

CHAPTER-5

Periodic Classification of Elements

Pg. No. 81

Q.1 Did Dobereiner's triads also exist in the columns of Newland's Octaves?

Compare and find out.

A.1 Yes, it exists in the Newland's octave. It is Li, Na and K.

Q.2 What were the limitations of Dobereiner's classification?

A.2 The limitation of **Dobereiner's classification** :

Dobereiner could identify only three triads from the elements and all the known elements could not be classified into groups of triads on the basis of their properties.

Q.3 What were the limitations of Newlands Law of Octaves?

A.3 • Newlands' law was applicable only up to calcium, after Ca, every eighth element did not possess properties similar to first.

• New elements discovered did not fit into the law.

• Wrong order of arrangement of elements was done, e.g. Co and Ni do not resemble halogen were found together in same slot, Fe being similar to Co and Ni was separated and kept in different slot.

Pg. No. 85

Q.1 Use Mendeleev's Periodic Table to predict the formulae for the oxides of the following elements:

K, C, Al, Si, Ba

A.1

Element	Group No.	Formula
K	1	K_2O
C	4	CO_2
Al	3	Al_2O_3
Si	4	SiO_2
Ba	2	BaO

Q.2 Besides gallium, which other elements have since been discovered that were left by Mendeleev in his Periodic Table? (any two)

A.2 Besides gallium, germanium and scandium have been discovered

Q.3 What were the criteria used by Mendeleev in creating his Periodic Table?

A.3 (i) Increasing order of atomic mass of the elements.

- (ii) All elements in a group with similar properties.
- (iii) The formula of oxides and hydrides formed by an element.

Q.4 Why do you think noble gases are placed in a separate group?

A.4 Noble gases are inactive, do not resemble other elements and all of them show same properties, hence they are grouped separately.

Pg.No.90

Q.1 How could the Modern Periodic Table remove various anomalies of Mendeleev's Periodic Table?

A.1 Modern Periodic Table is based on the atomic number of elements, therefore

- (i) problem of isotopes was solved because isotopes have same atomic number
- (ii) wrong order of K, Co, Ni was removed.
- (iii) In the Modern Periodic table elements are arranged in the increasing order of their atomic number, removing the anomaly regarding certain pairs of elements in Mendeleev's periodic table.

Q.2 Name two elements you would expect to show chemical reactions similar to magnesium. What is the basis for your choice?

A.2 Calcium and barium.

Reason: (i) Both of them belong to same group as magnesium.

(ii) Ba and Ca has same valence electrons as Mg, and will show same properties as of magnesium.

Q.3 Name:

(a) **Three elements that have a single electron in their outermost shells.**

(b) **Two elements that have two electrons in their outermost shells.**

(c) **Three elements with filled outermost shells.**

A.3	(a) Li, (2, 1)	Na, (2, 8, 1)	K (2, 8, 8, 1)
	(b) Be, (2, 2)	Mg (2, 8, 2)	
	(c) He, (2)	Ne, (2, 8)	Ar (2, 8, 8)

Q.4 (a) Lithium, sodium, potassium are all metals that react with water to liberate hydrogen gas. Is there any similarity in the atoms of these elements?

(b) Helium is an unreactive gas and neon is a gas of extremely low reactivity.

What, if anything, do their atoms have in common?

A.4 (a) All these metals are highly reactive, they have same valence electrons i.e. 1 and can readily loose electrons to become positive ions.

(b) Helium and neon have completely filled outermost shell.

- Q.5 **In the Modern Periodic Table, which are the metals among the first ten elements.**
- A.5 Lithium and beryllium are metals.
- Q.6 **By considering their position in the Periodic Table, which one of the following elements would you expect to have maximum metallic characteristics?**

Ga, Ge, s, Se, Be

- A.6 Among the given elements Be will show maximum metallic characteristics as it belongs to extreme left of the Periodic Table.

Pg.No.91

- Q.1 **Which of the following statements is not a correct statement about the trends when going from, left to right across the periods of the Periodic Table?**

- (a) **The elements become less metallic in nature.**
(b) **The number of valence electrons increases.**
(c) **The atoms lose their electrons more easily,**
(d) **The oxides become more acidic.**

- A.1 (c) The atoms lose their electrons more easily.

- Q.2 **Element forms a chloride with the formula XCl_2 , which is a solid with a high melting point. X would most likely be in the same group of the Periodic Table as:**

- (a) Na (b) Mg (c) Al (d) Si

- A.2 (b) Mg.

- Q.3 **Which element has**

- (a) **two shells, both of which are completely filled with electrons?**
(b) **the electronic configuration 2, 8, 2?**
(c) **a total of three shells, with four electrons in its valence shell?**
(d) **a total of two shells, with three electrons in its valence shell?**
(e) **twice as many electrons in its second shell as in its first shell?**

- A.3 (a) Ne (2, 8)
(b) Mg (2, 8, 2)
(c) Si (2, 8, 4)
(d) B (2, 3)
(e) C (2, 4)

- Q.4 (a) **What property do all elements in the same column of the Periodic Table as boron have in common?**

(b) What property do all elements in the same column of the Periodic Table as fluorine have in common?

- A.4 (a) All other elements have same valence electrons and their valency is 3.
(b) All are non-metals, they have same valence electrons i.e., 7 and their valency is 1, all of them gain electrons to form negative ions.

Q.5 **An atom has electronic configuration 2, 8, 7.**

(a) What is the atomic number of this element?

(b) To which of the following elements would it be chemically similar?

(Atomic numbers are given in parentheses)

N(7) F(9) P(15) Ar (18)

A.5 (a) The atomic number of the element is 17.

(b) F (9) (2, 7) will be chemically similar to the given element.

Q.6 **The position of three elements A, B and C in the Periodic Table are shown below:**

Group 16	Group 17
—	—
—	A
—	—
B	C

(a) State whether A is a metal or non-metal.

(b) State whether C is more reactive or less reactive than A.

(c) Will C be larger or smaller in size than B?

