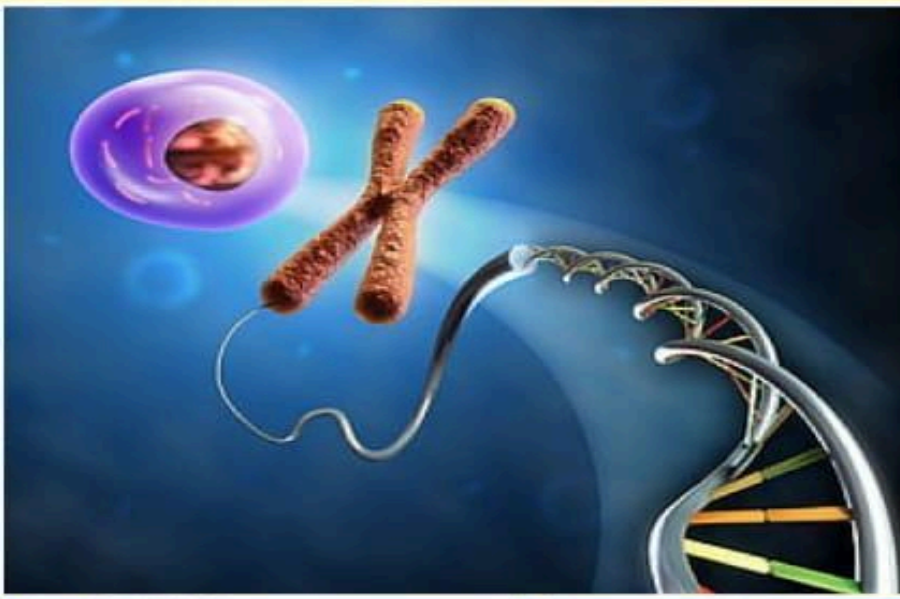
तत् त्वं पूषन् अपावृणु
केन्द्रीय विद्यालय संगठन

KENDRIYA VIDYALYA SANGATHAN
PATNA REGION

STUDENT STUDY MATERIAL
2023-24



CLASS X
SCIENCE

KENDRIYA VIDYALYA SANGATHAN
PATNA REGION

OUR INSPIRATION

HONORABLE SH. ANURAG BHATNAKAR
DC KVS RO PATNA

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HONORABLE SH. MANISH KUMAR PRABHAT
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CLASS X
Science

STUDENT STUDY MATERIAL

2023-24

HONORABLE SH PURNENDU MANDAL
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HONORABLE SH SANTOSH CHAUDHARY
PRINCIPAL KV JAMALPUR

MESSAGE BY THE DEPUTY COMMISSIONER

I am delighted to announce the release of Support Material/Study material for the students of class X science. In our relentless pursuit of academic excellence, we have been constantly revising and upgrading our teaching methodologies and resources. One of the important resources is the support material which is prepared by Kendriya Vidyalayas for the students of class X. This Support material consist of topics/lessons with practice questions which aims to foster a deeper understanding of subject, stimulate critical thinking and helps in achieving better score in CBSE exam.

I hope this support material will greatly benefit the academic journey of class X not only in pursuit of good result in CBSE exams but also helpful for various entrance examinations.

Let's march ahead with dedicated minds and relentless endeavors for better future through better education.

With warm regards

List of TGT(Science/Bio) for preparation of sample paper & study material for class 10(2023-24) science: -

Sl.no	Name of Teacher &Vidyalaya	Chapters allotted
1.	Sh. Sanjay Suman, K.V. No.1, kankarbagh Patna(FS)	1.Chemical Reaction& Equations 6.Control and Coordination 1 sample paper
2.	Smt. Vinita Kumari, K.V. No.2, Bailey Road Patna(FS)	2. Life Processess 3. Light-Reflection and Refraction.
3.	Md. ShamimUddin, K.V. Khagaul, Patna	5. Acids, Bases & Salts 10. Carbon & its compounds
4.	Smt. Jyoti Gupta, K.V. DanapurCantt(FS)	11. Heredity & Evolution 4. Human Eye & colorful world
5.	Sh. Vikash Kumar, K.V. Muzaffarpur(FS)	7. Electricity 12. Our Environment - 1 Sample paper
6.	Sh. B.B. Sahni, K.V.No.1 Kankarbagh, Patna(FS)	8. Metals & Non- Metals 13. Magnetic effect of current
7.	Smt. Swati Kumari, K.V. Jamalpur	9. How do organism Reproduce? -1 sample paper

Document Editing- Saurabh KumarSingh(Comp. Ins)
Swati Kumari (TGT-Sc)

INDEX

COURSE STRUCTURE

CLASS X

(Annual Examination)

Marks: 80

Unit No.	Unit	Marks
I	Chemical Substances-Nature and Behaviour	25
II	World of Living	25
III	Natural Phenomena	12
IV	Effects of Current	13
V	Natural Resources	05
	Total	**80**
	Internal assessment	**20**
	Grand Total	**100**

Theme: Materials

Unit I: Chemical Substances - Nature and Behaviour

Chemical reactions: Chemical equation, Balanced chemical equation, implications of a balanced chemical equation, types of chemical reactions: combination, decomposition, displacement, double displacement, precipitation, endothermic exothermic reactions, oxidation and reduction.

Acids, bases and salts: Their definitions in terms of furnishing of H+ and OH– ions, General properties, examples and uses, neutralization, concept of pH scale (Definition relating to logarithm not required), importance of pH in everyday life; preparation and uses of Sodium Hydroxide,Bleaching powder, Baking soda, Washing soda and Plaster of Paris.

Metals and nonmetals: Properties of metals and non-metals; Reactivity series; Formation and properties of ionic compounds; Basic metallurgical processes; Corrosion and its prevention.

Carbon compounds: Covalent bonding in carbon compounds. Versatile nature of carbon. Homologous series. Nomenclature of carbon compounds containing functional groups (halogens, alcohol, ketones, aldehydes, alkanes and alkynes), difference between saturated hydro carbons and unsaturated hydrocarbons. Chemical properties of carbon compounds (combustion, oxidation, addition and substitution reaction). Ethanol and Ethanoic acid (only properties and uses), soaps and detergents.

Theme: The World of the Living

Unit II: World of Living

Life processes: 'Living Being'. Basic concept of nutrition, respiration, transport and excretion in plants and animals.

Control and co-ordination in animals and plants: Tropic movements in plants; Introduction of plant hormones; Control and co-ordination in animals: Nervous system; Voluntary, involuntary and reflex action; Chemical co-ordination: animal hormones.

Reproduction: Reproduction in animals and plants (asexual and sexual) reproductive health - need and methods of family planning. Safe sex vs HIV/AIDS. Child bearing and women's health.

Heredity and Evolution: Heredity; Mendel's contribution- Laws for inheritance of traits: Sex determination: brief introduction: (topics excluded - evolution; evolution and classification and evolution should not be equated with progress).

Theme: Natural Phenomena

Unit III: Natural Phenomena

Reflection of light by curved surfaces; Images formed by spherical mirrors, centre of curvature, principal axis, principal focus, focal length, mirror formula (Derivation not required),magnification. Refraction; Laws of refraction, refractive index.

Refraction of light by spherical lens; Image formed by spherical lenses; Lens formula(Derivation not required); Magnification. Power of a lens.

Functioning of a lens in human eye, defects of vision and their corrections, applications of spherical mirrors and lenses.

Refraction of light through a prism, dispersion of light, scattering of light, applications in dailylife (excluding colour of the sun at sunrise and sunset).

Theme: How Things Work

Unit IV: Effects of Current

Electric current, potential difference and electric current. Ohm's law; Resistance, Resistivity, Factors on which the resistance of a conductor depends. Series combination of resistors, parallel combination of resistors and its applications in daily life. Heating effect of electric current and its applications in daily life. Electric power, Interrelation between P, V, I and R. **Magnetic effects of current :** Magnetic field, field lines, field due to a current carryingconductor, field due to current carrying coil or solenoid; Force on current carrying conductor, Fleming's Left Hand Rule, Direct current. Alternating current: frequency of AC. Advantage of AC over DC. Domestic electric circuits.

Theme: Natural Resources

Unit V: Natural Resources

Our environment: Eco-system, Environmental problems, Ozone depletion, waste production and their solutions. Biodegradable and non-biodegradable substances.

Note for the Teachers:

1. The chapter Management of Natural Resources (NCERT Chapter 16) will not be assessed in the year-end examination. However, learners may be assigned to read this chapter and encouraged to prepare a brief write up to any concept of this chapter in their Portfolio. This

Theory (80 marks)

Question Paper Design

(Class X)

Subject: Science

Competencies	Total
Demonstrate Knowledge and Understanding	46 %
Application of Knowledge/Concepts	22 %
Formulate, Analyze, Evaluate and Create	32 %
	100%

Note:

- Typology of Questions: VSA including objective type questions, Assertion – Reasoning type questions; SA; LA; Source-based/ Case-based/ Passage-based/ Integrated assessment questions.
- An internal choice of approximately 33% would be provided.

Internal Assessment (20 Marks)

- **Periodic Assessment** - 05 marks + 05 marks
- **Subject Enrichment** (Practical Work) - 05 marks
- **Portfolio** - 05 marks

Suggestive verbs for various competencies

- **Demonstrate Knowledge and Understanding**
  - State, name, list, identify, define, suggest, describe, outline, summarize, etc.
- **Application of Knowledge/Concepts**
  - Calculate, illustrate, show, adapt, explain, distinguish, etc.
- **Formulate, Analyze, Evaluate and Create**
  - Interpret, analyze, compare, contrast, examine, evaluate, discuss, construct, etc.

1: CHEMICAL REACTION & EQUATION

Chemical Reaction:

The transformation of chemical substance into another chemical substance is known as chemical reaction.

A + B ----------> C + D	
REACTANT	PRODUCT
A chemical substance that takes part in a chemical reaction and undergoes change during a reaction.	A new chemical substance formed as a result of a chemical reaction.

Chemical equation: *The symbolic representation of a chemical reaction in the form of symbols and formulae*

- Physical state of the reactant and products are mentioned to make chemical reaction more informative.

  Ex- We use (g) for gas, (l) for liquid, (s) for solid and (aq) for aqueous.

- We can observe or recognize a chemical reaction by observing

1	Change in state	Formation of water from $H_{2(g)}$ and $O_{2(g)}$ $2H_{2\,(g)} + O_{2\,(g)} \rightarrow 2H_2O_{(l)}$
2	Change in colour	White silver chloride turns grey in sunlight. $2AgCl(s) \xrightarrow{Sunlight} 2Ag(s) + Cl_2(g)$
3	By evolution of gas	Formation of hydrogen gas by the action of dilute sulphuric acid on zinc $Zn + H_2SO_{4(dil.)} \text{ -----> } ZnSO_4 + H_{2(g)}$
4	By change in temperature	CaO reacts vigorously with water to produce slaked lime with release of heat. $CaO(s)$ (Quick lime) $+ H_2O(l) \rightarrow Ca(OH)_2(aq)$ (Slaked lime) $+$ Heat

Balanced chemical equation: It follows => * Law of conservation of mass
* Law of definite proportions.

Balancing Equation: We balance the chemical equation so that no. of atoms of each element involved in the reaction remain same at the reactant and product side.

	Fe + H_2O -----> Fe_3O_4 + H_2	
	L.H.S.	R.H.S.
Fe	1 x 3	1 x 2
H	~~2~~ 8	2 x 4
O	1 x 4	4

Types of chemical reaction:

1. **Combination reaction**	2. **Decomposition reaction**
The reaction in which two or more substances combine to form a new single substance $CaO(s)$ (Quick lime) $+ H_2O(l) \rightarrow Ca(OH)_2(aq)$ (Slaked lime) $+$ Heat	The reaction in which a single substance decomposes to give two or more substances. $CaCO_3(s) \xrightarrow{Heat} CaO(s) + CO_2(g)$ (Limestone) (Quick lime)

Decomposition reactions can be of three types

- Thermal decomposition reaction: When a decomposition reaction is carried out by heating

  $CaCO_3(s) \xrightarrow{Heat} CaO(s) + CO_2(g)$
  (Limestone) (Quick lime)

- Electrolytic decomposition reaction: When a decomposition reaction is carried out by electric current.

  Ex- Decomposition of water into H_2& O_2 by passing electric current using graphite rod as electrode

  $2H_2O_{(l)} \xrightarrow[current]{Electric} 2H_{2\,(g)} + O_{2\,(g)}$

- Photolytic decomposition reaction: When a decomposition reaction is carried out by light.

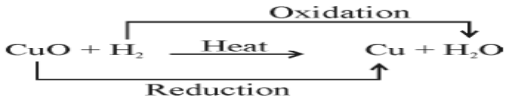
  $2AgCl(s) \xrightarrow{Sunlight} 2Ag(s) + Cl_2(g)$

  White silver chloride turns grey in sunlight.

Exothermic Reactions	Endothermic Reactions
Reaction in which heat is released along with the formation of products. Ex- CaO reacts vigorously with water to produce slaked lime with release of heat. $CaO(s)$ (Quick lime) $+ H_2O(l) \rightarrow Ca(OH)_2(aq)$ (Slaked lime) $+$ Heat	The reactions which require energy in the form of heat, light or electricity are called Endothermic Reactions. Ex- Decomposition of ferrous sulphate crystals on heating. $2FeSO_4(s) \xrightarrow{Heat} Fe_2O_3(s) + SO_2(g) + SO_3(g)$ (Ferrous sulphate) (Ferric oxide)

3. **Displacement Reaction**	4. **Double Displacement Reaction**
The chemical Reaction in which an more reactive element displaces another least reactive element from its salt solution. $Fe(s) + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$ (Copper sulphate) (Iron sulphate) Here, iron has displaced, copper, from $CuSO_4$ solution.	The reaction in which two different atoms or group of atoms are mutually exchanged. ● Exchange of ions&Precipitation occurs. $Na_2SO_4(aq) + BaCl_2(aq) \rightarrow BaSO_4(s) + 2NaCl(aq)$ (Sodium sulphate) (Barium chloride) (Barium sulphate) (Sodium chloride) Here, white precipitate of BaSO4 is formed.

Redox Reaction: The reaction in which one reactant gets oxidised while the other gets reduced during the reaction.

Oxidation	It is the gain of oxygen or loss of hydrogen	
Reduction	It is the loss of oxygen or gain of hydrogen.	

Corrosion: An irreversible damage or destruction of material in which metals are gradually eaten up by the action of air, moisture or, due to a chemical or electrochemical reaction on the surface of metal.

Corrosion of Iron	$4Fe_{(s)} + 3O_{2\ (from\ air)} + xH_2O_{\ (moisture)} \rightarrow 2Fe_2O_3.xH_2O_{\ (rust)}$
Corrosion of copper	$Cu_{(s)} + H_2O_{\ (moisture)} + CO_{2\ (from\ air)} \rightarrow CuCO_3.Cu(OH)_{2\ (green)}$
Corrosion of Silver	$Ag_{(s)} + H_2S_{\ (from\ air)} \rightarrow Ag_2S_{\ (black)}) + H_{2\ (g)}$

Rancidity: It refers to the oxidation of fats and oils in food that is kept for a long time.
It gives foul smell and bad taste to food. Rancid food causes stomach infections during consumption.

Prevention- (i) Use of air-tight containers (ii) Packaging with nitrogen
(iii) Refrigeration (iv) Addition of antioxidants or preservatives

Xsc1: CHEMICAL REACTION & EQUATION

1. The reaction between lead nitrate and potassium iodide present in aqueous solution is an example of
   (a) Decomposition Reaction (b) Displacement Reaction
   (c) Double Displacement Reaction (d) Neutralisation Reaction
2. A student adds lead and silver to two different test tubes containing an equal amount of Copper Sulphate solution. The student observes that the color of the solution in the test tube with lead changes.
   What explains the change in the color of the solution?
(a) A displacement reaction takes place as lead replaces copper from the solution.
(b) A combination reaction takes place as lead combines with sulphate in the solution.
(c) Decomposition reaction takes place as copper dissociates from sulphate in the solution.
(d) Double displacement reaction occurs as Cu dissociates from sulphate & lead combines with sulphate in solution.
3. In the reaction: PbO + C ------>Pb + CO
   (a) PbO is oxidised (b) C acts as an oxidising agent
   (c) Carbon acts as a reduction agent (d) Reaction does not represent redox reaction.
4. Some crystals of copper sulphate were dissolved in water. The color of the solution obtained would be:
   (a) Green (b) Red (c) Blue (d) Brown
5. In an electrolytic cell where electrolysis is carried, cathode has:
   (a) Positive change (b) Negative charge
   (c) Connected to negative terminal of the battery (d) None of these is correct.

ANS.	1. C	2. B	3. C	4. C	5. A

ASSERTION- REASON QUESTIONS

DIRECTION: Each of these questions contains an Assertion (A) followed by Reason(R). Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.	(a) Both A & R are true and R is correct explanation of the assertion- A. (b) Both A & R are true but R is not the correct explanation of A. (c) A is true but R is false. (d) A is false but R is true.

6. Assertion: Calcium carbonate when heated gives calcium oxide and water.
   Reason: On heating calcium carbonate, decomposition reaction takes place.

7. Assertion: Corrosion of iron is commonly known as rusting.
Reason: Corrosion of iron occurs in presence of water and air.

8. Assertion: In a reaction, $Zn_{(s)} + CuSO_{4\ (aq)}$ -------> $ZnSO_{4(aq)} + Cu_{(s)}$
Zn is a reductant but itself get oxidized.
Reason: In a redox reaction, oxidant is reduced by accepting electrons and
reductant is oxidized by losing electrons.

9. Assertion: A reducing agent is a substance which can either accept electron.
Reason: A substance which helps in oxidation is known as reducing agent.

10. Assertion: The balancing of chemical equations is based on law of conservation of mass
Reason: Total mass of reactants is equal to total mass of products.

11. We need to balance a chemical equation. Give reason to justify the statement.

12. Giving an example list two information which make a chemical equation more useful (informative).

13. Name the reducing agent in the following reaction:
$3MnO_2 + 4Al$ ------> $3Mn + 2Al_2O_3$

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

15. In electrolysis of water, why is the volume of gas collected over one electrode double that of gas collected over the other electrode?

ANS.	6. d	7. b	8. a	9. d	10. a

11. To obey law of conservation of mass.
12. (i) Physical state of reactants must be mentioned
(ii) Condition in which reaction takes place are written on the arrow head.
13. 'Al' is reducing agent.
14. To remove the layer of MgO.
15. It is because water contains hydrogen and oxygen in the ratio of 2 : 1.

16. Write the balanced chemical equations for the following reactions & identify the type of reaction in each case.
(a) Thermit reaction, iron (III) oxide reacts with aluminium and gives molten iron and aluminium oxide.
(b) Magnesium ribbon is burnt in an atmosphere of nitrogen gas to form solid magnesium nitride.
(c) Cl_2 gas is passed in an aqueous potassium iodide solution to form potassium chloride solution & solid iodine.
(d) Ethanol is burnt in air to form carbon dioxide, water and releases heat.

17. Complete the missing components/variables given as x and y in the following reactions

(a) $Pb(NO_3)_2\ (aq) + 2KI(aq) \longrightarrow PbI_2\ (x) + 2KNO_3(y)$
(b) $Cu(s) + 2Ag\ NO_3(aq) \longrightarrow Cu(NO_3)_2(aq) + x(s)$
(c) $Zn(s) + H_2SO_4(aq) \longrightarrow ZnSO_4(x) + H_2(y)$
(d) $CaCO_3(s) \xrightarrow{x} CaO(s) + CO_2(g)$

18. Grapes hanging on the plant do not ferment but after being plucked from the plant can be fermented.
Under what conditions do these grapes ferment? Is it a chemical or a physical change?

19. Why do fire flies glow at night?

20. 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. 16.
(a) $Fe_2O_3(s) + 2Al(s) \longrightarrow Al_2O_3(s) + 2Fe(l) + Heat$
Displacement reaction/Redox reaction
(b) $3Mg(s) + N_2(g) \longrightarrow Mg_3N_2(s)$
Combination reaction
(c) $2KI(aq) + Cl_2(g) \longrightarrow 2KCl(aq) + I_2(s)$
Displacement reaction
(d) $C_2H_5OH(l) + 3O_2(g) \longrightarrow 2CO_2(g) + 3H_2O(l) + Heat$
Redox reaction/Combustion reaction

Ans. 17.
(a) $x \longrightarrow$ (s)
$y \longrightarrow$ (aq)
(b) $x \longrightarrow$ 2 Ag
(c) $x \longrightarrow$ (aq)
$y \longrightarrow$ (g)
(d) $x \longrightarrow$ Heat

Ans. 18. Grapes when attached to the plants are living and therefore their own immune system prevents fermentation. The microbes can grow in the plucked grapes and under anaerobic conditions these can be fermented.
This is a chemical change.

19. Fire flies have a protein which in the presence of an enzyme undergoes aerial oxidation. This is a chemical reaction which involves emission of visible light. Therefore, fire flies glow at night.

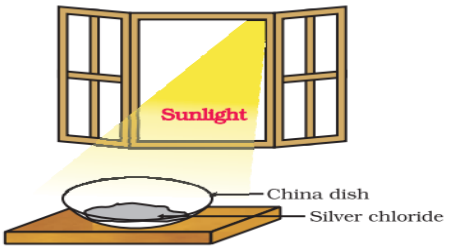
20. 'X' is copper (Cu) and the black-coloured compound formed is copper oxide (CuO). The equation of the reaction involved on heating copper is given below.

21. On heating blue coloured powder of copper (II) nitrate in a boiling tube, copper oxide (black), oxygen gas and a brown gas X is formed
(a) Write a balanced chemical equation of the reaction. (b) Identity the brown gas X evolved.
(c) Identity the type of reaction. (d) What could be the pH range of aqueous solution of the gas X?

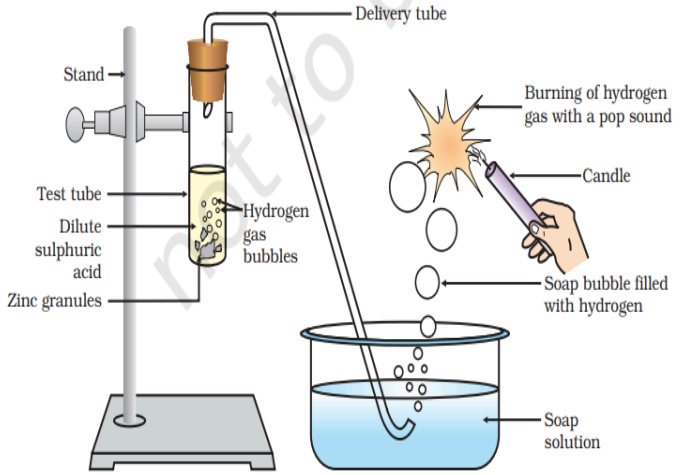
22.During the reaction of some metals with dilute hydrochloric acid, following observations were made.
(a) Silver metal does not show any change
(b) The temperature of the reaction mixture rises when aluminium (Al) is added.
(c) The reaction of sodium metal is found to be highly explosive
(d) Some bubbles of a gas are seen when lead Pb is reacted with acid. Explain the observations with suitable reasons.
23. Write difference between Combination reaction & Decomposition reaction with suitable example.
Ans. See page no. 6,7& 8.
24.Write difference between Exothermic & Endothermic Reaction with suitable example.
Ans.See page no. 7, 8.
25.Write difference between Displacement Reaction & Double Displacement Reaction with suitable example.
Ans.See page no. 10, 11.

26. The following diagram displays a chemical reaction.
Observe carefully and answer the following questions .

(a) Identify the type of chemical reaction that will take place and define it.
(b) How will the color of the salt change? Write the chemical equation of the reaction that takes place.
(c) Mention one commercial use of this salt.



27. In the following schematic diagram for the preparation of hydrogen gas as shown in Fig below.



What would happen if following changes are made?
(a) In place of zinc granules, same amount of zinc dust is taken in the test tube

(b) Instead of dilute sulphuric acid, dilute hydrochloric acid is taken

(c) In place of zinc, copper turnings are taken

d) Sodium hydroxide is taken in place of dilute sulphuric acid and the tube is heated.

28. A chemical reaction is a representation of chemical change in terms of symbols and formulae of reactants and products. There are various types of chemical reactions like combination, decomposition, displacement, double displacement, oxidation and reduction reactions. Reactions in which heat is released along with the formation of products are called exothermic chemical reactions. All combustion reactions are exothermic reactions.

(i) The massive force that pushes the rocket forward through space is generated due to the
(a) combination reaction (b) decomposition reaction
(c) displacement reaction (d) double displacement reaction

(ii) A white salt on heating decomposes to give brown fumes and yellow residue is left behind. The yellow residue left is of 16
(a) lead nitrate (b) nitrogen oxide (c) lead oxide (d) oxygen gas

(iii) Which of the following reactions represents a combination reaction?
(a) $CaO_{(s)} + H_2O_{(l)} \rightarrow Ca(OH)_{2\,(aq)}$
(b) $CaCO_{3\,(s)} \rightarrow CaO_{(s)} + CO_{2(g)}$
(c) $Zn_{(s)} + CuSO_{4\,(aq)} \rightarrow ZnSO_{4\,(aq)} + Cu_{(s)}$
(d) $2FeSO_{4(s)} \rightarrow Fe_2O_{3\,(s)} + SO_{2(g)} + SO_{3(g)}$

(iv) Complete the following statements by choosing correct type of reaction for X and Y.
Statement 1: The heating of lead nitrate is an example of 'X' reaction.
Statement 2: The burning of magnesium is an example of 'Y' reaction.
(a)X-Combination, Y-Decomposition (b)X-Decomposition, Y-Combination
(c)X-Combination, Y-Displacement (d) X- Displacement, Y-Decomposition

****

Answer:

21. (a) Balanced chemical equation $2Cu(NO_3)_2(s) \xrightarrow{Heat} 2CuO(s) + O_2(g) + 4NO_2(g)$	21. (b) The brown gas X evolved is nitrogen dioxide (NO_2) (c) This is a decomposition reaction (d) Nitrogen dioxide dissolves in water to form acidic solution because it is an oxide of non-metal. So, pH < 7 for this solution
22. (a) Silver metal does not react with dilute HCl (b) The temperature of the reaction mixture rises when aluminium is added because it is an exothermic reaction. (c) Reaction of sodium metal is found to be highly explosive because it is an exothermic reaction	22 (d) When lead is treated with hydrochloric acid, bubbles of hydrogen gas are evolved $Pb + 2HCl \rightarrow PbCl_2 + H_2$

26. (a) Photochemical decomposition reaction.
(b) The colour of salt will change from white to grey. (c) in photography

27. a) rate of the reaction will increase. b) HCl is strong acid, so evolution of H_2 gas will increase.
c) No reaction takes place. d) Sodium zincate will be formed.

28.	i) (b) The massive force that pushes the rocket forward through space is generated due to the decomposition reaction. Hydrogen peroxide decomposes and provides it with a considerable reaction force thrust. ii) (c) Lead nitrate decomposes to give brown fumes of nitrogen dioxide gas and yellow residue of lead oxide is left behind. iii) (a) A reaction in which two or more reactants combine to form a single product is known as a combination reaction. iv) (b) Heating of lead nitrate to form nitrogen dioxide and lead oxide is an example of thermal decomposition reaction and the burning of magnesium ribbon in the air to form magnesium oxide is an example of combination reaction.

CHAPTER2

ACIDS, BASES AND SALTS

Acids: Acids are sour in taste, turn blue litmus red, and dissolve in water to release H^+ ions.

Example:Sulphuricacid(H2SO4),AceticAcid(CH3COOH),NitricAcid(HNO3)etc.

Chemical Properties of Acid:

i. Reaction of acids with metal: Acids give hydrogen gas along with respective salt when they react with a metal.
Examples: Hydrogen gas and zinc chloride are formed when hydrochloric acid reacts with zinc metal.

Zn(s)+2HCl (aq) ⟶ nCl2(aq)+H2(g)

Test for Hydrogen Gas: The gas evolved after reaction of acid with metal can be tested bybringingalightedcandle near it.Ifthegas burnswithapopsound,thenit confirmsthe evolutionofhydrogengas.Burningwith pop soundisthecharacteristictest forhydrogengas.

ii. **Reaction of acids with metal carbonate:**Acids give carbondioxide gas and respective salts along with water when they react with metal carbonates.

Na2CO3(aq)+2HCl(aq) ⟶ 2NaCl (aq)+CO2(g) +H2O(l)

iii. **Reactionofacidwithhydrogencarbonates(bicarbonates):**Acidsgivecarbondioxidegas,respectivesaltand waterwhentheyreactwithmetalhydrogen carbonate.

2NaHCO3(aq)+H2SO4(aq) ⟶ a2SO4(aq)+CO2(g)+H2O(l)

Bases: Basesarebitterintaste, havesoapytouch, turnred litmusblueand givehydroxideions(OH^-)in aqueous solution.

Examples: Sodium hydroxide (caustic soda) – NaOH, Calcium hydroxide – Ca (OH)2Potassiumhydroxide (causticpotash) – (KOH)

Types of bases: Bases can be divided in two types– Water soluble and Water-insoluble.

Thehydroxideofalkaliand alkalineearthmetals aresolublein water.Thesearealsoknownasalkali.ForexampleNaOH, Mg(OH)2, Ca(OH)2

Chemical properties of bases:

i. **Reaction of Base with Metals:**When alkali (base)reacts with metal, it produces salt and hydrogen gas.

$2NaOH(aq)+Zn(s) \longrightarrow Na2ZnO2(aq)+H2(g)$

ii. **Reaction of Base with Oxides of Non-metals:**

Sodium hydroxide gives sodium carbonate and water when it reacts with carbon dioxide.

$2NaOH(aq)+CO2(g) \longrightarrow a2CO3(aq)+H2O(l)$

iii. **NeutralisationReaction:**

Examples: Sodium chloride and water are formed when hydrochloric acid reacts with sodium hydroxide (a strong base).

$HCl(aq)+NaOH(aq) \longrightarrow aCl(aq)+H2O(l)$

iv. Reaction of Acid with Metal Oxides:

When an acid, such as hydrochloric acid, reacts with calcium oxide, neutralization reaction takes place and calcium chloride, along with water is formed.

$2HCl(aq)+CaO(aq) \longrightarrow CaCl2(aq)+H2O(l)$

Salts: Salts are the ionic compounds which are produced after the neutralization reactionbetween acidandbase.

Acid+Base⟶Salt +Water

$HCl(aq)+NaOH(aq) \longrightarrow aCl(aq)+ H_2O (l)$

Example: Sodium chloride (NaCl), Sodium Sulphate (Na2SO4), Calcium chloride (CaCl2),Calciumsulphate(CaSO4), Zinc chloride(ZnCl2)and Zincsulphate(ZnSO4)

ImportanceofpHeverydaylife:

i. **PH in our digestive system:** Dilute HCl (Hydrochloric acid) helps in digestion of food(proteins)inourstomach.Excessacidinstomachcausesacidity(indigestion).Antacidslikemagnesium hydroxide [Mg (OH)2] also known as milk of magnesia and sodium hydrogencarbonate(bakingsoda)areused to neutralizeexcess acid.

ii. **Tooth decay caused by acids:** The bacteria present in our mouth converts the sugar intoacids. When the pH of acid formed in the mouth falls below 5.5, tooth-decaying starts. Theexcessacidhastoberemovedbycleaningtheteethwithgoodqualitytoothpastebecausethesekindsof toothpaste arealkaline in nature.

iii. **SoilofpHandplantgrowth:**Most oftheplantshaveahealthygrowthwhenthesoil hasaspecificpH(close to 7) rangewhichshouldbeneitheralkaline norhighlyacidic.

SomeImportantChemicalCompounds

1. **Common Salt (Sodium Chloride):** Sodium chloride (NaCl) is also known as Common orTableSalt.Itisformedafterthereactionbetweensodiumhydroxideandhydrochloricacid.Itisa neutral salt. The pH value of sodium chloride is about 7. Sodium chloride is used to enhancethetasteoffood.Sodiumchlorideis used in themanufacturingofmanychemicals.

$HCl(aq)+NaOH(aq) \longrightarrow aCl(aq)+H2O(l)$

2. **SodiumHydroxide(NaOH):**Sodiumhydroxideisastrongbase.Itisalsoknownascausticsoda. It is obtained by the electrolytic decomposition of solution of sodium chloride (brine). Inthe process of electrolytic decomposition of brine (aqueous solution of sodium chloride), brinedecomposes to form sodium hydroxide. In this process, chlorine

is obtained at anode andhydrogen gas is obtained at cathode as by products. This whole process is known as Chlor –Alkaliprocess.

$2NaCl(aq)+2H_2O(l) \longrightarrow 2NaOH(aq)+Cl_2(g)+H_2(g)$

3. **Bleaching Powder (CaOCl2):** Bleaching powder is also known as chloride of lime. It is asolid and yellowish white in colour. Bleaching powder can be easily identified by the strongsmellof chlorine.

When calcium hydroxide (slaked lime) reacts with chlorine, it gives calcium oxy chloride(bleachingpowder) andwateris formed.

$Ca(OH)_2(aq)+Cl_2(aq) \longrightarrow CaOCl_2(aq)+H_2O(l)$

Aqueous solution of bleaching powder is basic in nature. The term bleach means removal of colour.Bleaching powder is often used as bleaching agent.It works because of oxidation.

Chlorine in the bleaching powder is responsible for bleaching effect.

4. **Baking Soda (NaHCO3):**Baking soda is another important product which can be obtained using by products of chlor – alkali process. The chemical name of baking soda is sodium hydrogencarbonate(NaHCO3) or sodium bicarbonate.

Preparation Method: Baking soda is obtained by the reaction of brine with carbondioxide and ammonia. This is known as Solvay process.

$NaCl+H_2O+CO_2+NH_3 \longrightarrow NH_4Cl+NaHCO_3$

5. **WashingSoda(Sodium Carbonate)**

PreparationMethod: Sodium carbonateismanufacturedbythethermaldecomposition ofsodiumhydrogencarbonate obtained bySolvayprocess.

$NaCl+H_2O+CO_2+NH_3 \longrightarrow NH_4Cl+NaHCO_3$

$2NaHCO_3+Heat \rightarrow Na_2CO_3+CO_2+H_2O$

The sodium carbonate obtained in this process is dry.It is called Soda ash or anhydrous sodium carbonate. Washing soda is obtained by rehydration of anhydrous sodium carbonate.

$Na_2CO_3+10H_2O \rightarrow Na_2CO_3.10H_2O$

Since there are 10 water molecules in washing soda, hence,it is known as Sodium Bicarbonate decahydrate.

Sodium carbonate is a crystalline solid and it is soluble in water when most of the carbonates are in soluble in water.

6. **PlasterofParis: Calciumsulphatehemihydrate[$CaSO_4.\frac{1}{2}H_2O$]**

$CaSO_4.2H_2O \xrightarrow{373K} \mathbf{CaSO_4.\frac{1}{2}H_2O} + 3/2H_2O$

PlasterofParis

$CaSO_4.1/2H_2O + 3/2H_2O \longrightarrow CaSO_4.2H_2O$(Gypsum)

MCQ'S

1.What happens when a solution of an acid is mixed with a solution of a base in a test tube?

(i) The temperature of the solution increases (ii) The temperature of the solution decreases

(ii) The temperature of the solution remains the same (iv) Salt formation takes place

(a) (i)only (b)(i)and(iii)

(c)(ii)and (iii) (d)(i)and(iv)

2.An aqueous solution turns red litmus solution blue. Excess addition of which of the following solution would reverse the change?

