front of the Hanel's loop coils up to form this part. It has a network of blood cells on its surface.
6. **Collecting duct :** The end of the nephron meets a tube that leads to the bladder.

Mechanism of action of the nephron :

1. Due to the high blood pressure in the cell clusters of Bowman Capsule, excretory substances are filtered out of the blood. These substances go along with the water into the collecting canal and reach the bladder.
2. Due to the high blood pressure of the cell cluster, some important substances such as glucose, amino acids etc. are also filtered out, which are reabsorbed in the hanel's loop and tubule car part. This is called reabsorption.

2. What methods do plants use to get rid of excretory products?

Ans. Plants use the following methods to get rid of excretory products:

1. They can get rid of the excess water by transpiration.
2. Many tissues in plants are made of dead cells, they get rid of by decaying leaves.
3. Some excreted products are stored in the dormant xylem as gum.
4. The excretory substances tannins, resins, gums are stored in the bark which are destroyed by the removal of the bark.

3. How is the amount of urine produced regulated ?

Ans. The amount of urine depends on the water intake by the body. The amount of water absorbed by the nephron tubule depends on the following factors.

1. How much water is there in the body, how much water is to be excreted so that there is no shortage of water in the body tissues
2. How much of the soluble excretory like urea and uric acid and salt etc. is to be excreted from the body. When there is more excretion in the body, more water is required. In this situation more urine is produced.

NCERT EXERCISES

1. The kidneys in human beings are a part of the system for

- (a) nutrition. (c) excretion.
(b) respiration. (d) transportation.**

Ans.(c)Excretion

2. Xylem in plant is responsible for :

- (a) transport of water
(b) transport of food
(c) carrying amino acids
(d) carrying oxygen.**

Ans.(a) transport of water

3. For autotrophic nutrition _____ is necessary.

- (a) carbon dioxide and water
- (b) chlorophyll
- (c) sunlight
- (d) all of the above.

Ans.(d) all of the above.

4. By fission of pyruvate, it gives carbon dioxide, water and energy and this reaction takes place in :

- (a) cytoplasm (b) mitochondria
- (c) chloroplast (d) Nucleus.

Ans.(b) mitochondria

5. How does the digestion of fat take place in our body ? Where does this process take place ?

Ans.Fat digestion takes place in the small intestine. The alkaline secretion of the liver, bile is carried to the small intestine by the bile duct. The process starts with emulsification (breakdown) of large fat globules by the salt of bile into smaller micelles to facilitate further enzymatic reaction and digestion process. The fat-digesting lipase enzyme in pancreatic juice and intestinal juices digest the fat in micelles into triacylglycerol and then fatty acids and glycerol. These fat digestion products are then absorbed by the intestinal mucosa and are carried to tissues by the lymphatic system and blood where they either serve as energy fuel or are stored after re-esterification.

6. What is the role of saliva in digestion of food?

Ans.The juice released from the salivary gland is called saliva. It makes the food very soft. When we break the food into small pieces by chewing with the teeth, then saliva enzyme gets mixed in it. This makes it easier to swallow food. This is called salivary amylase. It also digests the food.

7. What are the conditions necessary for autotrophic nutrition and what are its by products ?

Ans.The following are the conditions necessary for autotrophic nutrition:

- Absorption of light energy by chlorophyll Conversion of light energy into chemical form and hydrolysis water molecules into H_2 and O_2 .
- Reduction of carbon dioxide into carbohydrates.

The main products of nutrition are as follows :

- Sugar

- Water
- Oxygen and its by-product

8. What is the difference between aerobic and anaerobic respiration? Name some organisms which have anaerobic respiration.

Ans.

Aerobic Respiration		Anaerobic Respiration
1.	In the presence of oxygen	In the absence of oxygen
2.	CO_2 and water	Ethanol or lactic acid
3.	Mainly plants and animals	Anaerobic bacteria, yeast, airborne muscles
4.	Energy produced in high amount	Energy produced in low amount

9. How are alveoli designed for maximum exchange of gases?

Ans. The tubules have a balloon-like structure in which the oxygen gas is transferred, it has a surface in which the exchange of gases takes place. In the wall of the alveoli there is a very wide network of blood vessels. The CO_2 brought from the body through the blood gives to the alveoli. The blood of the alveolar blood vessel carries oxygen from the air to all the cells of the body.

10. What can be the consequences of the deficiency of hemoglobin in our body?

Ans. If the amount of hemoglobin in our body is less, then the carrying capacity of oxygen decreases, so diseases caused by lack of oxygen start to suffer. Breathlessness occurs especially due to lack of hemoglobin.

11. Describe the double circulation in human beings. Why is it necessary?

Ans. Blood has to pass through the human heart twice to reach once in the body, hence it is called double circulation. There are two circulations under this :

- (i) Systemic circulation
- (ii) Pulmonary circulation

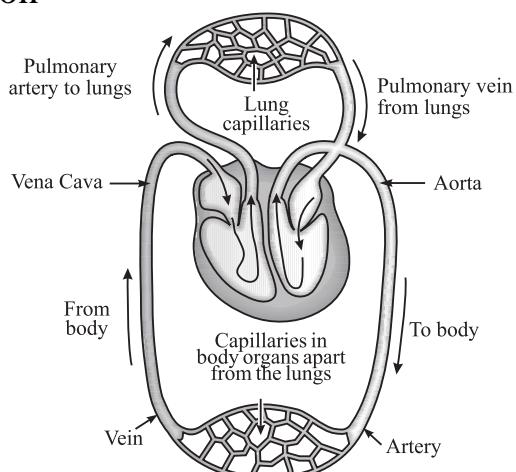


Fig. 5.23 : Double Circulation

(i) Systemic circulation : Systemic circulation transfers oxygenated blood from the left ventricles to capillaries in the tissue. The oxygen-rich blood is passed to the aorta for distribution into various body parts. The veins and vessels later absorb the deoxygenated blood, rich in carbon dioxide from different parts of the body. The deoxygenated blood is transferred back to the superior vena cava, then on to the right atrium. The right atrium transports blood to the right ventricle for pulmonary circulation after receiving the deoxygenated blood.

(ii) Pulmonary circulation : The pulmonary artery receives the blood from the right ventricle and carries it to the lungs for oxygenation. When the oxygenated blood is pumped back to the left atrium via the pulmonary vein that is brought to the left ventricles after the purification process. The left ventricles pump the oxygenated blood to the aorta for systemic circulation.

The need for double circulation : The right and left sides of the human heart do not allow oxygenated and deoxygenated blood to mix. Due to the separation of oxygenated and deoxygenated blood, oxygen reaches the body effectively. It keeps on giving energy to regulate the temperature of the body.

12. What is the difference between transport of materials in xylem and phloem?

Ans. The following is the difference between the transport of materials by xylem and phloem :

Transport by Xylem	Transport by Phloem
1. Xylem carries water and soluble salts to the trunk, branches and leaves of the tree.	The food substances are transported from the leaves to other parts of the plant in a dissolved state.
2. The rise of water and dissolved salts is due to the pull caused by evaporation.	This increases the osmotic pressure, which transports substances from the phloem to the tissues, and the pressure decreases.
3. It does not consume energy.	It requires energy because it is an active process.

13. Compare the structure and mechanism of alveoli in the lung and nephron in the kidney.

Ans.

	Alveoli	Nephron
1.	The alveoli are thin, fine, with a delicate surface. It has a similar structure to a balloon	It is a thin cup-shaped structure.

2.	It increases the surface area for the exchange of gases in the lungs.	In this, the tubular parts carry urine to the collecting duct.
3.	There is a long and wide network of blood cells for the exchange of gases.	Its function is to filter. Due to this there is re-absorption of beneficial substances and water.
4.	In this, there is diffusion of carbon dioxide from blood to air and oxygen from air to blood.	Its surface area also increases for filtering blood and for reabsorption of water. Urine remains as the end product

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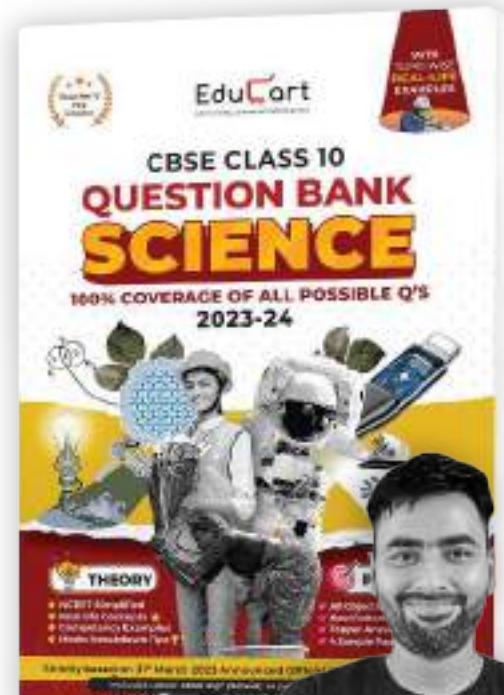
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Control and Coordination

6

NCERT SOLUTIONS



What's inside

- *In-Chapter Q's (solved)*
- *Textbook Exercise Q's (solved)*

IN-CHAPTER QUESTIONS

Test Yourself

1. What is the difference between reflex action and walking ?

Ans.	Reflex action	Walking
	It is controlled and coordinated by the spinal cord	It is acquired through learning
	This action takes place in the state of the subconscious mind	This action takes place under the control of the brain
	It cannot be changed.	It can be changed.

2. What happens at the synapse between two neurons ?

Ans. The synapse is the small empty space between the two nerve cells. At the synapse, a chemical substance is produced at the end of the axon of one of the neurons that reaches to the other neurons with the help of dendrite. Therefore, the information signal is transmitted through one neuron to other neurons by synapse.

3. Which part of the brain maintains posture and equilibrium of the body ?

Ans. Cerebellum controls and maintains the posture and equilibrium of the body.

4. How do we detect the smell of an agarbatti (incense stick) ?

Ans. It is detected by the olfactory receptor of the nose. The sensory nerves of the forebrain send this information to the olfactory lobe and respond to the information signal.

5. What is the role of the brain in reflex action ?

Ans. The nerves of the whole body join in the form of a bundle on the way to the brain through the spinal cord, which is called reflex arc. The response to a sensation is informed by this reflex arc to the brain. It is reconsidered by the brain.

Test Yourself

1. What is Plant Hormone?

Ans. The chemical substances that co-ordinate the biological activities of plants are called plant hormones or phytohormones.

2. How is the movement of leaves of the sensitive plant different from the movement of a shoot towards light?

Ans. The speed of a mimosa plant is different from the speed affected by the speed of stimulation of light. The speed of mimosa is called contractile speed, while the speed of shoots towards light is affected by the direction of stimulation of light. The plant appears to bend in the same direction from where light is received.

3. Give an example of a plant hormone that promotes growth.

Ans. • Auxins are responsible for the cell elongation in shoots and also regulate growth.
• Gibberellin is responsible for stem elongation and germination.

4. How do auxins promote the growth of a tendril around a support?

Ans. The tendrils are sensitive to touch. As the tendril comes in contact with a base, the auxin diffuses out and moves to that side. Due to this the cells elongate and the tendril is twisted and wrapped around the base.

5. Design an experiment to demonstrate hydrotropism.

Ans. Hydrotropism is the directional growth of plant roots towards or away from water. For the germination of seeds, moist soil on one side and dry land on the other is used. The seedling first moves downwards due to positive gravity. Later it starts turning towards the wet ground.

Test Yourself

1. How does chemical co-ordination take place in animals?

Ans. In animals, chemical coordination takes place through the hormones secreted by the endocrine gland. It can also be done by the nervous system, which is called the endocrine system. Endocrine glands secrete hormones directly into the bloodstream that directly reaches the specific cells. These cells act according to the information that particular hormones carry.

2. Why is the use of iodised salt advisable?

Ans. Iodine is essential for synthesis of the hormone thyroxine in the thyroid gland. Thyroxine controls basal metabolic rate, carbohydrate, protein and fat metabolism. Deficiency of thyroxine causing disorders of goitre Therefore, it is always advisable to take iodised salt.