(d) Which type of ion, cation or anion, will be formed by element A?

A.6 (a) 'A' is non-metal.

(b) 'C' is less reactive than 'A'

(c) 'C' is smaller in size than 'B'

(d) 'A' will form an anion as it accepts an electron to complete its octate.

Q.7 **Nitrogen (atomic number 7) and phosphorous (atomic number 15) belong to group 15 of the Periodic Table. Write the electronic configuration of the two elements. Which of the will be more electronegative? Why?**

A.7 Nitrogen atomic number 7 → 2, 5

Phosphorus atomic number 15 → 2, 8, 5

Nitrogen with two shells will be more electronegative because it can easily gain electron due to its smaller size of atom, the nuclear charge attracts the electron easily to become negative ion.

Q.8 How does the electronic configuration of an atom relate to its position in the Modern Periodic Table?

A.8 The position of element depends upon its electronic configuration. The number of shells is equal to the period number. The valence electrons decides the group number in which it will be, elements with 1 valence electrons belong to group 1.

Elements with 2 valence electrons belong to group 2.

Q.9 In the Modern Periodic Table, calcium (atomic number 20) is surrounded by elements with atomic numbers 12, 19, 21 and 38. Which of these have physical and chemical properties resembling calcium.

A.9 Ca atomic number — 20

Electronic configuration — 2, 8, 8, 2

Elements with atomic number 12 → 2, 8, 2

and atomic number 38 → 2, 8, 18, 8, 2

The element with atomic number 12 will resemble calcium as they all have same valence electrons and their chemical properties are also same.

Q.10 Compare and contrast the arrangement of elements in Mendeleev's, Periodic Table and the Modern Periodic table.

A.10

<i>Mendeleev's Periodic Table</i>	<i>Modern Periodic Table</i>
1. It has 8 groups and 6 periods.	It has 18 groups and 7 periods.
2. Transition elements are not separated.	Transition elements are given separate place.
3. The inert gases were not present.	The inert gases are present in separate group.
4. Lanthanides and Actinides were not present.	Lanthanides and Actinides are at the bottom of the Periodic Table.
5. Position of element <i>i.e.</i> , group number and period number cannot be predicted.	Group number and period number can be predicted from its electronic configuration.
6. Elements are arranged according to the atomic mass.	Elements are arranged according to the atomic number.

Chapter 13 - Magnetic Effects of Current

Exercise (pg- 224)

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

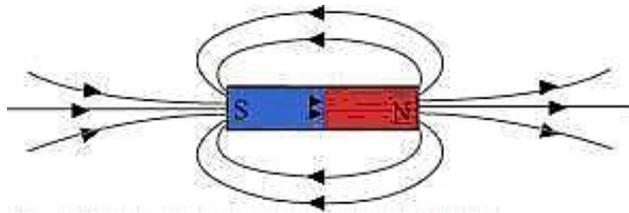
(not to be done in notebook)

Ans: A compass needle is a small bar magnet. When it is brought near a bar magnet, its magnetic field lines interact with that of the bar magnet. Hence, a compass needle shows a deflection when brought near a bar magnet.

Exercise (pg-228)

Q.1 Draw magnetic field lines around a bar magnet.

Ans: Magnetic field lines of a bar magnet emerge from the North Pole and terminate at the South Pole. Inside the magnet, the field lines emerge from the South Pole and terminate at the North Pole, as shown in the given figure.



Q.2 List the properties of magnetic lines of force.

Ans: The properties of magnetic lines of force are as follows.

1. Outside a magnet, magnetic field lines are directed from North Pole to South Pole.
2. The direction of field lines inside the magnet is from the South Pole to the North Pole.
3. Magnetic lines do not intersect with each other.
4. Magnetic lines of force are crowded near the poles of a magnet but they are widely separated at other places.

Q.3: Why don't two magnetic lines of force intersect each other?

Ans: If two field lines of a magnet intersect, then at the point of intersection, there would be two directions of magnetic field. This is not possible. Hence, two field lines do not intersect each other.

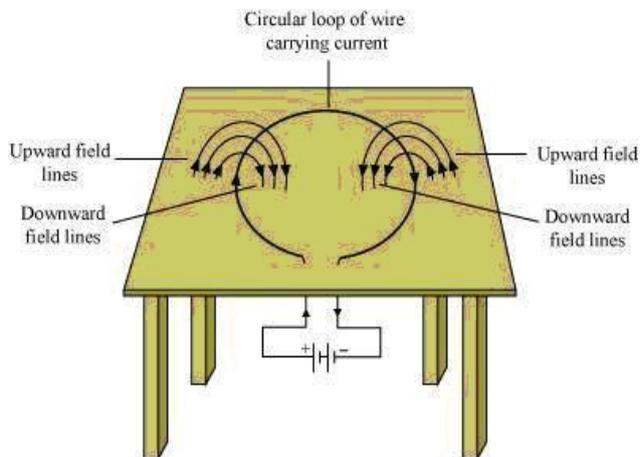
Exercise (pg-229)

Q.1 Consider a circular loop of wire lying in a plane of the table. Let the current pass through the loop clockwise. Apply the right - hand rule to find out the direction of the magnetic field inside and outside the loop.

Ans: Applying right hand thumb rule to the loop:

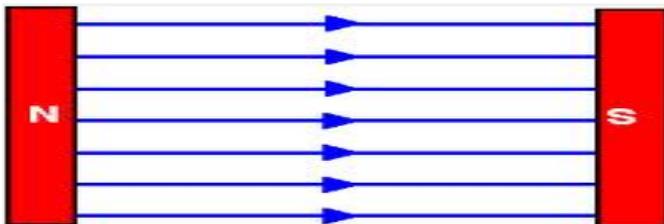
- For the right side of the circular loop, the direction of magnetic field lines will be as if they are emerging from the table outside the loop and merging in the table inside the loop.

- Similarly, for the left side of the circular loop, the direction of magnetic field lines will be as if they are emerging from the table outside the loop and merging in the table inside the loop, as shown in the given figure.