(a)Bakingpowder (b)Lime

(c)Ammonium hydroxide solution (d)Hydrochloricacid

3. **During the preparation of hydrogen chloride gas on a humid day, the gas is usually passed through the guard tube containing calcium chloride. The role of calcium chloride taken intheguardtubeisto**

(a)absorb the evolved gas (b)moistenthe gas

(c)absorb moisture from the gas

(d)absorb Cl–ions from the evolved gas

$$2NaHCO_3 \xrightarrow{heat} Na_2CO_3 + H_2O + CO_2$$

$$Na_2CO_3.10H_2O \xrightarrow{heat} Na_2CO_3 + 10H_2O$$

4. **Which of the following salts does not contain water of crystallization?**

(a)Bluevitriol (b)Baking soda

(c)Washing soda (d)Gypsum

5. **Sodium carbonate is a basic salt because it is a salt of**

(a) strong acid and strong base (b) weak acid and weak base

(c) strong acid and weak base (d) weak acid and strong base

ANSWERS:1.(d) 2.(d) 3.(c) 4.(b) 5.(d)

VSA

1. **What is brine?**

Answer: Concentrated solution of sodium chloride is called brine

2. **Write the formula of a salt in which water of crystallization is present.**

Answer:CuSO4.5H2O,Na2CO3.10H2O or any other correct salt.

3. **Write the chemical name and chemical formula of the salt used to remove permanent hardness of water**

Answer:Sodium carbonatedecahydrateNa2CO3.10 H2O

4. **Write the chemical name and chemical formula of a salt which is used for disinfecting drinking water to make it germ free.**

Answer::Calcium oxychloride,$CaOCl_2$

5. **Name a salt which is used as soda–fire extinguisher,write its chemical formula**

Answer:SodiumHydrogen carbonate($NaHCO_3$)

SA

1.A student prepared solutions of (i) an acid and (ii) a base in two separate beakers. She forgot to label

the solutions and litmus paper is not available in the laboratory. Since both the solutions are colourless, how will she distinguish between the two?

Answer:Usingchemicalindicatorlikephenolphthaleinornaturalindicatorsliketurmeric,chinarose.

2.How would you distinguish between baking powder and washing soda by heating?

Answer:The chemical formula of baking powder is Sodium Hydrogen carbonate(NaHCO3).Whereas, that Of washing soda is sodiumcarbonate(Na2CO3.10H2O)

Sodiumhydrogen carbonate on heating gives CO2 gas which will turn lime water milky where as no such gas is obtained from sodium carbonate.

3. **Name the acid present in ant sting and give its chemical formula. Also give the common method to get relief from the discomfort caused by the ant sting.**

Answer: The acid present in ant sting is methanoic acid (formic acid).The chemicalformulaisHCOOH.

To get relief one should apply any available basic salt e.g.,baking soda(NaHCO3)on it.

4.What is water of crystallisation? Give two examples.

Answer: Water of crystallisation is the fixed number of water molecules present in one formula unitofa

salt. Examples-CuSO4.5H2O,CaSO4.2H2O.

5.Write the formula and give one use of each of the following compound-

i. Plasterof Paris
ii. Bleachingpowder
iii. Baking soda

Answer:

i. [CaSO4. ½H2O] Used to Plaster fractured bone.
ii. $CaOCl_2$, used to disinfect water
iii. $NaHCO_3$, making food items crispy and fluffy

LA

1. **Salt A commonly used in bakery products on heating gets converted into another salt By which itself is used for removal of hardness of water and a gas C is evolved. The gas C when passed through lime water, turns it milky due to formation of D. Identify A,B, C and D write equation to show formation of D from C.**

   Answer: Baking powder ($NaHCO_3$), salt A is commonly used in bakery products. On heating it forms sodium carbonate (Na_2CO_3), B and CO_2 gas, C is evolved.

   When CO_2 gas is passed through lime water it forms calcium carbonate ($CaCO_3$), which is slightly soluble in water making it milky.

   A —NaHCO3 B—Na2CO3 C —CO2gas D—CaCO3

   $$CO_2 + Ca(OH)_2 \rightarrow CaCO_3 + H_2O$$

2. **In one of the industrial processes used for manufacture of sodium hydroxide, a gas X isformed as by product. The gas X reacts with lime water to give a compound Y which is usedas a bleaching agent in chemical industry. Identify X and Y giving the chemical equation ofthereactionsinvolved.**

   Answer: In the manufacture of sodium hydroxide, hydrogen gas and chlorine gas (X) are formed asby–products. When chlorine gas (X) reacts with lime water, it forms calcium oxychloride (bleachingpowder)Y.Thereactionsare—

   $$2NaCl(aq) + 2H_2O(l) \rightarrow 2NaOH(aq) + Cl_2(g) + H_2(g) \quad X \rightarrow Cl_2(Chlorine\ Gas)$$

   $$Ca(OH)_2 + Cl_2(g) \rightarrow CaOCl_2(s) + H_2O$$

3. Match the following pH values 1, 7, 10, 13 to the solutions given below:

   (i)Milk of magnesia (ii) Gastric juices (iii) Brine (iv)Aqueous Sodium hydroxide.

Amit and Rita decided to bake a cake and added baking soda to the cake batter. Explain with a balanced reaction, the role of the baking soda. Mention any other use of baking soda.

4. (i) Four samples A, B, C and D change the colour of pH paper or solution to Green, Reddish-pink, Blue and Orange.Their pH was recorded as 7, 2, 10.5 & 6 respectively. Which of thesamples has the highest amount of Hydrogen ion concentration? Arrange the four samplesin thedecreasingorderoftheirpH.

   (ii) RahulfoundthatthePlaster ofParis,whichhestoredinacontainer,hasbecomeveryhardand lost its binding nature.What is the reason for this?Also, write a chemical equation torepresentthereactiontakingplace.

   (iii) GiveanyoneuseofPlaster ofParisotherthan forplasteringorsmootheningofwalls.

5. A dry pellet of a common base B, when kept in open absorbs moisture and turns sticky. The compound is also a by–product of Chlor alkali process. Identify B

   What type of reaction occurs when B is treated with an acidic oxide? Write a balanced chemical equation for one such solution.

ASSERTION REASON TYPE QUESTIONS

For the following question numbers (1-5) two statements are given- one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer to these questions from the codes (a), (b),
(c) and (d) as given below:

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

1. Assertion: After white washing the walls, a shiny white finish on walls is obtained after two to three days.
Reason: Calcium Oxide reacts with Carbon dioxide to form Calcium Carbonate which gives shiny white finish.
2. Assertion: Plaster of Paris is a is a white powder used to join fractured bones
Reason: On mixing with water plaster of paris changes to Gypsum giving a solid hard mass
3. Assertion: Sodium Hydroxide is formed during Chlor-alkali process.
Reason: Electricity is passed through Sodium Hydroxide during chlor- alkali process.
4. Assertion: Baking soda is used for making food substances crispy during cooking.
Reason: The chemical name of baking soda is Sodium hydrogencarbonate
5. Assertion: Our stomach produces Sulphuric acid, which helps in digestion of food.
Reason: During indigestion excess acid secreted is neutralized by using bases called antacids.

Answers: 1.a 2.a 3.c 4.b 5.d

CASE STUDY BASED QUESTIONS:

Q.1. Read the following and answer the questions :

There are many substances which are used to detect the solutions as acidic or basic. They are called Acid-Base indicators. Depending upon the property of the indicator, we have different groups of Acid-Base indicators. Some indicators show different colors in acidic or basic medium and some indicators give different odors in acidic and basic medium. These indicators are either extracted from the plants or synthesized in the laboratory or industry.

1. Which of the following will turn red litmus blue?

A.) Amla juice B.) Lemon juice C.) Soft drink D.) Baking soda

2. A solution turns blue litmus red, the pH of the solution is likely to be.
A.) 6 B.) 7 C.) 8 D.) 9
3. Which one of the following can be used as an acid-base indicator by visually impaired student?
A.) Turmeric B.)Hibiscus C.)Vanilla D.) Litmus
4. Select the incorrect option.

Indicator	Colourinacidicmedium	Colourinbasic medium
A.)Litmus(Purple)	Red	Blue
B.)Phenolphthalein(Colorless)	Pink	Colorless
C.)Red cabbageextract(Purple)	Red	Green
D.)Methylorange(Orange)	Red	Yellow

Q.2. Read the following and answer the questions :

A scale for measuring hydrogen ion concentration in a solution, called pH scale has been developed. The p in pH stands for 'potenz' in German, meaning power. On the pH scale we can measure pH from 0 to 14. pH should be thought of simply as a number which indicates the acidic or basic nature of a solution. Higher the hydronium ion concentration, lower is the Ph value.

i. Whichoneofthefollowingwillhavethehighesthydrogenionconcentration?
A.) pH=1.1 B.) pH=2.2 C.)pH=3.3 D.)pH=4.4

ii. HowisthehydrogenionconcentrationandpHrelatedtoeachother?
A.) They are inversely proportional. B.) They are directly proportional.

C.) They are equal. D.) They have no relation.

iii. A basic solution could have a pH of-
A.)3 B.) 5 C.) 7 D.) 9

iv. If the pH of any solution is 13, then the color obtained on adding universal indicator to it will be:
A.) Red B.)Orange C.)Green D.) Purple

Q.3. Read the following and answer the questions :

Water of crystallization is the fixed number of water molecules present in one formula unit of a salt. Water of crystallization or water(s) of hydration are water molecules that are present inside crystals. Water is often incorporated in the formation of crystals from aqueous solutions. A salt with associated water of crystallization is known as a hydrate.

i. Which of the following salt does not contain water of crystallisation?
A.) Blue Vitriol B.) Baking Soda C.)Washing soda D.) Gypsum

ii. The temperature at which Gypsum ($CaSO_4$. $2H_2O$) into Plaster of Paris ($CaSO_4$.1/2 H_2O
A.) 373K B.)273K C.)374K D.)430K

iii. The formula of Plaster of Paris is $CaSO_4$. ½ H_2O, it is to be noted that half water molecule is shown to be attached as water of crystallization. This indicates that
A.) Only half water molecule is present in Calcium Sulphate crystal.
B.) Two formula units of Calcium Sulphate share one molecule of water.
C.) Two formula units of calcium Sulphate share two molecules of water
D.) Two formula units of Calcium Sulphate share one and a half molecules of water

iv. Given below are some chemicals. Select the one that have 7 molecules of water attached in hydrated form:
A.) Blue vitriol B.) Green Vitriol C.)POPD.) Washing Soda

CHAPTER–3

METALSANDNON–METALS

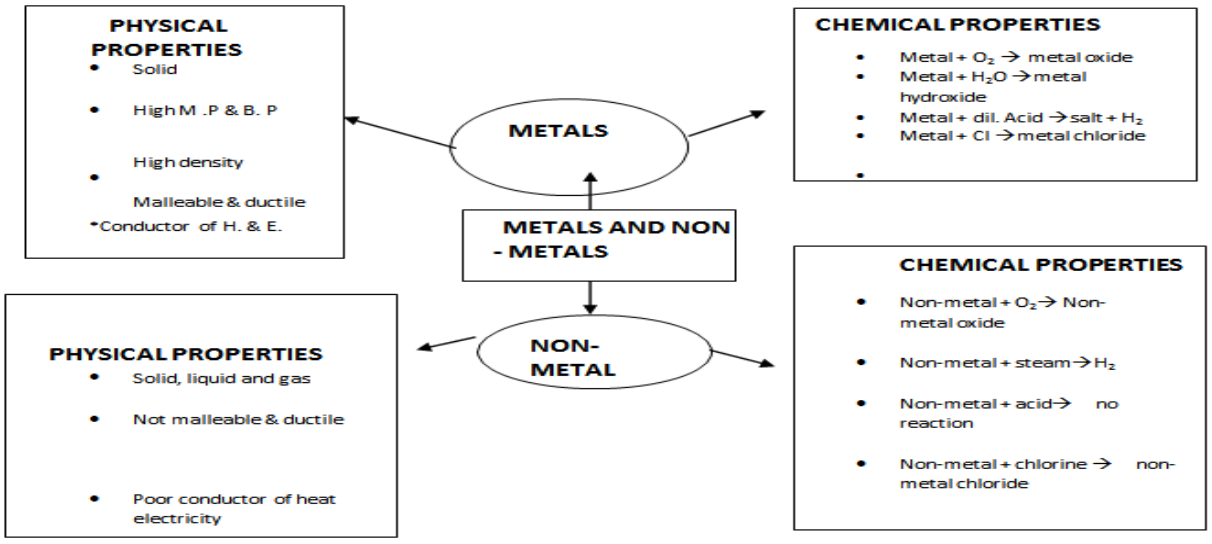
GIST OF THE LESSON

Elements are classified broadly in to two categories on the basis of properties:

- Metals: Iron, Zinc, Copper, Aluminium etc.
- Non–metals:Chlorine,Nitrogen,Hydrogen,Oxygen,Sulphuretc.

A part from metals and non-metals some elements show properties of both metals and non–metals, e.g.Silicon,Arsenic,Germanium.They are called **metalloids**

MIND MAP



Comparison of Chemical Properties of Metals and Non-metals:-

1	Reaction with Oxygen	Metal+Oxygen → Metal oxide $4Na(s)+O_2(g)\rightarrow 2Na_2O(s)$ $4Al(s)+3O_2(g)\rightarrow 2Al_2O_3$ Amphoteric oxides show the properties of both acid and base Ex- Oxides of ZnandAl Most of the metal oxides are insoluble in water. Someofthemdissolveto form Alkali $Na_2O(s)+H_2O(l)\rightarrow 2NaOH(aq)$	Non-metal+Oxygen→Non-metaloxide $C + O_2\rightarrow CO_2$ $S+O_2\rightarrow SO_2$ Non-metalsformacidic oxides CO and H_2O are neutral oxides (they are neither acidic nor basic in nature) Non-metaloxidesaresoluble in water Theydissolveinwaterto form acids $SO_2+H_2O\rightarrow H_2SO_3$
2	Reaction withwater	Metals react with water to formmetaloxidesormetal hydroxide and H_2 gas is released. $2Na(s)+2H_2O(l)\rightarrow 2NaOH+H_2(g)+heat$	Non-metalsdonotreact with water, steam to evolve hydrogen gas. BecauseNon-metals cannot give electrons to hydrogeninwatersothat it can be released as H_2gas.
3	Reaction withdilute Acids	Metal+Acid--->Metalsalt+H_2 (g) $Mg(s)+2HCl(aq)\rightarrow MgCl_2(aq) + H_2(g)$ $2Na(s)+H_2SO_4\rightarrow Na_2SO_{4(aq)}+ H_2(g)$ Metal+HNO_3--->H_2gasis not displaced. **Reason-**HNO_3isstrong oxidizing agent.	Non-metals do not react with acids to release H_2gas **Reason-** Non-metalscannotloose electrons and give it to Hydrogen ions of acids so that the gas is released. $Mn+2HNO_3\rightarrow Mn(NO_3)_2+ H_2$ H_2gasfromHNO_3
4	Reaction with salt solutions	Whenmetalsreactwithsalt solution, more reactive metal will displace a less reactive metal from its salt solution. $CuSO_4(aq)$ $+Zn(s)\rightarrow ZnSO_4(aq)+ Cu(s)$	Whennon-metalsreact withsaltsolution,more reactive non-metal will displace a less reactive non-metal from its salt solution. $2NaBr(aq)+Cl_2(g)\rightarrow$ $2NaCl(aq)+Br_2(aq)$

Propertiesofioniccompounds

1. **Physical nature:**solid and hard due to strong force of attraction.(generally brittle)

2. **Melting point and boiling point:** have high M.P and B.P,as large amount of heat energy is required to break strong ionic attraction.
3. **Solubility:**soluble in water and in soluble in kerosene and petrol.

4. **Conduction of electricity:** ionic compounds in solid state does not conduct electricity.

Corrosion - Gradual deterioration of a material usually a metal by the action of moisture, air or chemicals in the surrounding environment.
Prevention
1. Coating with paints or oil or grease: Application of paint or oil or grease on metal surfaces keep out air and moisture.
2. Alloying: Alloyed metal is more resistant to corrosion. Example: stainless steel.

3. Galvanization: This is a process of coating molten zinc on iron articles. Zinc forms a protective layer and prevents corrosion.
4. Electroplating: It is a method of coating one metal with another by use of electric current. This method not only lends protection but also enhances the metallic appearance. Example: silver plating, nickel plating.

MCQ

1. Aluminium is used for making cooking utensils. Which of the following properties of aluminium are responsible for the same?
(i) Good thermal conductivity (ii) Good electrical conductivity
(iii) Ductility (iv) High melting point
(a) (i) and (ii)(b) (i) and (iii)
(c) (ii) and (iii)(d) (i) and (iv) Answer: d

2. The most abundant metal in the earth's crust is
(a) Iron (b) Aluminium
(c) Calcium (d) Sodium Answer: b

3.The poorest conductor of heat among metals is
(a) Lead (b) Mercury
(c) Calcium (d) Sodium Answer: a

4. Which property of metals is used for making bells and strings of musical instruments like Sitar and Violin?
(a) Sonorous(b) Malleability
(c) Ductility (d) Conductivity Answer: a

5. Which of the following is the correct arrangement of the given metals in ascending order of their reactivity?
Zinc, Iron, Magnesium, Sodium
(a) Zinc > Iron > Magnesium > Sodium (b) Sodium > Magnesium > Iron > Zinc
(c) Sodium > Zinc > Magnesium > Iron (d) Sodium > Magnesium > Zinc > Iron
Answer: d

Very Short type

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.
(v) Two example of amphoteric oxide
Ans- Answer:
(i) Mercury (ii) Sodium (iii) Silver (iv) Lead (v) Aluminium oxide and zinc oxide

Short type

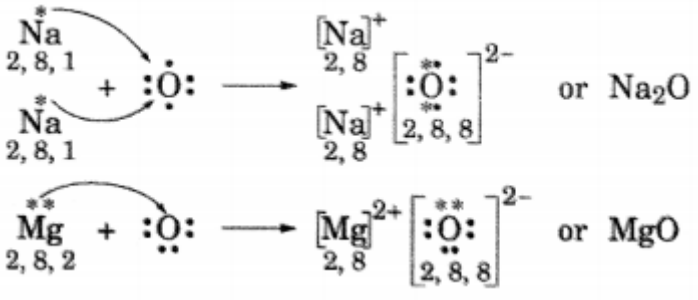
Question 1
(i) Write the electron dot structures for sodium, oxygen and magnesium.
(ii) Show the formation of Na_2O and MgO by the transfer of electrons.
(iii) What are ions present in these compounds?
(iv) You are given a hammer, a battery, a bulb, wires and a switch.
How could you use them to distinguish between samples of metals and non-metals?

(v) Write chemical equations that show aluminium oxide reacts with acid as well as base.

(i)

Element	Sodium (Na)	Oxygen (O)	Magnesium (Mg)
Electron dot structure	Na 2, 8, 1	O 2, 8, 6	Mg 2, 8, 2

(ii) Formation of Na_2O and MgO



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

iv. Metals can be beaten into thin sheets with a hammer without breaking. Non-metals cannot be beaten with a hammer to form thin sheets. Non-metals break into pieces when hammered. Metals are malleable, while non-metals are non-melleable. When metals are connected into circuit using a battery, bulb, wires and switch, current passes through the circuit and the bulb glows. When non-metals (like sulphur) are connected, the bulb does not light up at all. Metals are good conductors of electricity.

V. Write chemical equations that show aluminium oxide reacts with acid as well as base.

Answer:

Those metal oxides which show basic as well as acidic behaviour are known as amphoteric oxides. In other words, metal oxides that react with both acids and bases to form salt and water are called amphoteric oxides. Aluminium oxide and zinc oxide are amphoteric in nature.

Long Answer type question

Q1..A metal 'X' combines with a non-metal 'Y' by the transfer of electrons to form a compound Z.

(i.)Write metal and non metal element

(ii) State the type of bond in compound Z.

(iii) What can you say about the melting point and boiling point of compound Z?

(iv) Will this compound dissolve in kerosene or petrol?

(v) Will this compound be a good conductor of electricity? (Board Term I, 2017

Answer:

(i)X being a metal loses electrons and Y being a non-metal gains electrons to form Z.

(ii) The chemical bond formed by the transfer of electrons from one atom to another is known as an ionic bond. Hence, Z is an ionic compound.

(iii) Compound Z is an ionic compound thus, it has high melting and boiling points.

(iv) Ionic compounds are insoluble in non-polar solvents such as kerosene or petrol.

(v) As Z is an ionic compound, it does not conduct electricity in the solid state because movement of ions in the solid is not possible due to their rigid structure. But it conducts electricity in the molten state or in aqueous solution due to the movement of ions freely.

Q2. (a) What is meant by corrosion? Name any two methods used for the prevention of corrosion.

(b) Suppose you have to extract metal M from its enriched sulphide ore. If M is in the middle of the reactivity series, write various steps used in extracting this metal.

Answer. (a) Corrosion is a process in which metal reacts with substances present in the environment to form surface compounds.

Prevention:

(i) Galvanisation is a process to prevent corrosion of iron.

(ii)Electroplating is also used to prevent corrosion.

(b)(i) Concentration of ores: Sulphide ore will be concentrated by froth- floatation process. Sulphide ore will be collected in froth whereas gangue will be left behind.

(ii) Roasting: Sulphide ore is heated strongly in the presence of O_2 to form metal oxide and sulphur dioxide.

$2MS + 3O_2$ ————- ► $2MO + 2SO_2$

(iii) Reduction: MO reacts with carbon (acts as reducing agent) to form metal and CO.
MO + C —-> M + CO
(iv) Electrolytic refining: Impure metal 'M' is purified by electrolytic refining. Impure metal is taken as anode, pure metal is taken as cathode, soluble salt of metal is taken as electrolyte. Impure metal forms metal ions which gain electrons and form pure metal at cathode.

Q3. Zinc is a metal found in the middle of the activity series of metals. In nature, it is found as a carbonate ore, $ZnCO_3$. Mention the steps carried out for its extraction from the ore. Support with equations.(NCERT page 51)
Q4. How can the metals at the top of the reactivity series be extracted from their ores? Explain with an example. (NCERT page 52)
5. (A)Name any one alloy made from
(i) a metal and a non-metal Ans - Steel
(ii) two metals. Ans - Bronze
(B) Give reasons :
(a) Platinum, gold and silver are used to make jewellery.
(b) Sodium, potassium are stored under oil.
(c) Aluminium is a reactive metal, yet it is used to make utensils for cooking.
Answer:
(a) Platinum, gold and silver are used to make jewellery because these are malleable and ductile. These are highly resistant to corrosion.
(b) Sodium, potassium are very reactive and catch fire when exposed to air. This is due to their low ignition temperature and high reactivity.
(c) Aluminium forms a non-reactive layer of aluminium oxide on its surface. This layer prevents aluminium to react with other substances. That's why aluminium is used to make cooking utensils.
Assertion/ Reason
Following questions consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:
(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.
Q.1. Assertion (A) : Hydrogen gas is not evolved when a metal reacts with nitric acid.
Reason (R) : Nitric acid is a strong oxidising agent.
Answer(a)
Q.2. Assertion (A) : Highly reactive metals are obtained by electrolytic reduction.
Reason (R) : In the electrolytic reduction, metal is deposited at the cathode.
Answer(b)
Q.3. Assertion (A): Bronze is an alloy of copper and tin.
Reason (R) : Alloys are heterogeneous mixture of metals with other metals and non-metals.
Answer(c)
Q.4. Assertion (A): Zinc oxide is amphoteric in nature.
Reason (R): Zinc oxide reacts with both acids and bases.
Answer(a)
Q.5. Assertion (A) : Magnesium chloride is an ionic compound.
Reason (R) : Metals and non-metals react by mutual transfer of electrons.
Answer(a)
Case Based
Question 1
Metals are the elements which are often found in nature in combined form (as ores) but few metals occur in free state too. Metals possess such specific properties which make them very useful in practical life. The properties shown by them are lustrous surface, they can also be polished for obtaining a highly reflective surface, hard and strong in nature, good conductor of heat and electricity and also malleable and ductile. But few metals are exceptionally different too in some properties like Sodium and Potassium are exceptional cases in this case as they can be cut with knife. Metallic elements possess high melting and boiling points too.

1.Which of the following metals is the most abundant in earth crust? (a) Al (b) Fe (c) Na (d) Ca
2.Which of the following is the poor conductor of heat among given metals: (a) Na (b) Ca (c) Pb (d) Hg
3.Metal with highest melting point: (a) Tungsten (b) Mercury (c) Molybdenum (d) Osmium
4. Bauxite is an ore of: (a) Na (b) Al (c) Pb (d) Hg
5.Soft metals: (a) Chlorine and bromine (b) Lithium and magnesium (c) Zinc and cadmium (d) Sodium and potassium

Question 2

Rusting of iron refers to the formation of layer of rust, a mixture of iron oxides, on the surface of iron objects or structures. This rust is formed from a redox reaction between oxygen and iron in the environment containing moist air. This process is characterized by the formation of a red flaky layer on iron article.

1.Rusting of iron takes place in: (a) Ordinary water (b) Distilled water (c) Both a and b (d) None
2. Rusting involves----------? (a) Reduction (b)oxidation& Decomposition (d) Displacement
3. Rusting of iron is ------ a) oxidative corrosion b) Liquid metal corrosion c) Wet corrosion d) Corrosion by other gases
4. Galvanization refers to depositing layer of : a) Zinc b) Sodium c) Potassium d) Magnesium
5. Silver corrode and the composition of layer formed is: a) Ag_3N b) Ag_2O c) Ag_2S d)Both c and a

Question 3

Non-metals are the elements which forms negatively charged ions by accepting electrons. They usually have 4,5,6 or 7 valence electrons in their outermost shell. They lack lustre and are poor conductors of heat and electricity. They are good insulators and are mostly gases, few solid and one liquid at room temperature.

1.Chlorides of non-metals are covalent because: a) sharing electrons b) as they donate electrons to chlorine c) they can't share electrons with chlorine d) they donate electrons to chlorine to form chloride ion.
2.Which is lustrous non-metal: a) Oxygen b) Sulphur c) Iodine d) Nitrogen
3.Which of the non-metals is liquid at room temperature: a) Helium b) Carbon c)Mercury d)Bromine
4.Which among the following contain non-metal as its constituent: a) Brass b) Amalgam c) Gunmetal d)Steel
5.Non metal which is exceptionally good conductor of electricity: a) Copper b) Bromine c) Zinc d) Graphite

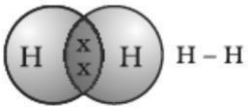
Ans Q1 - 1-a, 2-c,3-a,4-b,5-d Ans Q2. – 1- a, 2-b, 3-a, 4-a, 5-c Ans 3.- 1-a, 2-c,3-d,4-d, 5-d

CHAPTER4

CARBONANDITSCOMPOUNDS

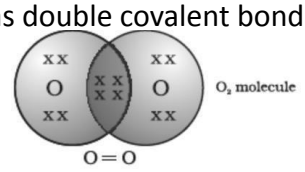
BONDINGINCARBON– THECOVALENTBOND

Covalent Bond: The chemical bond formed by the sharing of electrons between twoatomsis called covalentbond.

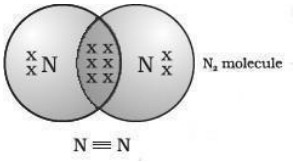


(i) Single covalent bond: A covalent bond formed by sharing of one pair of electronsbetween two atoms is known as single covalent bond. For example, H_2.

(ii) Double covalent bond:The covalent bond formed by sharing of two pairs of electrons between two atoms is known as double covalent bond. For example, The electron dot structure of O_2 and its double bond.



(iii) Triple covalent bond: The covalent bond formed by the sharing of three pairs ofelectrons between two atoms is known as triple covalent bond. TheelectrondotstructureofN2andits



triplebond

VERSATILENATUREOFCARBON

(i) **Catenation:** Carbon has the unique ability to form bonds with other atoms of carbon, givingrise to large molecules. The self-linking property of carbon atoms through covalent bonds toformlongchainsofcarbon,branchedchainsofcarbonorevencarbonatomsarrangedin rings Compoundsofcarbon,which arelinkedbyonlysinglebonds betweenthe carbonatoms, arecalledsaturatedcompounds.

(i) **Tetravalency:**Carbon has a valency of four, it is capable of bonding with four other atoms of carbon or atoms of some other mono-valent element. Compounds of carbon are formed withoxygen,hydrogen,nitrogen,sulphur,chlorineand many other elements giving rise to compounds with specific properties which depend on the elements other than carbon present in the molecule.

Homologous Series: It is a family of organic compounds having the same functional group in which the formula of successive members differs by–CH_2 group. For example,

Foralkanes CH_4,C_2H_6,C_3H_8,C_4H_{10}etc.Foralkenes C_2H_4,C_3H_6,C_4H_8andC_5H_{10}etc.

Foralkynes C_2H_2,C_3H_4,$C_4H_6$and C_5H_8etc.

No.ofCatoms	Name	Formula	Structure
1	Methane	CH_4	CH_4
2	Ethane	C_2H_6	$CH_3– CH_3$
3	Propane	C_3H_8	$CH_3– CH_2–CH_3$
4	Butane	C_4H_{10}	$CH_3– CH_2–CH_2–CH_3$
5	Pentane	C_5H_{12}	$CH_3– CH_2–CH_2–CH_2– CH_3$
6	Hexane	C_6H_{14}	$CH_3–CH_2–CH_2–CH_2– CH_2–CH_3$
7	Heptane	C_7H_{16}	$CH_3–CH_2–CH_2–CH_2–CH_2– CH_2-CH_3$
8	Octane	C_8H_{18}	$CH_3–CH_2–CH_2–CH_2–CH_2–CH_2-CH_2-CH_3$
9	Nonane	C_9H_{20}	$CH_3–CH_2–CH_2–CH_2–CH_2–CH_2-CH_2-CH_2-CH_3$

10	Decane	$C_{10}H_{22}$	$CH_3–CH_2–CH_2–CH_2–CH_2–CH_2-CH_2-CH_2-CH_2-CH_3$

NomenclatureofCarbonCompounds

S.No	Class of Example compounds	Functional Group	Prefix/Suffix	Example	Structure
1.	Haloalkane	-Cl, -Br (substitutesforhydrogen atom)	Prefix-Chloro,-Bromo	ChloropropaneBromopropane	$CH_3CH_2CH_2Cl$ $CH_3CH_2CH_2Br$
2.	Alcohol	-OH	Suffix-ol	Propanol	$CH_3CH_2CH_2OH$
3.	Aldehyde	-CHO	Suffix-al	Propanal	CH_3CH_2CHO
4.	Ketone	>C=O	Suffix-one	Propanone	CH_3COCH_3
5.	Carboxylicacid	-COOH	Suffix-oicacid	Propanoicacid	CH_3CH_2COOH
6.	Alkenes	=	Suffix-ene	Propene	$CH_3CH= CH_2$
7.	Alkynes	≡	Suffix-yne	Propyne	$CH_3C \equiv CH$

CHEMICALPROPERTIESOFCARBONCOMPOUNDS:

1. **Combustion:**Carbon,inall itsallotropicforms,burnsinoxygento givecarbondioxidealongwiththereleaseof heatand light.

(i) $C+O_2 \rightarrow CO_2$+heatandlight

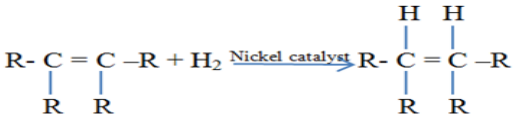
(ii) $CH_4+2O_2 \rightarrow CO_2+2H_2O$+heat and light

(iii) $CH_3CH_2OH+3O_2 \rightarrow 2CO_2+3H_2O$+heatandlight

2. **Oxidation:** Carbon compounds can be easily oxidised on combustion. In addition to this complete oxidation, in which ethyl alcohol is converted to ethanoic acid upon heating in the presence of alkaline potassium permanganate or acidified potassium dichromate (oxidising agents).

$$CH_3CH_2OH \xrightarrow{Alkaline\ KMnO_4 + Heat} CH_3COOH$$

3. **Additionreaction:**Unsaturatedhydrocarbonsadd hydrogeninthepresenceofcatalystsuch as palladium or nickel togivesaturated hydrocarbons



4. **Substitution reaction**: Chlorine can replace the hydrogen atoms one by one. It is called a substitution reaction.$CH_4+Cl_2 \rightarrow CH_3Cl+HCl$(inthepresenceofsunlight)

SOMEIMPORTANTCARBONCOMPOUNDS-ETHANOLANDETHANOIC ACID

Propertiesofethanol: Ethanol is a liquid at room temperature. Ethanol is commonly called alcohol and is the active ingredient of all alcoholic drinks. Ethanol is also soluble in water in all proportions.

i. **Reaction with sodium:**$2CH_3CH_2OH + 2Na \rightarrow 2CH_3CH2O–Na + H_2$
(Sodium ethoxide)

ii. **Reaction to give unsaturated hydrocarbon:**$CH_3CH_2OH \xrightarrow{Hot\ Conc.H_2SO_4} CH_2=CH_2+H_2O$

Properties of ethanoic acid:

Ethanoic acid is commonly called acetic acid and belongs to a group of acids called carboxylic acids. Carboxylic acids are obviously characterized by their acidic nature. Carboxylic acids are weak acids. The melting point of pure ethanoic acid is 290 K and hence it often freezes during winter in cold climates. This gave rise to its name glacial aceticacid.

Reactions of ethanoic acid:

i. Esterification reaction:$CH_3COOH+CH3CH2OH \xrightarrow{Acid} CH_3COOCH_2CH_3+H2O$
(Ethanoicacid)(Ethanol) (Ester)

$CH_3COOCH_2CH_3+NaOH \rightarrow CH3COONa+CH_3CH_2OH$

ii. Reaction with a base: $CH3COOH+NaOH \rightarrow CH3COONa+H2O$

iii. Reaction with carbonates and hydrogencarbonates: $2CH_3COOH + Na2CO_3 \rightarrow 2CH_3COONa + H2O + CO_2$

$CH_3COOH+NaHCO_3 \rightarrow CH3COONa+H_2O+CO_2$

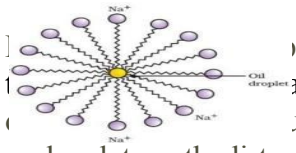
Uses: Generally, esters are sweet-smelling substances. These are used in making perfumes and as flavouring agents. 5-8% solution of acetic acid in water is called vinegar and is used widely as a preservative in pickles.

SOAPSANDDETERGENTS:

Preparationofsoap:Onheatingwithsodiumhydroxide,vegetableoiloranimal fatformsasodiumsalt offattyacidandglycerol. This processis known assaponification.

Vegetableoil/Animalfat+NaOH $\xrightarrow{\text{Saponification}}$ Glycerol+Sodiumsaltoffattyacid(Soap)

Cleansing action of soaps:



hobicend:Thepolarendis hydrophilic(water-loving)innature,anditisdrawn ar end is hydrophobic (hates water) in nature, and it is attracted todirt or ut not to water. As a result, the hydrophobic part of the soap moleculetrapsthedirt whilethehydrophilic partmakes theentiremoleculewater-soluble. Whensoapordetergentis dissolvedinwater,themoleculesformclusters knownas**'micelles'**.

Detergents are generally sodium salts of sulphonic acids or ammonium salts with chlorides orbromidesions,etc.Bothhavelonghydrocarbonchain. Thechargedendsofthesecompoundsdonot form insoluble precipitates with the calcium and magnesium ions in hard water. Thus, theyremain effective in hard water. Detergents are usually used to make shampoos and products forcleaningclothes.

MCQ

1. Which of the following is not the use of graphite?

(a) It is used as lubricant
(b) It is used in manufacturing of lead-pencils
(c) It is used in manufacturing of artificial diamond
(d) It is used for making insulated plates

Ans: (d) It is used for making insulated plates
Graphite cannot be used for making insulated plates, as it is a good conductor of electricity.

2. Methane, ethane and propane are said to form a homologous series because all are-

(a) Hydrocarbons (b)saturated compounds

(c) aliphatic compounds (d)differ from each other by a CH_2 group

Ans: (d) differ from each other by a CH_2 group

3. Why does carbon form compounds mainly by covalent bonding?

(a) There are four electrons in the outermost shell of carbon.