3. How does our body respond when adrenaline is secreted into the blood?

Ans. The rate of heartbeat becomes faster when adrenaline is secreted into the blood so that the supply of oxygen to our muscles is more. The amount of blood to the digestive system and skin is reduced because of the small arteries around the muscles of these organs contract.

4. Why are some patients of diabetes treated by giving injections of insulin?

Ans. Insulin hormone regulates the level of sugars in the blood. If it is not adequately secreted, then the sugar level rises in our blood, causing many harmful effects. So, that is why diabetic patients are treated by giving injections of insulin.

NCERT EXERCISES

1. Which of the following is a plant hormone?

- (a) Insulin
- (b) Thyroxine
- (c) Estrogen
- (d) Cytokinin

Ans.(d) Cytokinin

2. The gap between two neurons is called a :

- (a) Dendrite.
- (b) Synapse.
- (c) Axon.
- (d) Impulse.

Ans.(b) Synapse.

3. The brain is responsible for :

- (a) Thinking.
- (b) Regulating the heartbeat.
- (c) Balancing the body.
- (d) All of the above.

Ans.(b) Regulating the heartbeat

4. What is the function of receptors in our body? Think of situations where receptors do not work properly. What problems are likely to arise?

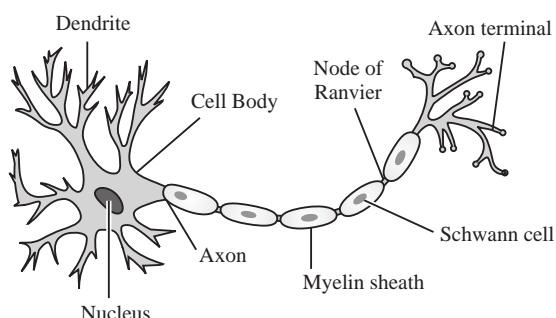
Ans.Receptors collect the information about changes that happen around us and send the signal to information to the brain which renders the effector mechanism against the change. When receptors do not work properly, the environmental stimuli are not able to create nerve impulses and the body does not respond.

5. Draw the structure of a neuron and explain its function.

Ans.Nerve cell or neuron is the functional and structural unit of the nervous system. A nerve cell has three parts :

- (i) cell body
- (ii) dendrite
- (iii) axon

Structure of a Typical Neuron :



The function of nerve cells is to carry information in the form of electrical signals which are called nerve impulses. Cells receive stimulus to send it to the spinal cord and brain and carry the message from the brain to the target organ.

6. How does phototropism occur in plants?

Ans. Phototropism in a plant takes place under the influence of the stimulus of light towards the light. In light tracking, the plant turns towards the light while the root turns in the opposite direction to the ground.

7. Which signals will get disrupted in case of a spinal cord injury?

Ans. In case of a spinal cord injury, signals coming from the nerves as well as the signals coming to the receptors will be disrupted. Both these signals meet in a bundle in the spinal cord. Hence, both these signals get disrupted.

8. How does chemical co-ordination take place in plants?

Ans. Some chemical substances are secreted by the cells in plants. They are called plant hormones. Plant hormones co-ordinate with the growth and development of plants. These plant hormones work by being secreted somewhere away from the site of action and reaching that place by diffusion.

9. What is the need for a system of control and co-ordination in an organism?

Ans. Every environmental change has an effect on the response of the organism. Like we talk slowly in an office, do not talk loudly. Our activities are done in such a way that the work gets completed. There should not be any interference in it. Control and co-ordination mechanism is absolutely needed in working according to the environment and occasion, due to which the person remains controlled and related.

10. How are involuntary actions and reflex actions different from each other?

Ans.

Involuntary actions	Reflex actions
1. Those actions which occur immediately without any thinking are called involuntary actions .	1. Reflex action is an immediate response to an event which does not require any processing by the brain.
2. Involuntary actions are controlled by the mid and hind brain. Example: Breathing, beating of heart, etc.	2. Reflex actions are controlled by the spinal cord. Example: Sneezing, coughing, etc.

11. Compare and contrast the neural and hormone mechanisms of action for control and co-ordination in animals.

Ans. Sensory nerves receive information. Actions in animals are controlled by the nerves of the nervous system. It is regulated by all the hormones on the blood sugar level, metabolism, growth and development. Therefore, control and co-ordination in human beings are done by the nervous system and the hormonal system together.

12. What is the difference between the movement in the mimosa plant and the mode of movement in our leg?

Ans. The information of touch is transmitted in the mimosa plant. Plants use electrochemical means to transmit this information from one cell to another. The leaves of the plants bend down. This is due to the reduced osmotic pressure in the base cells. When the time of stimulation is over, the leaves return to their normal state.

Movement of leg : Information operates in the form of electrochemical signals. By reaching the muscles, they are converted into signals, due to which there is movement in the foot. This movement is due to the contraction and expansion of muscles which are controlled by the brain. Leg muscles are connected with nerves.

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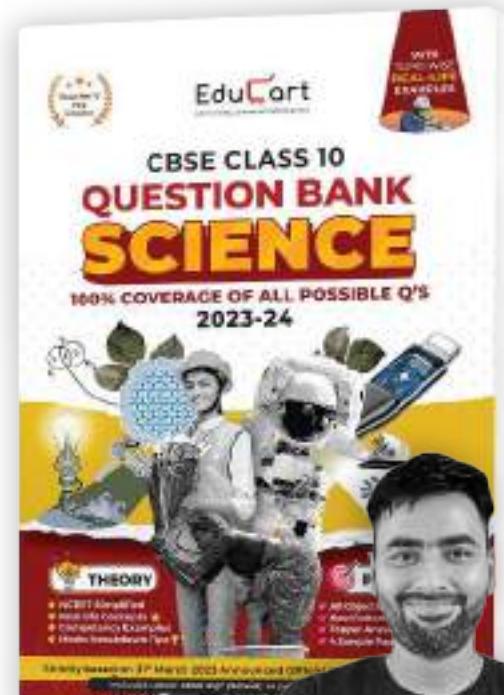
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CBSE 2022-23



How do Organisms Reproduce?

7

NCERT SOLUTIONS



What's inside

- *In-Chapter Q's (solved)*
- *Textbook Exercise Q's (solved)*

IN-CHAPTER QUESTIONS

Test Yourself

1. What is the importance of DNA copying in reproduction?

Ans.● DNA copying, also known as DNA replication, is a critical process in reproduction because it ensures that the genetic information of the parent organism is accurately passed on to its offspring.

- During reproduction, genetic information is transmitted from one generation to the next, and this information is stored in the DNA of the parent cells.

2. Why is variation beneficial to the species but not necessarily for the individual?

Ans. The various populations of organisms interact with many types of ecological niches. This is important for them to survive in given conditions. In case of any damage caused to the ecological conditions of the population, the population gets adversely affected. The organisms which are able to survive may reproduce to develop a population which is adapted or suited to the varied conditions. Hence variation is beneficial to species, but not to the individuals.

Test Yourself

1. How does binary fission differ from multiple fission?

Ans.	Binary Fission	Multiple Fission
	In unicellular organisms, new organisms are produced by cell division. In this, the cell divides into two equal parts like- Amoeba.	In multicellular organisms, new organisms are produced by cell division. In this the cell divides into many daughter cells. E.g. Malaria, Parasites, Plasmodium.

2. How will an organism be benefited if it reproduces through spores?

Ans. An organism is benefited by reproducing through the spores because spores are surrounded by a thick layer which protects them in adverse conditions. When the favourable conditions occur, these spores start to grow again. In this way they successfully live in unfavourable conditions.

3. Can you think of reasons why more complex organisms cannot give rise to new individuals through regeneration?

- Ans.**● In complex multicellular organisms, specialised cells make up tissues, tissue make up organs, organs make up organ systems and finally organ systems make up organisms.
- Since complex multicellular organisms have a very high degree of organisation in their body, they cannot be reproduced from their cut body parts by the process of regeneration.

- For example, a dog is a complex multicellular organism which cannot be regenerated from its cut body part say, a cut tail. This is because the cells present in the cut tail of a dog cannot produce dog's organs like heart brain, lungs, stomach, intestines and limbs, etc. needed for the making of a complete dog.

4. Why is vegetative propagation practised for growing some types of plants?

Ans. Vegetative propagation is practiced for growing such plants which usually do not produce seeds or produce non-viable seeds.

Test Yourself

1. How is the process of pollination different from fertilisation?

Ans. Pollination is the process of transfer of pollens from anther to stigma. It occurs with the help of certain pollinators such as air, water, birds, or some insects. Fertilization, on the other hand, is the fusion of the male and female gametes. It occurs inside the ovule and leads to the formation of zygote.

2. What is the role of the seminal vesicles and the prostate gland?

Ans. The prostate and sperms put their secretions in the vas deferens, due to which the sperms come in a liquid medium. Due to this, its transfer is easily done, as well as this discharge also provides nutrition to them. Sperm are microscopic structures.

3. What are the changes seen in girls at the time of puberty?

Ans. The following changes are seen in girls at the time of puberty :

- The production of reproductive hormones starts and the skin becomes oily.
- Breasts and buttocks begin to grow.
- Darkening of the nipple skin that is present at the tip of the breast.
- Beginning of menstruation.

4. How does the embryo get nourishment inside the mother's body?

Ans. The blood flow is good so as to nourish the growing embryo. Placenta is a special tissue which is embedded in the uterine wall and helps the embryo get the nourishment from the mother's tissue. Placenta has villi on the embryo side and blood space on the mother's side. This spacing provides a large area between the mother and the embryo and also for waste removal.

5. If a woman is using a copper-T, will it help in protecting her from sexually transmitted diseases?

Ans. No, a Copper-T (intrauterine device) is a form of contraception that is inserted into the uterus to prevent pregnancy. It does not protect against sexually transmitted infections (STIs). While using a Copper-T may help prevent unwanted pregnancy, it is still important to use condoms or practice other safe sex methods to protect against STIs.

NCERT EXERCISES

1. Asexual reproduction takes place through budding in :

- (a) Amoeba (b) Yeast
- (c) Plasmodium (d) Leishmania

Ans.(b) Yeast

2. Which of the following is not a part of the female reproductive system in human beings?

- (a) Ovary (b) Uterus
- (c) Vas deferens (d) Fallopian tube

Ans.(c) Vas deferens

3. The anther contains :

- (a) sepals (b) ovules
- (c) pistil (d) pollen grains

Ans.(d) pollen grains

4. What are the advantages of sexual reproduction over asexual reproduction?

Ans.Advantages of sexual reproduction :

- (a)In sexual reproduction, more variations are produced. Thus, it ensures survival of species in a population.
- (b) The new formed individual has characteristics of both the parents. Variations are more viable in sexual mode than in asexual one. This is because in asexual reproduction, DNA has to function inside the inherited cellular apparatus.

5. What are the functions performed by the testis in human beings?

Ans.The testes are the male reproductive organs that are located outside the abdominal cavity within a pouch called scrotum.

Functions of testes :

- (a)Produce sperms
- (b)Produce a hormone called testosterone, which brings about secondary sexual characters in boys.

6. Why does menstruation occur?

Ans. If there is no fertilization of the ovum, it lives for about a day because each ovary releases a new egg. Therefore, the uterus also prepares every month to receive the fertilized egg. Its end wall becomes fleshy and conjoined. It is necessary for the nutrition of the egg at the time of fertilization. But in the absence of fertilization, even this layer is not needed. Therefore, this layer gradually breaks down and is expelled from the vaginal tract in the form of blood and mucus. This cycle takes about 1 month and it is called the menstrual cycle. Its duration is about 2 to 8 days.

7. Draw a labelled diagram of the longitudinal section of a flower.

Ans.