Q. 2 The magnetic field in the given region is uniform. Draw a diagram to represent it. (Not to be done in notebook)

Ans:



Q. 3 Choose the correct option. (Not to be done in notebook)

The magnetic field inside a long straight solenoid-carrying current

- Is zero
- Decreases as we move towards its ends
- Increases as we move towards its ends
- Is same at all points

Ans: (d) Is same at all points

Exercise (pg- 231-232)

Q.1 Which of the following property of a proton can change while it moves freely in a magnetic field? (there may be more than one correct answer) (Not to be done in notebook)

- (a) mass
- (b) speed
- (c) velocity
- (d) momentum

Ans: (c) velocity and (d) momentum

Q.2 In activity 13.7, how do we think the displacement of the rod AB will be affected if (i) current in the rod AB is increased? (ii) a stronger horse-shoe magnet is used; and (iii) length of the rod AB is increased?

Ans:

Concept Insight: A force is experienced by a current-carrying conductor placed in a magnetic field. The magnitude of force increases with the increase in the amount of current, strength of the magnetic field, and the length of the conductor. Hence, the magnetic force exerted on rod AB and its deflection will increase if

- (i) current in rod AB is increased
- (ii) a stronger horse-shoe magnet is used
- (iii) length of rod AB is increased

Q.3 A positively charged particle (alpha-particle) projected towards west is deflected towards north by a magnetic field. The direction of magnetic field is: (Not to be done in notebook)

- (a) towards south
- (b) towards east
- (c) downward
- (d) upward

Ans: (d) Upward

Exercise (pg- 233)

Q.1 State Fleming's left-hand rule.

Ans: According to Fleming's left hand rule, if we arrange the thumb, the central finger, and the forefinger of the left hand at right angles to each other and if the forefinger points in the direction of magnetic field, the central finger points in the direction of current, then the thumb points in the direction of motion or the force acting on the conductor.

Q.2 What is the principle of electric motor?

Ans: The working principle of an electric motor is based on the magnetic effect of current. A current-carrying loop experiences a force and rotates when placed in a magnetic field. The direction of rotation of the loop is given by Fleming's left-hand rule.

Q.3 What is the role of split ring in an electric motor?

Ans: The split ring in the electric motor acts as a commutator. The commutator reverses the direction of current flowing through the coil after each half rotation of the coil. Due to this reversal of the current, the coil continues to rotate in the same direction.

(Exercise pg- 236)

Q.1 Explain different ways to induce current in a coil.

Ans: The different ways to induce current in a coil are as follows:

1. Induce current on a coil by moving the coil in a magnetic field.
2. Induce current on a coil by changing the magnetic field across it.
3. If a coil is moved rapidly between the two poles of a horse-shoe magnet, then an electric current is induced in the coil.

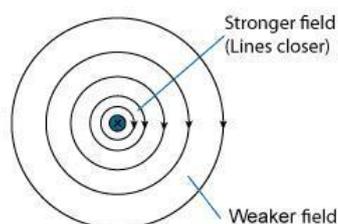
Chapter 13 - Magnetic Effects of Current Exercise 240 (MCQs not to be done in notebook)

Which of the following correctly describes the magnetic field near a long straight wire?

- (a) *The field consists of straight lines perpendicular to the wire.*
- (b) *The field consists of straight lines parallel to the wire.*
- (c) *The field consists of radial lines originating from the wire.*
- (d) *The field consists of concentric circles centred on the wire.*

➤ **Solution 1** (d) The field consists of concentric circles centered on the wire.

Concept Insight: The magnetic field lines, produced around a straight current-carrying conductor, are concentric circles. Their centers lie on the wire.



The phenomenon of electromagnetic induction is

- (a) *the process of charging a body.*
- (b) *the process of generating magnetic field due to a current passing through a coil.*
- (c) *producing induced current in a coil due to relative motion between a magnet and the coil.*
- (d) *the process of rotating a coil of an electric motor.*

➤ **Solution 2** (c) producing induced current in a coil due to relative motion between a magnet and the coil

Concept Insight: When a coil and a magnet are moved relative to each other, a

current is induced in the coil. This phenomenon is known as electromagnetic induction.

List three sources of magnetic fields.

➤ **Solution**

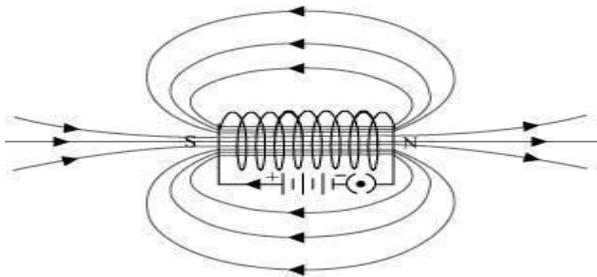
Two methods of producing magnetic field are as follows:

- (a) By using current-carrying conductors
- (b) By using permanent magnets
- (c) By electromagnets

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.

➤ **Solution**

A solenoid is a long coil of circular loops of insulated copper wire. Magnetic field is produced around the solenoid when a current is allowed to flow through it. The magnetic field produced by it is similar to the magnetic field of a bar magnet. The field lines produced in a current-carrying solenoid is shown in the following figure.



In the above figure, when the North pole of a bar magnet is brought near the end connected to the negative terminal of the battery, the solenoid repels the bar magnet. Since like poles repel each other, the end connected to the negative terminal of the battery behaves as the North Pole of the solenoid and the other end behaves as a South Pole. Hence, one end of the solenoid behaves as a North Pole and the other end behaves as a South Pole.

When is the force experienced by a current-carrying conductor placed in a magnetic field largest?

➤ **Solution**

The force experienced by a current-carrying conductor is the maximum when the direction of current is perpendicular to the direction of the magnetic field.

Imagine that you are sitting in a chamber with your back to one wall. An electron beam, moving horizontally from back wall towards the front wall, is deflected by a strong magnetic field to your right side. What is the direction of magnetic field?