(b) It requires large amount of energy to form C^{4+} or C^{4-}

(c) It shares its valence electrons to complete its octet.

(d) All the above.

Ans: (d) All the above

4. **Whichofthefollowingbelongstohomologousseriesofalkynes?**

C_6H_6,C_2H_6,C_2H_4, C_3H_4

(a) C_6H_6 (b) C_2H_4
(c)C_2H_6(d)C_3H_4

Ans:C_3H_4

5. **Indiamond,eachcarbonatomisbondedtofourother carbonatomstoform**
   (a) ahexagonalarray
   (b) arigidthree-dimensionaltetrahedralstructure
   (c) astructurein theshapeofafootball
   (d) astructureof aring

Ans: (b) a rigid three-dimensional tetrahedral structure.

VSQ

1. Name the product formed when a mixture of ammonium chloride and potassium cyanateisheated?Istheproduct,anionicoracovalentcompound?
   Ans:Urea.Itisacovalentcompound.
2. Aboysharpensapencilatboth theendsandconnectsthemtothepolesofthebattery.Will thecurrentflow through thecircuit?Givereasonsfor your answer.
   Ans: Yes, because Graphite is a good conductor of electricity due to free electron .
3. Anorganiccompoundburnswithsootyflame.Isitsaturatedorunsaturatedcompound?
   Ans: Unsaturated Compound
4. Drawthestructureof3,3-Dimethylpentane.
5. WhatisthevalencyofcarboninCH3-CH3andCH2=CH2?

Ans:Thevalencyofcarboninall itscompoundswhethersaturatedorunsaturatedis4.

SA

1. Analkanehasmolecularweight86.Writeitsmolecularformula.Whatwillbeitsphysicalstate?

Hints:C_6H_{14}(Hexane) ,Hexane is a colorless liquid with a Gasoline-like odor. The commercial product is a mixture of Hexanes and small amounts of other chemicals. n-Hexane is used in laboratories and as a solvent to remove vegetable oils from crops.

2. Comparetheabilityofcatenationof carbonandsilicon.Givereasons.

Ans:Hints:StrengthofC-Cbond>Si-Sibond

3. **Explainthefollowing:**
   (a) Diamond does not conduct electricity.
   (b) Diamond is used for making tools for cutting and drilling.

Ans:Hints:(a)Nofreeelectrons

(b)Diamondhasthehighestthermalconductivityofanyknownsubstance.

4. (a)Howcandiamondsbemadeartificially (b) Giveanytwodifferencesbetweenthepropertiesofdiamondandgraphite.Whatcausesthese differences?

Ans: (a) Diamonds can be made artificially by subjecting pure carbon to very high pressure andtemperature.Thesyntheticdiamondsaresmallwhereasnaturaldiamonds arebig.

(ii) Diamond is a non-conductor of electricity whereas graphite is a good conductor of electricity.The difference in the physical properties of diamond and graphite arises because of the differentarrangementsofcarbonatoms inthem.

5.NaCl conducts electricity in its molten as well as in aqueous state but not in its solid state.Why?

ASSERTION AND REASON QUESTIONS:

DIRECTION: Each of these questions contains an Assertion followed by Reason. Read them carefullyand answer the question on the basis of following options. You have to select the one that bestdescribesthetwostatements.

(a) BothAandRaretrueand Risthe correctexplanationofA.
(b) BothAand Raretrue but Risnotthe correctexplanation ofA.
(c) A istruebutR isfalse.
(d) Aisfalse butRistrue.

Q.1. Assertion (A): Carbonistheonlyelementthatcanformlargenumberofcompounds.

Reason(R): Carbonistetravalentandshowsthepropertyofcatenation**.[Ans-a]**

Q.2. **Assertion (A) :**If the first member of a homologous series is methanal, its third member will bepropanal.

Reason(R): Allthemembersofahomologousseriesshowsimilarchemicalproperties.**[Ans-a]**

Q.3. Assertion(A): Diamondandgraphiteareallotropesofcarbon.

Reason (R) : Some elements can have several different structural forms while in the same physicalstate.Theseformsarecalledallotropes**..[Ans-a]**

CASESTUDYBASEDQUESTIONS:

Q.1.Readthefollowingandanswerthequestions:

The compounds which have the same molecular formula but differ from each other in physical or chemical properties are called isomers and the phenomenon is called isomerism. When the isomerism is due to difference in the arrangement of atoms within the molecule, without any reference to space, the phenomenon is called structural isomerism. In other words.structural isomers are compounds that have the same molecular formula but different structural formulas, i.e., they are different in the order in which different atoms are linked. In these compounds, carbon atoms can be linked together in the form of straight chains, branched chains or even rings.

1.1. Which of the following sets of compounds have same molecular formula?

(a) Butane and iso-butane (b) Cyclohexane and hexane

(c) Propanal and propanone (d) All of these

1.2. In order to form branching, an organic compound must have a minimum of carbon atoms

(a) 2 (b) 3

(c) 4 (d) 5

1.3. Which of the following is an isomeric pair?

(a) Ethane and propane (b) Ethane and ethene

(c) Propane and butane **(d) Butane and 2-methylpropane**

1.4. Among the following the one having longest chain is

(a) neo-pentane (b) iso-pentane

(c) 2-methylpentane (d) 2,2-dimethylbutane

Q.2.Read the following and answer the questions :

Food, clothes, medicines, books, or many of the things are all based on this versatile element carbon. In addition, all living structures are carbon based. The earth's crust has only 0.02%carbon in the form of minerals. The element carbon occurs in different forms in nature with widely varying physical properties. Both diamond and graphite are formed by carbon atoms, the difference lies in the manner in which the carbon atoms are bonded to one another. Carbon has the unique ability to form bonds with other atoms of carbon, giving rise to large molecules. This property is called catenation.

2.1. From the given alternatives, whose chemical and physical properties are not same?

(a) Graphite and Diamond (b) Phosphorous and Sulphur

(c) Carbon and Hydrogen (d) Methyl alcohol and Acetic acid

2.2. Which of the following statements is not correct?

(a) Graphite is much less dense than diamond (b) Graphite is black and soft

(c) Graphite has low melting point (d) Graphite feels smooth and slippery

2.3. Which of the following are isomers?

(a) Butane and isobutene (b) Ethane and ethene

(c) Propane and propyne **(d) Butane and isobutane**

2.4. Which one of the following is not an allotrope of carbon?

(a) Soot (b) Graphite (c) Diamond (d) Carborundum

LONG ANSWER TYPE QUESTION

1. **Why carbon and its compounds are 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 higher calorific values, maximum ignition temperature and

their combustion can be restrained. Hence, carbon and its compounds are a great source of fuel.

2. **What is meant by isomers? Draw the structures of two isomers of butane. Explain why we cannot have isomers of first three members of alkane series?**

Ans: Chemical compounds that have identical chemical formulae but differ in properties and the arrangement of atoms in the molecule are called isomers.

First three members of alkane family are methane (CH_4), ethene (CH_3-CH_3) and propane ($CH_3-CH_2-CH_3$). Since there is no scope for branching in alkanes having upto three carbon atoms, therefore no isomerism is possible

3.State the reason why carbon can neither form C^{+4}cation nor C^{-4} anions but forms covalent compound.

Ans: Carbon cannot form C4+ cation because of removal of 4 elections from a carbon atom would require a large amount of energy.

Carbon cannot form C4- anion because it would be difficult for the nucleus with 6 protons to hold on to 10 electrons. c Hence carbon atoms share electrons forming covalent compounds

4.What is a homologous series? List any of its two features.

Ans:A homologous series is a group or class of organic compounds that have the same general formula and similar chemical properties but differ by a $-CH_2$.

CH_4, C_2H_6, and C_3H_8 are homologs. The same thing can be observed in the case of alkenes in which the first member is ethene and the successive members are C_3H_6, C_4H_8, and C_5H_{10}. They differ from each other by a $-CH_2$ unit.

5.The element carbon forms a very large number of compounds. Give reason for this fact.

Ans: The element, carbon, forms a large number of carbon compounds because of its property of self-combination (catenation).

Chapter 5

Life Processess

Nutrition in Plants and Animals

- **Nutrition:** The process by which an organism takes food and utilizes it, is called nutrition..
- **Modes of Nutrition**

1.Autotrophic Nutrition

.**Main Events of Photosynthesis:**

- Absorption of light energy by chlorophyll.
- Conversion of light energy into chemical energy + splitting (breaking) of water into hydrogen and oxygen.
- Reduction of CO_2 to carbohydrates..

$$\underset{\text{Carbon dioxide}}{6CO_2} + \underset{\text{Water}}{12H_2O} \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Oxygen}}{6O_2} + \underset{\text{Water}}{6H_2O}$$

Heterotrophic Nutrition – Heterotrophs are classified into different categories based on their mode of nutrition. They are:

Parasites (e.g. leeches, ticks) Saprophytes (e.g. mushrooms) Holozoic (e.g. humans, dogs)

- **Steps of Holozoic Nutrition:**

1, Ingestion: 2.Digestion: 3.Absorption: 4.Assimilation: 5. Egestion:

Nutrition in Amoeba Amoeba is a unicellular animal which follows the holozoic mode of nutrition..Figure 6.5 Nutrition in Amoeba © NCERT science

Nutrition in Human Beings –

Human beings are complex animals, which have a complex digestive system. The human digestive system is composed of an alimentary canal and some accessory glands..

- Alimentary Canal: It comprises of mouth, oesophagus, stomach, small intestine and large intestine. Refercert science Figure 6.6 Human alimentary canal page no. 99

Role of the digestive glands:

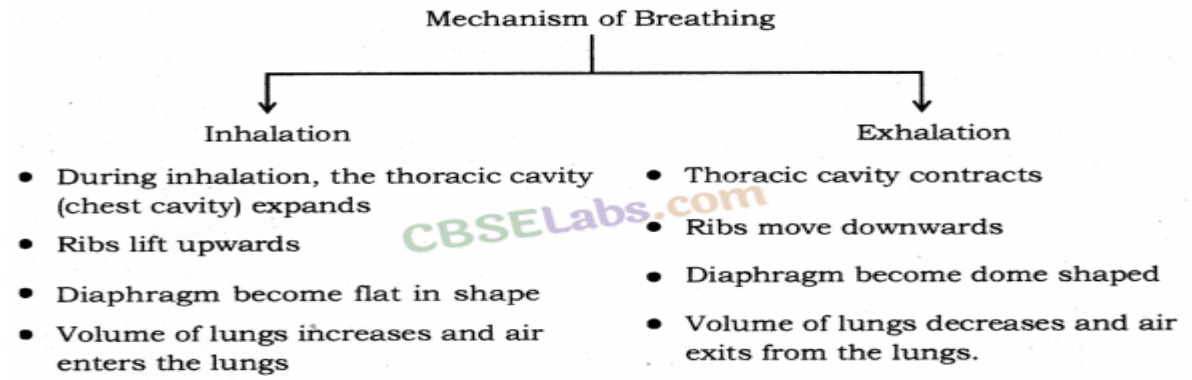
- **Salivary gland – secretes salivary amylase enzyme which breaks starch into sugar molecules.**
- **Gastric glands – secret hydrochloric acid (HCl), pepsin enzyme, and mucus. Pepsin helps in the digestion of proteins while mucus helps in the protection of the inner lining of the stomach from acid.**
- **Intestinal glands – secrete intestinal juices to break fat molecules and bile salts into simpler substances.**
- **Liver – is an organ that secretes bile juice to break fat molecules.**
- **Pancreas – an organ that secretes insulin hormone along with pancreatic juices that break proteins, and fats molecules in the small intestine.**

Respiration

Respiration: The process by which a living being utilises the food to get energy, is called respiration.

Steps of respiration:

Breathing.



- Breakdown of simple food in order to release energy inside the cell respiration

Cellular Respiration

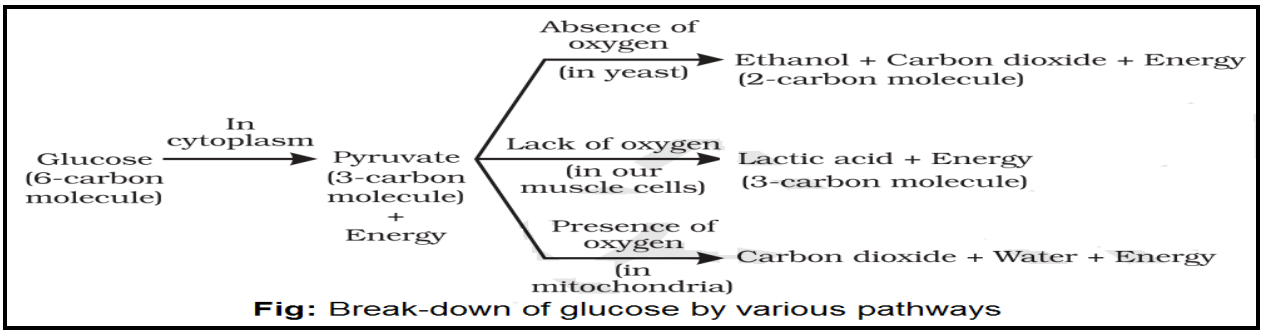


Fig: Break-down of glucose by various pathways

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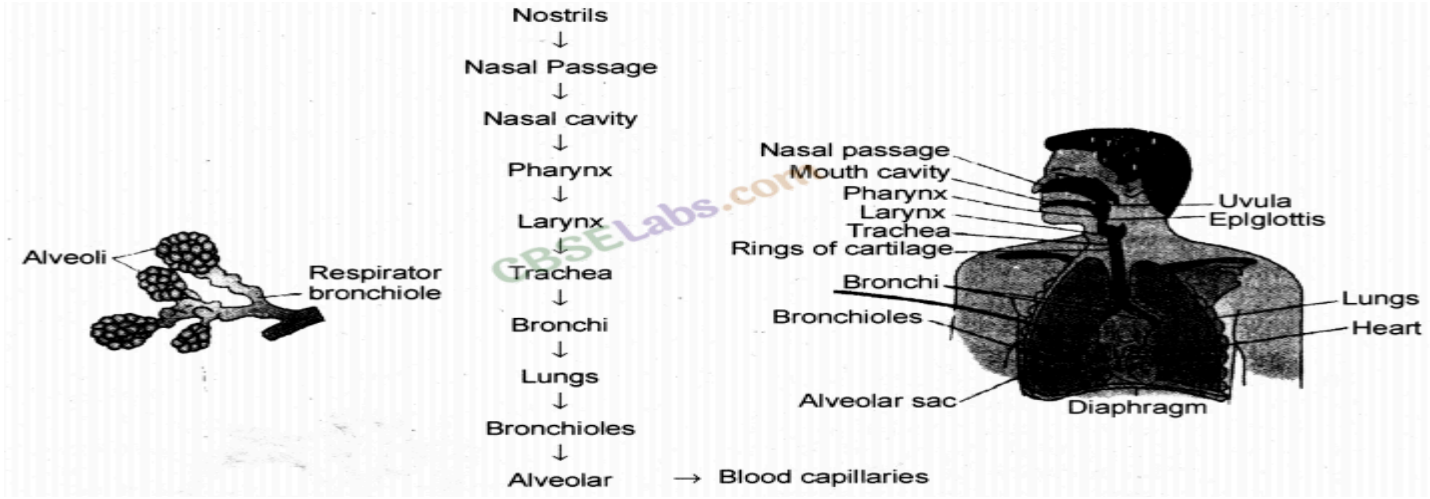
Human respiratory system –

Passage of air through the respiratory system in human beings:



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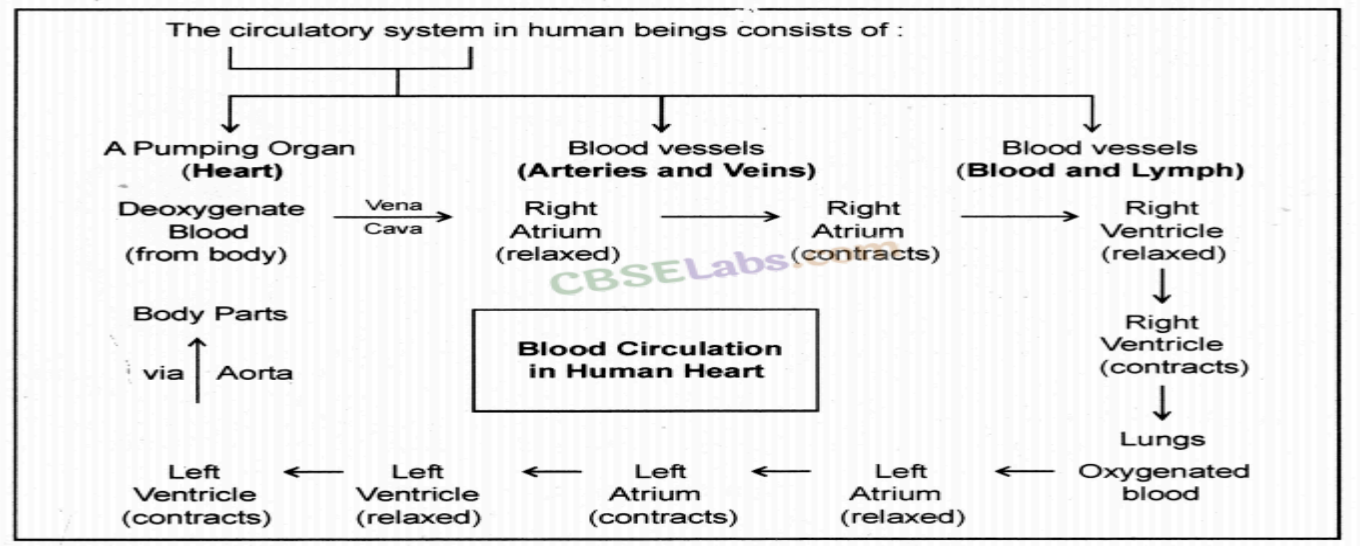
Transportation

Transportation in Human Beings: The circulatory system is responsible for transport of various substances in human beings. It is composed of the heart, arteries, veins and blood capillaries. Blood plays the role of the

carrier of substances.

Sectional view of the human heart

1. Heart. **2. Arteries:** **3. Veins:** **4. Capillaries:**



Blood: Blood is a connective tissue which plays the role of the carrier for various substances in the body. Blood is composed of

1.**Blood plasma:** Blood. Blood plasma forms the matrix of blood.

2.Bloods cells: There are two types viz. Red Blood Cells (RBCs) and White Blood Cells (WBCs)..

3.Platelets: Platelets are responsible for blood coagulation

Lymph: Lymph is similar to blood but RBCs are absent in lymph.Lymph also plays an important role in the immune system.

Double circulation: In the human heart, blood passes through the heart twice in one cardiac cycle Double circulation ensures complete segregation of oxygenated and deoxygenated blood which is necessary for optimum energy production in warm-blooded animals.

Transportation in plants: Plants have specialized vascular tissues for transportation of substances. There are two types of vascular tissues in plants.

- **Xylem:** Carry water and minerals from the leaves to the other part of the plant.
- **Phloem:** Phloem is responsible for transportation of food.

- .**Ascent of sap:** The upward movement of water and minerals from roots to different plant parts is called ascent of sap. Many factors are at play in ascent of sap and it takes place in many steps. They are as follows :

1. Root pressure 2.Capillary action. 3.Adhesion-cohesion of water molecules.

4.Transpiration pull. 5. **Transport of food(**active transport)

Transpiration is the process of loss of water through stomata and lenticels as vapour.

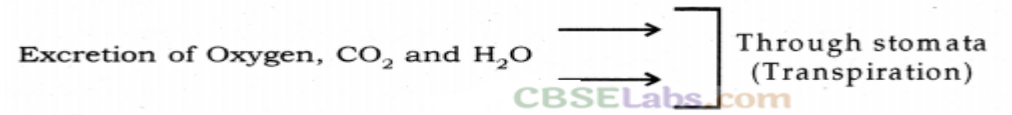
Excretion Removal of harmfulnitrogenous waste from the body is called excretion.

.**Human Excretory System:**

- The human excretory system is composed of a pair of kidneys.
- A tube, called ureter, comes out of each kidney and goes to the urinary bladder.
- Urine is collected in the urinary bladder, from where it is expelled out through urethra as and when required. Refer Figure 6.13 Excretory system in human beings © NCERT science

.**Haemodialysis:** The process of purifying blood by an artificial kidney. It is meant for kidney failure patient.

Excretion in Plants



- Other wastes may be stored in leaves, bark etc. which fall off from the plant.

Life Processes Class 10 Science Chapter 6

1. Which of these juices is secreted by pancreas?
I. Trypsin II. Pepsin III. Bile juice IV. Both I and II
2. Lipase acts on
I. Amino acids II. Fats III. Carbohydrates IV. All of these
3. Respiratory pigment in human body is
I. Chlorophyll II. Water III. Blood IV. haemoglobin
4. Blood consist of what fluid medium?
I. LymphII.Platelets III.PlasmaIV.All of these
5. One cell-thick vessels are called
I. Arterie II.Veins III.Capillarie IV .Pulmonary artery
ANSWERS

1. IV2. II3. IV 4. III 5. III
Differentiate between autotrophs and hetero- trophs and give one example of each.
Answer:
Differences between autotrophs and hetero- trophs are as follows:

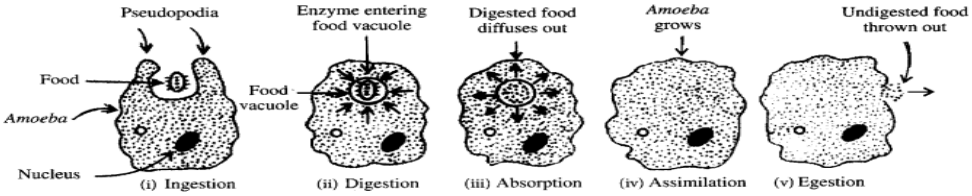
Autotrophs	Heterotrophs
(i) These organisms are able to form organic substances from simple inorganic substances such as CO_2 and H_2S and water.	They cannot produce organic compounds from inorganic sources and therefore completely rely

	on consuming other organisms for its food requirement.
(ii) They have chlorophyll to trap solar energy.	Chlorophyll is absent, so they cannot trap solar energy.
(iii) They can be chemoautotroph and photoautotroph.	They can be saprophytic, parasitic and holozoic in mode of nutrition.
(iv) Autotrophs are placed at the bottom of the food chain as producers.	Heterotrophs are placed above autotrophs in the food chain as consumers.
(v) Green plants, some bacteria and some protists like Euglena are examples of autotrophs.	Mushrooms, Euglena, cow, goat, etc., are examples of heterotrophs.

Question 9.
Explain with the help of neat and well labelled diagrams the different steps involved in nutrition in Amoeba.
Answer:
The mode of nutrition in Amoeba is holozoic. The process of obtaining food by Amoeba is called phagocytosis.

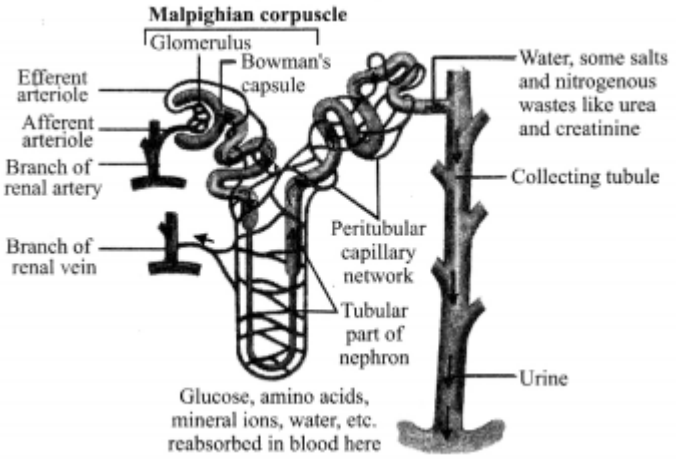
1. Amoeba ingests food by using its finger-like projections called pseudopodia.
2. The food is engulfed with a little surrounding water to form a food vacuole inside the Amoeba. The food is digested inside food vacuole by digestive enzymes.
3. Food is absorbed directly into the cytoplasm of Amoeba by diffusion.
4. Food is used to obtain energy and growth of Amoeba.
5. When considerable amount of undigested food collects inside Amoeba then its cell membrane ruptures at any place to throw out this undigested food.

Diagrammatic representation of different stages in the holozoic nutrition (feeding) of Amoeba is as follows:



10.Describe the structure and function of nephron with the help of diagram.)
Answer:

Structure of nephron is as follows:



Question 2.
Mention the raw materials required for photosynthesis.
Answer:
Raw materials required for photosynthesis are carbon dioxide (CO_2), water, light and chloroplast.

Question 3.
State the location and function of gastric glands. (Board Term I, 2014)
Answer:
The procedure used for cleaning the blood of a person by separating urea from it is called:
(a) osmosis
(b) filtration
(c) dialysis
(d) double circulation

Answer

Answer: c

27. Which is the correct sequence of body parts in the human alimentary canal?
(a) Mouth → stomach → small intestine → large intestine → oesophagus
(b) Mouth → oesophagus → stomach → small intestine → large intestine
(c) Mouth → stomach → oesophagus → smallintestine → large intestine
(d) Mouth → oesophagus → stomach → large intestine → small intestine

Answer

Answer: b

28. Identify the correct path of urine in the human body.
(a) Kidney → urinary bladder → urethra → ureter
(b) Urinary bladder → ureter → kidney → urethra
(c) Kidney → ureter → urethra → urinary bladder
(d) Kidney → ureter → urinary bladder → urethra

Answer C

Fill in the Blanks
1. The exit of food from the stomach is regulated by a ……. muscle.
2. ……. is the longest part of the alimentary canal.
3. The process of breakdown of glucose, (a six-carbon molecule) into pyruvate, (a three-carbon molecule), takes place in the ……. .
4. ……. is the site of the complete digestion of carbohydrates, proteins and fats.
5. Breaking of pyruvate using oxygen takes place in the ……. .

6. Rings of cartilage are present in the wind pipe to ensure that the ……. .
7. The blood has ……. cells which plug the leakage in the vessels by helping to clot the blood at the point of injury.
8. ……. transports products of photosynthesis from the leaves to other parts of the plant.

Answers
1.sphincter
2. Small intestine
3.cytoplasm
4. Small intestine
5.mitochondria
6. air-passage does not collapse
7. platelet
8. phloem

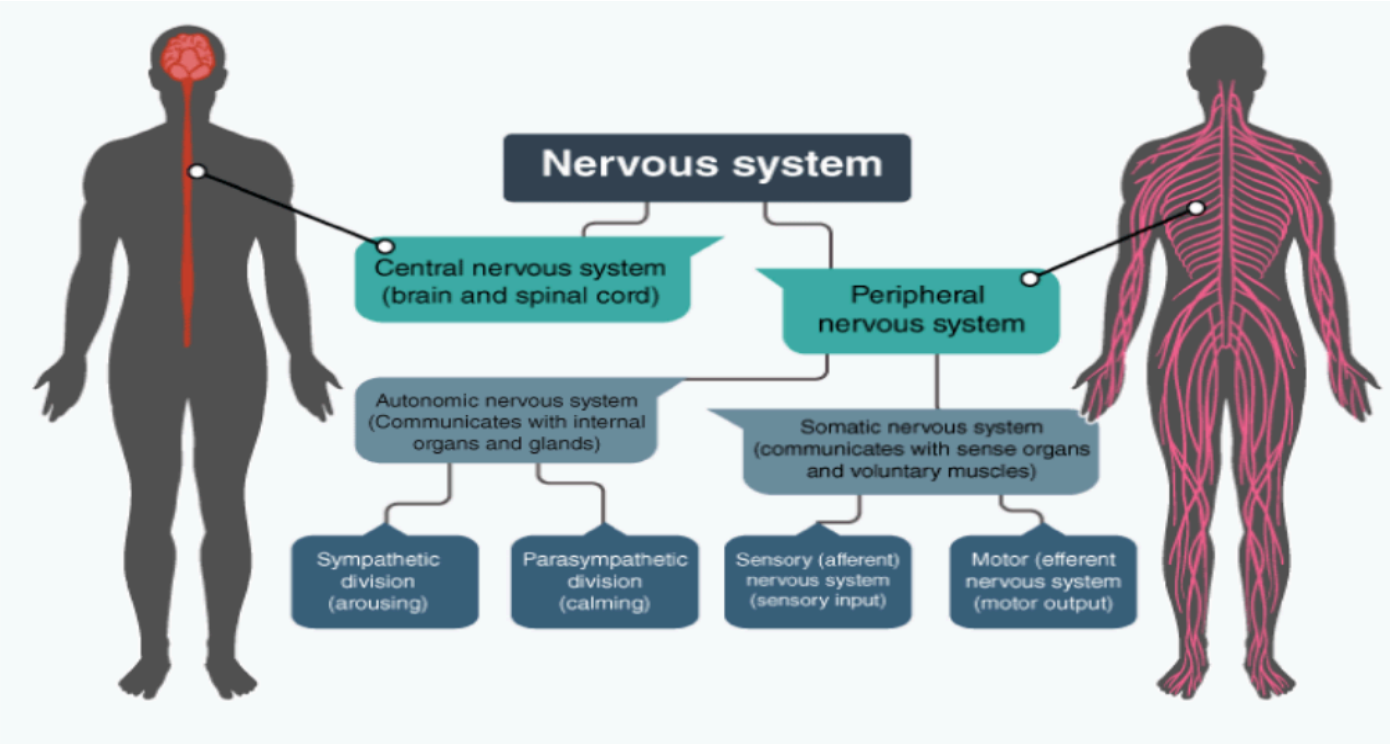
We hope the given MCQ Questions for Class 10 Science Life Process with Answers will help you. If you have any query regarding CBSE Class 10 Science Chapter 6 Life Process Multiple Choice Questions with Answers, drop a comment below and we will get back to you at the earliest.

Chapter-6
Control and Coordination

- The working together of various organs of a living organism in a systemic, controlled and efficient way to produce proper response to various stimuli is called **Coordination.**

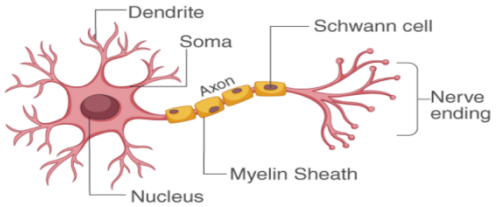
Control and Coordination is carried out I) In Animals: by the Nervous/ Endocrine systems. II) In Plants: by using hormones	Hormones: The chemical messengers which assist the nervous system in carrying out various functions. These are secreted by endocrine glands.

- Neuron/ Nerve cell: It is the structural and functional unit of the nervous system.
  It is specialised cells which respond to stimuli and coordinate their activities.



- Each neuron has three main parts:

Dendrites	Receive impulses from other neurons.
Cyton/Soma/ Cell Body	Processes the impulse.
Axon.	i) Transmits the impulse, either to another neuron or to muscles/glands. ii) It may be myelinated/ non-myelinated. iii) impulse transmission is faster in myelinated neurons.



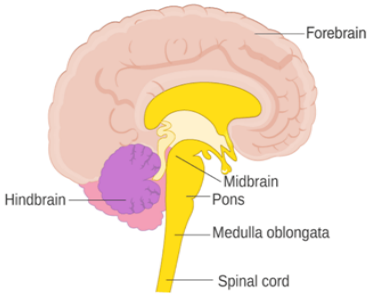
Structure of Neuron

Central Nervous System = Brain + Spinal Cord.

Protection of CNS : Brain is protected by 3 main layers –

- The bony skull (cranium)
- The cerebrospinal fluid
- The meninges (Dura mater, Arachnoid and Pia mater).

Cerebrum	Responsible for reasoning, logic, emotions, speech, memory, visual processing, recognition of auditory and taste stimuli.
Cerebellum	Regulates and coordinates body movements, posture and balance.
Pons	Relays signals from the hindbrain to the forebrain.
Medulla Oblongata	i) Controls all involuntary movements like heartbeat, breathing, blood pressure, Peristaltic movement. ii) Continues as the spinal cord, which runs through the vertebral column and it controls reflex actions like vomiting, sneezing, yawning.



Mid Brain	Controls reflex action of head, neck/trunk in response to visual/ auditory stimuli.	

Peripheral Nervous System (PNS)

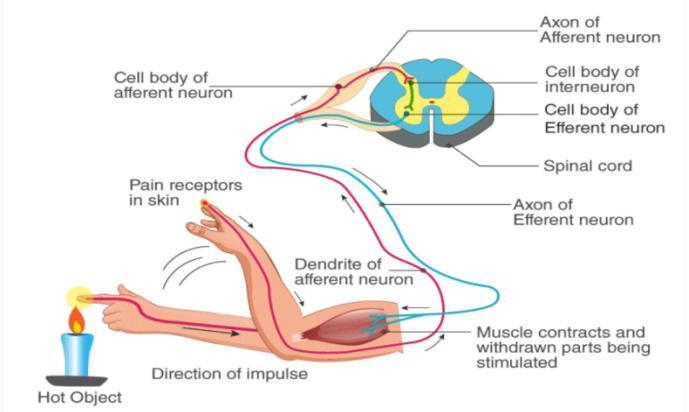
1. Somatic Nervous System: It is the nerves of PNS that control the voluntary actions of the body. **2. Autonomic Nervous System**: It is nerves of PNS that control the involuntary actions in the body. Ex – Regulation of respiration, heart rate, blood pressure, etc.	**Sympathetic Nervous Systems.** It prepares the body for intense physical activity and is often referred to as the fight-or-flight response . **Parasympathetic Nervous Systems.** It has almost the exact opposite effect & relaxes the body and Inhibits/ slows many high-energy functions.

- The nerves coming out from the brain and the spinal cord constitute the PNS.

Reflex action: It is a sudden, immediate, involuntary reaction of the body in response to stimuli.

Reflex Arc

- It is the path followed by an electrical impulse during a reflex action.
- The impulse travels from the receptor organ to the spinal cord/brain. It is processed there, and the information is brought back to the concerned muscle to carry out the action.
- Thus, the receptor organ, sensory/afferent neuron, interneuron, motor/efferent neuron and effector organ are the components of a reflex arc.



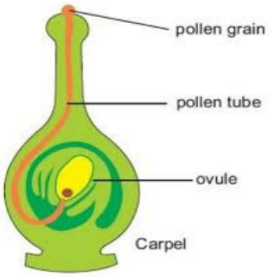
Plant Hormones and Movements

Plant Hormones:

- The chemical compounds which produced naturally in plants &control the growth and other physiological functions.

Plant Hormone	Function
Auxin	Synthesize at shoot tip. Helps in the growth of plant tissues. Involved in tropic movement of plants.
Cytokinin	Promotes cell division Delays ageing of cells
Gibberellins	Helps in the growth of stems, Initiates seed germination, Promotes flowering, cell division and seed growth after germination
Abscisic acid	Inhibits growth and causes wilting of leaves, Promotes dormancy of buds and seeds
Ethylene	This is a gaseous hormone which causes the ripening of fruits. Promotes senescence (Ageing) and abscission of leaves.

3.



Touch-me-not Plant

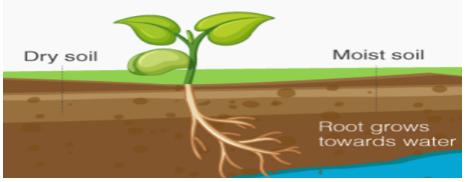
THIGMONASTIC Movement: Movement in response to touch. Ex- Touch-me-not Plant

Tropism / Tropic movement	Nastism / Nastic movement
Growth-Related Movements	Growth Independent Movements
These movements occur in response to environmental stimuli and the direction of the response is dependent on the direction of the stimulus.	These movements occur in response to environmental stimuli but the direction of response is not dependent on the direction of the stimulus.

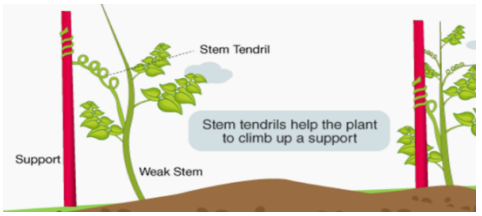
Plant responds to stimulus very slowly by growing.