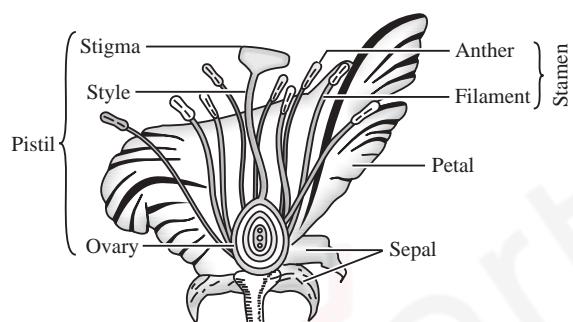


Fig. 7.19 : Longitudinal section of flower

8. What are the different methods of contraception?

Ans. Following are the different methods of contraception :

- Physical devices such as condoms, diaphragms and cervical caps are used.
- This method involves tablets or drugs which have to be taken orally. These contain small doses of hormones that prevent the discharge of eggs and thus fertilization cannot occur.
- Contraceptive devices such as loop or Copper-T are placed within the uterus to prevent pregnancy.
- In surgical method, the fallopian tubes are blocked in females to stop flow of eggs and vas deferens is blocked in men to stop the flow of sperms.
- Self-Control is also a solution.

9. How are the modes for reproduction different in unicellular and multicellular organisms ?

Ans.

Unicellular Organisms	Multicellular Organisms
Reproductive Cell. The same cell which functions as the body of the organism also gets transformed into reproductive cell.	Specific cells take part in reproduction.

Asexual Reproduction occurs through fission, budding and spore formation.	It occurs by several methods like fragmentation, regeneration, budding, spore formation, vegetative reproduction, etc.
No special sex cell or sex organ is present.	special sex cell or sex organ is present.

10. How does it help in the stability of the population of an organism?

Ans. Reproduction ensures the continuity of various species on the Earth and the absence of reproduction; the species will not be able to exist for a long time and may soon get extinct. It is not necessary for an organism to reproduce to stay alive. But for the continuity of life on earth, reproduction is inevitable.

11. What could be the reasons for adopting contraceptive methods?

Ans. The increasing population is a matter of concern for humans because the organism increases its population only through reproduction. Therefore, due to the increasing population, to improve the standard of living

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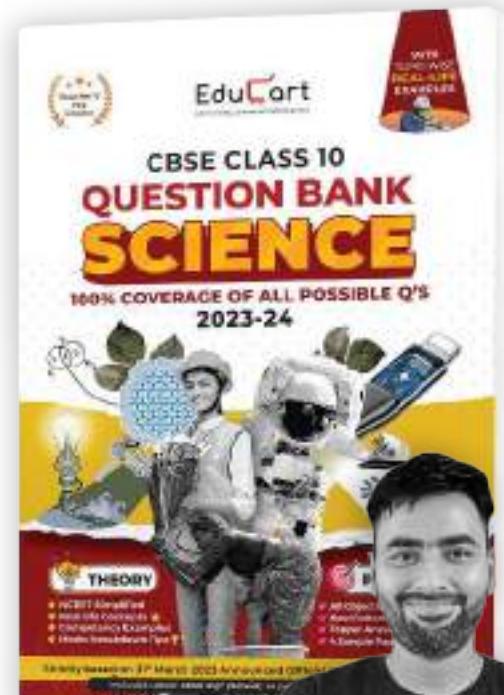
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(99.80%), CBSE Topper 2023



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Arun Sharma

Regional Topper
CBSE 2022-23



Heredity and Evolution

8

NCERT SOLUTIONS



What's inside

- *In-Chapter Q's (solved)*
- *Textbook Exercise Q's (solved)*

IN-CHAPTER QUESTIONS

Test Yourself

- If a trait A exists in 10% of a population of an asexually reproducing species and a trait B exists in 60% of the same population, which trait is likely to have arisen earlier?**

Ans. In the given question we will see that trait B will be seen earlier. This happens because, in the case of an asexually reproducing population, the organisms will be the exact copy of their parents. Now if there is a mutation just in the case of trait A as we see, it will take time to appear in the population. Trait B being the majority will appear first.

- How does the creation of variations in a species promote survival?**

Ans. Variation promotes the survival of species in the following ways:

- Variation improves the survival rate of species as it helps the individual organisms adapt based on altering environmental conditions.
- Variants formed due to environmental concerns form the basis for evolution.

Test Yourself

- How do Mendel's experiments show that traits may be dominant or recessive?**

Ans. Mendel selected true breeding tall (TT) and dwarf (tt) pea plants. When a tall pea plant is crossed with a short (dwarf) pea plant, all the F₁ hybrids are tall. (i.e., in this case, the gene causing tallness is dominant while the gene causing dwarfism is recessive.). The trait expressing itself in the hybrid is the dominant one. Mendel's first law of inheritance states that when a pair of contrasting factors is brought in a hybrid, one factor inhibits the appearance of the other. The one which inhibits is the dominant one and which is inhibited is recessive.

- How do Mendel's experiments show that traits are inherited independently?**

Ans. During dihybrid cross by Mendel, it was observed that when two pairs of traits were considered; each trait expressed independently of the other. Thus, Mendel was able to propose the Law of Independent Assortment which says about the independent inheritance of traits.

- A man with blood group A marries a woman with blood group O and B their daughter has blood group O. Is this information enough to tell you which of the traits – blood group A or O – is dominant? Why or why not?**

Ans. The given information is not sufficient to tell which blood group is dominant B

or O. For a daughter to have blood group O her mother should be homozygous OO and father should be heterozygous AO.

4. How is the sex of the child determined in human beings?

Ans. Prediction of whether a child will be male or female before the birth is called sex determination. The child who gets the X chromosome from the father is a girl and the child who gets the Y chromosome from the father is a boy. Father has XY but mother has only XX chromosomes. Thus the Y chromosome determines the sex of the child.

NCERT EXERCISES

1. In one of Mendel's experiments, tall pea plants with purple flowers were crossed with dwarf plants with white flowers. The flowers of all the plants of his praise were purple in color. But about half of them were dwarfs. From this it can be said that the genetic composition of tall parent plants was :

- (a) TTWW (b) TTww
(c) Tt WW (d) Tt Ww

Ans.(c) TtWW

2. One study showed that the parents of children with light colored eyes also have light colored eyes. On the basis of this, can we say whether the symptom of light colored eyes is effective or ineffective? Explain your answer.

Ans.On the basis of the above description we cannot say whether the light colored eye trait is dominant or recessive, as both the parents have light colored eyes. It may be that both the gene variants are recessive in the parent, so whether there is a second choice of eye color or not, the offspring was found to have light colored eyes. Considering the second assumption, it is shown that the light-colored eye symptom is dominant. Some children at this stage may have dark eyes, as the recessive symptom should be expressed in 1 in 4 children.

3. Make a project to find the effective color of dog skin.

Ans.First a pure black skin dog (BB) and a pure white skinned bitch (WW) are selected. They are hybridized on time. If all the pups produced in them are black-skinned then the black-skinned trait is said to be dominant.

Dog	×	bitch
Black skinned (BB)	↓	white skinned (WW)
F ₁ progeny	previous BW	all black skinned

4. How is equal share of genetic contribution by male and female parents in the progeny ensured?

Ans. If tall pea plants with round seeds are crossed with dwarf plants with wrinkled seeds, then in the F_2 generation, the tall or dwarf trait and the rounded wrinkled trait are inherited independently.

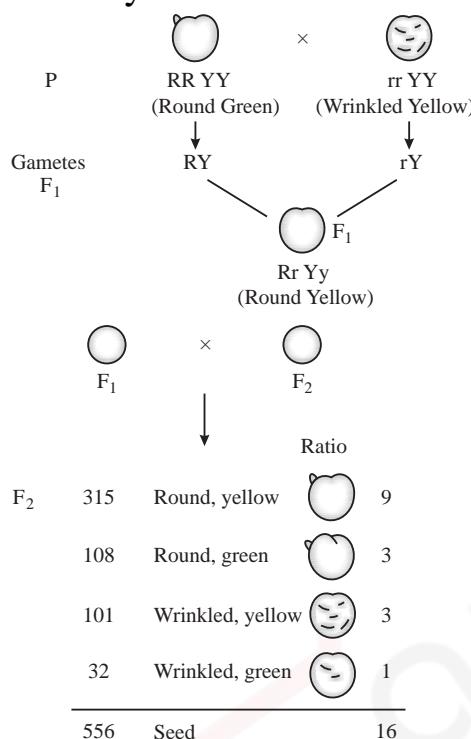


Fig. 8.8

If a complete set of whole organisms is obtained from the parent plant of the offspring plant, then the experiment given in the figure 8.8 cannot be successful, because the 2 traits R and Y will be attached to each other in the set and cannot be drawn independently. In fact, gene sets do not exist as a single DNA chain, but as separate independent atoms of DNA. Each of these chromosomes has two replicates. In which they get one from the male and the other from the female parent. Only 1 chromosome of each pair of chromosomes from each generative cell goes to a generative cell. When the fusion of two gametes takes place, the number of chromosomes in the zygote formed from them becomes normal again.

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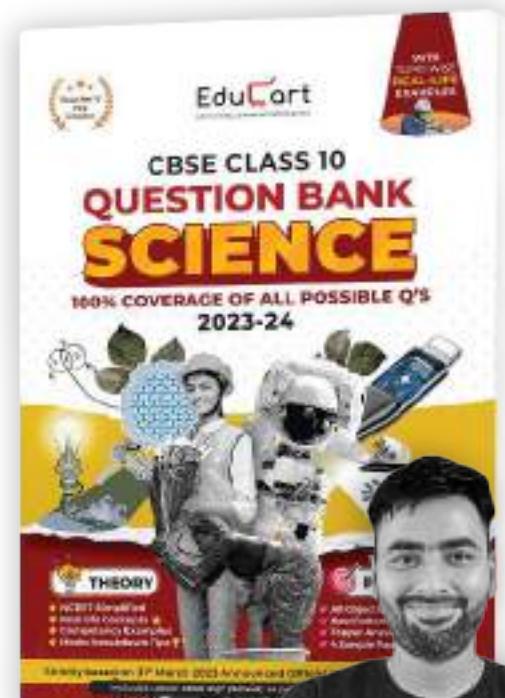
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CBSE 2022-23



Light : Reflection and Refraction

9

NCERT SOLUTIONS



What's inside

- *In-Chapter Q's (solved)*
- *Textbook Exercise Q's (solved)*

IN-CHAPTER QUESTIONS

Test Yourself

1. Define the principal focus of a concave mirror.

Ans. The principal focus of a concave mirror is the point on its principal axis where rays parallel to the principal axis meet after reflection from the mirror.

2. The radius of curvature of a spherical mirror is 20 cm. What is its focal length?

Ans. $f = \frac{R}{2}$

$$= \frac{20}{2} = 10 \text{ cm}$$

3. Name a mirror that can give an erect and enlarged image of an object.

Ans. Concave mirror.

4. Why do we prefer a convex mirror as a rear-view mirror in vehicles?

Ans. Virtual and erect images are always formed in a convex mirror and have a wide field of vision, due to which the driver is able to see a very large area behind him. Thus, convex mirrors are preferred as rear-view in vehicles.

Test Yourself

1. Find the focal length of a convex mirror whose radius of curvature is 32 cm.

Ans. $f = +16 \text{ cm}$.

2. A concave mirror produces a three times magnified (enlarged) real image of an object placed at 10 cm in front of it. Where is the image located?

Ans. $m = 3$, $u = -10 \text{ cm}$, $v = ?$

From $m = -\frac{v}{u}$.

$$3 = -\frac{v}{-10}$$
$$v = -(3)(-10) = 30 \text{ cm}$$

So, the image is located 30 cm away behind the mirror.

Test Yourself

1. Define 1 dioptrre of power of a lens.

Ans. 1 dioptrre is the power of the lens whose focal length is 1 m.

2. A convex lens forms a real and inverted image of a needle at a distance of 50 cm from it. Where is the needle placed in front of the convex lens if the image is equal to the size of the object? Also, find the power of the lens.

Ans. $m = -1$, $v = +50 \text{ cm}$, $u = ?$

$$m = \frac{v}{u} = \frac{50}{u}$$

$$u = \frac{v}{m} = \frac{50}{-1}$$

$$u = -50$$

Using lens formula,

$$\begin{aligned}\frac{1}{f} &= \frac{1}{v} - \frac{1}{u} \\ &= \frac{1}{50} - \frac{1}{-50} = \frac{2}{50}\end{aligned}$$

$$f = 25 \text{ cm}$$

$$\text{Power of lens, } P = \frac{1}{f} = \frac{100}{25} \text{ m}^{-1} = +4 \text{ D}$$

3. Find the power of a concave lens of focal length 2 m.

Ans. -0.5 D .