➤ **Solution**

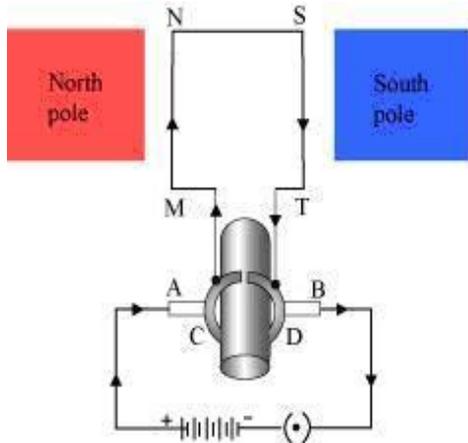
The direction of magnetic field is given by Fleming's left hand rule. Magnetic field inside the chamber will be perpendicular to the direction of current (opposite to the direction of electron) and direction of deflection/force i.e., either upward or downward. The

direction of current is from the front wall to the back wall because negatively charged electrons are moving from back wall to the front wall. The direction of magnetic force is rightward. Hence, using Fleming's left hand rule, it can be concluded that the direction of magnetic field inside the chamber is downward.

Draw a labelled diagram of an electric motor. Explain its principle and working. What is the function of a split ring in an electric motor?

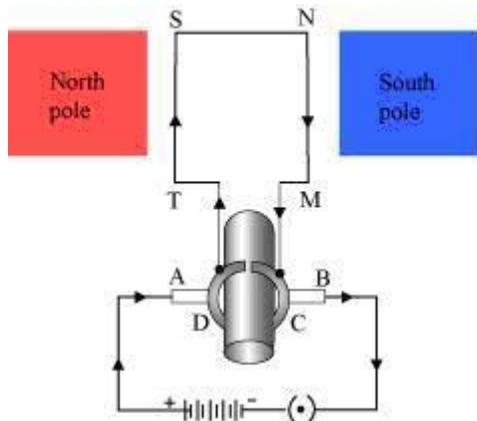
➤ **Solution**

Concept Insight: An electric motor converts electrical energy into mechanical energy. It works on the principle of the magnetic effect of current. A current-carrying coil rotates in a magnetic field. The following figure shows a simple electric motor.



- When a current is allowed to flow through the coil MNST by closing the switch, the coil starts rotating clockwise. This happens because an inward force acts on length MN and at the same time, an outward force acts on length ST. As a result, the coil rotates clockwise.
- Current in the length MN flows from M to N and the magnetic field acts from left to right, normal to length MN. Therefore, according to Fleming's left hand rule, an inward force acts on the length MN. Similarly, current in the length ST flows from S to T and the magnetic field acts from left to right, normal to the flow of current. Therefore, an outward force acts on the length ST. These two forces cause the coil to rotate clockwise.
- After half a rotation, the position of MN and ST interchange. The half-ring D comes in contact with brush A and half-ring C comes in contact with brush B. Hence, the direction of current in the coil MNST gets reversed.
- The current flows through the coil in the direction TSNM. The reversal of current through the coil MNST repeats after each half rotation. As a result, the coil rotates unidirectional. The split rings help to reverse the direction of current in the circuit.

These are called the commutator.



Name some devices in which electric motors are used.

➤ **Solution**

Some devices in which electric motors are used are as follows:

- (a) Water pumps
- (b) Electric fans
- (c) Electric mixers
- (d) Washing machines.

A coil of insulated copper wire is connected to a galvanometer. What will happen if a bar magnet is (i) pushed into the coil, (ii) withdrawn from inside the coil, (iii) held stationary inside the coil?

➤ **Solution**

Concept Insight: A current induces in a coil if a bar magnet is moved relative to it. This is the principle of electromagnetic induction.

- When a bar magnet is pushed into a coil of insulated copper wire, a current is induced momentarily in the coil. As a result, the needle of the galvanometer deflects momentarily in a particular direction.
- When the bar magnet is withdrawn from inside the coil of the insulated copper wire, a current is again induced momentarily in the coil in the opposite direction. As a result, the needle of the galvanometer deflects momentarily in the opposite direction.
- When a bar magnet is held stationary inside the coil, no current will be induced in the coil. Hence, galvanometer will show no deflection.

Two circular coils A and B are placed close to each other. If the current in the coil A is changed, will some current be induced in the coil B? Give reason.

➤ **Solution**

Two circular coils A and B are placed close to each other. When the current in coil A is changed, the magnetic field associated with it also changes. As a result, the magnetic field around coil B also changes. This change in magnetic field lines around coil B induces an electric current in it. This is called electromagnetic induction.

State the rule to determine the direction of a (i) magnetic field produced around a straight conductor-carrying current, (ii) force experienced by a current-carrying straight conductor placed in a magnetic field which is perpendicular to it, and (iii) current induced in a coil due to its rotation in a magnetic field.

➤ **Solution 8**

- (i) Right hand thumb rule
- (ii) Fleming's left hand rule
- (iii) Fleming's right hand rule

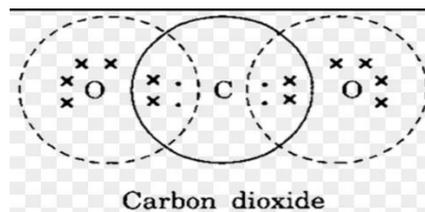
CHAPTER-4

CARBON AND ITS COMPOUNDS

Pg.No.61

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

Ans The electron dot structure of CO_2 is:

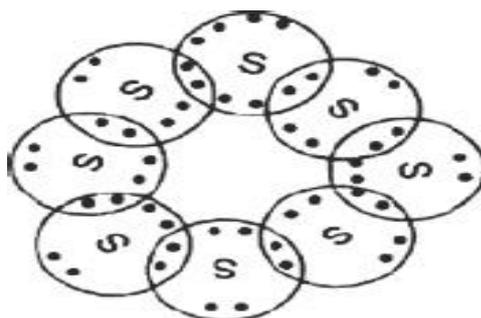


(OR)



Q.2 What would be the electron dot structure of a molecule of sulphur which is made up of eight atoms of sulphur?