	Tropism	+ve Tropism	-ve Tropism
1	Phototropic movement (light-dependent)	Shoot/ Stem	Root
2	Geotropic movement (gravity-dependent)	Root	Shoot
3	Chemotropic movement (chemical-dependent)	Growth of the pollen tube towards the ovule	x
4	Hydrotropic movement (water-dependent)	Movement of roots towards H_2O/ high humidity level.	x
5	Thigmotropic movement (touch dependent)	Movement of tendrils around the support	

4.



5.



The Endocrine System

Exocrine Glands: It discharge secretions by means of ducts, which open onto an epithelial surface.

Endocrine Glands: It is ductless glands which secrete hormones into the bloodstream in humans.

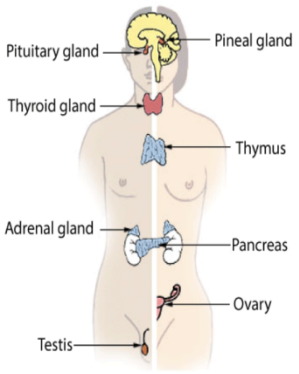
Pituitary Gland: It is a pea-sized gland located at the base of the brain.

* It is the master gland, as it controls the secretions of all the other endocrine glands.
* It also secretes Growth Hormone (GH).

Under-secretion of GH causes - **Dwarfism**, and
over-secretion causes - **Gigantism** in children and '**Acromegaly**' in adults.

Adrenal Gland: Occurs in pairs above each kidney.

* It decreases in size with age.
* Secrets the hormone adrenaline, which helps in flight and fight response.
* Also secretes **Noradrenaline.**



Pancreas: leaf-like gland present behind the stomach in the abdomen.

* It is an endocrine as well an exocrine gland.

* **As an endocrine gland**, it manufactures two hormones – Insulin & glucagon. * Both these hormones act antagonistically & regulate the sugar level in blood. ● An insufficient amount of insulin from the pancreas leads to **diabetes.**	**As an exocrine gland,** It secretes enzymes to break down the proteins, lipids, carbohydrates and nucleic acids in food.

Gonads: * It is gamete-producing organs – Testes in males (Hormone - Testosterone) and
- Ovaries (Hormones - Oestrogen/ Progesterone) in females.
- Progesterone is the pregnancy hormone.

* Testosterone and Oestrogen help in producing gametes and are responsible for the sexual characteristics.

Parathyroid glands It produces the parathyroid hormone which regulates the level of Ca^{2+} in blood.

Pineal gland: It influence on our sleep patterns.

Hypothalamus It links the nervous & endocrine systems through the pituitary.

- It is the site of synthesis for the posterior pituitary hormones

Xsc 6 Control and Coordination

1. In a neuron, conversion of electrical signal to a chemical signal occurs at/in
   (a) cell body (b) axonal end (c) dendritic end (d) axon
2. Posture and balance of the body is controlled by
   (a) cerebrum (b) cerebellum (c) medulla (d) pons
3. The main function of abscisic acid in plants is to

(a) increase the length of cells (b) promote cell division
(c) inhibit growth (d) promote growth of stem

4. The substance that triggers the fall of mature leaves and fruits from plants is due to
   (a) Auxin (b) Gibberellin (c) Abscisic acid (d) Cytokinin
5. Dramatic changes of body features associated with puberty are mainly because of secretion of
   (a) oestrogen from testes and testosterone from ovary
   (b) oestrogen from adrenal gland and testosterone from pituitary gland
   (c) testosterone from testes and estrogen from ovary
   (d) testosterone from thyroid gland and estrogen from pituitary gland

DIRECTION: Each of these questions contains an Assertion (A) followed by Reason(R). Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.	(a) Both A & R are true and R is correct explanation of the assertion- A. (b) Both A & R are true but R is not the correct explanation of A. (c) A is true but R is false. (d) A is false but R is true.

6. Assertion (A): Insulin regulates blood sugar level.
   Reason (R): Insufficient secretion of insulin will cause diabetes.
7. Assertion (A): The effect of Auxin hormone on the growth of root is exactly opposite to that on a stem.
   Reason (R): Auxin hormone increases the rate of growth in root and decreases the rate of growth in stem.
8. Assertion (A): A receptor is a specialized group of cells in a sense organ that perceive a particular type of stimulus. Reason (R): Different sense organs have different receptors for detecting stimuli.
9. Assertion(A): Impulse travels from dendrite to cell body and then along the axon to its end.
   Reason (R): Information acquired at the end of the dendrite tip of a nerve cell sets of an electric impulse.
10. Assertion (A): Abscisic acid is a stress hormone.
    Reason (R): Stimulation of ABA occurs in adverse condition.

11. Answer the following:
    (a) Which hormone is responsible for the changes noticed in females at puberty?
    (b) Dwarfism results due to deficiency of which hormone?
    (c) Blood sugar level rises due to deficiency of which hormone?
    (d) Iodine is necessary for the synthesis of which hormone?
    (e) Which gland secretes digestive enzymes as well as hormones?

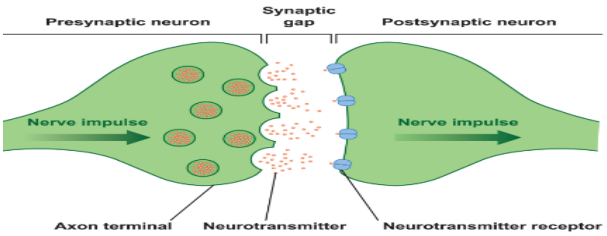
ANS.	1. b	2. b	3. c	4. c	5. c
	6.a	7.c	8.b	9.b	10.a
	(a) Oestrogen (b) Growth hormone		(c) Insulin	(d) Thyroxin	(e) Pancreas

12. Give the answer of the following questions in 40 to 60 words.
    a) How are involuntary actions and reflex actions different from each other?
    b) What happens at the synapse between two neurons?
    c) Which signals will get disrupted in case of a spinal cord injury?
    d) How do auxins promote the growth of a tendril around a support?
    e) Why are some patients of diabetes treated by giving injections of insulin?

Ans:
(a) Involuntary actions cannot be consciously controlled. For example, we cannot consciously control the movement of food in the alimentary canal. These actions are however directly under the control of the brain.

On the other hand, the reflex actions such as closing of eyes immediately when bright light is focused show sudden response and do not involve any thinking. This means that unlike involuntary actions, the reflex actions are not under the control of brain.

(b) A very small gap that occurs between the last portion of axon of one neuron and the dendron of the other neuron is known as a synapse. It acts as a one way valve to transmit impulses in one direction only. This uni-directional transfer of impulses occurs as the chemicals are produced in only one side of the neuron i.e., the axon's side. From axon, the impulses travel across the synapse to the dendron of the other neuron.



(c) The reflex arc connections between the input and output nerves meet in a bundle in the spinal cord. In fact, nerves from all over the body meet in a bundle in the spinal cord on their way to the brain. In case of any injury to the spinal cord, the signals coming from the nerves as well as the signals coming to the receptors will be disrupted.
(d) Auxin is synthesized at the shoot tip. It helps the cell grow longer. When a tendril comes in contact with a support, auxin stimulates faster growth of the cells on the opposite side, so that the tendril forms a coil around the support. This makes the tendrils appear as a watch spring.
(e) Diabetes is a disease in which the level of sugar in the blood is too high. Insulin, a hormone secreted by the pancreas, helps in regulating the blood sugar levels. This is the reason why diabetic patients are treated by giving injections of insulin.

13. Give the answer of the following questions in 60 to 80 words.
    a) What is the function of receptors in our body?
    Think of situations where receptors do not work properly. What problems are likely to arise?
    b) What is the need for a system of control and coordination in an organism?
    c) What are reflex actions? Give two examples. Explain a reflex arc.
    Ans: See page no 102, 103
    d) Name various plant hormones. Also give their physiological effects on plant growth and development.
    Ans: See page no 108 (3^{rd}/ 4^{th} paragraph)
    e) What constitutes the central and peripheral nervous systems? How are the components of central nervous system protected?
    Ans: See page no 103,104/ 105(1^{st} Paragraph)

Ans: a) Receptors are sensory structures (organs/tissues or cells) present all over the body.
The receptors are either grouped in case of eye or ear, or scattered in case of skin.
Functions of receptors: (i) They sense the external stimuli such as heat or pain.
(ii) They also trigger an impulse in the sensory neuron which sends message to the spinal cord. When the receptors are damaged, the external stimuli transferring signals to the brain are not felt.
For example, in the case of damaged receptors, if we accidentally touch any hot object, then our hands might get burnt as damaged receptors cannot perceive the external stimuli of heat and pain.

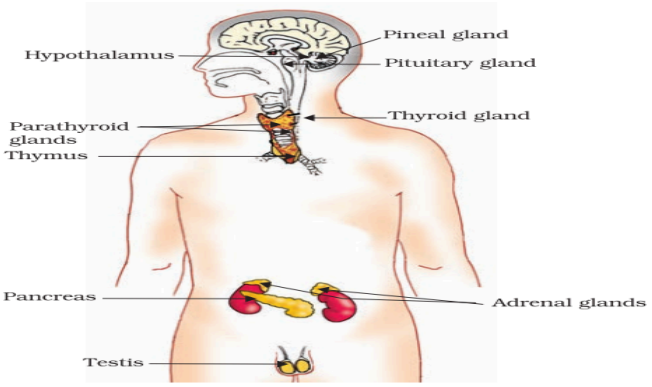
b) The maintenance of the body functions in response to changes in the body by working together of various integrated body systems is known as coordination. All the movements that occur in response to stimuli are carefully coordinated and controlled. In animals, the control and coordination movements are provided by nervous and muscular systems.
The nervous system sends messages to and away from the brain. The spinal cord plays an important role in the relay of messages. In the absence of this system of control and coordination, our body will not be able to function properly.
For example, when we accidentally touch a hot utensil, we immediately withdraw our hand. In the absence of nerve transmission, we will not withdraw our hand and may get burnt.

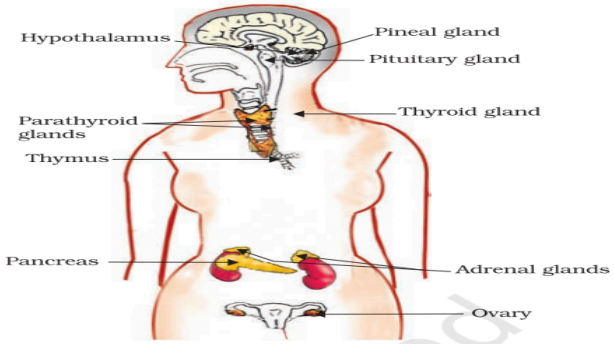
14. Smita's father was complaining about frequent urination, pain in legs and a frequent weight loss to Smita's mother and she discussed the things with her daughter when Smita returned from school. Listening to this Smita told her mother that her father should go and visit a doctor immediately. The doctor diagnosed that Smita's father was having a 93 elevated level of blood glucose. He should take care of his diet and should exercise regularly to maintain his normal glucose level.
    On the basis of the text, answer the following questions:

    (i) Name the disease he is suffering from and name the hormone whose deficiency causes it.
    (ii) Identify the gland that secretes it and mention the function of this hormone.
    (iii) Explain how the time and amount of secretion of this hormone is regulated in human system.

(i)	Disease-Diabetes, Hormone: Insulin
(ii)	Gland-Pancreas: The blood glucose level is regulated by insulin hormone secreted by the pancreas.
(iii)	Feedback Mechanism - Cells of pancreas secrete insulin hormone when level of blood glucose level increases in the blood. Insulin regulates the blood glucose level and its secretion gets reduced when blood glucose level falls down.

15. Read the passage carefully and answer the questions given below.





A gland P is located just below the stomach in the human body. The gland P secretes a hormone Q. The deficiency of hormone Q in the body causes a disease W in which the blood sugar level of a person rises too much. Person having high blood sugar is called X.

i) Name gland P.
a. Pancreas b. Adrenal c. Thyroid d. Hypothalamus

ii) Name hormone Q.
a. Insulin hormone b. Thyroxine c. Adrenaline d. Growth

iii) What is disease W?
a. Diabetes b. Obesity c. Asthma d. Arthritis

iv) Name the person X.
a. Obese person b. Diabetic person c. Cancerous person d. Asthmatic person

v) Which is the target organ of both adrenaline and insulin?
a. Heart b. Kidney c. Liver d. Pancreas

Ans.	i)a	ii)a	iii)a	iv)b	v)c

16. A brain is displayed at the Allen Institute for Brain Science.

The human brain is a 3- pound (1.4-kilogram) mass of jelly-like fats and tissues—yet it's the most complex of all known living structures The human brain is more complex than any other known structure in the universe. Weighing in at three pounds, on average, this spongy mass of fat and protein is made up of two overarching types of cells—called glia and neurons— and it contains many billions of each. Neurons are notable for their branch-like projections called axons and dendrites, which gather and transmit electrochemical signals. Different types of glial cells provide physical protection to neurons and help keep them, and the brain, healthy. Together, this complex network of cells gives rise to every aspect of our shared humanity. We could not breathe, play, love, or remember without the brain.

1) Animals such as elephants, dolphins, and whales actually have larger brains, but humans have the most developed cerebrum. It's packed to capacity inside our skulls and is highly folded. Why our brain is highly folded?

2) Which among this is not a function of cerebrum?
a) speech b) Learning c) Posture d) Emotion

3) Which among these protects our brain?
a)Neurotransmitter b) Cerebrospinal fluid c)Meninges d) Grey matter
i) a, b & c ii)b& c iii)c & d iv) b,c&d

4) Ram was studying in his room. Suddenly he smells something burning and sees smoke in the room. He rushes out of the room immediately. Was Ram's action voluntary or involuntary? Why?

1. To increase the surface area of the brain to receive sensory impulses from various receptors, interpret the sensory information with the information that is stored in the brain and respond accordingly
2. option C
3. option ii
4. Ram's action was voluntary because rushing out of the room was under conscious control. The smoke and smell were perceived by the receptor and sensor and signals are sent to the brain. The brain then sent the signals to effector organs.

Chapter -7

HOW DO ORGANISMS REPRODUCE ?

•**Reproduction is the biological process by which living organisms produce new individuals of the same species.** • It is necessary for the survival and continuity ofspecies .

VARIATION- DNA copying involves some variations so offspring are not identical rather they are similar to their parents. variation leads to adaptation ,evolution and existence of the species.

Types of Reproduction-

I.**ASEXUAL REPRODUCTION**. – Only single parent is involved.

1.Fission -For unicellular organisms, cell division, or fission, leads to the creation of new individuals.**Binary Fission - Amoeba**, **Bacteria**, **Leishmania**.**Multiple Fission Plasmodium** (malarial parasite).

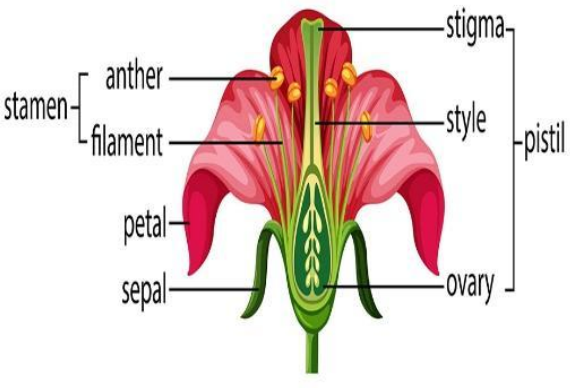
2. Fragmentation- in**Spirogyra** **3. Regeneration –**in **Planaria 4. Budding-** in**Hydra**

5. Spore Formation –in breadmould (Rhizopus)

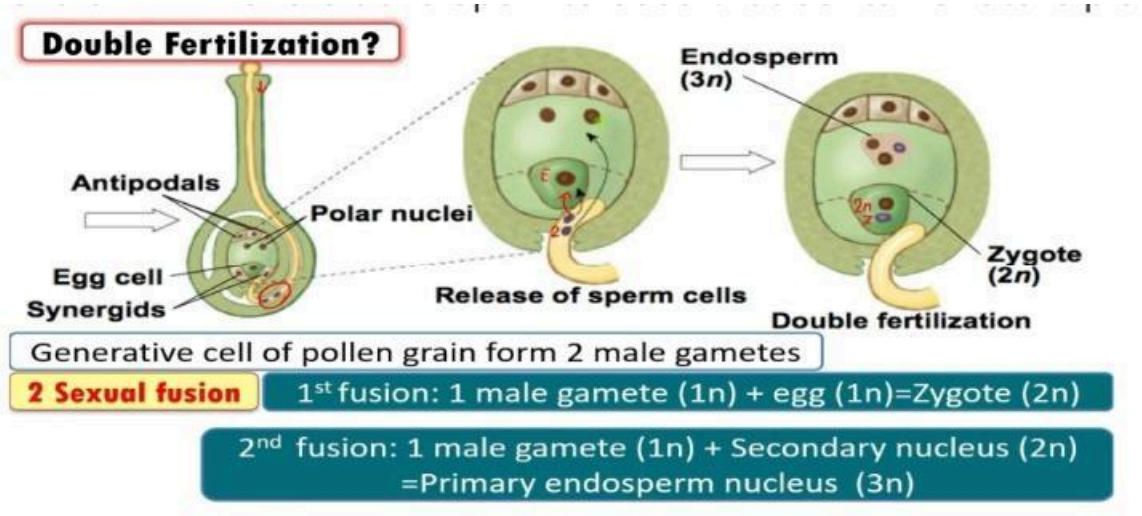
6. Vegetative Propagation-The method of producing new plants from vegetative parts like **roots, stems, and leaves** are called vegetative propagation.

II.SEXUAL REPRODUCTION- The sexual life cycle can be grouped into – i- Pre-reproductive phase- development to attain sexual maturity (puberty) ii- Reproductive phase- sexually mature, able to reproduce, able to produce fertile gametes iii- Post reproductive phase- after fertilization, development of embryo into new individual

SEXUAL REPRODUCTION IN PLANT -Reproductive part of plant is flower. Flower consists sepals, petals, stamens and carpels. • Anther produces male gamete pollen and ovary contains female gamete egg. • After pollination pollen fuses with egg to form zygote. • Zygote develops into embryo within ovule • Ovule develops into seed that contains future plant and ovary ripens in fruit.

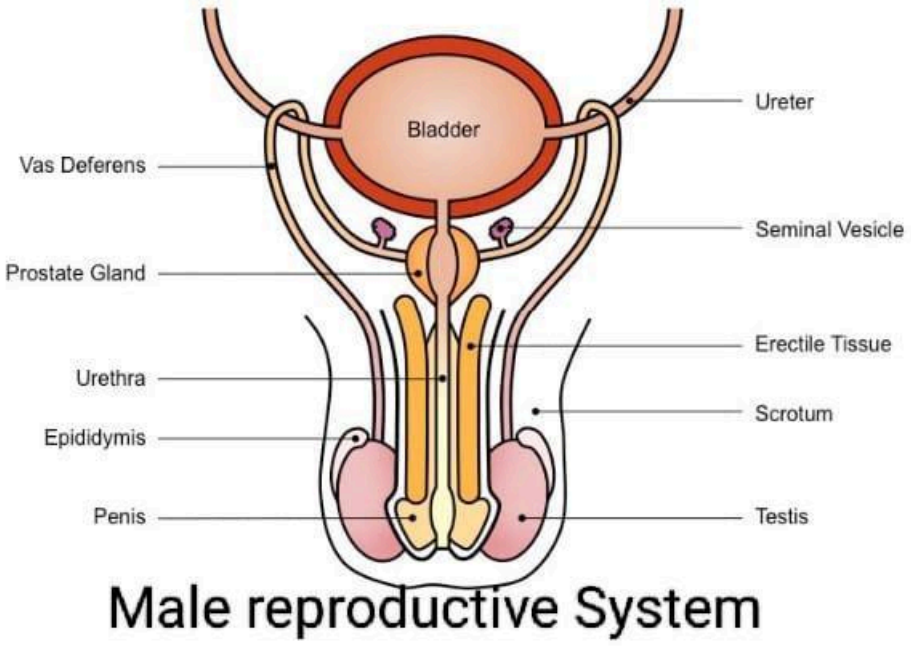


Double fertilization- In flowering plants One of the male gametes(n) fertilizes the egg(n) resulting in the formation of a zygote(2n) and the another male gamete(n) unites with polar nuclei (2n) for the formation of an endosperm(3n)(triple fusion).



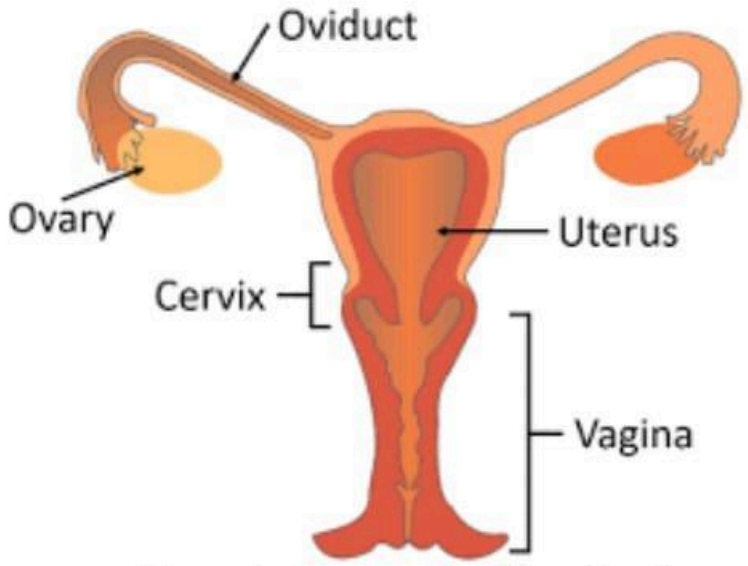
SEXUAL REPRODUCTION IN HUMAN BEINGS

Male reproductive system – • It consists of one pair of testes where sperm formation takes place. • Testes also secrete hormones like testosterone. • Testosterone brings about changes in the appearance of boys at the time of puberty. • Sperm is delivered through the vas deferens where secretions of the prostate gland and seminal vesicles add their secretions. These secretions help in transportation and provide nutrition to sperm.



Female reproductive system- • It consists of mainly a pair of ovaries and a uterus. • On puberty the ovary starts producing eggs and releases one egg each month. **Fertilization** - Fertilization is a fusion of sperm and egg. It takes place in the fallopian tube. **The fertilized egg is**

called a zygote which developsinto an embryo. • Uterus is for implantation purposes which hold the developing embryo in its layer through the placenta and umbilical card. • When egg is not fertilized the inner lining of uterus breaks and comes out through the vagina as blood and mucus (menses). This cycle repeats every month and is called menstrual cycle.



Female Reproductive System

REPRODUCTIVE HEALTH --- STDs (Sexually transmitted diseases)- Spread from infected person to healthy person due to unprotected sex. E.g.- HIV-AIDS, Gonorrhea, Syphilis, and Warts.

Population control methods 1. Hormonal Method: Use of contraceptive pills.

2. Barrier Methods: use of Condoms, spermicidals

3. Intra-uterine Devices (IUDs): IUDs such as copper – T is fitted in the uterus. They prevent fertilisation.

4. Surgical Methods: In females, the fallopian tubes are ligated. This is called tubectomy. In males, the vas deferntia are ligated. This is called vasectomy.

IMPORTANT QUESTIONS

MCQ

1) The correct sequence of organs in the male reproductive system for the transport of sperm is --
a) Testis → vas deferens → urethra b) Testis → ureter → urethra

c) Testis → urethra → ureter d) Testis → vas deferens → ureter Ans: (a)

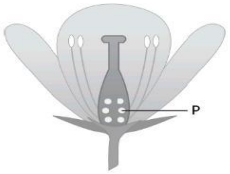
2.Sexually reproducing are different form asexually reproducing organisms in-

a) Mitosis b) Meiosis c) Offsprings d) All of these Ans: b

3. The process in which small portions of the oviducts of a woman are removed by surgical operation, and the cut ends are ligated is

a) copper T b) tubectomy c) vasectomy d) diaphragm Ans: (b)

4.The image shows the structure of a flower.Which of the following processes will likely be disturbed or not occur if the labelled part is removed from the flower?



a) Formation of fruit b) Transport of pollen

c) Formation of pollen d) Development of the pollen Ans-(a)

5. In a potato, vegetative propagation takes place by:
(a) root (b) leaf c) stem tuber (d) grafting Ans-(c)

Very Short Answer Type Questions

6. What is pollination? Give an example of any two pollinating agents.

Ans: The transfer of pollen from the anther to the stigma of a flower is known as pollination. Examples of pollinating agents: Insects, Wind, Water

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

Ans: No, the usage of copper-T cannot stop the contact of body fluids. Hence, it cannot protect her from getting sexually transmitted diseases.

8.What could be the reason for adopting contraceptive methods? Ans- To control population ,to avoid unplanned pregnancy and transfer of sexually transmitted diseases.

9.When a cell reproduces, what happens to its DNA?

Ans: When a cell reproduces, DNA replication occurs which forms two similar copies of DNA .

10. Name the parts of a bisexual flower that are not directly involved in reproduction.
Ans:-Calyx and corolla are parts of a flower that are not directly involved in reproduction.

Short Answer Type Questions

11. Explain the process of regeneration in Planaria. How is this process different from reproduction?
Ans:-Planaria possesses great power of regeneration. If the body of Planaria somehow gets cut into a number of pieces, then each body piece can regenerate into a complete Planaria by growing all the missing parts.

12. .List two functions of ovary of human female reproductive system.
Ans:- (i) Production of female gametes, i.e., ova (ii)secretion of female hormones, i.e., estrogen and progesterone.

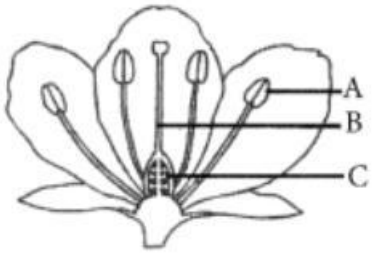
13. What provides nutrition to human sperms? State the genetic constitution of a sperm.

Ans:- The secretions of seminal vesicles and prostate gland provides nutrition to the human sperms and also make their further transport easier. The genetic constitution of a sperm can be 50% have X chromosome and 50% have Y chromosome

14. Differentiate asexual and sexual mode of reproduction. Which one shows variation and why?

Asexual reproduction	Sexual reproduction
•In this single parent is involved •It does not involve fusion of gametes •There is no meiosis Meiosis occur •No variation in Offspring occur	• In this two parents are involved • Fusion of gamete is involved • Genetic material from both the parents mixed by fertilization. • Hence Offsprings gets the charactersticsof mother and father.

15. Name the parts A, B and C shown in the following diagram and state one function of each.



called carpel / pistil.

Ans:In the given figure, part A is anther, part B is style and part C is ovule.Anther (A) is a part of male reproductive organ of flower called stamen. Large number of pollen grains are formed inside anther. Style (B) and ovule (C) are parts of female reproductive organ of flower called carpel / pistil.

ASSERTION AND REASON

Assertion and Reason Questions

Read the sentences carefully and choose the correct alternative from the following :-

a)Both the assertion and reason are correct, and reason is the correct explanation of the assertion.

b)The assertion and the reason are correct, but the reason is not the correct explanation of the assertion.

c)Assertion is true, but reason is false.

d)The statement of the assertion is false, but the reason is true.

16.**Assertion(A) :** Growth hormone stimulates the growth of different body parts.
Reason (R) : Gonadotropins stimulate the production of sex hormones. Ans:(b)

17. **Assertion(A) :** Colonies of yeast multiply in sugar solution.
Reason (R) : Sugar is made of sucrose which provides energy for sustaining all life activities.Ans:-(a)

18.**Assertion (A):** Spore formation is a form of sexual reproduction.
Reason (R): Spores are produced by the fusion of gametes from two different individuals.Ans: (c)

LONG ANSWER TYPE QUESTION

19.- What are STDs? Give examples of it. Write the methods to prevent the STDs.

Ans: Sexually transmitted diseases (STDs) are illnesses that are passed from one person to another through intimate contact. STDs can be caused by bacteria, viruses, or parasites. Some STDs, such as HIV, cannot be cured and can only be managed through treatment. examples of STDs include gonorrhea, syphilis, herpes, and HIV. The best way to prevent STDs is to practice safe sex. Additionally, it's important to avoid sharing needles and to practice proper hygiene.

20. What is double fertilization? Give its significance.

Double fertilization, in flowering plant reproduction, the fusion of the egg and sperm and the simultaneous fusion of a second sperm and two polar nuclei that ultimately results in the formation of the endosperm (the food-storage tissue) of the seed. This is called double fertilization because the true fertilization (fusion of a sperm with an egg) is accompanied by another fusion process (that of a sperm with the polar nuclei) called Triple Fusion that resembles fertilization. Double fertilization of this type is unique to flowering plants (angiosperms) and is responsible for the formation of both the embryo and its potential food source in the seed.

21.. Draw a labelled diagram of the longitudinal section of a flower. Ans:-NCERT page-134

22. How does the embryo gets nourishment inside mothers body? Ans:- NCERT page-138

23. List five advantages of vegetative propagation Ans:- NCERT page-131

CASE BASED/ COMPETENCY BASED QUESTIONS

24.A newly married couple does not want have children for few years. They consulted a doctor who advised them barrier method and chemical method of birth control. Yet another couple who already have two children and are middle aged also consulted doctor for some permanent solution to avoid unwanted pregnancy. Doctor advised them surgical method of birth control.

(i) What are the barrier methods of birth control?

(a)Condom (b) Diaphragm. (c)Oral pills (d) both a and b

(ii) How physical barrier prevent pregnancy?

(iii) How chemical methods prevent pregnancy?

(a) Vaginal pills contain chemical called spermicides which kill the sperms

(b) Oral pills prevent ovulation so there will be no fertilisation

(c) Oral pills stop menstruation in females

(d) Both (a) and (b)

(iv) what is tubectomy?

25.Rohit collected some pond water which was dark green in color in a test tube. She took out green-colored mass from it and separated its filaments by using needles. She broke some filaments into small fragments and put them in a Petri dish containing clean water. She observed that after a few days the small fragments gave rise to complete filaments.

i) What do you think the mass of green filament was ?

(a) It was a mass of Spirogyra filament.(b) It was a colony of Volvox algae.
(c) It was large brown algae.(d) It was a mass of fungal filaments

ii) Organisms that reproduces in similar ways as Spirogyra is :

(a) yeast(b) hydra**(c) Planaria**(d) Sea anemone

iii) Select the correct statement from the following.
(a) Only multicellular organisms can undergo fragmentation.
(b) Both unicellular and multicellular organisms can undergo fragmentation.
(c) Fragmentation is sexual mode of reproduction.
(d) Fragmentation is found only in algae

iv)Which type of asexual reproduction is seen in spirogyra?Ans-Fragmentation.

Chapter 8

HEREDITY AND EVOLUTION

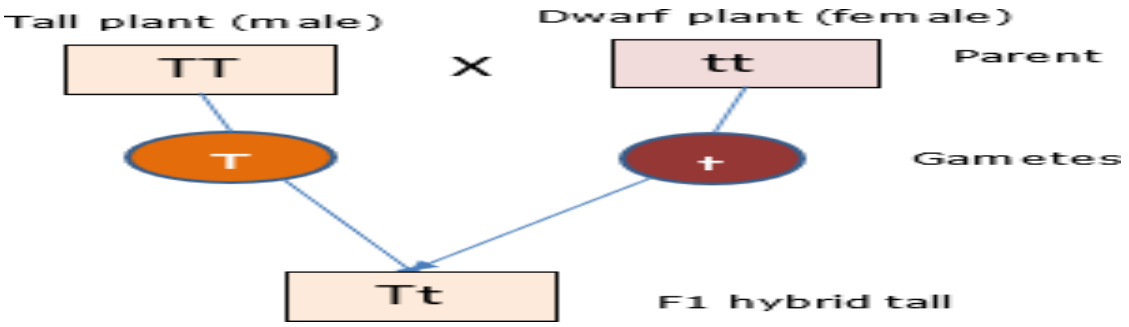
- The processoftransmissionofcharactersfromparentstooffspringisknownasinheritance..
- Geneticsisthesciencethatdealswithhereditvandvariation.
- Variation: Small changes / modifications in a particular character that are visible between parents and Off springs
- **GregorJohann *Mendel***isknownas the**—fatherofgenetics**‖.

Importance of variations

- Variationenablesorganismstoadjustandadaptbetteraccordingtothechangingconditions of the environment (Survivaladvantage),
- Differentkinds ofvariationsinorganismsleadtothedevelopmentofnewspecies.

MENDEL'S LAW OF INHERITANCE

- The Law ofDominance
- The Law ofSegregation
- The Law of IndependentAssortment



Law of Dominance: When parents having pure contrasting characters are crossed then only one character expresses itself in Heterozygous Two different alleles are present together. E.g.-Tt Genotype It is the genetic makeup of an individual. E.g.- TT, tt, Tt Phenotype It is an observable feature. E.g.- tall, dwarf Monohybrid cross Cross to observe a single character.

Gregor Johann *Mendel* is known as the **—father of genetics**‖. Mendel worked on Pea plant (***Pisumsativum***).

Advantages of using pea plant are- availability of pure line plant, clearly visible observable characters, contrast characters of same features, easily pollinated (self and cross) etc.

- Heworkedon7contrastingfeaturesofpeaplant.E.g.Heightofplant,flowercolour, seedcolour,seedshape,podcolour,podshapeandpositionofflower.
- HeconductedmonohybridandDihybridcross.theF1generation.Thischaracteristhedominantcharacter and the character/factor which cannot express itself is called the recessivecharacter.

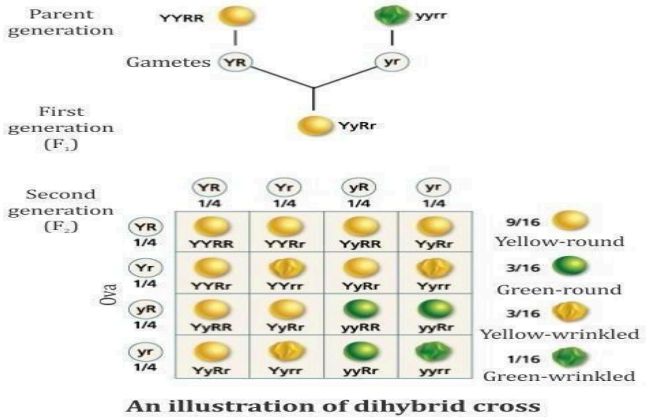
Law of segregation: The phenomenon of separation of the two alternating factors of one character, during gamete formation so that one gamete receives only one factor of a character

Law of Independent Assortment-

'When two pairs of traits are combined in a hybrid, segregation of one pair of characters is independent of the other pair of characters'.

- **Dihybridcross**.Hecrossesbreedpeaplantsbearingroundgreenseed(RRyy)withplantsbearingwrinkled and yellow seeds(rrYY).
- In the F1 generation he obtained all round and yellow seeds it means round and yellow traits of seeds are dominant features while wrinkled and green arerecessive.

- He self-crossed the plants of F1 and found that in F2 generation four different types of seeds round yellow, round green, wrinkled yellow an wrinkled green in the ratio of **9 : 3 : 3: 1** are present

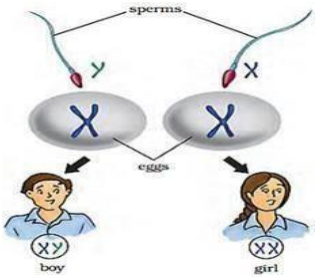


An illustration of dihybrid cross

SEX DETERMINATION IN HUMAN

The process of determining the sex of an individual, based on the composition of the genetic makeup is called sex determination.