NCERT EXERCISES

1. Which of the following materials cannot be used to make lenses?

- (a) Water (b) Glass
- (c) Plastic (d) Soil

Ans.(d) Soil

2. The image formed by a concave mirror of an object is found to be virtual, erect and larger than the object. The position of the object will be :

- (a) Between the principal focus and the center of curvature
- (b) At the center of curvature
- (c) Beyond the center of curvature
- (d) Between the pole and the principal focus of the mirror

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(824 - BN)]

Ans.(d) Between the pole and the principal focus of the mirror

3. Where do you place the object in front of a convex lens to get a real and equal size image of an object?

- (a) At the principal focus of the lens,
- (b) At twice the focal length
- (c) At infinity
- (d) Between the optical centre of the lens and the principal focus

Ans.(c) At infinity

4. The focal length of a spherical mirror is : 15 cm. The mirror is probably :

- (a) concave (b) convex
- (c) plane mirror (d) none of these

Ans.(a) concave

5. No matter how far you stand from a mirror, your image always appears straight. The mirror probably is :

- (a) plane
- (b) only concave
- (c) only convex
- (d) either plane or convex

Ans.(d) either plane or convex

6. Which of the following lenses would you prefer while reading small letters in a dictionary?

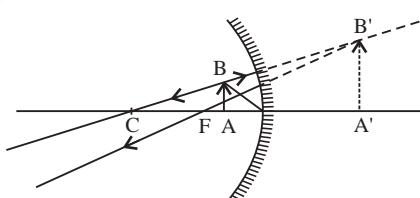
- (a) A convex lens with focal length of 50 cm
- (b) A concave lens with focal length of 50 cm
- (c) A convex lens with focal length of 5 cm
- (d) A concave lens with focal length of 5 cm

Ans.(c) A convex lens with focal length of 5 cm

7. Using a concave mirror of focal length 15 cm, we want to form an erect image of an object. What should be the range of distance of the object from the mirror? What is the nature of the image? Is the image bigger or smaller than the object?

Draw a ray diagram of the image formation for this case.

Ans.



Place the object 15 cm away from the mirror.

Nature of image is virtual and erect. Size of image is larger than the object.

8. Name the mirror used for the following situations :

- (a) Headlight of a car
- (b) Side mirror/ rear mirror of a vehicle
- (c) Solar furnace

Explain your answers.

Ans.(a) A concave mirror is used in the headlight of a car. The reason is that it is a good reflector and produce parallel beam of light.

- (b) A convex mirror is used for side/rear view in a vehicle because it helps the driver to view large areas of the traffic behind him and he can easily detect the vehicle coming or running behind him.
- (c) A concave mirror is used in the solar furnace, because it focuses the rays of the sun and puts it on the furnace, due to which the furnace receives more heat.

9. Cover the half of a convex lens with black paper. Will this lens be able to form a complete image of an object? Check your answer with the help of an experiment. Explain your observations.

Ans. Yes, this lens will be able to form a complete image of an object.

Observation : When half of a convex lens is covered with black paper and the object is placed near it, it is observed that its full image is formed on the screen.

10. An object 5 cm long is placed at a distance of 25 cm from a converging lens of focal length 10 cm. Find the position, size and nature of the image formed along with the ray diagram.

Ans. Here, $h = 5\text{ cm} = \text{Height of image}$, $h' = \text{Height of image} = ?$, $u = -25\text{ cm}$, $f = +10\text{ cm}$, $v = ?$

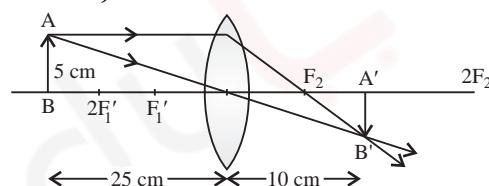


Fig. 9.65

Using Lens formula :

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{v} = \frac{1}{f} + \frac{1}{u} = \frac{1}{10} + \frac{1}{-25}$$

$$= \frac{1}{10} - \frac{1}{25} = \frac{5-2}{50}$$

$$\frac{1}{v} = \frac{3}{50}$$

$$v = \frac{50}{3}$$

$$\therefore v = 16.6 \text{ cm}$$

$v = \text{positive}$. This implies that the image formed at a distance of 16.6 cm behind the mirror is real and inverted.

$$\text{Power of lens} \quad m = \frac{h'}{h} = \frac{v}{u}$$

$$\Rightarrow h' = \frac{v}{u} \times h = \frac{50}{3} \times \frac{1}{-25} \times 5$$

$$= -3.33 \text{ cm}$$

h' = negative. Thus, the image formed is inverted.

- 11. An object is placed at a distance of 15 cm from a convex lens of focal length 10 cm. Write the nature and magnification of the image.**

[Ans. The image will be real and inverted. $m = 2$]

Ans. $\mu = -15 \text{ cm}$; $f = +10 \text{ cm}$; $v = ?$

Using lens formula

$$\begin{aligned}\frac{1}{f} &= \frac{1}{v} - \frac{1}{u} \\ \frac{1}{v} &= \frac{1}{f} + \frac{1}{u} \\ &= \frac{1}{10} + \left(\frac{1}{-15} \right) \\ \frac{1}{v} &= \frac{5}{150}\end{aligned}$$

$$v = +30 \text{ cm}$$

$$\text{Magnification } m = \frac{v}{\mu} = +\left(\frac{30}{-15} \right) = -2$$

The image formed will be real and inverted and twice the size of the object.

- 12. An object is placed at a distance of 10 cm from a convex mirror of focal length 15 cm. Find the position and image of the image.**

Ans. $u = -10 \text{ cm}$, $v = ?, f = 15 \text{ cm}$

Using the formula :

$$\begin{aligned}\frac{1}{v} + \frac{1}{u} &= \frac{1}{f} \\ \Rightarrow \frac{1}{v} &= \frac{1}{f} - \frac{1}{u} = \frac{1}{15} - \frac{1}{-10} \\ &= \frac{1}{15} + \frac{1}{10} = \frac{5}{30} \\ &= \frac{1}{6}\end{aligned}$$

$$\square \quad v = 6 \text{ cm}$$

Image is formed 6 cm behind the mirror and is virtual and erect in nature.

- 13. The magnification of an image formed by plane mirror is +1. What does this mean?**

Ans. The image formed by plane mirror has $m = +1$. Plus (+) sign represent that the image is virtual and erect. In this mirror, the size of an image is equal to that of an object.

- 14. An object of length 0.5 cm is placed at a distance of 20 cm in front of a convex mirror of radius of curvature 30 cm. Find the position, nature and size of the image.**

Ans. Here, $h = 5 \text{ cm}$ = height of an object

$$R = \text{Radius of curvature} = 30 \text{ cm}$$

$$\therefore f = \frac{R}{2} = \frac{30}{2} = 15 \text{ cm}$$

$$v = -20 \text{ cm}$$

$$v = ?, h' = ?$$

Using mirror formula,

$$\begin{aligned}\frac{1}{f} &= \frac{1}{u} + \frac{1}{v} \\ \therefore \frac{1}{v} &= \frac{1}{f} - \frac{1}{u} = \frac{1}{15} - \frac{1}{20} = \frac{1}{60} \\ \Rightarrow v &= \frac{60}{7} = 8.57 \text{ cm}\end{aligned}$$

The distance of image is 8.57 cm behind the mirror.

$$\begin{aligned}\text{Magnification } m &= \frac{h'}{h} = -\frac{v}{u} \\ \therefore h' &= -\frac{v}{u} \times h = -\frac{60}{7} \times \frac{1}{-20} \times 5 \\ &= \frac{15}{7} = 2.17 \\ &= 2.2 \text{ cm}\end{aligned}$$

Image formed is small, virtual and erect in nature.

- 15. An object of size 7.0 cm is placed at a distance of 27 cm in front of a concave mirror of focal length 18 cm. At what distance from the mirror should a screen be placed so that a clear focused image of the object is formed? Find the size and nature of an object.**

Ans. Height of an object $h_1 = 5 \text{ cm}$

Object distance $u = -27 \text{ cm}$

Focal length = -18 cm

Height of an image $h_1 = ?$

Image distance $u = ?$

From the formula :

$$\Rightarrow \frac{1}{u} + \frac{1}{v} = \frac{1}{f}$$

$$\Rightarrow \frac{1}{-27} + \frac{1}{v} = \frac{1}{-18}$$

$$\Rightarrow \frac{1}{v} = -\frac{1}{18} + \frac{1}{27} = -\frac{3+2}{54} = -\frac{1}{54}$$

$$\Rightarrow v = -54 \text{ cm}$$

Therefore, screen should be placed at a distance of 54 cm from the screen.

$$m = \frac{h_2}{h_1} = -\frac{v}{u}$$

$$\Rightarrow \frac{h_2}{7} = \frac{-54}{-27}$$

$$\Rightarrow \frac{h_2}{7} = 2 \Rightarrow h_2 = 14 \text{ cm}$$

Thus, the height of the image formed is 14 cm and is real and inverted in nature.

16. Find the focal length of the lens whose power is – 2.0 D. What is the type of lens?

Ans. Here $P = -2.0 \text{ D}$

$$\text{Power of lens } P = \frac{100}{f} \text{ (in cm)}$$

$$f = \frac{100}{P} = \frac{-100}{2} = -50 \text{ cm}$$

f = negative. Thus, it is a concave lens.

17. A doctor prescribes a rectifier lens of power +1.5 D. Find the focal length of the lens. Is the lens converging or diverging?

Ans. Here $P = 1.5 \text{ D}$

$$\text{Power of lens } P = \frac{1}{f} (\text{m})$$

$$f = \frac{1}{P} = \frac{1}{1.5}$$

$$= \frac{10}{15} = \frac{2}{3} \text{ m}$$

f = positive. Thus, it is a converging (convex) lens.

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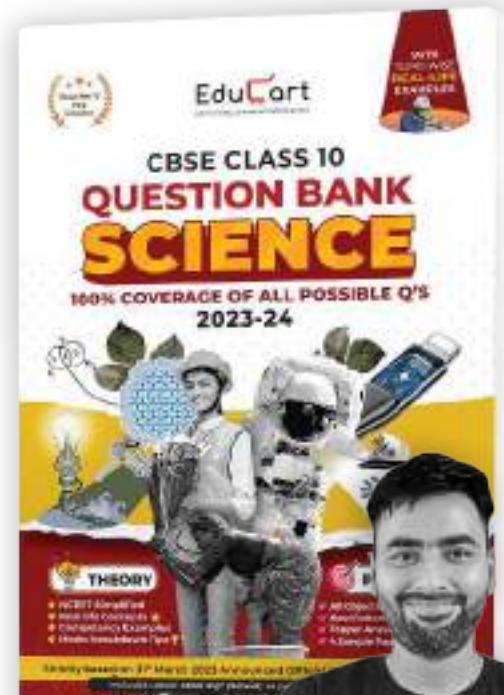
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These books are the best reference books that every CBSE student should have so they can cover each Chapter in a structured manner, along with school teaching. The best part I found is the quality of answers & coverage all possible Questions

I scored 99.2% studying from Educart books. They know exactly what the students need and it really helped me do focused NCERT-driver revision and practice. Must buy book!!!



Arun Sharma

Regional Topper
CBSE 2022-23



The Human Eye and the Colourful World

10

NCERT SOLUTIONS



What's inside

- *In-Chapter Q's (solved)*
- *Textbook Exercise Q's (solved)*

EduCart

IN-CHAPTER QUESTIONS

Test Yourself

1. What is meant by power of accommodation of the eye?

Ans. Power of accommodation is the ability of the eye to change the focal length of the eye-lens and form a clear image of a distant object or a near object on the retina.

2. A person with a myopic eye cannot see objects beyond 1.2 m distinctly. What should be the type of the corrective lens used to restore proper vision?