Ans

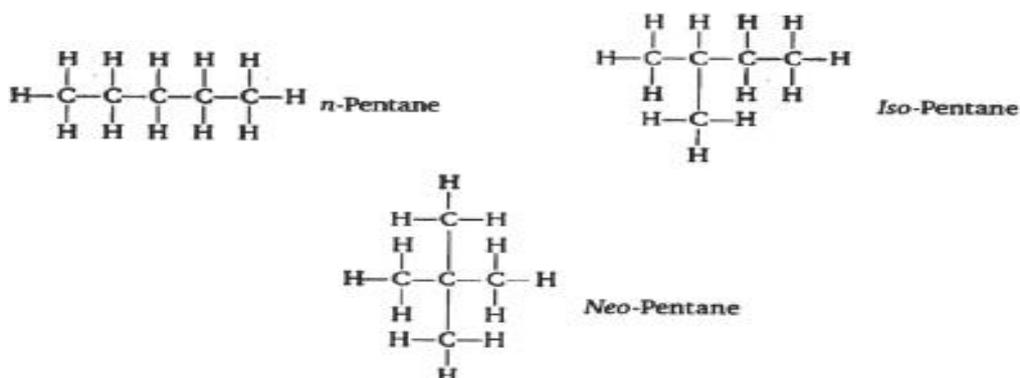


Pg.No.68

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

Ans Three structural isomers can be drawn from pentane.

Pentane: C_5H_{12}



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

Ans Carbon form large number of compounds due to the following properties:

(a) **Catenation** → Carbon shows the property of catenation that is the ability to form bonds with other carbon atoms forming long chains both branched and unbranched chains, and even rings.

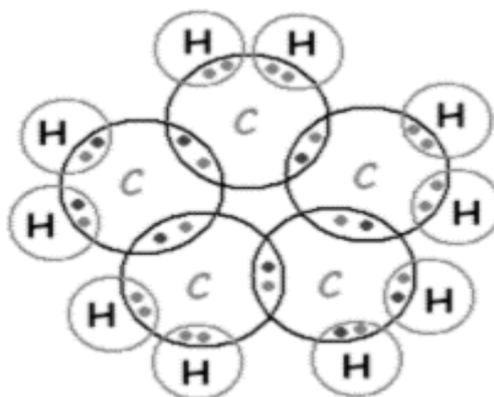
(b) **Tetravalency** → Carbon has valency 4, it is capable of bonding with 4 other carbon atoms or atoms of other non-covalent elements, giving rise to compounds with specific properties depending on the elements present in the compound.

(c) **Isomerism** → Carbon compounds show the property of isomerism that is compounds having same molecular formula but different structural formula.

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

Ans The formula of cyclopentane is C_5H_{10} .

The electron dot structure is:



Q.4 DELETED

Q.5 DELETED

Pg.No.71 DELETED

Pg.No.74 DELETED

Pg.No.76 DELETED

EXERCISE QUESTIONS (Pg.No.77)

Q.1 Ethane, with the molecular formula C_2H_6 has

(a) 6 covalent bonds. (b) 7 covalent bonds.

(c) 8 covalent bonds. (d) 9 covalent bonds.

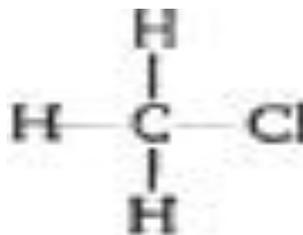
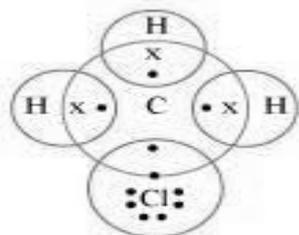
Ans (b) 7 covalent bonds.

Q.2 DELETED

Q.3 DELETED

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

Ans Covalent bond is formed by the sharing of electrons between two atoms. It is non-ionic in nature in CH_3Cl



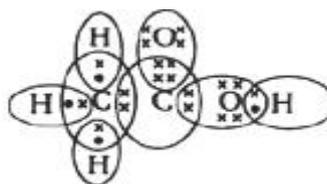
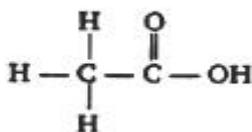
Q.5 Draw the electron dot structure for

(a) Ethanoic acid (b) H_2S .

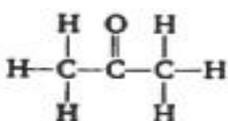
(c) Propanone. (d) F_2 .

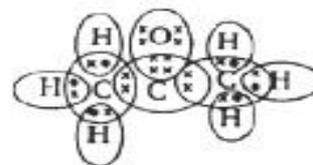
Ans The electron dot structure are as follows:

(a) Ethanoic acid - CH_3COOH



(b) H_2S 

(c) Propanone 



(d) F_2



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

Ans Series of compounds in which the same functional group substitutes for hydrogen in a carbon chain is called homologous series. It is a group of members of same class of organic compound having similar chemical properties, they have same general formula. They have same functional group, when arranged in the ascending order of molecular mass they differ by 14 u. or $-\text{CH}_2$ group.

Example: Alkane General formula $\text{C}_n\text{H}_{2n+2}$

Methane	CH_4
Ethane	C_2H_6
Propane	C_3H_8
Butane	C_4H_{10}

Q.7 to Q. 13 DELETED

Chapter 12 – Electricity

Chapter 12 - Electricity Exercise 209

On what factors does the resistance of a conductor depend?

• **Solution 1**

The resistance of a conductor depends upon the following factors:

- (a) Material of the conductor, i.e., resistivity of the material.
- (b) Temperature of the conductor
- (c) Length of the conductor
- (d) Cross-sectional area of the conductor

Will current flow more easily through a thick wire or a thin wire of the same material, when connected to the same source? Why?