- Human has 23 pair ofchromosomes.
- Autosome: 22 pairs(44)



- Sex chromosomes: 01 pair (02). They may beeither- i-Homogametic – XX for female (44+XX)

ii- Heterogametic XY for male (44 +XY)

In some organism-environment also plays a crucial role in the determination of sex-

- InsomeReptiles:Thetemperatureatwhichafertilizedeggisincubatedgovernsthegender.
- Snails: A particular animal can change gender within one ‘slifetime.

Gene: Mendel used the term factor for a gene. A gene is the unit of DNA responsible for the inheritance of character.

Allele: A pair of genes that control the two alternatives of the same character e.g., TT/tt.

Heterozygous: The organism in which both the genes of a character are unlike e.g. Tt.

Homozygous: The organism in which both the genes of a character are similar e.g., TT, tt.

Dominant: The gene which expresses itself in F1 generation is known as dominant gene.

Recessive: The gene which is unable to express itself in presence of the dominant gene.

Genotype: It is the genetic constitution (genetic makeup) of an organism which determines the characters.

Phenotype: It is the physical appearance of an individual. (Tall or short)

Accumulation of Variations

Genetics: Branch of science that deals with heredity and variation.

Heredity: It means the transmission of features/ characters/ traits from one generation to the next generation.

Variation: The differences among the individuals of a species/ population are called variations.

There are two types ofvariations:

Somatic variation: Takes place in the body Example: boring of pinna, cutting of tails in dogs.

Genetic variation: Takes place in the gametes/cells. (Reproductive cells)
Example: human height, skin colour.

Traits: Trait is a specific characteristic of an individual . Traits can be determined by genes,

environmental factors or by a combination of both. Traits are essentially physical characteristics. These include length of the body, body shape, colour pattern, eyesight.

Traits are of two types:
Acquired: Those characters which are obtained during the lifetime by any organism. For example - dancing, swimming, cycling, knowledge etc.

Inherited : Those characters which are present since birth and can be transferred from one generation to another. For example- eye colour, hair colour, height, complexion etc. Accumulation of Variation during Reproduction.

CBQ

Readthepassagegivenbelowandanswerthefollowingquestions:

Kunal performed an experiment to study the inheritance pattern of genes, he crossed tall pea plants (TT) with short pea plants (tt) and obtained all tall pea plants in F1generation.

Q1-what will be the set of genes present in the F1 generation?Ans-Tt

Q2-Give reasons why only tall plants are observed in the F1 progeny.
Ans- Traits like T are called dominant traits, while those that behave like t are called recessive traits. So as a reason of dominant trait T, all plants are tall in F1generation.

Q3-When F1 plant was self pollinated, a total of 800 plants were produced. How many of these would be tall, medium height or short? Give the genotype of F2generation.
Ans- Out of 800 plants, 600 will be tall and 200 will be short in height. 1TT: 2Tt: 1tt

MCQ

Q4-Exchange of genetic material takes place in?
a)vegetativereproduction b)asexualreproduction c)sexualreproduction d)budding
Answer: c) sexual reproduction

Q5- Which of the following statement is incorrect?
a)for every hormone there is agene
b)for every protein there is agene
c)for production of every enzyme there is agene
d) for every molecule of fat there is a gene
Answer: d) for every molecule of fat there is agene

Q6- The maleness of a childid determined by_
a)the X chromosome in thezygote
b)the y chromosome in thezygote
c)the cytoplasm of the germ cell which determines thesex
d)sex is determined bychance
Answer: b) the y chromosome in the zygote

Q7- Select the statement that determines the characteristics of genes.
a)genes are specific sequence of bases in a DNAmolecule
b)a gene does not code forproteins
c)intheindividualsofagivenspecies,aspecificgeneis locatedonaparticularchromosome
d)each chromosome only has onegene
1-aandb 2-aandc 3-aand d 4-b and d

Answer: 2-a andc

Q8-Inpeas,apuretallplant(TT)iscrossedwithashortplant(tt).Theratiooftallplantstoshortplantsin F2is?

a)1:3b)3:1c)1:1d)2:1Answer: b) 3:1

Q9-A zygote which has a X chromosome inherited from the father will develop into a:
a)boy b)girlc)X chromosome does not determine the gender of thechild.d)either boy or a girl
Answer: b)girl

Very Short Questions

Q10, Define Alleles.

Ans, Genes which code for a pair of contrasting traits as alleles, e.g. the different forms of the same genes.

Q11, What is the function of a gene?

Ans, Gene is the carrier of genetic information from one generation to the next.

Q12, What is a sex chromosome?

Ans, Sex chromosome is a chromosome that operates in the sex determining mechanism of a species.

Q13, Write the expanded form of DNA. Ans,
Deoxyribonucleic Acid

Q14, Name the characters that show their existence in F1 generation. Ans,
Dominant Characters

Short Questions

Q15, List two differences in dominant traits and recessive traits.

Dominant Traits	Recesseive traits
1. The trait which appears in the F1 progeny is dominant.	**1.** The trait which remains hidden, or which does not appear in the F1 progeny is the recessive trait.
2. It appears in more numbers	**2.** It appears in less numbers

Q16, Why did Mendel choose pea plants for his experiments?

Ans, i) easy to grow.

ii) shortlifespan

iii) easily distinguishablecharacters

iv) larger size offlower

Q17, What are acquired traits? Why are these traits generally not inherited over generation? Explain.

- Acquiredtraitsarethosetraitswhichanindividualacqiresafterbirthduringitslifetime.
- These are changes in non-reproductivetissues.
- TheDNAor geneofthe germcellsisnotinfluenced/changedbythesecharactershence,theycannot be passed on to the nextgeneration.

Q18, What are the rules of inheritance?

Ans. One the basis of his experiments Mendel established some rules which are called rules of inheritance, they are:

i)Law ofDominance

ii) Law ofSegregation

iii) Law of IndependentAssortment

Q19, Mention four characteristics of a gene.Ans, i)
Gene is a unit of inheritance.

ii) Itis asegmentoffunctionalDNAon achromosomeoccupyingaspecificposition.

iii) Itis aunitofgeneticinformationwhichcodesforaspecifictraitorproteinsynthesis.

iv) It can maintain uniformity throughgenerations.

Long Questions

Q20, Make a representation of a dihybrid cross showing a phenotypic ratio of 9:3:3:1.
Ans, Fig 9.5, Page no. 145, NCERT

Q21, Describe Law of Dominance, The Law of Segregation and the Law of Independent Assortment.

Ans,**Low of dominance**: - When parents having pure contrasting characters are crossed then only one character expresses itself in the F1 generation. This character is the dominant character and the character/factor which cannot express itself is called the recessive character.

Law of segregation: - The phenomenon of separation of the two alternating factors of one character, during gamete formation so that one gamete receives only one factor of a character is called as Law of Segregation.

Law of independent assortment: the alleles of two (or more) different genes get sorted into gametes independently of one another.

Q22, a) What is the Law of Dominance of traits?
b) Why are the traits acquired during the lifetime of an individual is not inherited?
Ans, a) Law of Dominance: Mendel took pea plant and carried two contrasting characters (tall and short) and cross pollination done among them. The traits which get expressed in F1 generation are called dominant and which are unexpressed are called recessive which reappears in F2 generation. This is called law of dominance..
b) Certain experiences and traits acquired by people in their lifetime are not passed on to their next generations because these traits do not change the gene/DNA of the germ cell.Q23, Give basic features of the mechanism of inheritance.
Ans, i) Characters are controlled by genes.
ii) Each gene controls one character.
iii) There maybe two or more forms of gene.
iv) One form may be dominant over other.
v) Genes are present on chromosomes.
vi) An individual has two forms of gene whether similar or dissimilar.
vii) The two forms separate from each other at the time of gamete formation.
viii) The two forms are brought together in the zygote.

Q24, How did Mendel explain that it is possible that a trait is inherited but not expressed in an organism. Ans, i) Dominant traits are those which expresses itself in the F1 generation.
Recessive traits are those traits which remain hidden or does not express itself in the F1 generation.
ii) Yes it is possible that a trait is inherited but is not expressed.
For Example, when pure tall pea plants are crossed with pure dwarf pea plants, only tall pea plants are obtained in the F1 generation.
On selfing tall plants of F1, both tall and dwarf plants are obtained in the F2 generation in the ratio 3:1.

Reappearance of the dwarf character, a recessive trait in F2 generation shows that the dwarf trait was present in the individuals of F1 generation, but it did not express.

Assertion and Reason Questions
Read the sentences carefully and choose the correct alternative from the following :-

a) Both the assertion and reason are correct, and reason is the correct explanation of the assertion.
b) The assertion and the reason are correct, but the reason is not the correct explanation of the assertion.
c) Assertion is true, but reason is false.
d) The statement of the assertion is false, but the reason is true.

Q25, Assertion: Variation is high in sexually reproducing organisms compared to asexually reproducing organisms.
Reason: Inaccuracies during DNA copying gives rise to variation.Ans, b)

Q26, Assertion: Height in pea plants is controlled by efficiency of enzymes and thus is genetically controlled. Reason: Cellular DNA is the information source for making proteins in the cell. Ans, a)

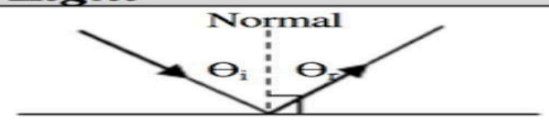
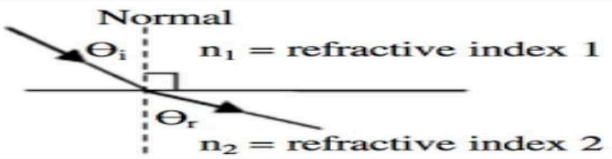
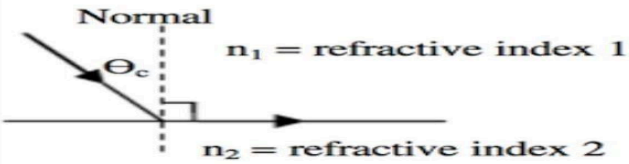
Q27, Assertion: Each and every child has two versions of DNA both paternal and maternal.
Reason: Both the father and the mother contribute equal amount of genetic material Ans, a)

Q28, Assertion: The sex of a newborn individual is always genetically determined.
Reason: Snails can change their sex depending on the temperature at which the fertilized eggs are kept.

Ans, d)

CHAPTER-9

LIGHT-REFLECTION AND REFRACTION

Light	
Law of Reflection $\Theta_i = \Theta_r$ Θ_i = angle of incidence Θ_r = angle of reflection	
Snell's Law (refraction) $n_1 \text{Sin}\ \Theta_i = n2\text{Sin}\ \Theta_r$ Θ_i = angle of incidence Θ_r = angle of refraction	
Critical angle $\sin \Theta_c = \frac{n_2}{n_1}$ (special case of Snell's law where $\Theta_r = 90°$)	
Refractive Index $n = \frac{c}{v}$ (n of air ≈ 1)	c = speed of light in vacuum. v = speed of light in medium Higher reflective index of a medium means light travel slower in the medium
Magnification $M = \frac{h_i}{h_o} = \frac{d_i}{d_o}$	M = magnification h = height d = distance from lens Subscript i = image Subscript o = object

- Light is a form of energy that produces in us the sensation of sight.

In a plane mirror, the image of a real object is always
(i) virtual,
(ii) erect
(iii) of same size as the object,
(iv) as far behind the mirror as the object is in front of the mirror.
(v) laterally inverted

Image formation by Concave Mirror Figure 10.7 illustrates the ray diagrams for the formation of image by a concave mirror for various positions of the object. (b) Figure 10.8 Formation of image by a convex mirror

- Absolute refractive index(n) of a medium is the ratio of speed of light in vacuum or air(c) to the speed of light in the medium(v) i.e.

$$n = \frac{c}{v}$$

- Refraction of light is the phenomenon of change in the path of light in going from one medium to another.
- In going from a rarer to a denser medium, the ray of light bends towards normal and in going from a denser to a rarer medium, the ray of light bends away from normal.
- Snell's law of refraction,

$$\frac{\sin i}{\sin r} = \frac{n_2}{n_1} = {}^1n_2$$

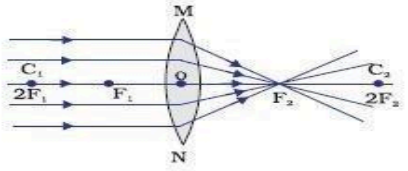
- No refraction occurs, when

  (i) light is incident normally on a boundary,
  (ii) refractive indices of the two media in contact are equal.

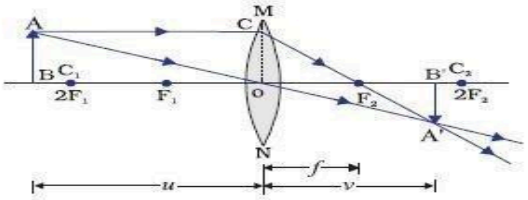
- $n_{21} = \frac{n_2}{n_1} = \frac{v_1}{v_2}$
- Lens formula : $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

Refraction by Spherical Lenses

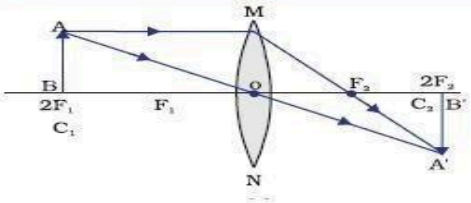
IMAGE FORMATION IN CONVEX LENSE



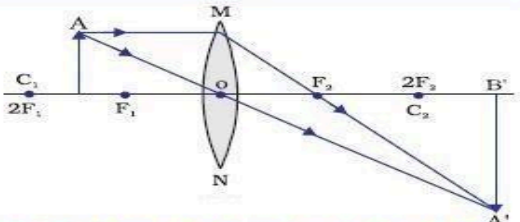
Case (i) Object at infinity



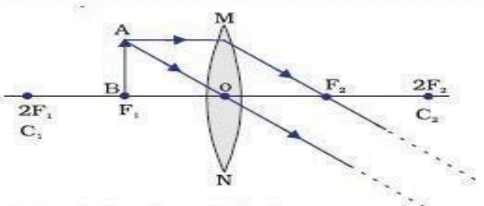
Case (ii) Object at beyond 2f



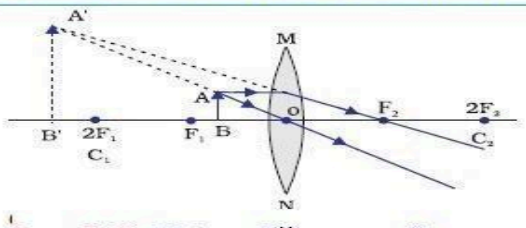
Case (iii) Object at 2f



Case (iv) Object in between f and 2f

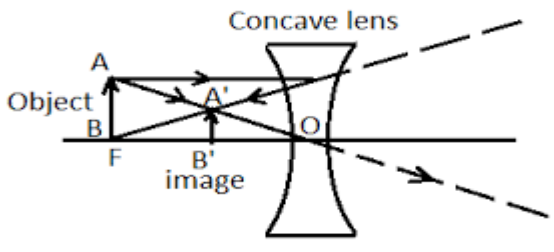


Case (v) Object at f



Case (vi) Object distance < f

IMAGE FORMATION IN CONCAVE LENSE



- Mirror formula: $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$

- The linear magnification produced by a lens is $m = \frac{h'}{h} = \frac{v}{u}$
- Linear magnification produced by a spherical mirror is

$$m = \frac{-v}{u} = \frac{\text{size of image } (h_2)}{\text{size of object } (h_1)}$$

- For a convex mirror, *m* is +ve and less than one, as the image formed is virtual, erect and shorter than the object.
- For a concave mirror, *m* is +ve when image formed is virtual and *m* is –ve, when image formed is real.

.

- • Power of the combination of lenses

$P = p_1 + p_2 + p_3 \ldots$

Power of a Lens

The power of a lens is the reciprocal of its focal length i.e. 1/f (in metre). The SI unit of power of a lens is dioptre (D).

MCQs

Question 1. An object is placed at a distance of 0.25 m
in front of a plane mirror. The distance between the object and image will be
(a) 0.25 m (b) 1.0 m (c) 0.5 m (d) 0.125 mAnswer: c

Question 2. The angle of incidence for a ray of light having zero reflection angle is
(a) 0 (b) 30° (c) 45° (d) 90°Answer: a
Question 3. An object at a distance of 30 cm from a
concave mirror gets its image at the same point. The focal length of the mirror is
(a) – 30 cm (b) 30 cm (c) – 15 cm (d) +15 cmAnswer: c

Question 4. The refractive index of transparent medium is greater than one because
(a) Speed of light in vacuum < speed of light in tansparent medium (b) Speed of light in vacuum > speed of light in tansparent medium
(c) Speed flight in vacuum = speed of light in tansparent medium
(d) Frequency of light wave changes when it moves from rarer to denser mediumAnswer: b
Question 5. The refractive index of water is 1.33. The speed of light in water will be
(a) 1.33×10^8 m/s (b) 3×10^8 m/s (c) 2.26×10^8 m/s (d) 2.66×10^8 m/sAnswer: c

VERY SHORT QUESTIONS

6..What kind of mirrors are used in big shopping stores to watch activities of customers? ANS:-Convex mirror 7..The magnification produced by a plane mirror is +1. What does it mean? ANS:- The magnification produced by a plane mirror is +1 which means that size of image formed is exactly equal to the size of the object and is formed behind the mirror. The positive sign shows that the image formed is virtual and erect.

8. Name the mirror which can show the size of the object to be double of its original.ANS Concave mirror

9.State the two laws of reflection of light. (Delhi 2011)
Answer:
Laws of reflection of light states that
(i) The angle of incidence is equal to the angle of reflection.
(ii) The incident ray, the reflected ray and the normal to the mirror at the point of incidence all lie in the same plane.

10. List four characteristics of the images formed by plane mirrors.
Answer:
Characteristics of the image formed by a plane mirror are
(i) imagedistanceissameasthatofobjectdistance
(ii) image formed is virtual and erect
(iii) image formed is of the same size as that of the object
(iv) image formed is laterally inverted (left appears right and right appears left).

SHORT ANSWER TYPE QUESTIONS

11. The magnification produced by a spherical mirror is -3". List four informations you obtain from this statement about the mirror/ image

Answer:

Negative sign of magnification indicates that the image is real and inverted. Since the image is real and inverted, the mirror is concave and magnification of -3 indicates that the image is magnified.

12, Find the focal length of a lens of power -2.0 D. what type of lens is this?

ANS

Given, lens of power **P=(−2.0)D**

Power, **P=1/f f=1/p =−1/2 f=−0.5 m**Since focal length is negative, it is concave lens.

13.An object is placed at a distance of 30 cm in front of a convex mirror of focal length 15 cm. Write four characteristics of the image formed by the mirrorAnswer:

Four characteristics of the image formed by the given convex mirror are :

(i) Virtual,Erect,Diminished, Image is always formed behind the mirror between pole and focus

14.Name the type of mirrors used in the design of solar furnaces. Explain how high temperature is achieved by this device.

Answer:

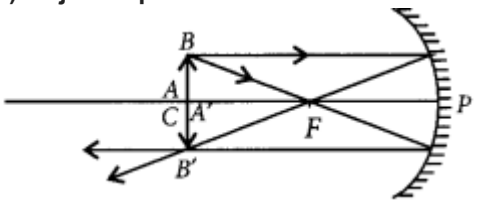
Concave mirrors are used in the designing of solar furnaces., it focuses a parallel beam of light on the furnace. Therefore, a high temperature is attained at the point after some time.

15.The linear magnification produced by a spherical mirror is -1. Analysing this value state the (i) type of mirror and (ii) position of the object with respect to the pole of the mirror. Draw any diagram to justify your answer.

Answer:

(i) Concave mirror because the image is real, inverted.

(ii) Object is placed at C.



LONG ANSWR TYPE QUESTIONS

16.A concave mirror has a focal length of 20 cm. At what distance from the mirror should a 4 cm tall object be placed so that it forms an image at a distance of 30 cm from the mirror? Also calculate the size of the image formed.

Answer:

Given f = -20 cm v = -30 cm u = ?

Using $1v + 1u = 1f$

$1u = 1f – 1v = 1−20 – 1−30 = −3+260$

⇒ u = -60 cm

∴ Object placed at 60 cm from the mirror.

Also magnification, $m = h′h = −vu$

⇒ $h' = −(−30)−60 × 4 = -2$ cm

∴ The size of the image is 2 cm.

17.(a) Water has refractive index 1.33 and alcohol has refractive index 1.36. Which of the two medium is optically denser? Give reason for your answer.

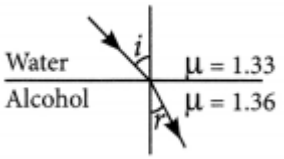
(b) Draw a ray diagram to show the path of a ray of light passing obliquely from water to alcohol.

(c) State the relationship between angle of incidence and angle of refraction in the above case. (2020)

Answer:

(a) Here, alcohol is optically denser medium as its refractive index is higher than that of water. When we compare the two media, the one with larger refractive index is called the optically denser medium than the other as the speed of light is lower in this medium.

(b) Since light is travelling from water (rarer medium) to alcohol (denser medium), it slows down and bends towards the normal.



where i = angle of incidence and r = angle of refraction.

(c) According to Snell's law,

$sini/sinr=μalcohol /μwater =1.36/1.33 = 1.0225$

∴ $\sin i = 1.0225 × \sin r$

18. The image of a candle flame placed at a distance of 40 cm from a spherical lens is formed on a screen placed on the other side of the lens at a distance of 40 cm from the lens. Identify the type of lens and write its focal length. What will be the nature of

the image formed if the candle flame is shifted 25 cm towards the lens? Draw a ray diagram to justify your answer. (Foreign 2014)
Answer:.

19. Rishi went to a palmist to show his palm. The palmist used a special lens for this purpose.
(i) State the nature of the lens and reason for its use.
(ii) Where should the palmist place/hold the lens so as to have a real and magnified image of an object?
(iii) If the focal length of this lens is 10 cm, the lens is held at a distance of 5 cm from the palm, use lens formula to find the position and size of the image. (2020)

20.Thus, the image will be formed at 10 cm on the same side of the palm and the size of the image will be enlarged.The refractive index of a medium V with respect to a medium 'y' is 2/3 and the refractive index of medium 'y' with respect to medium 'z' is 4/3. Find the refractive index of medium 'z with respect to medium V. If the speed of light in medium 'x' is 3×10^8 m s^{-1}, calculate the speed of light in medium 'y'. (2020)

Following questions consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

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

21. Assertion(A) : Concave mirrors are used as make-up mirrors.
Reason (R) : When the face is held within the focus of a concave mirror, then a diminished image of the face is seen in the concave mirror. Answer(c)) A is true but R is false.

22.Assertion (A) : A ray of light passing through the centre of curvature of a spherical mirror retraces its path after reflection from the mirror.
Reason (R) : A ray of light passing through the centre of curvature of a spherical mirror is incident normally on the surface of the mirror.
A Both (A) and (R) are true and (R) is correct explanation of the assertion.

23. Assertion (A) : Glass is optically denser than water.
Reason (R) : An optically denser medium is that in which speed of light is comparatively less.
A Both (A) and (R) are true and (R) is correct explanation of the assertion.

24.Assertion (A) : A convex lens is called a convergent lens but a concave lens acts as a divergent lens.
Reason (R) : A convergent lens is that which always forms a real image of a real object and a divergent lens is that which can never form a real image.**C**(A) is true but (R) is false.

25.Assertion (A) : Speed of light in water is $2.25 \times 108 ms-1$
Reason (R) : The refractive index of water is 4/3.
A Both (A) and (R) are true and (R) is correct explanation of the assertion.

CASE BASED QUESTIONS

Read the following and answer any four questions from (i) to (v).

26.The spherical mirror forms different types of images when the object is placed at different locations. When the image is formed on screen, the image is real and when the image does not form on screen, the image is virtual. When the two reflected rays meet actually, the image is real and when they appear to meet, the image is virtual.

(i) When an object is placed at the centre of curvature of a concave mirror, the image formed is
(a) larger than the object (b) smaller than the object
(c) same size as that of the object (d) highly enlarged.Answer: (c)

(ii) No matter how far you stand from a mirror, your image appears erect. The mirror is likely to be
(a) plane (b) concave (c) convex (d) either plane or convex.Answer: (d)

(iii) A child is standing in front of a magic mirror. She finds the image of her head bigger, the middle portion of her body of the same size and that of the legs smaller. The following is the order of combinations for the magic mirror from the top.
(a) Plane, convex and concave (b) Convex, concave and plane
(c) Concave, plane and convex (d) Convex, plane and concaveAnswer: (c)

(iv) To get an image larger than the object, one can use
(a) convex mirror but not a concave mirror (b) a concave mirror but not a convex mirror(c) either a convex mirror or a concave mirror (d) a plane mirror. Answer: (b)

(v) A convex mirror has wider field of view because
(a) the image formed is much smaller than the object and large number of images can be seen.
(b) the image formed is much closer to the mirror
(c) both (a) and (b)
(d) none of these. Answer: (c)

Read the following and answer any four questions from (i) to (v).

27. The lenses forms different types of images when object placed at different locations. When a ray is incident parallel to the principal axis, then after refraction, it passes through the focus or appears to come from the focus.When a ray goes through the optical centre of the lens, it passes without any deviation. If the object is placed between focus and optical center of the convex lens, erect and magnified image is formed.As the object is brought closer to the convex lens from infinity to focus, the image moves away from the convex lens from focus to infinity. Also the size of image goes on increasing and the image is always real and inverted.

(i) **The location of image formed by a convex lens when the object is placed at infinity is**
(a) at focus (b) at 2F
(c) at optical center (d) between Fand 2F
Answer: (a) **(ii) When the object is placed at the focus of concave lens, the image formed is**
(a) real and smaller (b) virtual and inverted
(c) virtual and smaller (d) real and erectAnswer: (b)
(iii) The size of image formed by a convex lens when the object is placed at the focus of convex lens is
(a) small (b) point in size
(c) highly magnified (d) same as that of object

Answer: (c)
(iv) When the object is placed at 2F in front of convex lens, the location of image is
(a) at F (b) at 2 F on the other side
(c) at infinity (d) between F and optical center Answer: (b)

(v) At which location of object in front of concave lens, the image between focus and optical centre is formed
(a) anywhere between centre and infinity (b) at F
(c) at 2F(d) infinity Answer: (a)

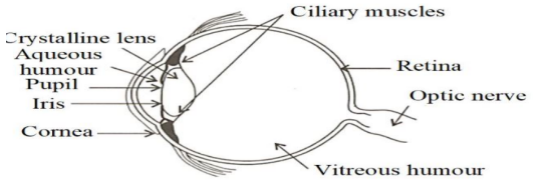
When the rays of light travels from one transparent medium to another, the path of light is deviated. This phenomena is called refraction of light. The bending of light depends on the optical density of medium through which the light pass.

Chapter 10

HUMAN EYE AND COLOURFUL WORLD

Structure of the Human Eye

Ahumaneyeisroughly2.3cmindiameterandisalmostasphericalballfilledwithsome fluid.Itconsistsofthefollowingparts:



- **Sclera:**Itistheoutercovering;aprotectivetoughwhitelayercalledthesclera(whitepart of theeye).

- **Cornea:**Thefronttransparentpartofthescleraiscalledthecornea.Lightenterstheeye through thecornea.

- **Iris:**Adarkmusculartissueandring-likestructurebehindthecorneaisknownastheiris. Thecolouroftheirisindicatesthecolouroftheeye.Theirisalsohelpsregulateoradjust exposurebyadjustingtheiris.

- **Pupil:**Asmallopeningintheirisisknownasapupil.Itssizeiscontrolledbythehelpofthe iris.Itcontrolstheamountoflightthatenterstheeye.

- **Lens:**Behindthepupil,thereisatransparentstructurecalledalens.Bytheactionof ciliarymuscles,itchangesitsshapetofocuslightontheretina.Itbecomesthinnertofocus ondistantobjectsandbecomesthickertofocusonnearbyobjects.

- **Retina:**Itisalight-sensitivelayerthatconsistsofnumerousnervecells.Itconvertsimages formedbythelensintoelectricalimpulses.Theseelectricalimpulsesarethentransmitted tothebrainthroughopticnerves.
- **Opticnerves:**Opticnervesareoftwotypes.Theseincludeconesandrods.

1. **Cones:**Conesarethenervecellsthataremoresensitivetobrightlight.Theyhelpin detailedcentralandcolourvision.

2. **Rods:**Rodsaretheopticnervecellsthataremoresensitivetodimlights.Theyhelpin peripheralvision.Atthejunctionoftheopticnerveandretina,therearenosensorynerve cells.So,novisionispossibleatthatpointandisknownasa**blindspot.**Aneyealsoconsists ofsixmuscles.Itincludesthemedialrectus,lateralrectus,superiorrectus,inferiorrectus, inferioroblique,andsuperioroblique.Thebasicfunctionofthesemusclesistoprovide differenttensionsandtorquesthatfurthercontrolthemovementoftheeye.

DEFECTS OF HUMAN EYES

.Myopia

Near-sightedness,ormyopia,isthedefectofvisionduetowhichapersoncan. seenearbyobjectsclearlybutfinditdifficulttoseefar-offobjectsdistinctly.
Inamyopicperson'seye,thereisabulgearoundthecornea,causingareductioninthe radius of the curvature of the whole eye, and hence, the focal length of the eye is

decreased.Theeyebecomesunabletofocustheimageofdistantobjectsattheretinaas theeyeballislonger(fromfronttoback)thannormal.Thiscausesimagestobefocusedin frontoftheretinainsteadofontheretina.Thus,theimageisformedneartheeyelens; thatiswhythiseyedefectiscallednear-sightednessormyopia.Asaresultofthisdefectof vision,thedistantobjectslookblurred.Themaximumdistanceatwhichamyopiceyecould seeanobjectisknownasitsfarpoint;beyondthisfarpoint,animageisformednearthe eyelensinsteadofattheretina. Myopiacanbecorrectedwithconcavelenses.Thelensesfocusimagesfarther. backintheeye,sotheyfallontheretinainsteadofinfrontofit.

Causes of Myopia

It is caused due to:

1. Highconvergingpoweroftheeyelens(becauseofitsshortfocallength):Due tothehighconvergingoftheeyelens,theimageisformedinfrontoftheretina,anda personcannotseedistantobjects.

2. Eyeballbeingtoolong,orcorneabulged:Iftheeyeballistoolong,thenthe retinaisatalargerdistancefromtheeyelens.Inthiscase,theimageisalso. formedinfrontoftheretinaeventhoughtheeye-eyelenscorrectsconverging. power.

3. Hereditaryorduetouncontrolleddiabetesorunattendedcataract growths.

(NORMAL VISION & MYOPIA)

Correction

Myopiceyesdonotdivergelightraysfromfar-offobjects;hence,afocused. imagecannotbeformedontheretina.Instead,theraysconvergemuchbefore theyreachtheretina.*Myopiaorshort-sightednesscanbecorrectedbywearing*. *spectaclescontainingaconcavelens.*Whenaconcavelensofsuitablepoweris usedforthemyopiceye,theconcavelensfirstdivergestheparallelraysoflight. fromadistantobject.Therefore,first,avirtualimageisformedatthefarpoint. ofthemyopiceye.Then,sincetheraysoflightappeartobecomingfromthe eye'sfarpoint,theyareeasilyfocussedbytheeyelens,andtheimageisformed. ontheretina.Thus,aconcavelensisusedforamyopiceyetodecreasethe convergingpoweroftheeyelens.

Causes of Hypermetropia

It is caused due to:

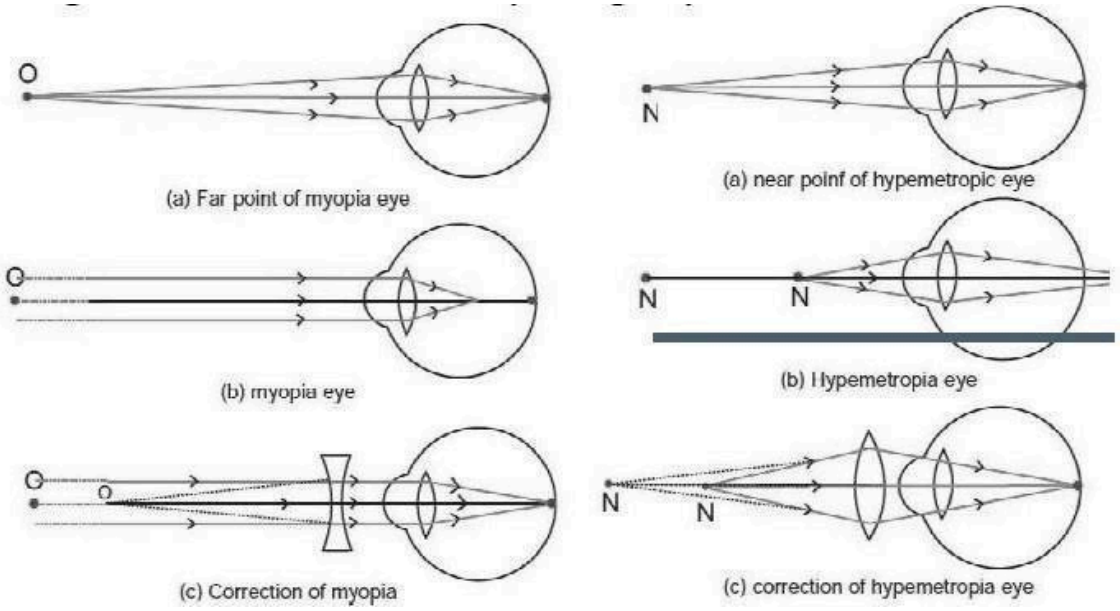
Lowconvergingorfocusingpowerofcrystallineeyelens(becauseofits large focallength)
Eyeball being tooshort.
.**Hypermetropia**canbepresentinbabiesatthetimeoftheirbirth,butasthey growolder,theeyeballlengthenstonormal,andthedefectiscurednaturally. **Correction** The near point of an eye having hypermetropia is more than 25cm. 25cm. *Therefore, this defect can be corrected by putting a convex lens in front of the eye*. When a convex lens of suitable power is placed in front of the hypermetropiceyes,theconvexlensfirstconvergesthedivergingraysoflight. comingfromanearbyobjectneartheeye,whichisthevirtualimageofthe nearbyobjectformed.Sincethelightraysnowappeartobecomingfromthe eyesnearpoint,theeyelenseasilyfocusesandformstheimageontheretina. Thus,aconvexlensisusedforhypermetropiatoincreasetheconvergingpower. of the eyelens. Thehypermetropiceyehaspositivepower.Thisindicatesthatthecorrective. lensrequiredisconvex.Suchlensesaremainlyusedduringreadingorusing laptops.

Presbyopia

Theeyeslosetheirpowerofaccommodationwithageing.Aspeoplegrowold,thegradual

weakeningoftheciliarymusclesanddiminishingflexibilityofthe eyelensresultsinthehardeningoftheeyelens,makingitmoredifficultfortheeyetofocus oncloseobjects.Thiscausesthenearpointtorecedeawayinolderpeoplegradually.Asa result,thesepeoplemayfinditdifficulttoseenearby. objectsdistinctlywithoutcorrectiveeyeglasses.Thisdefectoffarsightedness causedbythelossofelasticityoftheeyelensiscalledpresbyopia.Sometimes, apersonmayhavebothfarsightednessandshort-sightedness.Peoplesuffering frompresbyopiaoftenrequirebi-focallenses

Astigmatism-Ahumaneyewhichcannotfocusonbothhorizontalandverticallines simultaneously suffers fromastigmatism.
Astigmatism can be corrected by using a cylindrical lens.



Cataract-Ahumaneyeinwhichanopaquemembraneisformedovertheeyelenssuffers fromcataract.Cataractcanbecorrectedbyperformingsurgery.

Prismisahomogenoustransparentrefractingmediumboundedtwonon-parallelsurfaces inclined at someangle.

Angleofprism-Theanglebetweentwonon-calledangleofprism.