Ans. Concave lens.

$$\begin{aligned}\text{Power of lens} \quad P &= \frac{1}{f} \\ P &= \frac{1}{-1.2} \\ &= -\frac{10}{12} \text{ (for concave lens)} \\ \therefore P &= -0.83 \text{ D}\end{aligned}$$

3. What is the far point and near point of the human eye with normal vision?

Ans. Near point is the shortest distance of the eye at which the placed object is clearly visible is called near point. For a normal eye it is 25 cm.

Far Point is the farthest distance of the eye at which the placed object is clearly visible is called the far point. For the normal eye, the far point is infinity.

4. A student has difficulty reading the blackboard while sitting in the last row. What could be the defect the child is suffering from? How can it be corrected?

Ans. The student is suffering from myopia. It can be corrected with a concave lens.

NCERT EXERCISES

1. The human eye can focus on objects at different distances by adjusting the focal length of the eye lens. This is due to :

- (a) presbyopia (b) accommodation
- (c) near-sightedness (d) far-sightedness

Ans.(b) accommodation.

2. The human eye forms the image of an object at its :

- (a) cornea (b) iris
- (c) pupil (d) retina

Ans.(d) retina.

3. The least distance of distinct vision for a young adult with normal vision is about

Ans.(c) 25 cm

4. The change in focal length of an eye lens is caused by the action of the:

Ans.(c) ciliary muscles

5. A person needs a lens of power -5.5 dioptres for correcting his distant vision. For correcting his near vision, he needs a lens of power $+1.5$ dioptre. What is the focal length of the lens required for correcting :

(i) distant vision, and (ii) near vision?

Ans.(i) for far sight :

$$\begin{aligned} P &= -5.5 \text{ D} \\ \text{Power of lens} &= \frac{1}{f} \text{ (in m)} \\ \therefore f &= \frac{1}{P} = \frac{1}{-5.5} \\ &= \frac{-10}{15} = -0.182 = -0.18 \text{ m} \end{aligned}$$

(ii) for near sight

$$\begin{aligned} P &= +1.5 \\ \therefore P &= \frac{1}{f} \text{ (m)} \\ \therefore f &= \frac{1}{P} = \frac{1}{1.5} \\ &= \frac{10}{15} = \frac{2}{3} \\ &\equiv 0.66 \text{ cm} = 0.67 \text{ cm} \end{aligned}$$

6. The far point of a myopic person is 80 cm in front of the eye. What is the nature and power of the lens required to correct the problem?

1

$$P = \frac{1}{f}$$

$$f = -80 \text{ cm}$$

$$P = \frac{1}{f} = -\frac{100}{80}$$

$$= -\frac{5}{4} = -1.25 \text{ D}$$

For correction of the defect, the lens should be concave, because power is negative.

- 7. Make a diagram to show how hypermetropia is corrected. The near point of a hypermetropic eye is 1 m. What is the power of the lens required to correct this defect? Assume that the near point of the normal eye is 25 cm.**

Ans. Refer Fig. 10.5

Here $u = -25\text{cm}$, $v = -1\text{m} = -100\text{ cm}$

$$\text{Lens formula } \frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{-100} - \frac{1}{-25} = \frac{1}{f}$$

$$\Rightarrow \frac{1}{f} = \frac{-1+4}{100}$$

$$\Rightarrow f = \frac{100}{3}\text{cm}$$

$$= \frac{100}{3} \times \frac{1}{100}$$

$$= \frac{1}{3}\text{cm}$$

$$\text{Power of lens } P = \frac{1}{f} = \frac{1}{\frac{1}{3}} = +3\text{D}$$

So, convex lens is used to correct this defect.

- 8. Why are normal eyes not able to see clearly objects placed closer than 25 cm?**

Ans. A normal eye can see object kept at different distances clearly due to ability of ciliary muscles to increase or decrease its focal length of the eye lens. However, we cannot see objects placed closer than 25 cm because ciliary muscles can contract to a certain limit. Thus, the object placed closer than 25 cm appears blurred as the light rays coming from the object meet beyond retina.

- 9. What happens to the image distance in the eye when we increase the distance of an object from the eye?**

- 10. Why do stars twinkle?**

Ans. Refer Twinkling of Stars on page no. 248 of Textbook.

- 11. Why do planets not twinkle?**

Ans. Planets do not twinkle as they are closer to the Earth than those distant stars, so planets appear larger in comparison. Due to the planets' closeness to Earth, the light coming from them does not bend much due to Earth's atmosphere. Therefore, the light coming from our solar system's planets does not appear to twinkle.

12. Why does the sky appear dark instead of blue to an astronaut?

Ans. The sky appears black than blue to an astronaut because at a high altitude (space) there is lack of atmosphere. So, there is no scattering of light. Due to this, the sky appears dark to the astronaut when travelling in space.

“ I relied on NCERT as the bible. But I also referred different difficulty level Q's like from PYQs and new pattern Q's that my teachers recommended. It's a must! ”

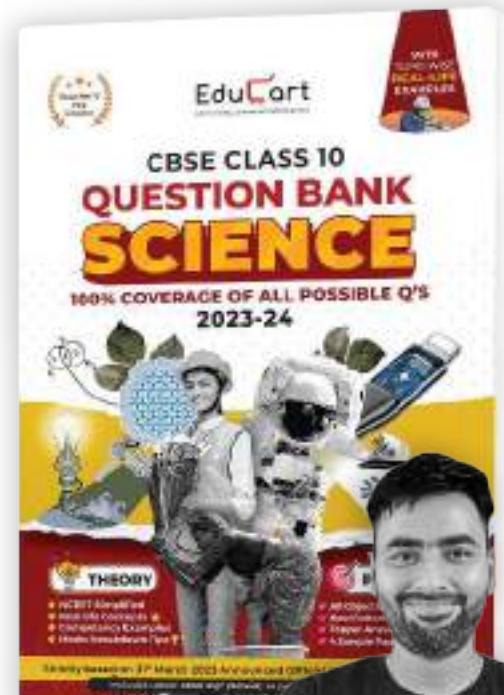
ARIHANT KAPKOTI
(99.80%), CBSE Topper 2023



According to this year's topper Arikant Kapkoti, PYQs and New pattern Q's all difficulties is a must for each Chapter. Keeping this in mind, my special book covers the below things:

- ✓ Ch-wise Past 10 Years Q's (with explanations)
- ✓ Ch-wise 100+ New Pattern Q's (all difficulties with explanations)
- ✓ Real-life examples of Topics
- ✓ CBSE Paper Checker Tips
- ✓ Topper Answers

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Rita Gupta

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Electricity

11

NCERT SOLUTIONS



What's inside

- *In-Chapter Q's (solved)*
- *Textbook Exercise Q's (solved)*

IN-CHAPTER QUESTIONS

Test Yourself

1. What does an electric circuit mean?

Ans. The arrangement in which electric current flows is called an electric circuit. It consists of batteries, conductors, resistors, switches and many other devices.

2. Define the unit of current.

Ans. When 1 coulomb of current flows through a conductor for 1 second, then the amount of electric current used is called 1 ampere.

3. Calculate the number of electrons constituting one coulomb of charge.

Ans. Since, charge of electron = 1.6×10^{-19} C

$$\text{No. of electrons} = n$$

According to the question,

$$n \times 1.6 \times 10^{-19} = 1 \text{ C}$$

$$n = \frac{1}{1.6 \times 10^{-19}}$$

$$= \frac{10^9}{1.6} \times \frac{100}{16} \times 10^{18}$$

$$= 6.25 \times 10^{18}$$

$$1 \text{ C} = 6.25 \times 10^{18} \text{ electrons}$$

Test Yourself

1. Name a device that helps to maintain a potential difference across a conductor.

Ans. Cell or Battery

2. What is meant by saying that the potential difference between two points is 1 V?

Ans. The potential difference between two points is 1 V means to move a charge of 1 C, 1 joule work is done.

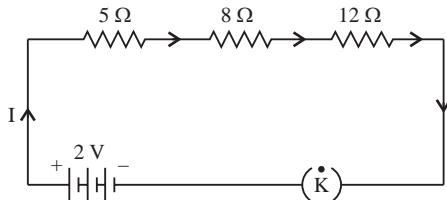
3. How much energy is given to each coulomb of charge passing through a 6 V battery?

Ans. Using formula— $W = V Q = 6 \text{ V} \times 1\text{C} = 6 \text{ J}$

Test Yourself

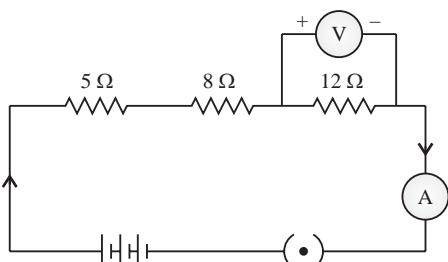
1. Draw a schematic diagram of a circuit consisting of a battery of three cells of 2 V each, a 5Ω resistor, an 8Ω resistor, and a 12Ω resistor, and a plug key, all connected in series.

Ans.



- 2.** Redraw the circuit of Question 1, putting in an ammeter to measure the current through the resistors and a voltmeter to measure the potential difference across the $12\ \Omega$ resistor. What would be the readings in the ammeter and the voltmeter?

Ans.



Resistance of circuit,

$$\begin{aligned} &= R_1 + R_2 + R_3 \\ &= 5 + 8 + 12 = 25\ \Omega \end{aligned}$$

Using Ohm's law

$$I = \frac{V}{R} = \frac{2 \times 3}{25} = \frac{6}{25} = 0.24\ \Omega$$

The potential difference between $12\ \Omega$ resistor is

$$V = IR = 0.24 \times 12 = 2.88\ V$$

The reading of the ammeter is 0.24 A and the voltmeter is 2.88 V.

Test Yourself

- 1.** Judge the equivalent resistance when the following are connected in parallel :
 (a) $1\ \Omega$ and $10^6\ \Omega$, (b) $1\ \Omega$ and $10^3\ \Omega$ and $10^6\ \Omega$.

Ans.(a) When resistance is arranged in parallel,

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{1} + \frac{1}{10^6}$$

$$= \frac{10^6 + 1}{10^6} = \frac{1000001}{1000000}$$

$$R_p = \frac{1000001}{1000000} = 0.9\ \Omega$$

(b) Similarly,

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

$$= \frac{1}{1} + \frac{1}{10^3} + \frac{1}{10^6}$$

$$= \frac{10^6 + 10^3 + 1}{10^6}$$

$$R_p = \frac{10^6}{1000000 + 1000 + 1}$$

$$= \frac{1000000}{1001001} = 0.9 \Omega$$

- 2.** An electric lamp of 100Ω , a toaster of resistance 50Ω , and a water filter of resistance 500Ω are connected in parallel to a $220 V$ source. What is the resistance of an electric iron connected to the same source that takes as much current as all three appliances, and what is the current through it?

Ans. Here, $R_1 = 100$, $R_2 = 50$, $R_3 = 500$

When they are connected in parallel, then

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

$$= \frac{1}{100} + \frac{1}{50} + \frac{1}{500}$$

$$= \frac{5+10+1}{500} = \frac{16}{500}$$

$$R_p = \frac{500}{16} = 31.25 \Omega$$

Equivalent resistance = 31.25Ω

Current flowing

$$I = \frac{V}{R}$$

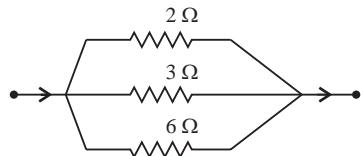
- 3.** What are the advantages of connecting electrical devices in parallel with the battery instead of connecting them in series?

Ans. Instead of connecting in series, connecting electrical devices in parallel has the following advantages:

- (i) The value of equivalent resistance in parallel is less than in series.
- (ii) The value of current becomes high in parallel resistors.
- (iii) Lesser resistance in the parallel leads to less energy loss.

- 4.** How can three resistors of resistances 2Ω , 3Ω and 6Ω be connected to give a total resistance of (a) 4Ω , (b) 1Ω ?