• **Solution 2**

Concept Insight: Resistance of a wire is given by the relation, $R = \rho l/A$

Where,

ρ = Resistivity of the material of the wire

l = Length of the wire

A = Area of cross-section of the wire

Resistance is inversely proportional to the area of cross-section of the wire.

Thicker the wire, larger is its area of cross-section and hence lower is the resistance of the wire. Therefore, current can flow more easily through a thick wire than a thin wire.

Let the resistance of an electrical component remains constant while the potential difference across the two ends of the component decreases to half of its former value. What change will occur in the current through it?

• **Solution 3**

Concept Insight: The current flowing through the component is given by Ohm's law.

$$V = IR$$

$$\text{Or, } I = V/R$$

Where,

Resistance of the electrical component = R

Potential difference = V

Current = I

The potential difference is reduced to half, keeping the resistance constant.

Let the new amount of current be I' .

Therefore, from Ohm's law, we obtain the amount of new current

$$I' = \frac{V'}{R'} = \frac{\frac{V}{2}}{R} = \frac{1}{2} \left(\frac{V}{R} \right) = \frac{1}{2} \times I = \frac{I}{2}$$

Therefore, the amount of current flowing through the electrical component is reduced by half.

Why are coils of electric toasters and electric irons made of an alloy rather than a pure metal?

• **Solution 4**

Concept Insight: Resistivity and melting point are two important factors here.

The resistivity of an alloy is higher than the pure metal. Moreover, at high temperatures, the alloys do not melt readily. Hence, the coils of heating appliances such as electric toasters and electric irons are made of an alloy rather than a pure metal.

Use the data in Table 12.2 to answer the following –

- (a) Which among iron and mercury is a better conductor?
- (b) Which material is the best conductor?

• **Solution 5**

(a) Resistivity of iron = 10.0×10^{-8} ohm m

Resistivity of mercury = 94.0×10^{-8} ohm m

Resistivity of mercury is more than that of iron. This implies that iron is a better conductor than mercury.

(b) It can be observed from the table that the resistivity of silver is the lowest among the listed materials. Hence, it is the best conductor.

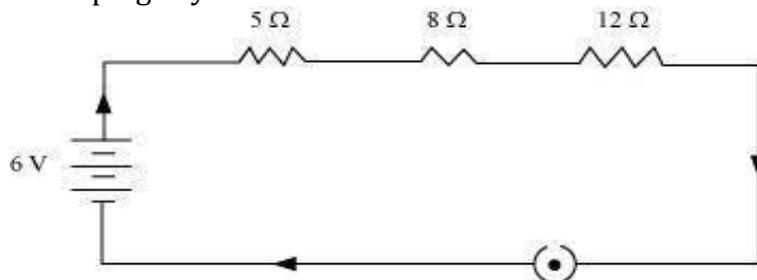
Concept Insight: Less resistivity means better conductance.

Chapter 12 - Electricity Exercise 213

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

• **Solution 1**

Three cells of potential 2 V each connected in series, is equivalent to a battery of potential $2\text{ V} + 2\text{ V} + 2\text{ V} = 6\text{ V}$. The following circuit diagram shows three resistors of resistances 5 ohm, 8 ohm and 12 ohm respectively connected in series with a battery of potential 6 V and a plug key.

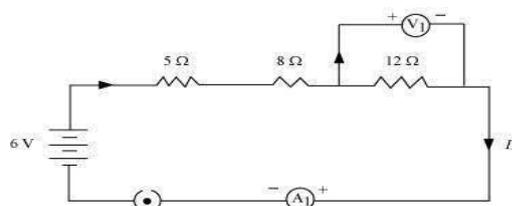


Concept Insight: The voltages of cells in series add up to give the final voltage.

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

• **Solution 2**

- To measure the current flowing through the resistors, an ammeter should be connected in the circuit in series with the resistors.
- To measure the potential difference across the 12 ohm resistor, a voltmeter should be connected in parallel to this resistor, as shown in the following figure.



The resistances are connected in series.

Concept Insight: Ohm's law can be used to obtain the readings of ammeter and voltmeter.

According to Ohm's law,

$$V = IR,$$

Where,

Potential difference, $V = 6 \text{ V}$

Current flowing through the circuit/resistors = I

Resistance of the circuit, $R = 5 + 8 + 12 = 25 \text{ ohm}$

$$I = V/R = 6/25 = 0.24 \text{ A}$$

Potential difference across 12 ohm resistor = V_1

Current flowing through the 12 ohm resistor, $I = 0.24 \text{ A}$

Therefore, using Ohm's law, we obtain

$$V_1 = IR = 0.24 \times 12 = 2.88 \text{ V}$$

Therefore, the reading of the ammeter will be 0.24 A.

The reading of the voltmeter will be 2.88 V.

Chapter 12 - Electricity Exercise 216

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

• Solution 1

(a) When 1 ohm and 10^6 ohm are connected in parallel:

Concept Insight: For parallel combination, equivalent resistance R is given by

$$(1/R) = (1/R_1) + (1/R_2)$$

$$\therefore \frac{1}{R} = \frac{1}{1} + \frac{1}{10^6}$$

$$R = \frac{10^6}{10^6 + 1} \approx \frac{10^6}{10^6} = 1\Omega$$

Therefore, equivalent resistance $\approx 1 \text{ ohm}$

(b) When 1 ohm, 10^3 ohm and 10^6 ohm are connected in parallel:

Concept Insight: For parallel combination, equivalent resistance R is given by

$$(1/R) = (1/R_1) + (1/R_2) + (1/R_3) \dots + (1/R_n)$$

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

$$R = \frac{1000000}{1001001} = 0.999\Omega$$

Therefore, equivalent resistance = 0.999 ohm or 1 ohm

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

• Solution 2

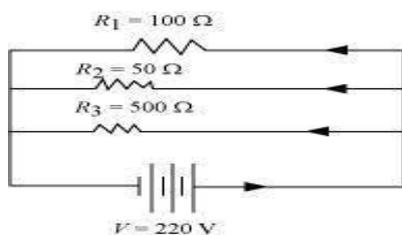
Resistance of electric lamp, $R_1 = 100 \text{ ohm}$

Resistance of toaster, $R_2 = 50 \text{ ohm}$

Resistance of water filter, $R_3 = 500 \text{ ohm}$

Voltage of the source, $V = 220 \text{ V}$

These are connected in parallel, as shown in the following figure.