Angleofdeviation-Theanglebetweenthedirectionsofincident and the emergent ray of light is called angle of deviation of passing through theprism.

Dispersion of white light- The phenomenon of splitting white reset infinity.sightedness.seeclearlythedistantobjectsissaidtobelength. erectedbi-focallensconsistingofaconcaveandconvexlens. ned non-parallel refracting the e by at least surfaces is ray of light. rayoflightintosevencolourswhenitpassesthroughaglassprismiscalleddispersionof whitelight.

Spectrum-Abandofsevencoloursofwhitelightiscalledspectrum.Redcolourdeviatestheleastwhilepassingthroug haglassprism. Violet colourdeviates the most while passing through a glass prism.
Glassprismsplitscoloursofwhitelightpassingthroughitanddoesnotproduceanycolourbyitself.
Rainbow is the example of dispersion of sunlight.
Rainbow is formed by tiny drops of water suspended in the atmosphere.

Atmosphericrefraction-Therefractionoflighttakingplaceintheatmosphereisknownas atmosphericrefraction.

Twinklingofstarstakesplaceduetoatmosphericrefractionoflightemittedbythestars.
Whenlightfallsontinyparticles,thislightisabsorbedbytheseparticles.Thenthese particlesre-emitlightinalldirections.ThisprocessisknownasScatteringoflight.Inaclear

atmosphereoftheearth,coloursofsmallwavelengthslikeviolet,andbluearescattered more than redcolour. Inapollutedatmosphereoftheearth(containingdustandsmokeparticles),thescattering ofcoloursofhigherwavelengthsismorethanthescatteringofsmallerwavelengths.

Case Based Questions:

Astudentsittingofthebackbenchinaclasshasdifficultyinreading.Heobservedthathe hasnodifficultyinreadingifheseatedatfrontseatofclass.Doctorprescribedhima suitablelensofnegativepowerandexplainhimthatthislensshiftstheimagebackintothe retinainsteadofinfrontofit.heisnowabletoreadtheblackboardwhilesittingattheback benchintheclass:----

Q-1:Namethedefectofvisioninthestudenteye?Ans-Myopia

Q-2:Ifthedoctorprescribesthelensofpower-0.5Dwritethetypeofthelenses?
Ans: Power of lens=-0.5Dconcave lens.

Q-3:Whythestudentisunabletoseedistantlywrittenontheblackboardfromtheback benchoftheclass:
Ans:Lightrayscomingfromtheblackboardtothebackbenchoftheclasslikearayscoming frominfinity,andtheyareconvergedbythedefectiveeyelensmuchbeforeretinadueto increasingconvergingpowerofthelens.sothewordwrittenontheblackboardlooks blurred.

Q-4No In an experiment Radha used an equilateral triangular glass prism and projected a narrow beam of white light source from one side of the surface of the prism. she placed a screen on the other side and saw many coloured appearing as patches on the screen but when she used a red light source she could only see a red patch on screen similarly she used a blue and green light source could only see one colour patch on both occasions.

a. State the phenomenon that she was trying to demonstrate .

b. Give reason why she could not see any other colour when the red light was used ?

c. She also could relate to another natural phenomenon that we observe on a rainy humid day as sun comes out.

what could be that phenomenon ? Or

d. State the reason that Radha can give to her friends to explain the phenomenon observed by her in the experiment.

Ans.

a. Dispersion b. Red colour is monochromatic .i.e. red colour have single wavelength. c. Rainbow

d. Different wavelength travel at different speed in the glass Prism.

MCQ

Q5, the Twinkling of stars is due to atmospheric.

a. Dispersion of light due to waterdroplets
b. Refractionoflightbydifferentlayersofvaryingrefractiveindices
c. Scattering of light by dustparticles
d. Internal reflection of light byclouds

Ans, b) Refraction of light by different layers of varying refractive indices

Q6, Which of the following statements is correct?

a. A person with myopia can see distant objectsclearly.
b. A person with hypermetropia can see nearby objectsclearly.
c. A person with myopia can see nearby objectsclearly.
d. A person with hypermetropia cannot see distant objectsclearly. Ans, c) A person with myopia can see nearby objectsclearly.

Q7, The focal length of the eye lens increases when eye muscles.

a. Are relaxed and the lens becomesthinner.
b. Contract and lens becomethicker.
c. Are relaxed and the lens becomesthicker.
d. Contract and lens becomethinner.

Ans, a) Are relaxed and the lens becomesthinner.

Q8, When light rays enter the eye, most of the refraction occurs at the

a. Crystallinelens
b. The outer surface of thecornea
c. Iris
d. PupilAns, b) The outer surface of the cornea

Q9, The near point and the far point are determined with regard to the function of which part of the eye?

a. Pupil b)Retina c)Eyeball d)Ciliary musclesAns, d)Ciliarymuscles

Very Short Questions

Q10, Which defect of the eye can be corrected using a cylindrical lens? Ans, Astigmatism

Q11, A person is advised to wear spectacles with concave lenses What type of defect of vision is he suffering from?

Ans, Near-Sightedness/ Short-Sightedness/ Myopia

Q12, What is colour blindness?

Ans, Colours blindness is that defect of the eye due to which a person is unable to distinguish certain colours, sometimes even the primary colours.

Q13, Why does the sky appear dark to astronauts?

Ans, For the scattering of light, particles are required. Since there are no particles in space, the sky appears dark to astronauts.

Q14, What is the nature of the image formed on the retina? Ans, Real, inverted and diminished in size.

Short Question

Q15, i) Why do different rays deviate differently in the prism?

Ans, i) Different wavelengths deviate differently in the prism because the angle of refraction fordifferentcoloursshavingdifferentwavelengthsisdifferentwhilepassingthrough theglass prism.

Q-16-Write in one sentence about the following:

I. Mirrorusedbydentiststoexamineteeth.
II. TheSmallestdistanceatwhichtheeyecanseeobjectsclearlywithoutstrain.

Ans:ConcaveMirror. Nearpointor25cm

Q-17- Why are danger signal lights red in colour?

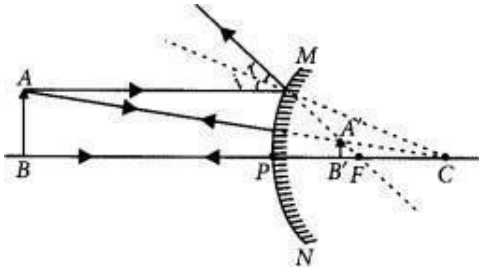
Ans:Dangersignallightsareredincolourbecausetheredcolouredlighthavinglonger wavelengthisscatteredtheleastbyfogorsmoke.thereforitcanbeseenclearlyfroma distance.

Q-18-Why is the colour of the clear sky is blue ?
Ans:Whensunlightpassesthroughtheatmospherethefineparticlesintheairscatterthe bluecolourmorestronglythanredthescatteredbluecolourentersoureyes.

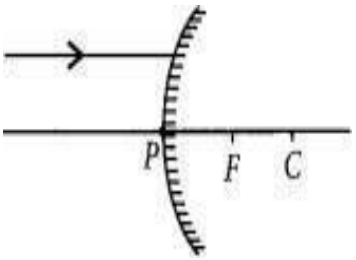
Q-19:Writethestructureofeyelensandstatetheroleofciliarymusclesinthehumaneyes ?
Ans:Theeyelensisaconvexlenscomposedofatransparentfibrousjellylikematerial ciliarymusclesholdtheeyelensinpositionandcontrolthefocallengthofeyelensby contractingandexpanding.theyincreaseanddecreasethefocallengthoftheeyelens .hencethesemuscleshaveagreatroleinfocusingthenearbyobjectsaswellasforall objects.

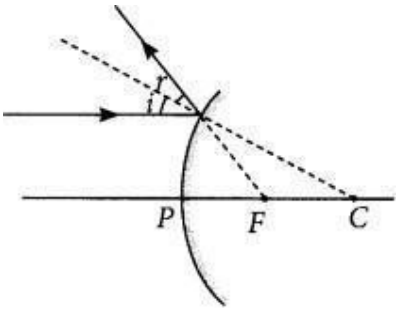
LONG ANSWERS
Q-20Iftheimageformedbyasphericalmirrorforallpositionsoftheobjectplacedinfront ofitisalwaysejectanddiminished,whattypeofmirrorisit?Drawalabelledraydiagramto support your answer
Answer:Iftheimageformedbyasphericalmirrorisalwaysejectanddiminishedthenitisconvex mirror.Referncert

Q-21:Anobjectisplacedatadistanceof30cminfrontofaconvexmirroroffocallength15 cm.Writefourcharacteristicsoftheimageformedbythemirror.(Delhi2017)



Answer:Four characteristics of the image formed by the given convex mirror are :
(i) Virtual,Erect,Diminished,Imageisalwaysformedbehindthemirrorbetweenpoleandfocus.
22.ARayoflightisincidentonaconvexmirrorasshown.Redrawthediagramand completethepathofthisrayafterreflectionfromthemirror.Makeangleofincidenceand angleofreflectiononit.(Delhi2016)





Answer:

“Ifthemagnificationproducedbyasphericalmirroris-3”.Listfourinformationyou obtainfromthisstatementaboutthemirror/image.(AI2016)
Answer:
Negativesignofmagnificationindicatesthattheimageisrealandinverted.Sincetheimage isrealandinverted,themirrorisconcaveandmagnificationof-3indicatesthattheimageis magnified.
23.Anobject4cminheight,isplacedat15cminfrontofaconcavemirroroffocallength 10cm.Atwhatdistancefromthemirrorshouldascreenbeplacedtoobtainasharpimage oftheobject.Calculatetheheightoftheimage.

.

Assertion and Reason Questions:

Read the sentences carefully and choose the correct alternative from the following :-

a) Boththeassertionandreasonarecorrect,andreasonisthecorrectexplanationofthe assertion.
b) Theassertionandthereasonarecorrect,butthereasonisnotthecorrectexplanationof theassertion.
c) Assertionistrue,butreasonisfalse.
d) Thestatementoftheassertionisfalse,butthereasonistrue.

Q1, Assertion: The near point of a hypermetropic eye is more than 25 cm away. Reason: Hypermetropia is corrected using spectacles containing concave lenses.Ans,c)

Q2,Assertion:Myopiaisthe defectofvision in whichaperson cannotseedistantobjects clearly.
Reason: This is due to eyeball being too short.
Ans,c)
Q3, Assertion: Pupil is black in colour.
Reason: Pupil is black in colour as no light is reflected back. Ans, a)
Q4, Assertion: The rainbow is a manmade spectrum of sunlight in the sky.
Reason: The rainbow is formed in the sky when the sun is shining with the presence of water droplets at the same time. Ans, d)
Q5, Assertion: The sky appears blue in the daytime. Reason: White light is composed of seven colours.
Ans, b)

CHAPTER-11

ELECTRICITY

Charge: It is an inherent property of the body due to which the body feels attractive and repulsive forces.

There are two types of electric charges:

(i) Positive and (ii) Negative

(ii) Like charges are repelling each other.

(iii) Unlike charges attract each other.

Electric Current (I)

Rate of flow of net charge is called current. Denoted by (I)

$$I = Q/t$$

Electric current can also be defined as the amount of charge flowing through a unit cross-section in per second.
SI unit of current is "Ampere" .Denoted by A.
Ampere →Defined as one coulomb of charge flowing per second.
1A =1C/1S
Small quantity of current are expressed in 1mA (milli Ampere) = 10^{-3} A &1μA (micro Ampere) = 10^{-6} A

Ammeter : It is an instrument used to measure the electric current in a circuit. It is always connected in series in a circuit. It has low resistance(practically). Ideally ammeter's resistance must be zero. It is represented as

Direction of Current:-The conventional direction of an electric current is taken as opposite to the direction of the flow of electron,which are negative charges and actually constitute the electric current.
Conductors and insulators: Those substances through which electricity can flowarecalled conductors.Allthemetalslikesilver,copper,aluminium etc. areconductors.

Thosesubstancesthroughwhichelectricitycannotflowarecalled insulators.Glass,ebonite,rubber,mostplastics,paper,drywood,etc.,areinsulators.

Electrostatic potential: Electrostatic potential at a point is defined as the amount of work done in bringing a unit positive charge from infinity to that point. Its SI unit is volt(Symbol V)

PotentialDifference:Potential difference between two points of a conductor carrying current is the work done required to move a unit positive charge from one point to another.

Potentialdifference(V)=W (Work done) /Q (Amount of charge moved)
TheSIunitofpotentialdifferenceisvolt(V).
1 volt: One volt is defined as the potential difference between two points in acurrent carrying conductor when 1 joule of work is done to move a charge of 1coulombfromonepointto another. Therefore,1volt =1joule/1coulomb
[1 Coulomb x 1 Volt = 1 Joule]

Voltmeter:Thepotentialdifferenceismeasuredbymeansofaninstrumentcalled Voltmeter. The voltmeter is connected in parallel across the points where thepotentialdifferenceismeasured. Note:-The resistance of voltmeter should be very high(almost infinite) so that it draw a negligible current from the circuit.

Battery:- A group of two or more electric cells is called a battery.

Electric circuit: A continuous and closed path of electric current is called an electric circuit.

Ohm's law: This law is stated as, "The current flowing through a conductor is directly proportional to the potential difference across its ends provided the physical conditions (shape size, material) of the conductor do not change, and its temperature remains constant".

Thus, according to Ohm's law $V \propto I$ or $V = IR$

Here, R is a proportionality constant known as the resistance of the given conductor.

Resistance: It is the physical property of a conductor by virtue of which it opposes the flow of charge (current) through it. It is expressed as,

Resistance (R) =Potential difference (V)/ Current (I)

The SI unit of resistance is ohm Ω (symbol).

The resistance of a conductor is said to be 1 Ohm if on applying a potential difference of 1 volt across its two ends, a current of 1 ampere flows through it, i.e.,

1 ohm Ω = 1 volt (V) /1 ampere (A) or $1\Omega = 1V / 1A$

*A rheostat is a variable resistance device used in electric circuits to regenerate current without changing the voltage source. It performs this function by changing the resistance in the circuit.

Factors affecting the resistance of a conductor: At a given temperature, the resistance R of a conductor (in the shape of a bar of uniform cross-section-circular/square/rectangular) depends upon its (i) length (L), (ii) area of cross-section A, and (iii) nature of material of the conductor. It is found that $R \propto L$ and $R \propto 1/A$ or $R \propto L/A$

Mathematically, $R = \rho L / A$ or $\rho = RA / L$

Where, ρ is a constant of proportionality and is called the resistivity of the material.

Resistivity: It is a characteristic property of a given material and depends on the nature of the material of the conductor. It is defined as the resistance offered by a cube of that material of side 1 metre when current flows perpendicular to its opposite faces. Its SI unit is ohm metre (symbol Ωm).

Note: (1) Resistivity is the basic property of the material. Therefore, its value does not depend upon the shape or size of the conductor.

(ii) Both the resistance and resistivity of a material vary with temperature.

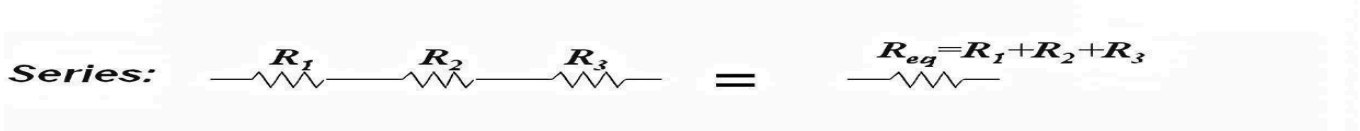
(iii) Resistivity of pure metals is generally low, whereas the resistivity of alloys is higher than that of its constituent metals.

(iv) However, alloys do not oxidise at high temperature hence, are used in electrical heating devices. Tungsten is used for filaments of bulbs, whereas copper and aluminium for electrical transmission lines.

Combination of resistors (or resistances): There are two ways of combining two or more resistors, namely

(i) series and (ii) parallel.

(1) **Series Combination :-**When two or more resistors are connected end to end consecutively, they are said to be connected in series.



In a series combination of resistors(1) Same current flows through each resistor,

(2) The total potential difference across the combination of resistors is equal to the sum of the potential differences across the individual resistors, i.e., $V = V_1 + V_2 + V_3$

(3) The total resistance of the combination (Req) is equal to the sum of the individual resistances,

i.e., $Req = R_1 + R_2 + R_2$

(2)Parallel Combination :- When two or more resistors are connected between the two same points, they are

said to be connected in a parallel combination.

In a parallel combination of resistors:-

- The potential difference across each resistor is same and it is also equal to the potential difference across the combination.
- The current in the various resistors are inversely proportional to their resistances, and the total current is the sum of currents flowing through different resistors.
- The reciprocal of the equivalent resistance of the parallel combination of resistors (Req) is the sum of the reciprocals of the individual resistances of the resistors ie

$$1/Req=1/R1+ 1/R2+1/R3$$

Joule's Law of Heating: It states that heat produced in a resistor is directly proportional to the square of current given to the resistor, directly proportional to the resistance for a given current and directly proportional to the time for which the current is flowing through the resistor.

$$H = I^2RT$$

Electric Power :-The rate of doing work or rate of consumption of electrical energy is called Electric Power. If W

is work done in time t, then P=W/t S.I unit is Watt (W). The commercial unit of electrical energy is a kilowatt-hour (kWh) or unit. 1kWh = 3.6×10^6 J. One kilowatt-hour is defined as the amount of energy consumed when 1kW of power is used for 1 hour.

OBJECTIVE QUESTIONS:-

1. **Abatteryof10voltcarries20,000Cofchargethrougharesistanceof20Ω.Theworkdonein**

   10 secondsis

   (a) 2×10^3joule (b)2×10^5 joule(c)2×10^4 joule(d)2×10^2joule

   Ans:(b)$W=qV=20000\times10=2,00,000=2\times10^5$J

2. **Theleastresistanceobtained byusing2 Ω,4 Ω,1 Ωand100 Ωis**

   (a)<100Ω (b)<4 Ω(c)< 1Ω(d)>2 Ω

Ans:(c)Inparallelcombination,theequivalentresistanceissmallerthantheleastresistanceusedinthe circuit.

3. **Theresistanceofhotfilamentofthebulbisabout10timesthecoldresistance.Whatwillbetheres istanceof100W-220Vlamp,whennotinuse?**

(a)48Ω (b)400 Ω(c)484 (d) 48.4Ω

Ans;-

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

4. **Afusewirerepeatedlygets burntwhenusedwithagoodheater.Itisadvisedtouseafusewire**of

(a) more length (b) Less radius (c) less length (d) More radius

Ans:(d)Inordertogettheworkingofheaterproperly,fusedwireof higherratingmustbeused.

5. Two bulbs of 100 W and 40 W are connected in series. The current through the 100 W bulb is 1 A. The current through the 40 W bulb will be:-

(a) 0.4 A (b) 0.6 A (c) 0.8 A (d) 1 A Ans:- (d) Same current flows in series.

ASSERTION AND REASON TYPE QUESTION:-

For the following question numbers (1-5) two statements are given- one labeled Assertion (A)

andtheotherlabeledReason(R).Selectthecorrectanswertothesequestionsfromthecodes(a),(b),
(c) & (d)
asgivenbelow:

(a) BothA andRaretrue,andRiscorrectexplanationoftheassertion.
(b) BothAand Raretrue,but Risnotthecorrectexplanationoftheassertion.
(c) A istrue,butRis false.
(d) Aisfalse,butRistrue

1. Assertion: A voltmeter is always connected in parallel across points between which the potential difference is to be measured.

Reason : The resistance of a voltmeter is very high.

2.Assertion: One can determine resistance and not the power of a circuit by using a voltmeter and ammeter simultaneously.

Reason: Power is the product of voltage and current (wattage = voltage x amperage).

3.Assertion:At high temperatures, metal wires have a greater chance of short circuiting.

Reason: Both resistance and resistivity of a material vary with temperature.

4. Assertion: A fuse wire is always connected in parallel with the mainline.

Reason: If a current larger than the specified value flows through the circuit, the fuse wire melts.

5.Assertion: When the shape of an Ohmic conductor is changed, its resistance changes but the resistivity remains the same.

Reason: Resistivity is the basic property of a material whereas resistance depends upon the dimensions of the conductor.

Answer:- 1- (a) 2. (d) 3. (b) 4. (d) 5. (a)

VERYSHORT ANSWER TYPE QUESTION:

1.Alampdrawsacurrentof0.5Awhenitisconnected toa60Vsource.What istheresistanceofthelamp?Ans: From Ohm'slaw,I=V/Rweget,

$R=V/I=60/0.5=120\Omega$

2.Whatisheatingeffectof electric current?

Answer: Theproductionofheatin aconductorduetotheflowofelectriccurrentthrough itis called heating effect ofelectriccurrent. $H = I^2RT$

3. Atorchbulbisrated at1.5V,500mA.Finditsresistance.

Ans: From Ohm'slaw,I=V/Rweget,

$R=V/I=1.5/500\times10^{-3}=3\Omega$

4. An electrical appliance is rated as 220 V, 60 W. Interpret this statement.

Ans:-This statement means that the electrical appliance operating at a potential difference of 220 V, consumes 60 joules of electrical energy in one second.

5. List two factors on which the resistivity of a material depends.

Ans. (i) nature of the material (ii) physical conditions like temperature and pressure.

SHORT ANSWER TYPE QUESTION:-

1. Define electric current. Give its SI unit. How is electric current related to the potential difference across

the terminals of a conductor?

Ans. The motion of charges (electrons) constitutes an electric current. The charge flowing per second in an electric circuit is the measure of electric current in the circuit. The SI unit of current is ampere (A).

Current, 1 = Charge Q / Time t

Current flowing through a conductor is directly proportional to the potential difference across its terminal. This is called Ohm's law and is true when the physical conditions of the conductor such as temperature, pressure, etc.

remain unchanged.

2 (a) Define an electric circuit.

(b) What is meant by a circuit diagram?

© Why ammeter should have low resistance when connected in an electric circuit?

Ans. (a) An electric circuit is a continuous conducting path through which current flows

(b) A circuit diagram indicates the arrangement of various circuit components of an electric circuit using their standard symbols.

(c) Ammeter should have low resistance as it is connected in series in a circuit and hence should not alter the

current flowing in the circuit.

3. (a) Calculate the resistance of a metal wire of length 2 m and area of cross section 1.55 x 10^6 m^2. (Resistivity of the metal is 2.8 x 10^8)

(b) Why are alloys preferred over pure metal to make the heating elements of electrical heating device?

Ans:-(a) $R = \rho L / A = 2.8 \times 10^8 \times 2 / 1.55 \times 10^6 = 3.61 \times 10^{-2}$ Ohm

(b) Alloys are preferred over pure metal because: (i) The resistivity of an alloy is generally higher than that of its constituent metals. (ii) Alloys do not oxidise or burn readily even at high temperature.

4. (a) State Joule's law of heating. Express it mathematically when an appliance of resistance R is connected to a source of voltage V and the current I flows through the appliance for a time t.

(b) A 5 a resistor is connected across a battery of 6V. Calculate the energy that dissipates as heat in 10 seconds.

Ans (a) **Joule's law of heating:** Heat produced in a resistor is directly proportional to: (i) the square of current for

a given resistance, (ii) the resistance for a given current and (iii) the time for which the current flows through the resistor. When a potential difference, V, is applied across the ends of a conductor having resistance R, an electric current I flows through the conductor. If the current I flows for a time t, then the conductor gets heated and the amount of heat (H) is given by: $H = I^2Rt$

(b) $E = V^2 t / R = 6 \times 6 \times 10 / 5 = 72$ Joules.

5. Two resistors 3 Ω and unknown resistor are connected in a series across a 12 V battery. Ifthevoltagedropacrosstheunknownresistoris6 V,find

(a) **potentialacross3Ωresistance(b)thecurrentthroughunknownresistor'R'**

(c)equivalentresistanceofthecircuit.

Ans:(a)Samecurrentwillflowthrougheachresistorofseriescombination,thepotentialdropacross both3Ωresistorwillbesame(V1=V2).Inseries,appliedpotential,

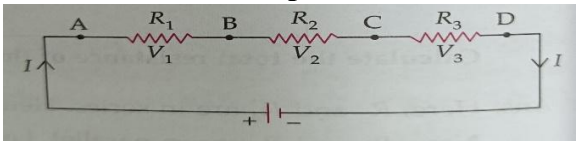
(b) Currentthrough3Ωresistance

So,currentthroughunknownresistanceRis1A.(c)Unknownresistance3.

LONG ANSWER TYPE QUESTION:-

Q.1. (a) Derive an expression for the equivalent resistance of three resistors R_1, R_2 and R_3 connected in series.

(b) Fuse of 3 A, 5 A and 7 A are available. Which of these will be most suitable to operate an electric iron of 1 kW power at 220 V electric line? Give reason to justify your answer.



Ans (a) When three resistors are connected in series, the current flowing through them remains same but the potential difference across each resistor is different. The total potential difference V across AD will be the sum of potential differences across AB, BC and CD, i.e.. $V = V_1 + V_2 + V_3$

$V_1 = I R_1$, $V_2 = IR_2$ and $V_3 = I R_3$ OR $V = IR$

$IR = I R_1 + IR_2 + I R_3$

$R = R_1 + R_2 + R_3$

(b) Power = 1 kW = 1000 W

V = 220 V

$P = VI$ or $I = P / V = 1000 / 220 = 4.54$ A

Fuse of 5A rating will be most appropriate because if we use 3A fuse it will burn, while for 7A the overloading of circuit may take place.

2. (a)Thoughsamecurrentflowsthroughtheelectriclinewiresandthefilamentofbulb,yet onlythefilamentglows.Why?

(b) Thetemperatureof thefilamentofbulbis2700 °Cwhenitglows.Whydoesitnot getburntupatsuchhightemperature?

(c)Thefilamentof anelectriclamp,whichdrawsacurrentof0.25Aisusedforfourhours.Calculatetheamountofchargeflowingth roughthecircuit.

(d) An electric iron is rated 2 kW at 220 V. Calculate the capacity of the fuse that should beusedfortheelectriciron.

Ans:- Ans:(a) Electric line wires offer extremely low resistance to the flow of current, so they do not glow because negligible heat is produced in it. The filament of bulb glows because it becomes red hot due to large amount of heat produced, as it offers high resistance to the flow of current through it.

(b) The filament of bulb when it glows at 2700 °C does not gets burnt because the tungsten metal of filament has (i) a very high melting point (of 3380 °C) and (ii) a high resistivity.

(c) Given: I = 0.25 A, t = 4 h = 4 × 60 × 60 sec. So, amount of charge flowing the filament of electric lamp

q = It = 0.25 × 4 × 60 × 60 = 3600 C

(d) Given P = 2 kW = 2000 W V = 220 V Using, P = VI 2000 = 220 × I

So, the capacity of the fuse that should be used for the electric iron is 10 A.

Q .3 State Ohm's law. Write the necessary conditions for its validity. How is this law verified experimentally? What will be the nature of graph between potential difference and current for a conductor? Name the physical quantity that can be obtained from this graph.

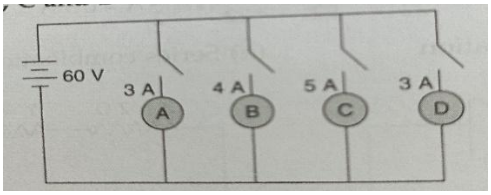
Ans: Ohm's law: When the physical conditions such as temperature etc. remain same, the current flowing through the conductor is directly proportional to the potential difference applied across the ends of the conductor, i.e., $I \propto V$ or $V \propto I$

where R is constant of proportionality and is called resistance of the wire.

Necessary condition for validity of Ohm's law: Physical condition such as temperature of the conductor remains same. Experimental verification: Refer to NCERT Activity-1 of this chapter.

Nature of V – I graph is a straight line passing through the origin of the graph and inclined to x-axis as shown. The slope of V – I graph gives the value of resistance of the conductor at the given temperature.

Q 4. In the given circuit, A, B, C and D are four lamps connected with a battery of 60 V.



Analyse the circuit to answer the following questions:

(a) What kind of combination are the lamps arranged in (series or parallel)?

(b) Explain with reference to your above answer, what are the advantages (any two) of this combination of lamps?

(c) Explain with proper calculations which lamp glows the brightest?

(d) Find out the total resistance of the circuit.

Ans:- (a) The lamps are in parallel.

(b) If one lamp is faulty, it will not affect the working of the other lamps. They will also be using the full potential of the battery as they are connected in parallel.

(c) The lamp with the highest power will glow the brightest.

$$P = VI$$

In this case, all the bulbs have the same voltage. But lamp C has the highest current.

Hence, for Lamp C, P=5A x 60 V =300 W

The total current in the circuit = 3 A+ 4 A+5A+3A-15 A. The voltage = 60 V

(d) V = IR and hence R = V / I

= 60/15 Ohm = 4 Ohm

Q. 5 In a factory, an electric bulb of 500 W is used for 2 hours and an electric motor of 373 W is used for 5 hours daily. Calculate the cost of electricity the factory has to pay for 30 days at the rate of 8 per unit.

Ans. Energy consumed per day by the bulb, P x t_1 = 500 W x 2 h = 1000 Wh

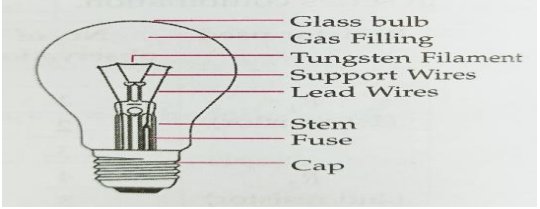
Energy consumed per day by the motor, P x t_2 = 373 W x 5 h = 1865 Wh

Total energy consumed per day = (1000+ 1865) Wh = 2.865 kWh or 2.865 units

Total cost for a month of 30 days = 2.865 x 8 x 30 rupees = 22.92 x 30 rupees =Rs 687.60

CASE STUDY -01

A heating element is an electrical component that is used to create heat in an electrical appliance. A typical heating element is usually a coil, ribbon or strip of wire. The elements are either nickel-based or iron-based. The nickel- based ones, usually nichrome, an alloy, are popularly in use. It works on the principle of the heating effect of electric current. Once the electricity starts to flow through the heating element, the electric energy is converted into heat energy and it radiates in all directions. This heating effect is also to produce light, as seen in the case of an electric bulb. The diagram given alongside shows the different components of an electric bulb.



On the basis of the above case and the related studied concepts, answer the following questions:

(a) Which of the following are not one of the components of nichrome other than nickel?

(i) Chromium (ii) Manganese (iii) Iron (iv) Copper

(b) Why is tungsten used in filament of electric bulb?

(c)The gas is used in electric bulb is (I) Nitrogen (II) Hydrogen (III) Argon (IV) Oxygen

(i) Only I (ii) Both I and III (iii) I , II and III (iv) Only IV

(d) Give reason:-Alloys are used in making heating device.

Answer:- (a) (iv) (b) Its resistivity and melting point both are high. (c) (ii) (d) Alloys have high resistivity , they do not get oxidized even at high temperature and have high melting point. (e) (i)

CASE STUDY -02

The rate of flow of charge is called electric current. The SI unit of electric current is Ampere (A). The direction of flow of current is always opposite to the direction of flow of electrons in the current.

The electric potential is defined as the amount of work done in bringing a unit positive test charge from infinity to a point in the electric field. The amount of work done in bringing a unit positive test charge from one point to another point in an electric field is defined as potential difference.

$$V_{AB} = V_B - V_A = W_{BA} / q$$

The SI unit of potential and potential difference is volt.

(i) The 2 C of charge is flowing through a conductor in 100 millisecond, the current in the circuit is

(a) 20 A (b) 2 A (c) 0.2 A (d) 0.02 A

(ii) Which of the following is true?

(a) Current flows from positive terminal of the cell to the negative terminal of the cell outside the cell.

(b) The negative charge moves from lower potential to higher potential.

(c) The direction of flow of current in same as the direction of flow of positive charge. (d) All of these

(iii) The potential difference between the two terminals of a battery, if 100 joules of work is required to transfer 20 coulombs of charge from one terminal of the battery to other is

(a) 50 V (b) 5 V (c) 0.5 V (d) 500 V

(iv) The number of electrons flowing per second in a conductor if 1 A current is passing through it

(a) 6.25×10^{20} (b) 6.25×10^{19} (c) 6.25×10^{18} (d) 6.25×10^{-19}

Answers (i) (a) (ii) (d) (iii) (b) (iv) (c)

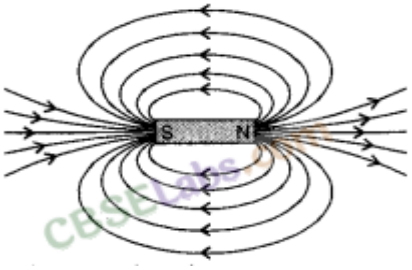
CHAPTER-12

Magnetic Effects of Electric Current

Magnetic field and magnetic field lines, Magnetic field due to a current carrying conductor, Right hand thumb rule, Magnetic field due to current through a circular loop. Magnetic field due to current in a solenoid.

- Magnet is an object that attracts objects made of iron, cobalt and nickle. Magnet comes to rest in North – South direction, when suspended freely.
- Magnetic field: The area around a magnet where a magnetic force is experienced is called the magnetic field. It is a quantity that has both direction and magnitude, (i.e., Vector quantity).
- Magnetic field and field lines: The influence of force surrounding a magnet is called magnetic field. In the magnetic field, the force exerted by a magnet can be detected using a compass or any other magnet.

  The magnetic field is represented by magnetic field lines.



Properties of magnetic field lines

(i) They do not intersect each other.

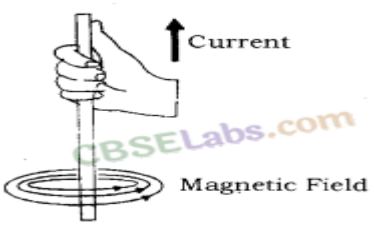
(ii) It is taken by convention that magnetic field lines emerge from North pole and merge at the South pole. Inside the magnet, their direction is from South pole to North pole. Therefore magnetic field lines are closed curves.

Magnetic field lines due to current a current carrying straight conductor

A current carrying straight conductor has magnetic field in the form of concentric circles, around it. Magnetic field of current carrying straight conductor can be shown by magnetic field lines.

The direction of magnetic field through a current carrying conductor depends upon the direction of flow electric current.

Right-Hand Thumb Rule: If a current carrying conductor is held by right hand, keeping the thumb straight and if the direction of electric current is in the direction of thumb, then the direction of wrapping of other fingers will show the direction of magnetic field.



The strength of the magnetic field at the centre of the loop(coil) depends on :

(i) The radius of the coil:

The strength of the magnetic field is inversely proportional to the radius of the coil. If the radius increases, the magnetic strength at the centre decreases

(ii) The number of turns in the coil :

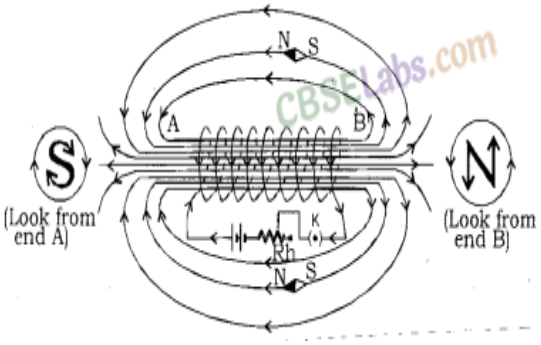
As the number of turns in the coil increase, the magnetic strength at the centre increases, because the current in each circular turn is having the same direction, thus, the field due to each turn adds up.

(iii) The strength of the current flowing in the coil:

As the strength of the current increases, the strength of the magnetic fields also increases.