Ans. (a) To get 4Ω equivalent resistance, 3Ω and 6Ω resistors are connected in parallel and 2Ω in series.



When $3\ \Omega$ and $6\ \Omega$ are added in parallel.

$$\begin{aligned}\frac{1}{R_p} &= \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{3} + \frac{1}{6} \\ &= \frac{2+1}{6} = \frac{1}{2} \Rightarrow R_p = 2\ \Omega\end{aligned}$$

When its equivalent resistance is connected in series with a resistor of $2\ \Omega$, then

$$R_s = R_1 + R_2 = 2 + 2 = 4\ \Omega$$

When all three resistors are connected, the equivalent resistance is $1\ \Omega$.

$$\begin{aligned}\frac{1}{R_p} &= \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \\ &= \frac{3+2+1}{6} = \frac{6}{6} = 1\end{aligned}$$

$$R_p = 1\ \Omega$$

5. What is (a) the highest, (b) the lowest total resistance that can be secured by combinations of four coils of resistance $4\ \Omega$, $8\ \Omega$, $12\ \Omega$, $24\ \Omega$?

Ans.(a) To obtain the highest resistance, connect the coils in series,

$$\begin{aligned}R_s &= R_1 + R_2 + R_3 + R_4 \\ &= 4 + 8 + 12 + 24 = 48\ \Omega\end{aligned}$$

(b) To obtain the lowest resistance, connect the coils in parallel,

$$\begin{aligned}\frac{1}{R_p} &= \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4} \\ &= \frac{1}{4} + \frac{1}{8} + \frac{1}{12} + \frac{1}{24} \\ &= \frac{6+3+2+1}{24} = \frac{12}{24} = \frac{1}{2}\end{aligned}$$

$$R_p = 2\ \Omega$$

Test Yourself

1. Why does the cord of an electric heater not glow while the heating element does?

Ans. By Joule's law of heating, $H \propto R$

Therefore, the resistance of the heating element is much higher than that of the heater cord. This gives more heat and makes this component better, whereas the cord of an electric heater does not.

- 2. Compute the heat generated while transferring 96000 Coulomb of charge in one hour through a potential difference of 50 V.**

Ans. Here,

$$t = 1 \text{ h} = 1 \times 60 \times 60 \text{ second} \\ = 3600 \text{ seconds}$$

From formula $W = H = VQ = 50 \times 96000$
 $= 4800000 \text{ J}$

- 3. An electric iron of resistance 20 Ω takes a current of 5 A. Calculate the heat developed in 30 s.**

Ans. Here, $I = 5 \text{ A}$, $R = 20 \Omega$, $t = 30 \text{ s}$

From formula $H = I^2Rt$
 $= 5 \times 5 \times 20 \times 30$
 $= 15000 \text{ J}$
 $= 15 \text{ KJ}$

Heat = 15 KJ

Test Yourself

- 1. What determines the rate at which energy is delivered by a current?**

Ans. The rate of energy provided by an electric current is determined by the work done per second.

$$\text{Amount of heat} = \frac{\text{Work done}}{\text{time required}}$$

- 2. An electric motor takes 5 A from a 220 V line. Determine the power of the motor and the energy consumed in 2 h.**

Ans. Here, $I = 5 \text{ A}$, $V = 220 \text{ V}$, $t = 2 \text{ h} = 2 \times 3600 \text{ s}$

From the formula, $P = VI$

$$= 5 \times 220 = 1100 \text{ W}$$

Heat = Power \times time

$$= 1100 \times 2 \times 3600$$

$$= 7920000 \text{ J} = 7.92 \times 10^3 \text{ KJ}$$

NCERT EXERCISES

- 1. A piece of wire of resistance R is cut into five equal parts. These parts are then connected in parallel. If the equivalent resistance of this combination is R' , then the ratio R/R' is :**

- (a) 1/25 (b) 1/5

- (c) 5 (d) 25

Ans. (d) Resistance of piece $= \frac{R}{5}$

Explanation : For parallel combination of five pieces:

$$\frac{1}{R'} = \frac{1}{R/5} + \frac{1}{R/5} + \frac{1}{R/5} + \frac{1}{R/5} + \frac{1}{R/5}$$

$$\frac{1}{R'} = \frac{5}{R} + \frac{5}{R} + \frac{5}{R} + \frac{5}{R} + \frac{5}{R} = \frac{25}{R}$$

$$\Rightarrow \frac{R}{R'} = 25$$

2. Which of the following terms does not represent electrical power in a circuit?

Ans.(b) \mathbb{R}^2

Explanation : Electric Power = $VI = IR$ (R) = I^2R

$$= V \left[\frac{V}{R} \right] = \frac{V^2}{R}$$

Only IR^2 does not represent electrical power in a circuit.

3. An electric bulb is rated 220 V and 100 W. When it is operated on 110 V, the power consumed will be :

Ans.(d) 25 W

Explanation: Resistance of bulb

$$R = \frac{V^2}{P} = \frac{220 \times 220}{100} = 484\Omega$$

Power used by 10 V bulb

$$P' = \frac{V^2}{R} = \frac{110 \times 110}{484} = 25 \text{ W.}$$

4. Two conducting wires of the same material and equal lengths and equal diameters are first connected in series and then parallel in a circuit across the same potential difference. The ratio of heat produced in series and parallel combinations would be :

- (a) 1 : 2 (b) 2 : 1
 (c) 1 : 4 (d) 4 : 1

Ans.(c) 1 : 4

Explanation : The wire is made of the same conducting material, having equal

length and width, thus each wire has the same resistance = R

For series combination :

$$R_s = R + R = 2R$$

For parallel combination :

$$\frac{1}{R_p} = \frac{1}{R} + \frac{1}{R} = \frac{2}{R}$$

Electric Power

$$P = \frac{V^2}{R}$$

For series combination, the heat released $P_s = \frac{V^2}{R_s}$

For parallel combination, the heat released :

$$P_p = \frac{V^2}{R_p}$$

$$\Rightarrow \frac{P_s}{P_p} = \frac{V^2/R_s}{V^2/R_p} = \frac{1}{4}$$

$$\therefore P_s : P_p = 1 : 4.$$

5. How is a voltmeter connected in the circuit to measure the potential difference between two points?

Ans. To measure the potential difference between two points, a voltmeter is connected in parallel between the two points.

6. A copper wire has a diameter of 0.5 mm and resistivity of $1.6 \times 10^{-8} \Omega \text{ m}$. What will be the length of this wire to make its resistance 10 Ω ? How much does the resistance change if the diameter is doubled?

Ans. $d = \text{diameter} = 0.5 \text{ mm}$, $\rho = 1.6 \times 10^{-8} \Omega \text{ m}$, $R = 10 \Omega$

$$r = \frac{d}{2} = \frac{0.5 \times 10^{-3}}{2}$$

$$m = \frac{\pi r^2 l}{4} = \frac{\pi (0.5 \times 10^{-3})^2 l}{4 \times 10^{-8}}$$

$$R = \rho \frac{l}{A} = \rho \frac{l}{\pi r^2} = \frac{\rho l}{\pi r^2}$$

$$l = \frac{R A}{\rho} = \frac{10 \times \pi (0.5 \times 10^{-3})^2}{1.6 \times 10^{-8}} = \frac{10 \times 3.14 \times (0.5 \times 10^{-3})^2}{1.6 \times 10^{-8}}$$

$$= \frac{3.14 \times 10}{1.6 \times 10^{-8}} \times \frac{5}{20} \times \frac{5}{20} \times 10^{-3} \times 10^{-3}$$

$$= \frac{78.50 \times 10}{1.6 \times 4}$$

$$= \frac{7850}{69} = 122.65 = 122.7\text{m}$$

\therefore Length of wire = 122.7 m

If $d = 2 \times 0.5 = 1.0\text{ mm}$, $r = \frac{1}{2} \times 10^{-3}\text{ m}$

$$R = \rho \frac{l}{A}$$

$$l = \frac{10 \times 3.14 \times \left(\frac{1}{2} \times 10^{-3}\right)^2}{1.6 \times 10^{-8}}$$

$$l = \frac{3.14 \times 10 \times 10^{-6}}{1.6 \times 4 \times 10^{-8}}$$

$$= \frac{31400}{64} = 490.5$$

Thus, we can say,

$$\text{Since } R \propto \frac{1}{d^2}$$

So, if d is doubled, then R becomes $1/4^{\text{th}}$ time.

- 7. The values of current I flowing in a given resistor for the corresponding values of potential difference V across the resistor are given below :**

I (amperes) 0.5 1.0 2.0 3.0 4.0

V (volts) 1.6 3.4 6.7 10.2 13.2

Plot a graph between V and I and calculate the resistance of that resistor.

Ans.

$$\text{Resistance} = \frac{V_2 - V_1}{I_2 - I_1}$$

$$R_1 = \frac{3.4 - 1.6}{1.0 - 0.5} = \frac{1.8}{0.5} = 3.5\Omega$$

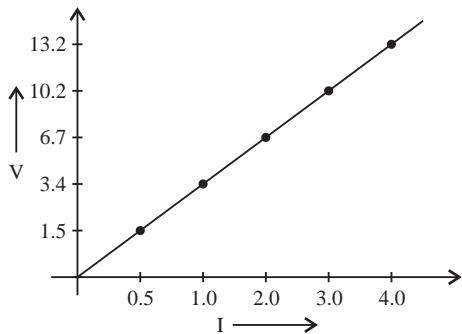
$$R_2 = \frac{6.7 - 3.4}{2.0 - 1.0} = 3.3\Omega$$

$$R_3 = \frac{10.2 - 3.4}{3.0 - 2.0} = 6.8 \Omega$$

$$R_4 = \frac{13.2 - 10.2}{4.0 - 3.0} = 3.0 \Omega$$

$$R = \frac{R_1 + R_2 + R_3 + R_4}{4} = \frac{16.7}{4} = 4.2 \Omega$$

$$\text{Resistance} = 4.2 \Omega$$



- 8. When a 12 V battery is connected across an unknown resistor, there is a current of 2.5 mA in the circuit. Find the value of the resistance of the resistor.**

Ans. Here, $V = 12 \text{ V}$, $I = 2.5 \text{ mA} = 2.5 \times 10^{-3} \text{ A}$

Using Ohm's Law,

$$\begin{aligned} R &= \frac{V}{I} = \frac{12}{2.5 \times 10^{-3}} \\ &= \frac{12 \times 10^3}{2.5} = \frac{120}{25} \times 10^3 = 4.8 \times 10^3 \Omega \end{aligned}$$

The resistance of a resistor is $4.8 \times 10^3 \Omega$.

- 9. A battery of 9 V is connected in series with resistors of 0.2Ω , 0.3Ω , 0.4Ω , 0.5Ω and 12Ω , respectively. How much current would flow through the 12Ω resistor?**

Ans. The resistance is connected in series

$$\begin{aligned} R_s &= 0.2\Omega + 0.3\Omega + 0.4\Omega + 0.5\Omega + 12\Omega \\ &= 13.4\Omega \end{aligned}$$

$$\text{Current} = I = \frac{V}{R_s} = \frac{9 \text{ V}}{13.4 \Omega} = 0.67 \text{ A}$$

So, the current flowing through 12Ω resistor = 0.67 A .

- 10. How many 176Ω resistors (in parallel) are required to carry 5 A on a 220 V line?**

Ans. Here, $V = 220 \text{ V}$, $I = 5 \text{ A}$

Let the number of resistors be n

$$\text{Resistance of circuit } R = \frac{V}{I} = \frac{220 \text{ V}}{5 \text{ A}} = 44 \Omega$$

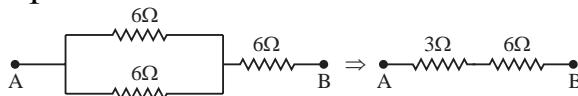
Resistance of each resistor $r = 176 \Omega$

For n resistors, if the resistance of each is r is connected in parallel, the resultant resistance R is :

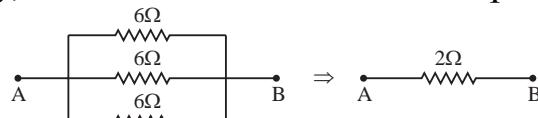
$$R = \frac{r}{n} \Rightarrow 44 = \frac{176}{n} \Rightarrow n = \frac{176}{44} = 4$$

11. Show how you would connect three resistors, each of resistance 6Ω so that the combination has a resistance of (i) 9Ω , (ii) 4Ω .