Concept Insight: For parallel combination, equivalent resistance R is given by

$$\left(\frac{1}{R}\right) = \left(\frac{1}{R_1}\right) + \left(\frac{1}{R_2}\right) + \left(\frac{1}{R_3}\right)$$

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{100} + \frac{1}{50} + \frac{1}{500}$$

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

$$R = \frac{500}{16} \Omega$$

According to Ohm's law,

$$V = IR$$

$$I = V/R$$

Where,

I = Current flowing through the circuit

$$I = \frac{220}{\frac{500}{16}} = \frac{220 \times 16}{500} = \frac{3520}{500}$$

$$\therefore I = 7.04 \text{ A}$$

7.04 A of current is drawn by all the three given appliances.

Therefore, current drawn by an electric iron connected to the same voltage source of 220 V = 7.04 A

Let R' be the resistance of the electric iron. According to Ohm's law,

$$V = IR'$$

$$V = IR'$$

$$R' = \frac{V}{I} = \frac{220}{7.04} = 31.25 \Omega$$

Therefore, the resistance of the electric iron is 31.25 Ω and the current flowing through it is 7.04 A.

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

Solution 3

The advantages of connecting electrical devices in parallel with the battery instead of connecting them in series are:

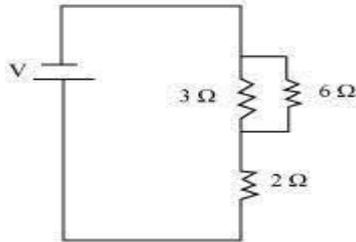
1. In parallel circuit, if one electrical device stops working, then all other devices keep working normally. This is not the case when devices are connected in series.
2. There is no division of voltage among the appliances when connected in parallel. The potential difference across each appliance is equal to the supplied voltage. In series circuit, the applied voltage is shared by all the appliances.
3. The total effective resistance of the circuit can be reduced by connecting electrical appliances in parallel. In series combination, the total effective resistance of the circuit increases.

How can three resistors of resistances $2\ \Omega$, $3\ \Omega$, and $6\ \Omega$ be connected to give a total resistance of (a) $4\ \Omega$, (b) $1\ \Omega$?

• **Solution 4**

There are three resistors of resistance $2\ \Omega$, $3\ \Omega$, and $6\ \Omega$ respectively.

(a) The following circuit diagram shows the connection of the three resistors to get a total resistance of $4\ \Omega$.



Concept Insight: Here, $6\ \Omega$ and $3\ \Omega$ resistors are connected in parallel.

Therefore, their equivalent resistance will be given by

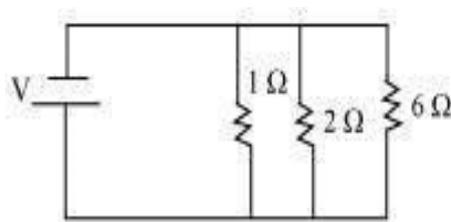
$$\frac{1}{\frac{1}{6} + \frac{1}{3}} = \frac{6 \times 3}{6 + 3} = 2\ \Omega$$

This equivalent resistor of resistance $2\ \Omega$ is connected to a $2\ \Omega$ resistor in series.

Therefore, equivalent resistance of the circuit = $2\ \Omega + 2\ \Omega = 4\ \Omega$

Hence, the total resistance of the circuit is $4\ \Omega$.

(b) The following circuit diagram shows the connection of the three resistors to get a total resistance of $1\ \Omega$.



Concept Insight: All the resistors are connected in parallel. Therefore, their equivalent resistance will be given as

$$\frac{1}{\frac{1}{2} + \frac{1}{3} + \frac{1}{6}} = \frac{1}{\frac{3+2+1}{6}} = \frac{6}{6} = 1\ \Omega$$

Therefore, the total resistance of the circuit is $1\ \Omega$.

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

• **Solution 5**

There are four coils of resistances $4\ \text{ohm}$, $8\ \text{ohm}$, $12\ \text{ohm}$, and $24\ \text{ohm}$ respectively.

(a) **Concept Insight:** For getting the highest resistance from a combination of resistances, connect them in series.

If these coils are connected in series, then the equivalent resistance will be the highest, given by the sum $4 + 8 + 12 + 24 = 48\ \text{ohm}$.

Therefore, $48\ \text{ohm}$ is the highest total resistance that can be secured by the combination of given resistances.

(b) **Concept Insight:** For getting the lowest resistance from a combination of resistances, connect them in parallel.

If these coils are connected in parallel, then the equivalent resistance will be the lowest, given by

$$\frac{1}{\frac{1}{4} + \frac{1}{8} + \frac{1}{12} + \frac{1}{24}} = \frac{1}{\frac{6+3+2+1}{24}} = \frac{24}{12} = 2 \Omega$$

Therefore, 2 ohm is the lowest total resistance that can be secured by the combination of given resistances.

Chapter 12 - Electricity Exercise 218

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

- **Solution 1**

Concept Insight: The amount of heat produced in a conductor is proportional to its resistance.

The resistance of the heating element of an electric heater is very high. As current flows through the heating element, it becomes too hot and glows red. On the other hand, the resistance of the cord of the heater is much lower, so it does not become very hot and does not glow when current flows through it.

Compute the heat generated while transferring 96000 coulomb of charge in one hour through a potential difference of 50 V.