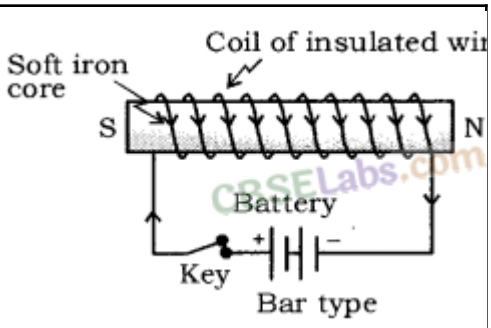
Magnetic field due to a current in a Solenoid:

Solenoid is the coil with many circular turns of insulated copper wire wrapped closely in the shape of a cylinder. A current carrying solenoid produces similar pattern of magnetic field as a bar magnet. One end of solenoid behaves as the north pole and another end behaves as the south pole.



Electromagnet: An electromagnet consists of a long coil of insulated copper wire wrapped on a soft iron.

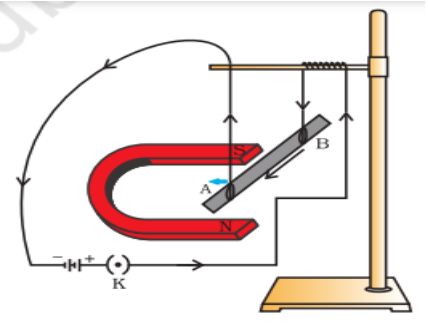
Magnet formed by producing magnetic field inside a solenoid is called electromagnet.



Force on a current carrying conductor in a magnetic field: A current carrying conductor exerts a force when a magnet is placed in its vicinity.

Similarly, a magnet also exerts equal and opposite force on the current carrying conductor. This was suggested by Marie Ampere, a French Physicist and considered as founder of science of electromagnetism.

The direction of force over the conductor gets reversed with the change in direction of flow of electric current. It is observed that the magnitude of force is highest when the direction of current is at right angles to the magnetic field.

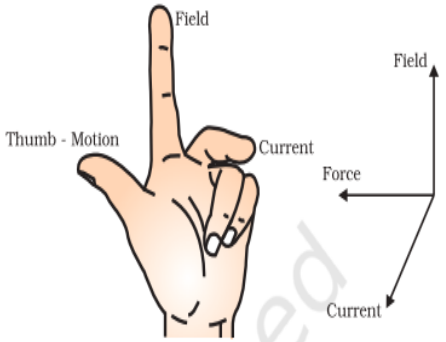


Fleming's Left-Hand Rule:

If the direction of electric current is perpendicular to the magnetic field, the direction of force is also perpendicular to both of them.

The Fleming's Left Hand Rule states that if the left hand is stretched in a way that the index finger, the middle finger and the thumb are in mutually perpendicular directions, then the index finger and middle finger of a stretched left hand show the direction of magnetic field and direction of electric current respectively and the thumb shows the direction of motion or force acting on the conductor.

The directions of electric current, magnetic field and force are similar to three mutually perpendicular axes, i.e. x, y, and z-axes.

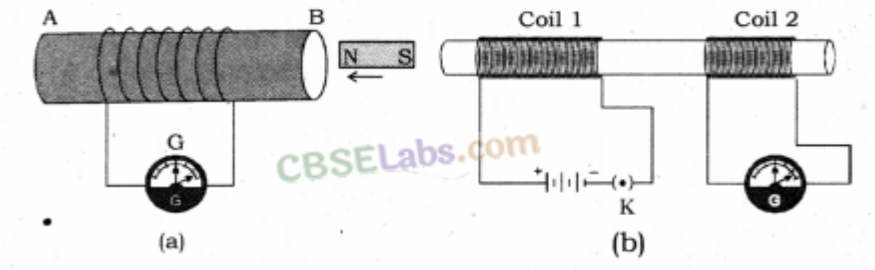


Many devices, such as electric motor, electric generator, loudspeaker, etc. work on Fleming's Left Hand Rule.

Electromagnetic Induction:

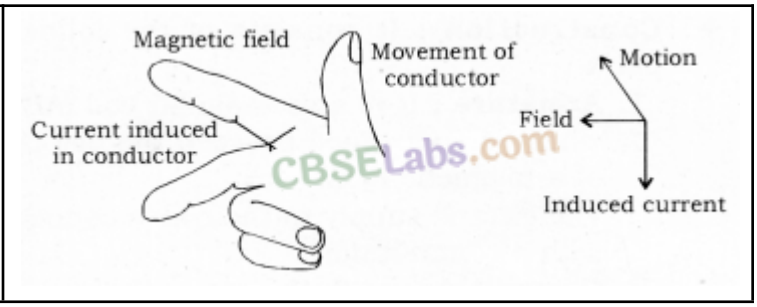
Michael Faraday, an English Physicist is supposed to have studied the generation of electric current using a magnetic field and a conductor.

* Electricity production as a result of magnetism (induced current) is called Electromagnetic Induction.



When a conductor is set to move inside a magnetic field or a magnetic field is set to be changing around a conductor, electric current is induced in the conductor. This is just opposite to the exertion of force by a current carrying conductor inside a magnetic field. In other words, when a conductor is brought in relative motion vis – a – vis a magnetic field, a potential difference is induced in it. This is known as electromagnetic induction.

Fleming's Right-Hand Rule: Electromagnetic induction can be explained with the help of Fleming's Right Hand Rule. If the right hand is structured in a way that the index (fore ginger) finger, middle finger and thumb are in mutually perpendicular directions, then the thumb shows direction of induced current in the conductor, in conductor The directions of movement of conductor, magnetic field and induced current can be compared to three mutually perpendicular axes, i.e. x, y and z axes.



The mutually perpendicular directions also point to an important fact that when the magnetic field and movement of conductor are perpendicular, the magnitude of induced current would be maximum.

Electromagnetic induction is used in the conversion of kinetic energy into electrical energy.

D.C – Direct Current:

Current that flows in one direction only is called Direct current. Electrochemical cells produce direct current.

Advantages of A.C over D.C

* Cost of generatior of A.C is much less than that of D.C.
* A.C can be easily converted to D.C.
* A.C can be controlled by the use of choke which involves less loss of power whereas, D.C can be controlled using resistances which involves high energy loss.
* AC can be transmitted over long distances without much loss of energy.
* AC machines are stout and durable and do not need much maintenance.

Disadvantages of AC

* AC cannot be used for the electrolysis process or showing electromagnetism as it reverses its polarity.
* AC is more dangerous than DC.

Domestic Electric Circuits:

Domestic Electric Circuits:

We receive electric supply through mains supported through the poles or cables. In our houses, we receive AC electric

Short Circuit: Short-circuiting is caused by the touching of live wires and neutral wire and sudden a large current flows. It happens due to damage insulation in power lines, or any fault in an electrical appliance.

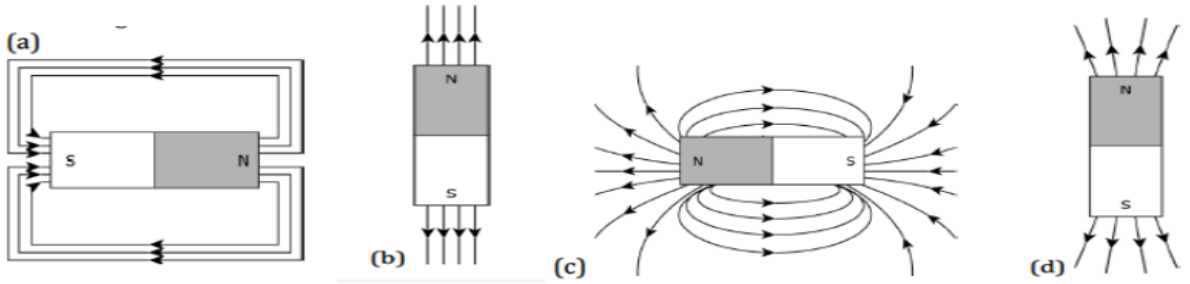
power of 220 V with a frequency of 50 Hz. The 3 wires are as follows Live wire – (Red insulated, Positive) Neutral wire – (Black insulated, Negative) Earth wire – (Green insulated) for safety measure to ensure that any leakage of current to a metallic body does not give any serious shock to a user.	**Overloading of an Electric Circuit**: The overheating of electrical wire in any circuit due to the flow of a large current through it is called overloading of the electrical circuit. A sudden large amount of current flows through the wire, which causes overheating of wire and may cause fire also.

Electric Fuse: It is a protective device used for protecting the circuit from short-circuiting and overloading. It is a piece of thin wire of material having a low melting point and high resistance.
Fuse is always connected to live wire.
Fuse is always connected in series to the electric circuit.
Fuse is always connected to the beginning of an electric circuit.
Fuse works on the heating effect.

Question –Ans

1. Choose the incorrect statement
   (a) Fleming's right-hand rule is a simple rule to know the direction of induced current
   (b) The right-hand thumb rule is used to find the direction of magnetic fields due to current carrying conductors
   (c) The difference between the direct and alternating currents is that the direct current always flows in one direction, whereas the alternating current reverses its direction periodically.
   (d) In India, the AC changes direction after every 1/50 second

2. The strength of magnetic field inside a long current carrying straight solenoid is
   (a) more at the ends than at the center (b) minimum in the middle
   (c) same at all points (d) found to increase from one end to the other
3. The most important safety method used for protecting home appliances from short circuiting or overloading is
   (a) earthing (b) use of fuse
   (c) use of stabilizers (d) use of electric meter
4. **When a straight conductor is carrying current:**
   a) There are circular magnetic field lines around it b) There are magnetic field lines parallel to the conductor
   c) There are no magnetic field lines d) None of the above
5. **A student learns that magnetic field strength around a bar magnet is different at every point.**
   Which diagram shows the correct magnetic field lines around a bar magnet?



Ans.	1. d	2. c	3. b	4. a	5. c

DIRECTION: Each of these questions contains an Assertion (A) followed by Reason(R). Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.	(a) Both A & R are true and R is correct explanation of the assertion- A. (b) Both A & R are true but R is not the correct explanation of A. (c) A is true but R is false. (d) A is false but R is true.

6. **Assertion(A):** On changing the direction of flow of current through a straight conductor, the direction of a magnetic field around the conductor is reversed.
   Reason (R): The direction of magnetic field around a conductor can be given in accordance with left hand thumb rule.
7. **Assertion(A):** The magnitude of the magnetic field at a point on the axis of a current carrying solenoid is inversely proportional to the current flowing through the solenoid.
   Reason (R) : The magnitude of the magnetic field at a point on the axis of a current carrying solenoid is directly

proportional to the number of turns per unit length of a solenoid.

8. **Assertion(A):** The strength of the magnetic field produced at the centre of a current carrying circular coil increases on increasing the current flowing through the coil.
   Reason (R): Magnetic field strength is inversely proportional to the current flowing in the coil.

9. **Assertion(A):** A current carrying wire deflects a magnetic needle placed near it.
   Reason (R): A magnetic field exists around a current carrying wire.

10. **Assertion(A):** The strength of the magnetic field produced at the centre of a current carrying circular coil increases on increasing the number of turns of the circular coil.
   Reason (R): Magnetic field strength is directly proportional to the number of turns of the circular coil.

Ans.	6. c	7. d	8. c	9. a	10. a

11. What is meant by magnetic field?
Ans. It is defined as the space surrounding the magnet in which magnetic force can be experienced.

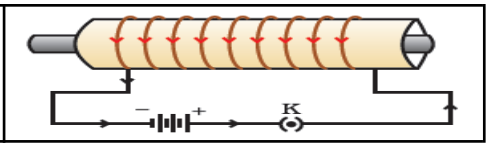
12. Write any one method to induce current in a coil.
Ans.A current is induced in a coil when it is moved/ rotated relative to a fixed magnet.

13. Which of the property of a proton can change while it moves freely in a magnetic field? List any two.
Ans. Velocity & Momentum

14. A magnetic compass shows a deflection when placed near a current carrying wire.
How will the deflection of the compass get affected if the current in the wire is increased? Support your answer with a reason.
Ans. The deflection increases. $B \propto I$
[The strength of magnetic field is directly proportional to the magnitude of current passing through the straight conductor.]

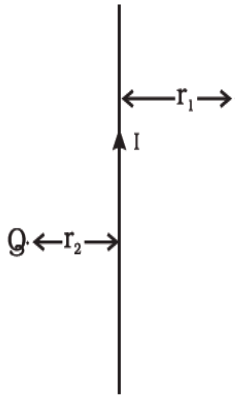
15. List the properties of magnetic lines of force. List any two.
Ans. (a) Magnetic field lines emerge from the north pole.
(b) They merge at the south pole.
(c) The direction of field lines inside the magnet is from the south pole to the north pole.
(d) Magnetic lines do not intersect with each other.

16. Under what conditions permanent electromagnet is obtained if a current carrying solenoid is used? Support your answer with the help of a labelled circuit diagram.

Ans. (i) The current through the solenoid should be direct current. (ii) The rod inside is made of a magnetic material such as steel.	

17. A magnetic compass shows a deflection when placed near a current carrying wire. How will the deflection of the compass get affected if the current in the wire is increased? Support your answer with a reason.
Ans. The deflection increases. The strength of magnetic field is directly proportional to the magnitude of current passing through the straight conductor.

18. It is established that an electric current through a metallic conductor produces a magnetic field around it.
Is there a similar magnetic field produced around a thin beam of moving
(i) alpha particles, (ii) neutrons? Justify your answer.
Ans. (i) Yes, Alpha particles being positively charged constitutes a current in the direction of motion.
(ii) No. The neutrons being electrically neutral constitute no current.

19. AB is a current carrying conductor in the plane of the paper as shown in figure. ----------> 

What are the directions of magnetic fields produced by it at points P and Q?
Given r1 > r2, where will the strength of the magnetic field be larger?
Ans. Into the plane of paper at P and out of it at Q.
The strength of the magnetic field is larger at the point located closer i.e. at Q.

20. What does the direction of thumb indicate in the right-hand thumb rule.
In what way this rule is different from Fleming's left-hand rule?
Ans. The thumb indicates the direction of current in the straight conductor held by curled fingers, whereas the Fleming's left-hand rule gives the direction of force experienced by current carrying conductor placed in an external magnetic field.

21. Why does a magnetic compass needle pointing North and South in the absence of a nearby magnet get deflected when a bar magnet or a current carrying loop is brought near it.
Describe some salient features of magnetic lines of field concept.

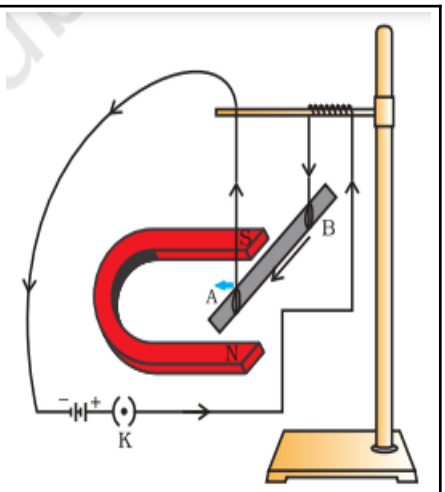
Ans. Current carrying loops behave like bar magnets and both have their associated lines of field. This modifies the already existing earth's magnetic field and a deflection results. Magnetic field has both direction and magnitude. Magnetic field lines emerge from N-pole and enter S pole. The magnetic field strength is presented diagrammatically by the degree of closeness of the field lines. Field lines cannot cross each other as two values of net field at a single point cannot exist. Only one value, a unique net value, can exist. If in a given region, lines of field are shown to be parallel and equispaced, the field is understood to be uniform.

22. Describe an activity with labelled diagram to show that a force acts on current carrying conductor placed in a magnetic field and its direction of current through conductor. Name the rule which determines the direction of this force.

Ans. A small aluminium rod (AB) about 5 cm is suspended with two connecting wires horizontally from a stand.

1. A strong horseshoe magnet is placed in such a way that the rod lies between the two poles with the magnetic field directed upwards, the north pole of the magnet vertically below &south pole vertically above the aluminium rod arranged.
2. The aluminium rod is connected in series with a battery, a key and a rheostat.
3. When a current is allowed to pass through aluminium rod from end B to end A, it is observed that the rod is displaced towards the left.
4. When the direction of the current is reversed from A to B, it is observed that the direction of displacement of the rod is towards the right.

This activity shows that when a current carrying conductor is placed in a magnetic field, a mechanical force is exerted on the conductor which makes it move.
The maximum force is exerted on a current carrying conductor only when it is perpendicular to the direction of magnetic field.



23. Give reasons for the following:
(a) It is dangerous to touch the live wire of the main supply rather than neutral wire.
(b) In household circuit, parallel combination of resistances is used.
(c) Using fuse in a household electric circuit is important.
Ans. See the NCERT Book.

24. (a) What is an electromagnet? List any two uses.
(b) Draw a labelled diagram to show how an electromagnet is made.
(c) State the purpose of soft iron core used in making an electromagnet.
(d) List two ways of increasing the strength of an electromagnet if the material of the electromagnet is fixed.
Ans. See the NCERT Book.

25. How does a solenoid behave like a magnet?
Can you determine the North and South Poles of a current-carrying solenoid with the help of a bar magnet? Explain
Ans. See the NCERT Book.

CASE BASED QUESTIONS.

26. An insulated copper wire wound on a cylindrical cardboard tube such that its length is greater than its diameter is called a solenoid. When an electric current is passed through solenoid, it produces a magnetic field around it. Magnetic field produced by a current-carrying solenoid is similar to the magnetic field produced by a bar magnet. The field lines inside the solenoid are in the form of parallel straight lines. The strong magnetic field produced inside a current-carrying solenoid can be used to magnetise a piece of magnetic material like soft iron, when placed inside the solenoid. The strength of magnetic field produced by a current carrying solenoid is directly proportional to the number of turns and strength of current in the solenoid.

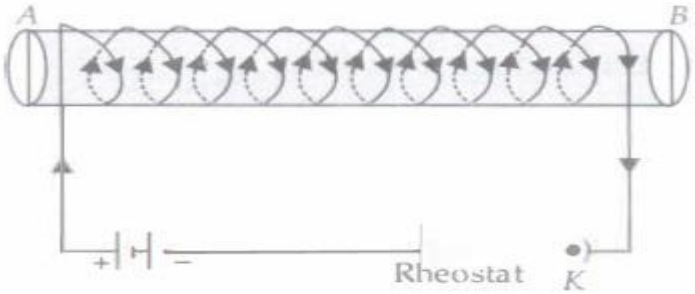
(i) The strength of magnetic field inside a long current -carrying straight solenoid is
(a) more at the ends than at the centre (b) minimum in the middle
(c) same at all points (d) found to increase from one end to the other.

(ii) The north-south polarities of an electromagnet can be found easily by using
(a) Fleming's right-hand rule (b) Fleming's left-hand rule
(c) Clock face rule (d) Left-hand thumb rule

(iii) For a current in a long straight solenoid N-and S-poles are created at the two ends.
Among the following statements, the incorrect statement is
(a) The field lines inside the solenoid are in the form of straight lines which indicates that the magnetic field is the same at all points inside the solenoid.
(b) The strong magnetic field produced inside the solenoid can be used to magnetise a piece of magnetic material like soft iron, when placed inside the coil.
(c) The pattern of the magnetic field associated with the solenoid is different from the pattern of the magnetic field around a bar magnet.
(d) The N- and S-poles exchange position when the direction of current through the solenoid is reversed.

(iv) A long solenoid carrying a current produces a magnetic field B along its axis. If the current is double and the number of turns per cm is halved, then new value of magnetic field is
(a) B (b) 2B (c) 4B (d) B/2

(v) A soft iron bar is enclosed by a coil of insulated copper wire as shown in figure. When the plug of the key is closed, the face B of the iron bar marked as



(a) N-pole

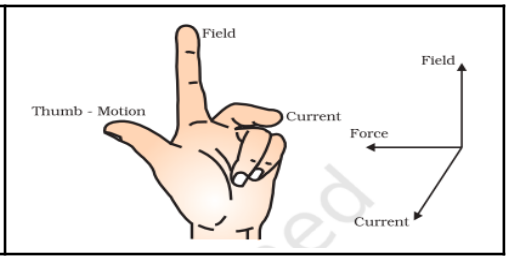
(b) S-pole

(c) N-pole if current is large

(d) S-pole if current is small

ANS- (i) (c), (ii) (c) , (iii) (c), (iv), (a) (v) (a)

27. If we stretched the thumb, forefinger and middle finger of our left hand so that they are mutually perpendicular to each other. If the forefinger gives the direction of magnetic field and middle finger gives the direction of electric current then the thumb gives the direction of motion or the force acting on the conductor.



1) List three sources of magnetic field.
2) Above paragraph is about _____
3) Fleming's right hand rule is used for ?
4) The phenomenon of electromagnetic induction was discovered by?

Answers:

1) Moving charge, electric current, magnet
2) Fleming's Left hand rule.
3) The rule mentioned above can be used for the find the direction of force on the current carrying conductor.
4) The phenomenon of electromagnetic induction was discovered by Michael Faraday.

Ques 3
The domestic electric circuit consist of red insulated cover called as live wire, wire with black insulation called as neutral wire and the wire with green insulation is called as Earth wire. We know that fuse is connected in series with the circuit to prevent the damaging of electrical appliances and circuit from overloading. Overloading occurs when live wire and the neutral wire comes in direct contact with each other. Because of which current through the circuit increases suddenly. Also, overloading may occurs because of connecting many appliances to a single socke
Questions:
1) What are the signs of live wire and neutral wire?
2) In our country what is the potential difference between live wire and neutral wire?
3) What is short circuiting?
4) What is the main purpose of using fuse in electric circuit?
Answers:
1) The red insulated wire is the live wire or positive and the black insulated wire is the neutral wire or negative.
2) In our country the potential difference between live wire and neutral wire is 220 V.

3) When live wire and neutral wire comes in direct contact, in that situation the current through the circuit increases suddenly and it is called as short circuiting.
4) Because of Joule's heating effect the heat produced causes the fuse to melt and to break the circuit. And thereby protect the circuit and electric appliances.

CHAPTER- 13

OURENVIRONMENT

Environment: It is the physical and biological world where we live in.

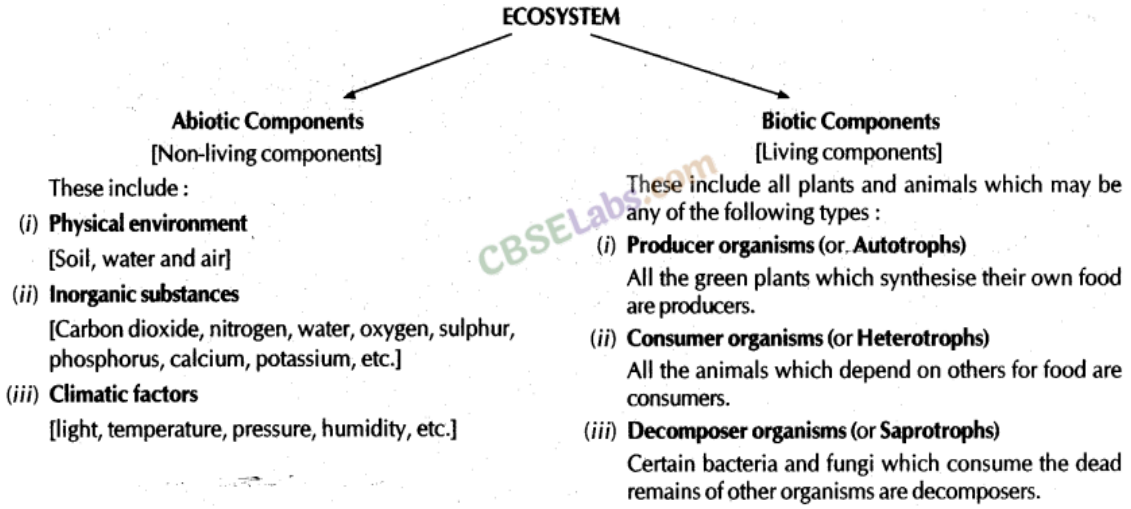
It comprises living (biotic) as well as non-living/physical factors (abiotic) components.

Biotic components comprise plants, animals, including human beings and microorganisms and abiotic are air, water, soil, minerals, temperature, wind and rainfall.

In the environment, the biotic and abiotic components interact with each other and maintain a balance in nature.

Ecosystem: It is a system in nature in which the biotic and abiotic constituents of an area interact with each other and maintain a state of balance.

All the above ecosystems are made up of two main components.



FOODCHAIN:-

Thesequenceoflivingorganismsinaecosysteminwhichoneorganismconsumesanotherorganismto transferfoodenergy, iscalled afoodchain.

Forexample

i- Grass Goat…Tiger

ii- Grass----insects…..frog……snake eagle

iii- Planktons…..insects……fish……crane

TROPHICLEVELS:

The various steps in the food chainat which thetransferoffood(or energy) takesplaceiscalledtrophiclevels.

The different trophic levels are – Producers (T1), Primaryconsumers(herbivores-T2),Secondaryconsumers(primarycarnivores–T3),Tertiaryconsumers(Seccarnivores–T4), Decomposers

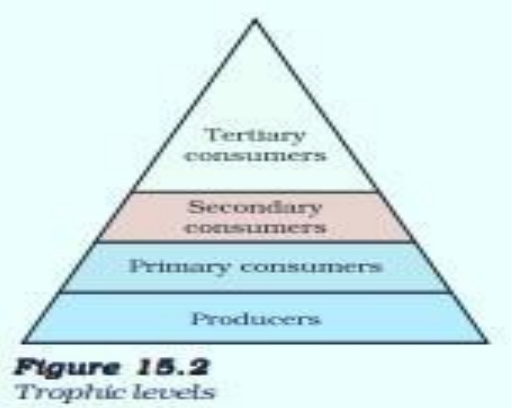
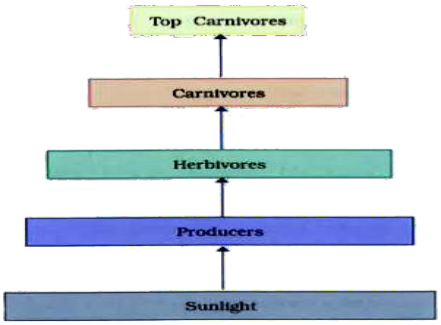


Figure 15.2
Trophic levels

Significanceof FoodChains:-

- Thefoodchaintransferenergyfromonetrophiclevelto another.
- Autotrophs---------- heterotrophs… decomposers
- Only 10 % of energy is transferred from one trophiclevel to another. Rest of energy is lost as heat, intodoing work, in digestion, growth, reproduction.It iscalled10 %law.
- Help in study of food relationships and interactionsamongthe variousorganismsin anecosystem.



Ten percent law: Ten percent law states that only 10 percent of the energy entering a particular trophic level of organisms is available for transfer to the next higher trophic level.

Example; Solar energy (1000 Joule) —1%→ 100 J (Plant) —10%→ 1 Joule (Deer) —10%→ 0.1 Joule (Lion)

FOODWEB:-

Itisinter-connectedfoodchainsinanecosystem.
Itformsanetworkofrelationshipbetween variousspecies.
Inafood web,oneorganism mayoccupyaposition in morethan onefoodchain.Morestable foodchain/foodweb meansmorestable ecosystem.

FOODPYRAMID:-

Itis graphicrepresentationoffoodchain.
Itmaybeformedas,depictedasapyramidhavingabroadbaseformedbyproducersand taperingto a point formed byendconsumers.

Grass (10 ppm) DDT → Deer (200 ppm) DDT → Lion (5000 ppm) DDT

BIOMAGNIFICATION:-

Biological Magnification: The increase in concentration of harmful chemical substances like pesticides in the body of living organisms at each trophic level of a food chain is called biological magnification.
Example:

Maximum concentration of such chemicals gets accumulated in human bodies

.

OZONELAYER:-

- Ozone(O3)is a moleculeformed bythreeatomsofoxygen.
- Ozoneshieldsthesurfaceoftheearthfromultraviolet (UV)radiationfromtheSun.
- UVradiationis highlydamagingtoorganisms.Itmaycauseevenskin cancerinhumanbeings.

Ozone is formed as a result of the following photochemical reaction.

$$O \xrightarrow{h\nu} O + O \text{ (Splitting of molecular oxygen)}$$

(1800 Å to 2000 Å)

$$O_2 + O \longrightarrow O_3 \text{ (Ozone)}$$

- The ozone layer depletion takes place at higher rate.The major cause ischlorofluorocarbons(CFCs)whichareusedasrefrigerantsandinfireextinguishers.

BIODEGRADABLEANDNONBIODEGRADABLEWATSES :-

i- BiodegradableWastes: Thesecan bebroken down bythe biologicalprocesses. E.g. Food waste, plant parts, animal wastes, agricultural residue, paper etc.Decomposers can decompose these without harming ecosystem. Food waste, treesleaves, urine and fecal matter, sewage agricultural residue, paper, wood, cloth, cow-dungetc.

ii- Non-biodegradablewaste-these can‘tbebroken downbybiologicalprocesses. E.g.-Chemicalpesticides,DDT,mercury,lead,plastics,polythenebagsetc.Th esewastesaremajor pollutants of theenvironment.

MAINTAININGTHEGARBAGEWEPRODUE:-

- Changeinattitudes toward usingonlybiodegradable items.
- Properdisposalofwastes
- FollowSewagetreatmentnorms
- 3_R‘principle-reduce,recycle,reuse

MULTIPLE CHOICE QUESTIONS

Q.NO-1. An ecosystem includes

(a) all living organisms. (b) non-living objects. (c) both living organisms and non-living objects. (d) sometimes living organisms and sometimes non-living objects.

Q.NO-2. In the given food chain, suppose the amount of energy at fourth trophic level is 5 kJ, what will be the energy available at the producer level?

Grass ———> Grasshopper ———>Frog ———>Snake ———>Hawk

(a) 5 KJ (b) 50 KJ (c) 500 KJ (d) 5000KJ

Q.NO-3 Which of the statements is incorrect?

(a) All green plants and blue-green algae are producers.
(b) Green plants get their food from organic compounds,
(c) Producers prepare their own food from inorganic compounds.
(d) Plants convert solar energy into chemical energy

Q.NO-4 Which group of organisms are not constituents of a food chain?

(i) Grass, lion, rabbit, wolf (ii) Plankton, man, fish, grasshopper

(iii) Wolf, grass, snake, tiger (iv) Frog , Snake , Eagle , Grass , Grasshoper.

(a) (i) and (iii) (b) (iii) and (iv) (c) (ii) and (iii) (d) (i) and (iv)

Q.NO-5 The percentage of solar radiation absorbed by all the green plants for the process ofphotosynthesis is about (a) 1% (b) 0.01 % (c) 0.001 % (d) 10%

Answers 1 © 2. (d) 3. (b) 4. (c) 5. (a)

ASSERSION AND REASON TYPE QUESTION

For the following question numbers (1-5) two statements are given- one labeled Assertion (A)
andtheotherlabeledReason(R).Selectthecorrectanswertothesequestionsfromthecodes(a),(b), (c) & (d) asgivenbelow:

(a) BothA andRaretrue,andRiscorrectexplanationoftheassertion.
(b) BothAand Raretrue,but Risnotthecorrectexplanationoftheassertion.
(c) A istrue,butRis false.
(d) Aisfalse,butRistrue

Q.No-1 Assertion: Plants are autotrophs.
Reason: Autotrophs are capable of synthesising organic food from inorganic raw materials with the help of solar radiations.

Q.No-2 Assertion: A food chain represents a unidirectional transfer of energy.
\Reason: Food chains help us in understanding various interactions among the different organisms and also their interdependence.

Q.No-3 Assertion: A food web establishes a network of relationships between various species with the help of interconnected food chains in an ecosystem.
Reason: A food web shows a series of branching lines and unidirectional flow of energy in an ecosystem. 4-6 trophic levels of different species.

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Answers 1 (a) 2. (b) 3. (c)

SHORT ANSWER TYPE QUESTION

Q.No-1 In a certain study conducted on the occurrence of DDT along food chains in anecosystem, the concentration of DDT in grass was found to be 0-5 ppm. In sheep, it was 2ppmand inmanit was10ppm. Namethephenomenon anddefine?

Ans:Bio-magnification
Bio-magnificationistheincreaseinthelevelof atoxicsubstancewitheach successiveriseinthetrophiclevel of a foodchain.

Q.No-2 Suggest one word for each of the following statements/definitions:
(a) The physical and biological world where we live in.
(b) Each level of food chain where transfer of energy takes place.

(c) The physical factors like temperature, rainfall, wind and soil of an ecosystem

(d) Organisms which depend on the producers either directly or indirectly for food.

Ans. (a) Environment or biosphere or ecosystem (b) Trophic Level (c) Abiotic Factor (d) Consumers or Heterotrophs

Q.No-3 Why is improper disposal of waste a curse to environment?

Ans. Improper disposal of waste is a curse not only to the environment but also to human beings who are a part of it. It leads to the following:

(i) It becomes a breeding ground for various germs. (ii) It disturbs the natural balance of the environment by polluting air, water and soil. (iii) It emits a foul odour which is injurious to all lives.

Q.No-4 Write the common food chain of a pond ecosystem.

Ans. Phytoplanktons→→→ Zooplanktons Small fish Fish-eating birds

Q.No-5 What are the advantages of cloth bags over plastic bags during shopping?

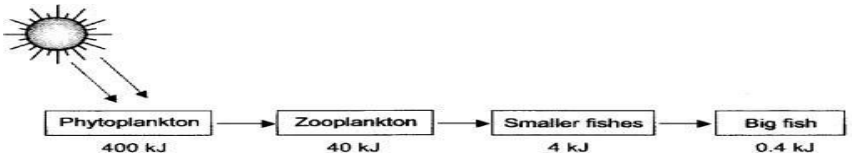
Ans, Cloth bags have a number of advantages over plastic bags, which are as follows:

(1) They are biodegradable. (ii) They can be reused.

(iii) They do not cause pollution. (iv) They can carry more articles.

Q 6Draw alinediagramtoshow flowof solarenergyin ecosystem

Ans:



Q7Inthefollowingfoodchain,100Jofenergyisavailabletothelion.Howmuchene rgywasavailable to theproducer?

Ans:simplefoodchain

Plants———>Deer———> Lion.

As per 10 % law only 10 % of energy is transferred to

next trophic level-Energyavailable to deer=100J x10

=1000 J

Energyavailable to plants = 1000x10 =10,000 J.

LONG ANSWER TYPE QUESTION

Q.No-1 Indicate the flow of energy in an ecosystem. Why is it unidirectional? Justify.

Ans. In a terrestrial ecosystem, the energy always flows from the sun to green plants (producers), to first consumers (herbivores) and then to second consumers (carnivores). An average of 10% of the food eaten is turned into its own body and made available to the next level of consumers.

The energy is progressive and its flow never reverts. It always moves from one trophic level

to the next higher trophic level. Also, energy always flows from prey to predator and not the other way round. While shifting of energy, the quantum of energy progressively reduces at higher trophic levels, making it impossible for energy to flow in the reverse direction. That is why the flow of energy is always unidirectional.

Q.No-2 What are decomposers? What will be the consequence of their absence in an ecosystem? Ans. Decomposers are the organisms that break down the complex organic dead bodies of plants and animals and convert them into simpler, inorganic and reusable minerals that go into the soil and are used again and again by the plants.

• Recycling of minerals will not take place in the absence of decomposers.

Decomposers help in keeping the environment clean by decomposing all dead plants and animals. In their absence, there will be the accumulation of dead plants and

animals in the environment.

Q.No-3 Suggest any four activities in daily life which are eco-friendly.

Ans. Following are the eco-friendly activities:

(i) Judicious use of natural resources such as fossil fuels, soil, water. (ii) use of items that are degradable. For example, use of jute/cloth/paper bags in place of polythene/plastic bags and recycling of waste papers. (iii) Use of bicycle and electric vehicles instead of vehicles run by fossil fuels. (iv) Segregation of biodegradable wastes from non-biodegradable wastes and their proper disposal.

Q.No-4 Explain some harmful effects of agricultural practices in the environment?

Ans Hint:-Excess use of fertilizer, non-biodegradable chemicals leads to bio-magnification, Excess use of ground water, Excess use of Pesticides.