Ans.(i) To get a resistance of 9Ω from three resistors of 6Ω , connect two resistors in parallel and the other in series.



(ii) To get 2Ω resistivity, connect all three resistors in parallel.



12. Several electric bulbs designed to be used on a 220 V electric supply line, are rated 10 W . How many lamps can be connected in parallel with each other across the two wires of a 220 V line if the maximum allowable current is 5 A ?

Ans. Resistance of each bulb

$$r = \frac{V^2}{P} = \frac{220 \times 220}{10} = 4840\Omega$$

Total resistance

$$R = \frac{220\text{V}}{5\text{V}} = 44\Omega$$

Let the number of bulbs be n and for resistance R :

$$R = \frac{r}{n} \Rightarrow n = \frac{r}{R} = \frac{4840}{44} \Omega = 110\Omega$$

13. A hot plate of an electric oven connected to a 220 V line has two resistance coils A and B, each of 24Ω resistance, which may be used separately, in series, or parallel. What are the currents in the three cases?

Ans.(i) Potential difference = 220 V , resistance of each coil = 24Ω

(ii) When Coil A and B are connected in series :

$$R_s = r + r = 2r = 48\Omega$$

Current flowing :

$$I_s = \frac{V}{R_s} = \frac{220}{48} = 4.58\text{A}$$

(iii) When Coil A and B are connected in parallel :

$$R_p = \frac{r}{2} = \frac{24}{2} = 12\Omega$$

Current flowing :

$$I_p = \frac{V}{R_p} = \frac{220\text{V}}{12\Omega} = 18.3\Omega$$

14. Compare the power used in the 2Ω resistor in each of the following circuits:

- (i) A 6 V battery in series with 1Ω and 2Ω resistors.
- (ii) A 4 V battery in parallel with 12Ω and 2Ω resistors.

Ans.(i) When resistors are arranged in series

$$R = R_1 + R_2 = 1 + 2 = 3\Omega$$

From Ohm's law

$$I = \frac{V}{R} = \frac{6}{3} = 2A$$

$$\text{Power } P_1 = VI = 6 \times 2 = 12 W$$

(ii) When resistors are arranged in parallel

$$R = \frac{R_1 R_2}{R_1 + R_2} = \frac{12 \times 2}{12 + 2} = \frac{24}{14}$$

$$I = \frac{V}{R} = \frac{4}{\frac{24}{14}} = \frac{14}{6} = \frac{7}{3} A$$

$$P = V \cdot I.$$

$$P_2 = 4 \times \frac{7}{3} = \frac{28}{3} = 9.33 W$$

$$\frac{P_1}{P_2} = \frac{12}{9.33} \Rightarrow P_1 = P_2 \frac{12}{9.33}$$

$$= P_2 \times \frac{120}{93} = P_2 \times \frac{40}{31}.$$

15. Two lamps, one rated 100 W at 220 V, and the other 60 W at 220 V, are connected in parallel to the electric mains supply. What current is drawn from the line if the supply voltage is 220 V?

Ans. Let, Resistance for the first lamp = R_1

Resistance for the second lamp = R_2

$P_1 = 100 W, P_2 = 60W, V = 220 V$

From Formula :

$$R_1 = \frac{V^2}{P_1} = \frac{220 \times 220}{100} = 484\Omega$$

$$R_2 = \frac{V^2}{P_2} = \frac{220 \times 220}{60} = \frac{2420}{3}\Omega$$

Connecting R_1 and R_2 in parallel series

$$R = \frac{R_1 \times R_2}{R_1 + R_2} = \frac{484 \times \frac{2420}{3}}{484 + \frac{2420}{3}} = \frac{2420}{8} = \frac{605}{2}\Omega$$

$$I = \frac{V}{R} = \frac{220}{\frac{605}{2}} = 220 \times \frac{2}{605} = \frac{8}{11} = 0.72 \text{ A}$$

So, the current drawn from mains is 0.72 A.

- 16. Which uses more energy, a 250 W TV set in 1 hr, or a 1200 W toaster in 10 minutes?**

Ans. In the T.V. set, $P = 250 \text{ W}$

Time $t = 1 \text{ hr} = 60 \times 60 \text{ seconds} = 36000 \text{ sec}$

Electrical energy $E_1 = P \times t = 250 \times 3600 = 900000 \text{ J}$

$$E_1 = 9 \times 10^5 \text{ J}$$

In heater, $P = 120 \text{ W}$

Time $t = 10 \text{ min} = 100 \times 60 \text{ seconds} = 600 \text{ sec}$

Electrical energy $E_2 = P \times t = 120 \times 600 = 72000 \text{ J}$

$$E_2 = 7.2 \times 10^4 \text{ J}$$

Since, $E_1 > E_2$

So, T.V. uses more energy.

- 17. An electric heater of resistance 8 W draws 15 A from the service mains for 2 hours. Calculate the rate at which heat is developed in the heater.**

Ans. $I = 15 \text{ A}$, $R = 8\Omega$

$$\therefore \text{Power } P = \frac{E}{t} = \frac{I^2 R t}{t}$$

$$\therefore P = I^2 R = 15 \times 15 \times 8 = 1800 \text{ W}$$

Amount of Heat = 1800 W.

- 18. Explain the following :**

- (a) Why is tungsten used almost exclusively for filament of electric lamps?
- (b) Why are the conductors of electric heating devices, such as bread-toasters and electric irons, made of an alloy rather than a pure metal?
- (c) Why is the series arrangement not used for domestic circuits?
- (d) How does the resistance of a wire vary with its area of cross-section?
- (e) Why are copper and aluminium wires usually employed for electricity transmission?

Ans. (a) Tungsten is used in the manufacture of filaments for electric lamps because tungsten has both a high melting point and high resistance. Due to the high resistance, the production of heat is also high in it. Therefore, the filaments shine very brightly after heating.

(b) Alloys are used in making bread toasters and electric irons because alloys have

higher melting points and high resistivity than other pure metals. Therefore, they produce a large amount of heat.

- (c) Since the resistance is very high in the series and, when the filament of one bulb is broken, the flow of current stops in all the connected bulbs, and thus all are extinguished simultaneously. Due to this, the amount of current flowing in the circuit becomes very less. But, when connected in parallel, the value of resistance is very less, due to which the value of current increases greatly. Therefore, in domestic electric circuits, the parallel is used instead of using the series connection.
- (d) Since the resistance of a wire is inversely proportional to the area of the cross-section. When the area of cross-section (increased) is increased, the value of resistance decreases, i.e.,
- $$R \propto \frac{1}{A}$$
- (e) Since copper and aluminium are the best conductors of electricity and they are also cheap. This is why copper and aluminium are used for power transmission.

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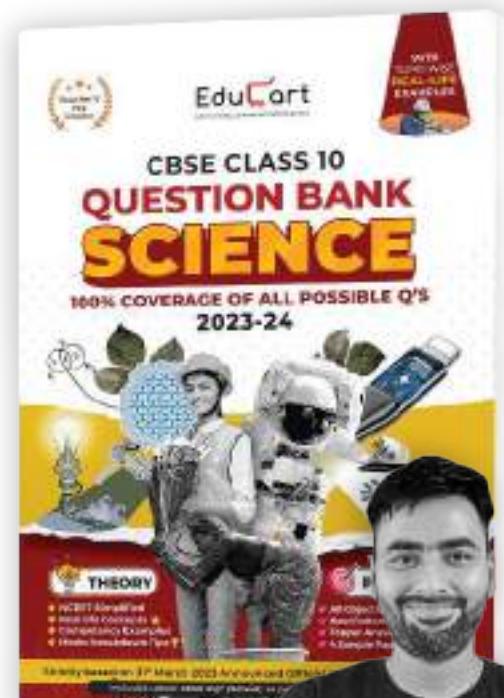
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Arun Sharma

Regional Topper
CBSE 2022-23



Magnetic Effects of Electric Current

12

NCERT SOLUTIONS



What's inside

- In-Chapter Q's (solved)
- Textbook Exercise Q's (solved)

EduCart

IN-CHAPTER QUESTIONS

Test Yourself

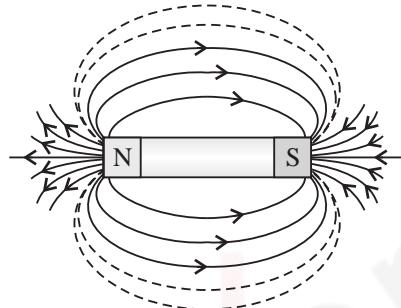
1. Why does a compass needle get deflected when brought near a bar magnet?

Ans. Because a magnetic field is generated around the magnet and this field exerts a magnetic force on the magnetic needle, due to which the needle is deflected.

Test Yourself

1. Draw magnetic field lines around a bar magnet.

Ans.



2. List the properties of magnetic field lines.

Ans. Magnetic field lines show the following properties :

- (i) Magnetic field lines originate from the north pole of the magnet and end at the south pole.
- (ii) These lines do not intersect each other.
- (iii) The direction of the tangent drawn at a point shows the direction of the magnetic field.

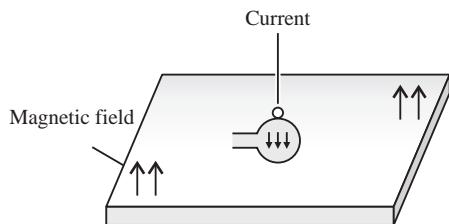
3. Why don't two magnetic field lines intersect each other?

Ans. Magnetic field lines have one direction in particular. If two magnetic field lines intersect, then there will be two directions of the magnetic field at the point of intersection which is impossible. Therefore, these lines do not intersect.

Test Yourself

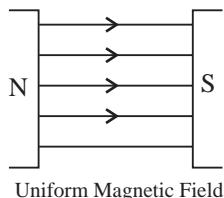
1. Consider a circular loop of wire lying in the plane of the table. Let the current pass through the loop clockwise. Apply the right-hand rule to find out the direction of the magnetic field inside and outside the loop.

Ans. Using the right hand thumb rule, the direction of the magnetic field inside the loop is downward and outside the loop is upwards as shown in the figure.



- 2. The magnetic field in a given region is uniform. Draw a diagram to represent it.**

Ans.



- 3. Choose the correct option.**

The magnetic field inside a long straight solenoid-carrying current :

- (a) is zero.
- (b) decreases as we move towards its end.
- (c) increases as we move towards its end.
- (d) is the same at all points.

Ans.(d) is the same at all points.

Test Yourself

- 1. Which one of the following properties of a proton changes while moving freely in a magnetic field?**

- (a) Mass
- (b) Speed
- (c) Velocity
- (d) Impulse

Ans.(c) Velocity

- 2. In Activity 13.9, how do we think the displacement of rod AB will be affected if (i) the current in rod AB is increased; (ii) a stronger horse-shoe magnet is used, and (iii) the length of the rod AB is increased?**

Ans. We know that if an electric current (I) is passed through a conductor of length l placed in a magnetic field (B), then the force acting :

$$F = BIl \quad \dots (1)$$

- (i) If the current is increased, then from eq. (1), $F \propto I$ i.e., Rod AB is more displaced.
- (ii) If a stronger horse-shoe magnet is used then from eq. (1), $F \propto B$, i.e., Rod AB is more displaced.
- (iii) If the length of rod AB is increased, then from eq. (1), $F \propto l$, i.e., Rod AB is more displaced.

3. A positively-charged particle (alpha-particle) projected towards the west is deflected towards the north by a magnetic field. The direction of magnetic field is :

- (a) towards south (b) towards east
- (c) downward (d) upward

Ans.(d) upward

Test Yourself

1. Name two safety measures commonly used in electric circuits and appliances.

Ans. (i) Fuse, (ii) Earth wire.

2. An electric oven with 2 kW power rating is operated in a domestic electric circuit (220 V) that has a current rating of 5 A. What result do you expect? Explain.