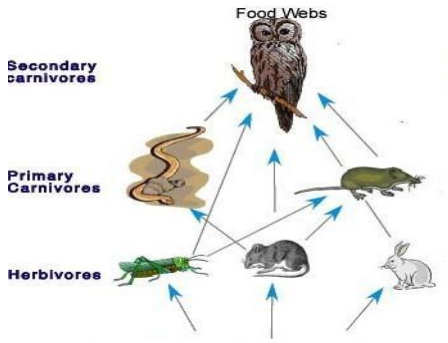
Q.No-5 What is a food web? Give two examples based on the given diagram. State its significance for ecosystem.

Ans. It has been observed that in an ecosystem, a number of food chains exist. As shown in the given food web, some organisms appear in more than one food chain. Thus the food chains get interlinked. The interlinking or network of food chains existing in an ecosystem results in the formation of food web, eg. (i) In the given food web, the mouse is the prey of a snake as well as a hawk. (ii) Similarly, rabbit, mouse, bird and grasshopper are all eaten by the hawk.

The significance of food web is in the maintenance of ecological balance which is based upon the interdependence of different organisms.

CASE STUDY BASED QUESTION

Q.No-1 Readthefollowingandanswerthequestionsanyfourfrom(i)to(iv)
Foodchainsareveryimportantforthesurvivalofmostspecies.



Food chains are very important for the survival of most species. When only one element is removed from the food chain it can result in extinction of a species in some cases. The foundation of the food chain consists of primary producers.

Primary producers, or autotrophs, can use either solar energy or chemical energy to create complex organic compounds, whereas species at higher trophic levels cannot and so must consume producers or other life that itself consumes producers. Because the sun's light is necessary for photosynthesis, most life could not exist if the sun disappeared. Even so, it has recently been discovered that there are some forms of life, chemotrophsthat appear to gain all their metabolic energy from chemosythesis driven by hydrothermal vents, thus showing that some life may not require solar energy to thrive.

1.

If10,000Jsolarenergyfallsongreenplantsinaterrestrialecosystem,whatpercentageofsolarenergywillbeconverted intofood energy?

a)10,000J
b)100J

c)1000J
d)Itwilldependonthetypeoftheterrestrialplant.

2. IfRaviisconsumingcurd/yogurtforlunch,whichtrophiclevelinafoodchainheshouldbeconsidered asoccupying?

a) Firsttrophiclevel
b) Secondtrophiclevel
c) Thirdtrophiclevel
d) Fourthtrophiclevel

3.Thedecomposersarenotincludedinthefoodchain .Thecorrectreasonforthesameisbecausedecomposers:

(a) Actateverytrophiclevelofthefoodchain
(b) Donotbreakdownorganiccompounds
© Convertorganicmaterialtoinorganicforms
(d) Releaseenzymesoutsidetheirbodytoconvertorganicmaterialtoinorganicforms

4. Matterandenergyaretwofundamentalinputsofanecosystem.Movementof

(a) Energyisbidirectionalandmatterisrepeatedlycirculating.
(b) Energyisrepeatedlycirculationandmatterisunidirectional.
© Energyisunidirectionalandmatterisrepeatedlycirculating.
(d) Energyismultidirectionalandmatterisbidirectional.

Answers 1 (b) 2. (c) 3. (a) 4. (c)

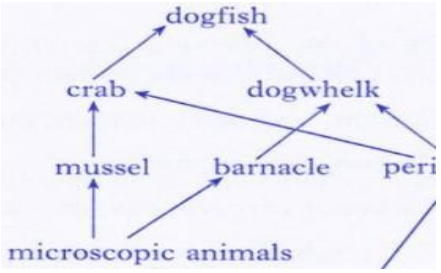
Q.No-2 Read the following and answer the questions any four from (i) to (iv)

Biosphere is a global ecosystem composed of living organisms and abiotic factors from which they derive energy and nutrients. And ecosystem is defined as structural and functional unit of the biosphere comprising of living and non-living environment that interact by means of food chains and chemical cycles resulting in energy flow, biotic diversity and material cycling to form a stable, self-supporting system

1. Which trophic level is incorrectly defined?
(a) Carnivores – secondary or tertiary consumers (b) Decomposers – microbial

heterotrophs (c) Herbivores – primary consumers (d) Omnivores – molds, yeast and mushrooms

2 The diagram below shows a food web from the sea shore



The mussel can be described as
(a) Producer (b) Primary consumer(c) Secondary consumer (d) Decomposer

3 The given figure best represents:

(a) Grassland food chain (b) Parasitic food chain (c) Forest food chain (d) Aquatic food chain

.4 Consider the following statements concerning food chains:

(i) Removal of 80% tigers from an area resulted in greatly increased growth of vegetation

(ii) Removal of most of the carnivores resulted in an increased population of herbivores.

(iii) The length of the food chains is generally limited to 3 – 4 trophic levels due to energy loss

(iv) The length of the food chains may vary from 2 to 8 trophic levels

Which two of the above statements are correct?

(a) (i), (iv) (b) (i), (ii) (c) (ii), (iii) (d) (iii), (iv)

Answers :-1 (d) 2. (c) 3. (a) 4. (c)

KENDRIYA VIDYALAYA SANGATHAN
PATNA REGION
SUBJECT – SCIENCE (CODE-086) SAMPLE PAPER 1 (SOLVED)

MAX. MARKS - 80 TIME ALLOWED – 3 HOURS

General Instructions:

1.This question paper consists of 39 questions in 5 sections.

2.All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.

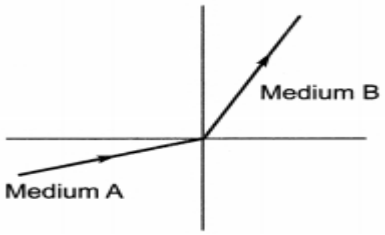
3.Section A consists of 20 objective type questions carrying 1 mark each.

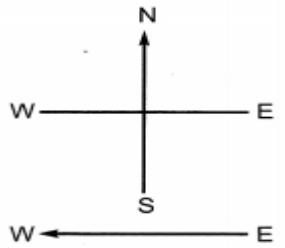
4.Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should in the range of 30 to 50 words.

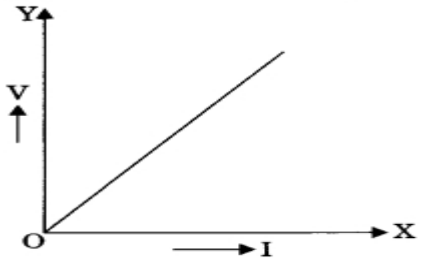
5.Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should in the range of 50 to 80 words

6.Section D consists of 3 Long Answertype questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.

7.Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

Q.	Questions	Marks
	SECTION – A	
1.	A red brown gas is released along with oxygen and lead oxide on heating lead nitrate. It is an example of : (a)Combination reaction (b)Oxidation reaction (c)Decomposition reaction (d)Reduction reaction	1
2.	The poorest conductor of heat among metals is (a) Lead (b) Mercury (c) Calcium (d) Sodium	1
3.	The process in which a carbonate ore is heated strongly in the absence of air to convert it into metal oxide is called (a) Roasting (b) Reduction (c) Calcination (d) Smelting	1
4.	The chemical formula for plaster of Paris is (a) CaSO4.3H2O (b) CaSO4.2H2O (c) CaSO4.1/2H2O (d) 2CaSO4.2H2O	1
5.	C3H8 belongs to the homologous series of (a) Alkynes (b) Alkenes (c) Alkanes (d) Cyclo alkanes	1
6.	Roots of plants are: (a) positively geotropic (b) negatively geotropic (c) positively phototropic (d) None of these	1
7.	Bryophyllum can be propagated vegetatively by the (a) stem (b) leaf (c) root (d) flower	1
8.	A trait in an organism is influenced by (a) paternal DNA only (b) maternal DNA only (c) both maternal and paternal DNA (d) neither by paternal nor by maternal DNA	1
9.	A light ray enters from medium A to medium B as shown in figure. The refractive index of medium B relative to A will be  	1

	(a) greater than unity (b) less than unity (c) equal to unity (d) zero	
10.	First link in any food chain is usually green plants because (a) they are widely distributed (b) they are fixed at one place in the soil (c) they alone have the capacity to synthesise food using sunlight (d) there are more herbivores than carnivores	1
11.	A constant current flows in a horizontal wire in the plane of the paper from east to west as shown in the figure. The direction of magnetic field at a point will be North to South  (a) directly above the wire (b) directly below the wire (c) at a point located in the plane of the paper, on the north side of the wire (d) at a point located in the plane of the paper, on the south side of the wire.	1
12.	At noon the sun appears white as (a) light is least scattered. (b) all the colours of the white light are scattered away. (c) blue colour is scattered the most. (d) red colour is scattered the most.	1
13.	Electrical resistivity of a given metallic wire depends upon (a) its length (b) its thickness (c) its shape (d) nature of the material	1
14.	Which of the following is a logical sequence of food chain (a) producer → consumer → decomposer (b) producer → decomposer → consumer (c) consumer → producer → decomposer (d) decomposer producer → consumer	1
15.	Roots of the plants absorb water from the soil through the process of: (a) diffusion (b) transpiration (c) osmosis (d) None of these	1
16.	Which of the following are energy foods? (a) Carbohydrates and fats (b) Proteins and mineral salts (c) Vitamins and minerals (d) Water and roughage	1
17.	Which of the following will undergo addition reactions? (a) CH4 (b) C3H8 (C) C2H6 (d) C2H4	1
18.	The enzyme responsible for the digestion of proteins in the small intestine is: (a) Pepsin (b) Trypsin	1

	(c) Amylase (d) Lipase	
19.	Assertion: - Chemical reaction changes the physical and chemical state of the substance. Reason:- When electric current passes through water, it decomposes to produces hydrogen and oxygen gases. (a)Both reason and assertion are true and reason is correct explanation of assertion. (b) Both reason and assertion are true but reason is not the correct explanation of assertion. (c)Assertion is true but reason is false. (d)Reason is true but assertion is false.	1
20.	The slope of voltage (V) versus current (I) is called  (a) resistance (b) conductance (c) resistivity (d) conductivity	1
	SECTION – B	
21.	A straight wire of diameter 0.5 mm carrying a current of 1A is replaced by another wire of 1 mm diameter. How is the strength of the magnetic field far away from it related to it's earlier value.	2
22.	Reverse of the following chemical reaction is not possible: Zn(s) + CuSO4(aq) → ZnSO4(aq) + Cu(s) Justify this statement with reason.	2
23.	Write two differences between binary fission and multiple fission.	2
24.	A Mendelian experiment consisted of breeding pea plants bearing violet flowers(VV) with pea plants bearing white flowers(vv). What will be the result in F1 progeny?	2
25.	What do you understand by homologous series ? Write the molecular formula of first two members of homologous series having functional group -OH.	2
26.	Out of HCl and CH3COOH, which one is a weak acid and why?	2
	SECTION – C	
27.	How is ozone formed in upper atmosphere ? State it's importance. What is responsible for it'sdepletion ? Write one harmful effect for ozone depletion.	3
28.	What do you understand by magnetic field lines ? Write their properties.	3
29	List three techniques that have been developed to prevent pregnancy. Which one of these techniques is not meant for males? How does the use of these techniques have a direct impact on the health and prosperity of a family?	3
30.	Give reasons for the following: (i) Element carbon forms compounds mainly by covalent bonding. (ii) Diamond has high melting point. (iii) Graphite is a good conductor of electricity.	3
31.	How is washing soda prepared from sodium carbonate? Give its chemical equation. Name the type of hardness of water which can be removed by it?	3
32.	Balance the following chemical reactions :- (i)HNO3 +Ca(OH)2 □Ca(NO)3 + H2O (ii)NaOH + H2SO4 □ Na2SO4 + H2O	3

	(iii) NaCl + AgNO3 □AgCl + NaNO3	
33.	Give reason for the following: (i) Hydrogen gas is not evolved when most of the metals react with nitric acid. (ii) Zinc oxide is considered as an amphoteric oxide. (iii) Metals conduct electricity.	3
	SECTION – D	
34.	(a) Name the organs that form the excretory system in human beings. (b) Draw the structure of nephron Describe in brief how urine is produced in human body.	5
35.	State and explain Ohm's law. Define resistance and give its SI unit. What is meant by 1 ohm resistance? Calculate the resistivity of the material of a wire of length 1 m, radius 0.01 cm and resistance 20 ohms.	5
36.	A spherical mirror produces an image of magnification -1.0 on a screen placed at a distance of 30 cm from the pole of the mirror. (i) Write the type of mirror in this case. (ii) What is the focal length of the mirror? (iii) What is the nature of the images formed? (iv) Draw the ray diagram to show the image formation in this case.	5
	SECTION – E	
37.	Read the following and answer the questions: Atmospheric refraction is the phenomenon of bending of light on passing through earth's atmosphere. As we move above the surface of earth, density of air goes on decreasing. Local conditions like temperature etc. also affect the optical density of earth's atmosphere. On account of atmospheric refraction, stars seen appear higher than they actual are; advanced sunrise; delayed sunset, oval appearance of the sun at sunrise and sunset; stars twinkle, planets do not. Q.1- Due to atmospheric refraction, apparent length of the day (a) increases (b) decreases (c) remains the same (d) all of these Q.2- Apparent position of the star appears raised due to (a) atmospheric refraction (b) scattering of light (c) both (a) and (b) (d) none of these Q.3.- The sun appears oval shaped or flattened due to (a) dispersion (b) scattering (c) atmospheric refraction (d) cannot say Q.4- Twinkling of stars and non-twinkling of planets is accounted for by (a) scattering of light (b) dispersion of light (c) atmospheric refraction (d) none of these	4
38.	. Read the following and answer the questions Plants perform chemical coordination for various activities with the help of hormones. Different hormones are produced by plants. These are the chemical compounds released by stimulated cells that diffuse to various locations in plants performing different function. There is a hormone that is	4

	synthesized in the tip of shoots. When light is coming from one side of the plant, this hormone diffuses towards the shady side of the shoot. Its concentration stimulates the cells to grow longer on the side of the shoot which is away from light Thus, the plant appears to bend towards light while growing. (1) The name of the hormone being described is: (a) Auxin (b) Gibberellin (c) Cytokinin (d) Ethephon (2) The movement of shoot towards light is known as (a) Chemotropism (b) Phototropism (c) Thigmotropism (d) Geotropism (3) A young plant receives sunlight from one direction only. What will happen to its roots and shoots? (a) The shoot of the plant bend towards light whereas roots bend away (b) The shoot of the plant bend towards light whereas roots also bend toward sunlight (c) The shoot of the plant bend away from the light whereas roots bends toward sunlight (d) Both b & c (4) The stimulus in growth of pollen tube ovule during fertilization is : (a) Pollen (b) Chemical (c) Light (d) Water	
39.	Read the given passage and answer the questions- Sex determination is the method by which distinction between males and females is established in a species. The sex of an individual is determined by specific chromosomes. These chromosomes are called sex chromosomes or allosomes. X and Y chromosomes are called sex chromosomes. The normal chromosomes other than the sex chromosomes of an individual are known as autosomes. Q.1- In XX-XO type of sex determination (A) females produce two different types of gametes (B) males produce two different types of gametes (C) females produce gametes with Y chromosome (D) males produce gametes with Y chromosome. Q.2- A couple has six daughters. What is the possibility of their having a girl next time? (A) 10% (B) 50% (C) 90% (D) 100% Q.3- Number of autosomes present in liver cells of a human female is (A) 22 autosomes (B) 23 autosomes (C) 22 pairs (D) 23 pairs. Q.4. XX-XO type of sex determination and XX-XY type of sex determination are the examples of (A) male heterogamety (B) female heterogamety (C) male homogamety (D) None of these	4

KENDRIYA VIDYALAYA SANGATHAN
PATNA REGION
SUBJECT – SCIENCE (CODE-086)
SAMPLE PAPER-1 MARKING SCHEME

Q. No.	Answer	Marks
1.	(c) Decomposition reaction	1
2.	(a) Lead	1
3.	(c) Calcination	1
4.	CaSO4.1/2H2O	1
5.	(c) Alkanes	1
6.	(a) positively geotropic	1
7.	(b) leaf	1
8.	(c) both maternal and paternal DNA	1
9.	(a) greater than unity	1
10.	(c) they alone have the capacity to synthesise food using sunlight	1
11.	(b) directly below the wire	1
12.	(a) light is least scattered	1
13.	(d) nature of the material	1
14.	(a) producer → consumer → decomposer	1
15.	(c) osmosis	1
16.	(a) Carbohydrates and fats	1
17.	(d) C2H4	1
18.	(b) Trypsin	1
19.	(b) Both reason and assertion are true but reason is not the correct explanation of assertion.	1
20.	a) resistance	1
21.	Remain same.	2
22.	This is because copper metal is less reactive than zinc metal and hence, cannot displace zinc from its salt solution.	2
23.	Any two differences between binary fission and multiple fission.	2
24.	colour of the flower in F1 progeny will be violet (Vw).	2
25.	Definition. CH3OH and CH3CH2OH.	1+1
26.	CH3COOH is a weak acid because it dissociates partially in the solution.	1+1
27.	Formation of ozone. Protect us from UV radiation. CFC. Any one harmful effect.	1+1/2+1/2+1
28.	Definition. Properties.	1+2
29.	Barrier method, Chemical method, Surgical method, Out of these methods, chemical method is not meant for males.	1+1+1
30.	(i) Carbon attains noble gas configuration only by sharing of electrons	1+1+1

	(ii) In diamond, each carbon atom is bonded to four other carbon atoms forming a rigid three-dimensional structure. (iii) In graphite, each carbon atom is bonded to three other carbon atoms by covalent bonds in the same plane giving a hexagonal array. Thus, only three valence electrons are used for bond formation and hence, the fourth valence electron is free to move.	
31.	Preparation of washing soda. Equation. Permanent Hardness.	1+1+1
32.	(i)2HNO3 + Ca(OH)2 □Ca(NO)3 + 2H2O (ii)2NaOH + H2SO4 □ Na2SO4 + 2H2O (iii) NaCl + AgNO3 □AgCl + NaNO3	1+1+1
33.	(i) HNO3 is a strong oxidising agent. It oxidises the H2 produced to water and itself gets reduced to any of the nitrogen oxides (N2O, NO, NO2). (ii)ZnO reacts both with acids as well as bases to form salt and water. Thus, ZnO is an amphoteric oxide. (iii)Metals conduct electricity due to the flow of free electrons present in them.	1+1+1
34.	Kidney, ureter, urethra and urinary bladder.	1+4
35.	ρ = 6.28 × 10-7 Ω m	1+1+1+2
36.	(i) The mirror is concave mirror. (ii) f = – 15 cm (iii) Image formed is real and inverted and of the same size of the object. (iv) Ray diagram	1+2+1+1
37.	1-(a) increases 2-(a) atmospheric refraction 3-(c) atmospheric refraction 4-(c) atmospheric refraction	1+1+1+1
38.	1-(a) Auxin 2-(b) Phototropism 3-(a) The shoot of the plant bend towards light whereas roots bend away 4-(b) Chemical	1+1+1+1
39.	1-(B) males produce two different types of gametes 2-(B) 50% 3-(C) 22 pairs 4-(A) male heterogamy	1+1+1+1

KENDRIYA VIDYALAYA SANGATHAN – PATNA REGION

SAMPLE PAPER - II
CLASS X (2023-24)

SCIENCE (CODE 086)

Time: 3 Hours
Maximum Marks: 80

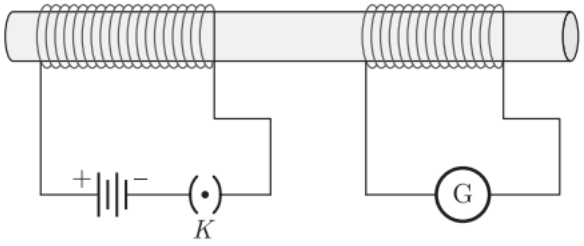
General Instructions:

(i) The question paper comprises of Five sections-A, B, C, D and E. Attempt all the sections.
(ii) All questions are compulsory.
(iii) All questions in Section A are one-mark questions comprising MCQ and assertion-reason type questions.
(iv) Section B has 2-marks questions. It should be answered in about 25 - 30 words each.
(v) Section C has 3-marks questions. It should be answered in about 50 - 60 words each.
(vi) Section D has 5-marks questions. It should be answered in about 80 - 90 words each.
(vii) All questions in Section E are of four-marks each, case based questions. These are to be answered logically as per given data.
(viii) This question paper consists of a total of questions.

Section A

1. What happens when copper rod is dipped in iron sulphate solution?
(a) Copper displaces iron
(b) Blue colour of copper sulphate solution is obtained
(c) No reaction takes place
(d) Reaction is exothermic

2. In the arrangement shown in the figure given alongside, there are two coils wound on a non-conducting cylindrical rod. Initially the key is not inserted. Then the key is inserted and later removed.
In this case



(a) the deflection in the galvanometer remains zero throughout.

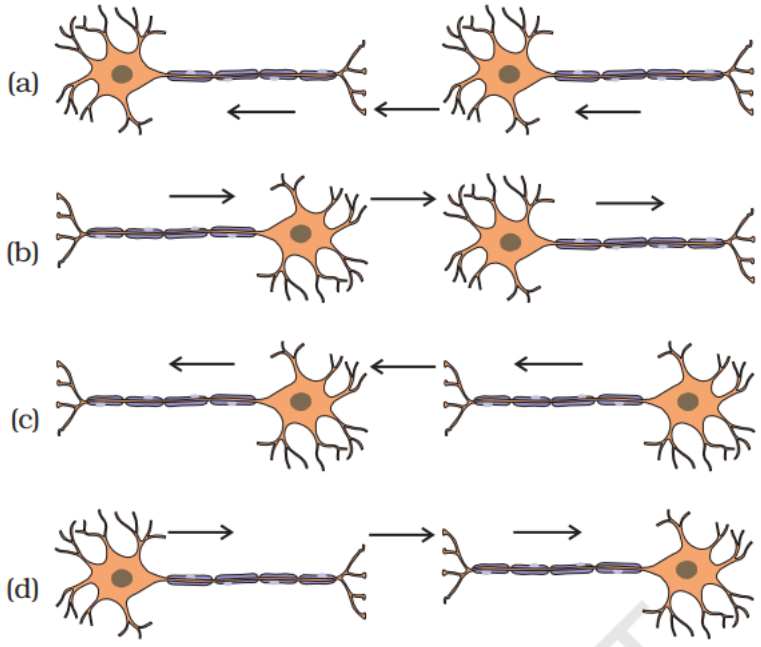
(b) there is a momentary deflection in the galvanometer but it dies out shortly and
there is no effect when the key is removed.
(c) there are momentary galvanometer deflections that die out shortly;
the deflections are in the same direction.
(d) there are momentary galvanometer deflections that die out shortly;
the deflections are in opposite directions.

3. Which one of the following four metals would be displaced from the solution of its salt by other three metals? (a) Mg (b) Ag (c) Zn
(d) Cu

4. Which among the following statement(s) is(are) true?
Exposure of silver chloride to sunlight for a long duration turns grey due to
(i) the formation of silver by decomposition of silver chloride
(ii) sublimation of silver chloride
(iii) decomposition of chlorine gas from silver chloride
(iv) oxidation of silver chloride

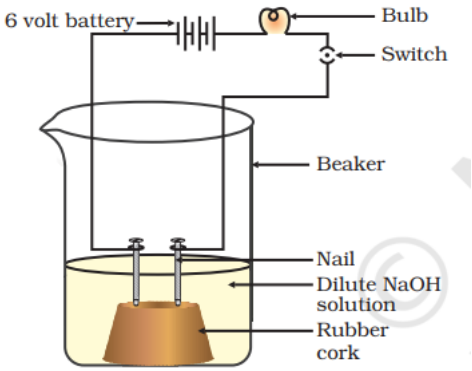
(a) (i) only (b) (i) and (iii) (c) (ii) and (iii) (d) (iv) only

5. What is the correct direction of flow of electrical impulses?



6. In an attempt to demonstrate electrical conductivity through an electrolyte, the following apparatus
as shown in given figure was set up. Which among the following statement(s) is (are) correct?
(i) Bulb will not glow because electrolyte is not acidic
(ii) Bulb will glow because NaOH is a strong base and furnishes ions for conduction.
(iii) Bulb will not glow because circuit is incomplete

(iv) Bulb will not glow because it depends upon the type of electrolytic solution



(a) (i) and (iii)

(b) (ii) and (iv)

(c) (ii) only

(d) (iv) only

7. Which among the following is not a base?
(a) NaOH (b) KOH (c) NH_4OH (d) C_2H_5 OH

8. Which of the following is the correct representation of electron dot structure of nitrogen?

(a) $:\dot{\ddot{N}} : \dot{\ddot{N}}:$

(b) $:\dot{N}::\dot{N}:$

(c) $:\dot{\ddot{N}} : \dot{N}:$

(d) $:N\vdots\vdots N:$

9. The correct sequence of organs in the male reproductive system for transport of sperms is
(a) testis → vas-deferens → urethra
(b) testis → ureter → urethra
(c) testis → urethra → ureter
(d) testis → vas-deferens → ureter

10. If a round, green seeded pea plant (RR yy) is crossed with wrinkled, yellow seeded pea plant, (rr YY)
the seeds produced in F1 generation are
(a) round and yellow (b) round and green
(c) wrinkled and green (d) wrinkled and yellow

11. Two pink coloured flowers on crossing resulted in 1 red, 2 pink and 1 white flower progeny.
The nature of the cross will be
(a) double fertilisation (b) self pollination
(c) cross fertilisation (d) no fertilisation

12. A zygote which has an X-chromosome inherited from the father will develop into a
(a) boy (b) girl

(c) X- chromosome does not determine the sex of a child (d) either boy or girl

13. The strength of magnetic field inside a long current carrying straight solenoid is

(a) more at the ends than at the centre
(b) minimum in the middle
(c) same at all points
(d) found to increase from one end to the other

14. What is the minimum resistance which can be made using five resistors each of 1/5 Ω?

(a) 1/5 Ω (b) 1/25 Ω (c) 1/10 Ω (d) 25 Ω

15. The resistivity does not change if
(a) the material is changed
(b) the temperature is changed
(c) the shape of the resistor is changed
(d) both material and temperature are changed

16. Which of the following is an incorrect statement?
(a) Organisms grow with time
(b) Organisms must repair and maintain their structure
(c) Movement of molecules does not take place among cells
(d) Energy is essential for life processes

**For question numbers 17 to 20, 2-statements are given-
one labelled Assertion (A) and the other labelled Reason (R).
Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given here:

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

17. Assertion : Ammonia solution is an alkali.
Reason : Ammonia solution turns blue litmus paper red.

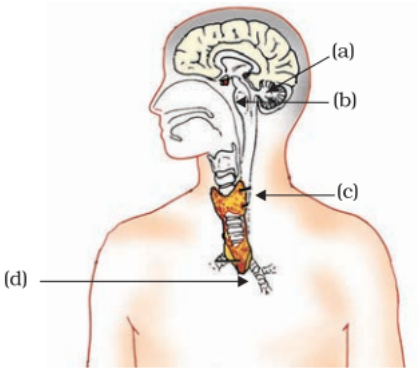
18. Assertion : A freely suspended magnet always rests in the geographical north-south direction.
Reason : The Earth behaves like a huge magnet with its north pole towards geographical south
and south pole towards geographical north.

19. Assertion : Copper articles, when exposed to moist air for a long time,
react with oxygen to form a green coating.
Reason : The green substance formed on the surface of copper articles is copper carbonate .

20. Assertion: Green plants are autotrophs.
Reason: Green plants synthesise their own food using sunlight, chlorophyll, CO_2 and water.

Section B

21. Label the endocrine glands in the given Figure.



22. What happens when
(a) ZnCO3 is heated in the absence of oxygen?
(b) a mixture of Cu2O and Cu2S is heated?

23. A student sitting at the back of the classroom cannot read clearly the letters written on
the blackboard. What advice will a doctor give to her?
=> Draw ray diagram for the correction of this defect.

24. We do not clean ponds or lakes, but an aquarium needs to be cleaned. Why?

25. Differentiate between an artery and a vein.

26. Why is small intestine in herbivores longer than in carnivores?

Section C

27. A zinc plate was kept in a glass container having copper sulphate solution. On examining it was found that the blue colour of the solution is fading slowly. After a few days when the zinc plate was taken out of the solution, a number of small holes were noticed in it. State the reason and give chemical equation of the reaction involved. [3]

28. i. By the transfer of electrons, illustrate the formation of bond in magnesium chloride and identify the ions present in this compound.

ii. Ionic compounds are solids. Give reasons. [1 ½ +1 ½]

29. i. Why is nutrition a necessity for an organism? State three reasons.

ii. What is likely to happen if green plants disappear from Earth? [1 ½ +1 ½]

30. How do Mendel's experments show that traits may be dominants or reessiv.

31. How are the power and focal length of a lens related? You are provided with two lenses of focal length 20 cm and 40 cm respectively. Which lens will you use to obtain more convergent light? [3]

32. For a heater, rated 4 kW and 220 V, calculate the following:

a. The current

b. Energy consumed in 2 hours

c. If 1 kWh is priced at ₹4.50, then find the cost of energy consumed .[1+1+1]

33. Draw a schematic diagram of a circuit consisting of a battery of three cells of 2 V each, a 5 resistor, an 8 resistor, and a 12 resistor and a plug key, all connected in series. Now, connect the ammeter to measure the current through the resistors and a voltmeter to measure the potential difference across the 12 resistors. What would be the readings in the ammeter and the voltmeter? [3]

SECTION D

34. The solid element A exhibits the property of catenation. It is also present in the form of a gas B in the air which is utilized by plants in photosynthesis. An allotrope C of this element is used in glass cutters. (any five)

i. What is element A?

ii. What is the gas B?

iii. Name the allotrope C.

iv. State another use of allotrope C (other than in glass cutters).

v. Name another allotrope of element A which exists as spherical molecules.

vi. Name a yet another allotrope of element A which conducts electricity. [5]

35. Draw a well labelled diagram of male reproductive system and describe its parts.

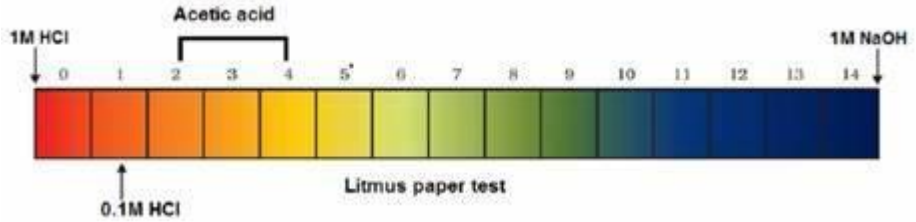
36. We wish to obtain an erect image of an object, using a concave mirror of focal length 15 cm. What should be the range of distance of the object from the mirror? What is the nature of the image? Is the image larger or smaller than the object? Draw a ray diagram to show the image formation in this case. [5]

OR,

An object 1 cm high is placed on the axis and 15 cm from a concave mirror of focal length 10 cm. Find the position, nature, magnification and size of the image.

SECTION E

37. Read the text carefully and answer the questions: The strength of acid and base depends on the number of H+ and the number of OH- respectively. If we take hydrochloric acid and acetic acid of the same concentration, say one molar, then these produce different amounts of hydrogen ions. Acids that give rise to more H+ ions are said to be strong acids, and acids that give less H+ ions are said to be weak acids. Can you now say what weak and strong bases are? [1+1+2]

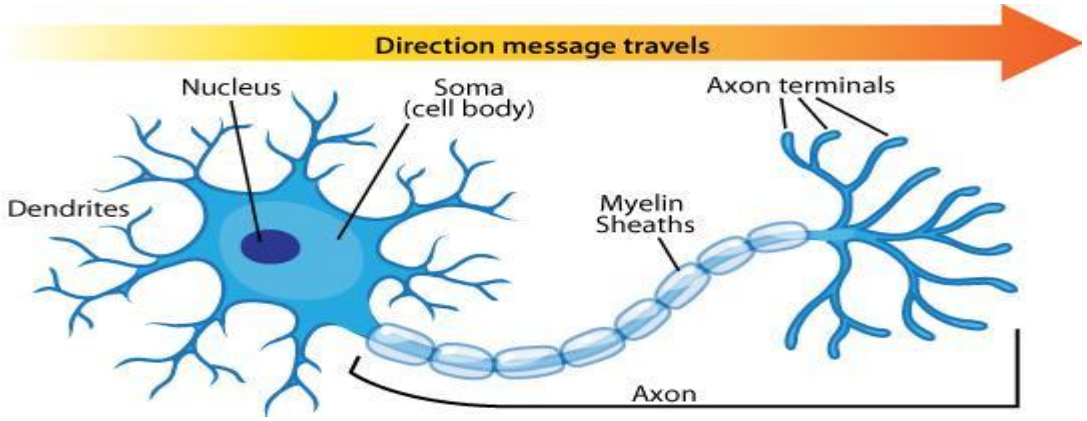


(i) Fresh milk has a pH of 6. How do you think the pH will change as it turns into curd?

(ii) Is Gastric juice a weak acid?

(III) Milk of magnesia is an acid or base? For what purpose it can be used?

38. Read the text carefully and answer the questions: In animals, control and coordination are provided by nervous and muscular tissues. Touching a hot object is an urgent and dangerous situation for us. We need to detect it and respond to it. How do we detect that we are touching a hot object? All information from our environment is detected by the specialised tips of some nerve cells. These receptors are usually located in our sense organs, such as the inner ear, the nose, the tongue, and so on. So gustatory receptors will detect taste while olfactory receptors will detect the smell. This information, acquired at the end of the dendritic tip of a nerve cell, see figure, sets off a chemical reaction that creates an electrical impulse. This impulse travels from the dendrite to the cell body, and then along the axon to its end. [1+1+2]

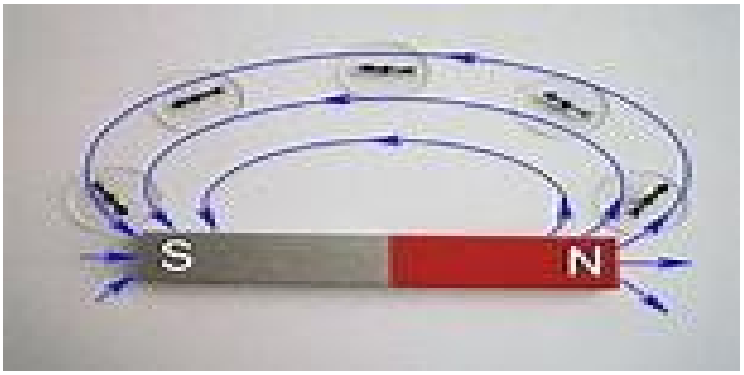


(i) Name the largest cell present in the body.

(ii) What is an axon ?

(iii) Name one gustatory receptor and one olfactory receptor present in a human beings.

39. Read the text carefully and answer the questions: A magnetic field is described by drawing the magnetic field lines. When a small north magnetic pole is placed in the magnetic field created by a magnet, it will experience a force. And if the north pole is free, it will move under the influence of the magnetic field. The path traced by a north magnetic pole free to move under the influence of a magnetic field is called a magnetic field line.



Since the direction of the magnetic field line is the direction of the force on a north pole, so the magnetic field lines always begin from the N-pole of a magnet and end on the S-pole of the magnet. Inside the magnet, however, the direction of magnetic field lines is from the S-pole of the magnet to the N-pole of the magnet. Thus, the magnetic field lines are closed curves. When a small compass is moved along a magnetic field line, the compass needle always sets itself along the line tangential to it. So, a line drawn from the south pole of the compass needle to its north pole indicates the direction of the magnetic field at that point. [1+1+2]

(i) Do the magnetic field lines intersect? if not why?

(ii) A strong bar magnet is placed vertically above a horizontal wooden board. What would be the magnetic lines of force?

(iii) Draw the pattern of magnetic field lines for a bar magnet.