Ans. Here $P = ?$, $V = 220\text{ V}$, $I = 5\text{ A}$

$$\text{Using formula, } P = \frac{V^2}{R}$$

$$\Rightarrow R = \frac{V^2}{P} = \frac{220 \times 220}{2 \times 10^3} = \frac{220 \times 5}{2 \times 10^3}$$
$$= \frac{11 \times 22}{10} = \frac{11 \times 11}{5}$$

$$\text{Using formula } V = IR$$

$$\Rightarrow I = \frac{V}{R}$$
$$= \frac{220 \times 5}{11 \times 11}$$
$$= 9.99\text{ A}$$

The current (9.1 A) exceeds the fuse rating (5 A) of the given circuit. Due to this, the fuse is broken due to the high flow of current through the circuit.

3. What precautions should be taken to avoid the overloading of domestic electric circuits?

Ans. In household electrical circuits, more than one socket should not be connected to electrical equipment, as there is a fear of overloading. To protect against this, the fuse is replaced.

NCERT EXERCISES

1. Which of the following correctly describes the magnetic field near a long straight wire?

- (a) The field consists of straight lines perpendicular to the wire.
- (b) The field consists of straight lines parallel to the wire.
- (c) The field consists of radial lines originating from the wire.
- (d) The field consists of concentric circles centred on the wire.

Ans.(d) The field consists of concentric circles centred on the wire.

2. At the time of the short circuit, the current in circuit :

- (a) reduces substantially
- (b) does not change
- (c) increases heavily
- (d) vary continuously

Ans.(c) increases heavily.

3. State whether the following statements are true or false :

- (a) The field at the center of a long circular coil carrying current will be parallel straight lines.
- (b) A wire with green insulation is usually the live wire of an electric supply

Ans.(a) True, (b) False

4. List two methods of producing magnetic fields.

Ans.The methods of producing magnetic fields are :

- (i) around a current carrying a straight conductor.
- (ii) around a current carrying solenoid.
- (iii) around a natural magnet.

5. When is the force experienced by a current-carrying conductor placed in a magnetic field largest?

Ans.The force exerted on a current-carrying conductor placed in a magnetic field is greatest when the direction of the current is perpendicular to the direction of the magnetic field.

6. Imagine that you are sitting in a chamber with your back to one wall. An electron beam, moving horizontally from the back wall towards the front wall, is deflected by a strong magnetic field to your right side. What is the direction of the magnetic field?

Ans.The direction of current flowing is from the front wall towards the back wall as it is in the opposite direction to the flow of electrons. If the direction of force applied

is towards the right side, then using Fleming's left-hand rule, the magnetic field is applied in a downward direction.

7. State the rules for finding the direction, when :

- (a) A magnetic field produced around a straight conductor carrying current,
- (b) The force experienced by a current carrying a straight conductor placed in a magnetic field placed perpendicular to it.
- (c) current induced in a coil due to its rotation in a magnetic field.

Ans.(a) The direction of the magnetic field produced around a straight current carrying conductor is given by the right-hand thumb rule.

(b) The direction of the force experienced by a current-carrying straight conductor placed in a magnetic field perpendicular to it is given by Fleming's left-hand rule.

(For an explanation on page no. 290 and 293 of Textbook respectively.

8. When does an electric short circuit occur?

Ans.When the live wire and neutral wire come in contact, a short circuit occurs.

9. What is the function of an earth wire? Why is it necessary to earth metallic appliances?

Ans.The wire which is in contact with the earth from the metallic part of an electrical device is called an earth contact wire. Its color is green. In a faulty situation, if an electric current starts flowing in the metallic part of the equipment, then there is a possibility of an accident. If there is earth contact, then the current is transferred to the earth. This does not cause electric shock and prevents accidents.

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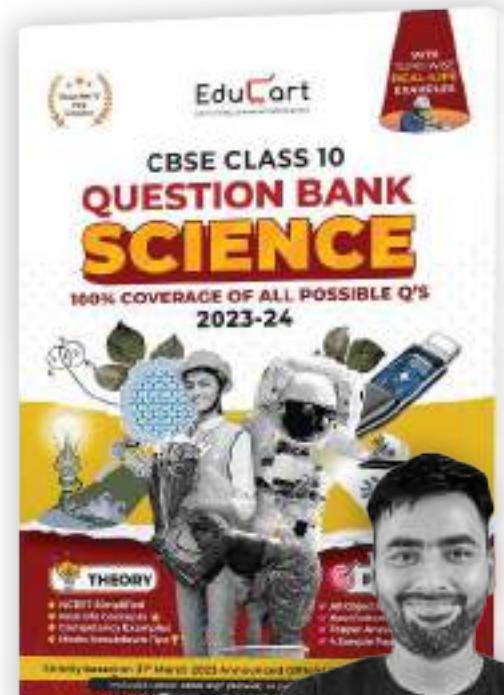
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Our Environment 13

NCERT SOLUTIONS



What's inside

- *In-Chapter Q's (solved)*
- *Textbook Exercise Q's (solved)*

IN-CHAPTER QUESTIONS

Test Yourself

1. What are trophic levels? Give an example of a food chain and state the different trophic levels in it.

Ans. The different steps in a food chain are called trophic levels.

For example: Grass → Deer → Lion (Tiger).

There are different trophic levels in this food chain.

- (i) The first trophic level is the grass which is called producer.
- (ii) The second trophic level is deer, it is a herbivore.
- (iii) The third trophic level is the lion, it is a carnivore.

2. What is the role of decomposers in the ecosystem?

Ans. Decomposers break apart dead organisms into simpler inorganic materials, making nutrients available to primary producers. Thus they maintain the flow of energy through an ecosystem.

Test Yourself

1. Why are some biodegradable substances and some non-biodegradable?

Ans. The substances which can be broken down by biological processes are biodegradable. In our environment, such substances are broken down by decomposers (bacteria and fungi). However, there are other substances which cannot break down and are known as non-biodegradable substances. Since these substances are not degraded by bacteria and fungi, they persist for a long time. Such substances are acted upon by physical processes like heat and pressure.

2. Give any two ways in which biodegradable substances would affect the environment.

Ans. Biodegradable substances affect the environment in two ways.

- (i) These substances decompose to form toxic substances, which increases air pollution.
- (ii) Biodegradable substances can be used as humus after composting, which enhance the soil fertility.
- (iii) They may produce a foul smell during the decomposition process.

3. Give any two ways in which non-biodegradable substances would affect the environment.

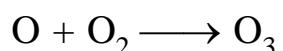
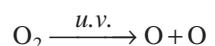
Ans. (i) Non-biodegradable substances, due to their non-degradable nature, create disposal problems and pollute the landscape.

- (ii) These substances often emit very harmful gaseous pollutants which are very dangerous for health.

Test Yourself

1. What is ozone and how does it affect any ecosystem?

Ans. Ozone is a poisonous gas made of three atoms of oxygen, present in the stratosphere. It protects the environment from the damaging effects of UV radiation which causes skin cancer and cataract and impairs our immune system.



2. How can you help in reducing the problem of waste disposal? Give any two methods.

Ans.(i) We should use more and more biodegradable materials, because it can be converted into manure by simple methods.
(ii) The waste of non-biodegradable materials should be sent to the factory for recycling.

NCERT EXERCISES

1. Which of the following groups contains only biodegradable items?

- (a) Grass, flowers and leather
- (b) Grass, wood and plastic
- (c) Fruit-peels, cake and lime-juice
- (d) Cake, wood and grass

Ans.(c) Fruit-peels, cake and lime-juice

2. Which of the following make up the food chain?

- (a) Grass, Wheat and Mango
- (b) Grass, Goat and Human
- (c) Goat, Cow and Elephant
- (d) Grass, Fish and Goat

Ans.(b) Grass, Goat and Human

3. Which of the following are environment-friendly practices?

- (a) Carrying cloth-bags to put purchases in while shopping
- (b) Switching off unnecessary lights and fans
- (c) Walking to school instead of getting your mother to drop you on her scooter

(d) All of the above

Ans.(d) All of the above

4. What will happen if we kill all the organisms in one trophic level?

Ans.The organisms at all trophic levels in the food chain depend on each other for food.

If all organisms at a trophic level are killed, the food chain will be destroyed, all the living beings at higher trophic level will be affected by the lack of food. They will start resorting to other sources. On the other hand, organisms at lower trophic level will face sudden increase in the population which will lead to a risk of deterioration of the unbalanced ecosystem.

For example, if we kill all the deer (second trophic level), then lion, tiger and other carnivores will face difficulty with the lack of food while the plants in that region will grow at unlimited rate.

5. Will the impact of removing all the organisms in a trophic level be different for different trophic levels? Can the organisms of any trophic level be removed without causing any damage to the ecosystem?

Ans.Yes, the impact of removing all the organisms in a trophic level will be different for different trophic levels. The removal of producers will affect herbivores due to absence of food. They will die. Similarly, the carnivores would also die in absence of herbivores and producers are also affected and may die due to competition for space and nutrients. Therefore, it is not possible to remove any trophic level organisms without affecting the ecosystem as they are all interlinked. This will create an imbalance in the ecosystem.

6. What is biological magnification? Will the levels of this magnification be different at different levels of the ecosystem?

Ans.Biological magnification is the phenomenon in which harmful chemicals enter in the food chain and its concentration increases at each trophic level. The levels of biological magnification is different at different levels of the ecosystem. It will be increases with each successive level. It is maximum at highest trophic levels and minimum at lowest trophic levels. For example, it is highest in humans and lowest in plants.

D. D. T. → Water → Algae → Fish → Birds
0.02 ppm 5 ppm 140 ppm 1600 ppm

7. What are the problems caused by the non-biodegradable wastes that we generate?

Ans.Non-biodegradable wastes do not get destroyed due to which many problems arise

like :

- (i) They pollute the water which becomes unfit for drinking.
- (ii) They stop the flow of water in drains.
- (iii) They make the atmosphere poisonous.
- (iv) They pollute the soil due to which the land becomes unsuitable.
- (v) They cause diseases.

8. If all the waste we generate is biodegradable, will this have no impact on the environment?

Ans. Biodegradable waste materials do not exist in nature for long. Some are affected by the environment but they get decomposed in a short time. The decomposed matter can be converted into manure which will be beneficial for the plants. However, it may still pollute the environment if they are not decomposed within a particular period of time or else the accumulation of the waste will lead again to pollution. It will become a breeding ground for flies causing the spread of diseases.

9. Why is damage to the ozone layer a cause for concern? What steps are being taken to limit this damage?

Ans. The damage to the ozone layer a cause for concern because :

- It causes skin darkening, skin cancer, ageing, and corneal cataracts in human beings.
- It can result in the death of many phytoplankton that leads to increased global warming.

To limit the damage to the ozone layer the release of CFCs into the atmosphere must be reduced. CFCs used as refrigerants and in fire extinguishers should be replaced with environmentally-safe alternatives. Also the release of CFCs through industrial activities should be controlled.

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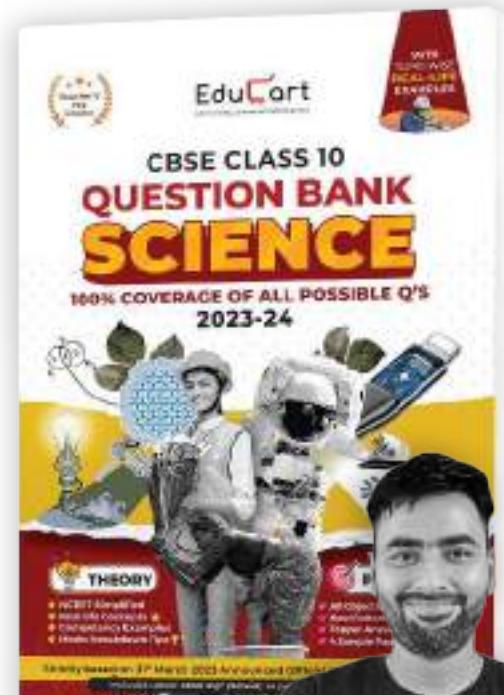
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