- **Solution 2**

Concept Insight: The amount of heat (H) produced is given by the Joule's law of heating as

$$H = VIt$$

Where,

$$\text{Voltage, } V = 50 \text{ V}$$

$$\text{Time, } t = 1 \text{ h} = 1 \times 60 \times 60 \text{ s}$$

$$\text{Amount of current, } I = \frac{\text{Amount of charge}}{\text{Time of flow of charge}} = \frac{96000}{1 \times 60 \times 60} = \frac{80}{3} \text{ A}$$

$$H = 50 \times \frac{80}{3} \times 60 \times 60 = 4.8 \times 10^6 \text{ J}$$

Therefore, the heat generated is $4.8 \times 10^6 \text{ J}$.

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

- **Solution 3**

Concept Insight: The amount of heat (H) produced is given by the joule's law of heating as

$$H = VIt = I^2Rt$$

Where,

$$\text{Current, } I = 5 \text{ A}$$

$$\text{Resistance, } R = 20 \text{ ohm}$$

$$\text{Time, } t = 30 \text{ s}$$

$$H = 5^2 \times 20 \times 30 = 1.5 \times 10^4 \text{ J}$$

Therefore, the amount of heat developed in the electric iron is $1.5 \times 10^4 \text{ J}$.

Chapter 12 - Electricity Exercise 220

What determines the rate at which energy is delivered by a current?

- **Solution 1**

The rate of consumption of electric energy in an electric appliance is called electric power. Hence, the rate at which energy is delivered by a current is the power of the appliance.

Concept Insight: Power of an appliance determines the rate at which electrical energy is delivered to it.

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

• **Solution 2**

Concept Insight: Power of an appliance can be determined by the rate at which electrical energy is delivered to it.

Power (P) is given by the expression,

$$P = VI$$

Where,

Voltage, $V = 220 \text{ V}$

Current, $I = 5 \text{ A}$

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

Energy consumed by the motor = $P t$

Where,

Time, $t = 2 \text{ h} = 2 \times 60 \times 60 = 7200 \text{ s}$

$$P = 1100 \times 7200 = 7.92 \times 10^6 \text{ J}$$

Therefore, power of the motor = 1100 W

Energy consumed by the motor = $7.92 \times 10^6 \text{ J}$

Chapter 12 - Electricity Exercise 221

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

(a) $1/25$

(b) $1/5$

(c) 5

(d) 25

Solution 1(d) 25

Resistance of a piece of wire is proportional to its length.

The given piece of wire has a resistance R . The wire is cut into five equal parts.

Therefore, resistance of each part = $R/5$

All the five parts are connected in parallel. Hence, equivalent resistance (R') is given as

Concept Insight: For parallel combination, equivalent resistance R' is given by

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

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

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

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

Therefore, the ratio $\frac{R}{R'}$ is 25.

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

(a) P^2R

(b) IR^2

(c) VI

(d) V^2/R

• **Solution 2**

Concept Insight: Power of an appliance determines the rate at which electrical energy is delivered to it.

Electrical power is given by the expression, $P = VI$... (i)

According to Ohm's law, $V = IR$... (ii)

Where,

V = Potential difference

I = Current

R = Resistance

So, it can be written that

$$P = (IR) \times I$$

- $P = I^2R$

From equation (ii), it can be written

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

$$\therefore P = V \times \frac{V}{R}$$

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

$$\therefore P = VI = I^2R = \frac{V^2}{R}$$

Power P cannot be expressed as IR^2 .

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

(a) 100 W

(b) 75 W

(c) 50 W

(d) 25 W

- Solution 3** (d) 25 W

Concept Insight: Power of an appliance determines the rate at which electrical energy is delivered to it.

Power of an appliance is given by the expression,

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

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

Where,

Power rating, $P = 100$ W

Voltage, $V = 220$ V

Resistance, $R = \frac{(220 \times 220)}{100} = 484$ ohm

The resistance of the bulb remains constant if the supply voltage is reduced to 110 V. If the bulb is operated on 110 V, then the energy consumed by it is given by the expression for power as

$$\therefore P' = \frac{(V')^2}{R} = \frac{(110)^2}{484} = 25 \text{ W}$$

Therefore, the power consumed will be 25 W.

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

(a) 1:2

(b) 2:1

(c) 1:4

(d) 4:1

- Solution 4** (c) 1:4

Both the wires have the same resistance because they are made of the same material and have equal lengths and diameters. Let the resistance be R .

For series combination, equivalent resistance R_s is

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

For parallel combination, equivalent resistance R_p is

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

Let the current through the series combination be I_s and heat produced in the circuit be H_s .

$$\begin{aligned} H_s &= I_s^2 R_s t \\ &= \left(\frac{V}{2R}\right)^2 2R t \\ H_s &= \frac{V^2 t}{2R} \quad \text{-----(i)} \end{aligned}$$

Let the current through the parallel combination be I_p and heat produced in the circuit be H_p .

$$\begin{aligned} H_p &= I_p^2 R_p t \\ &= \left(\frac{V}{R/2}\right)^2 \frac{R}{2} t \\ H_p &= \frac{2V^2 t}{R} \quad \text{-----(ii)} \end{aligned}$$

Hence, required ratio is $\frac{H_s}{H_p} = \frac{\frac{V^2 t}{2R}}{\frac{2V^2 t}{R}} = \frac{V^2 t}{2R} \times \frac{R}{2V^2 t} = \frac{1}{4}$

Therefore, the ratio of heat produced in series and parallel combinations is 1:4.

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

• **Solution 5**

To measure the potential difference between two points, a voltmeter should be connected in parallel across these points.

Concept Insight: Voltmeter is always connected in parallel to the element of any electrical circuit across which potential difference is to be measured.

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

• **Solution 6**

Resistance (R) of the copper wire of length (l) and cross-section (A) is given by the expression,

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

Where,

Resistivity of copper,

$$\rho = 1.6 \times 10^{-8} \Omega \text{ m}$$

Area of cross-section of the wire,

$$A = \pi \left(\frac{\text{Diameter}}{2}\right)^2$$

Diameter = 0.5 mm = 0.0005 m

Resistance, $R = 10 \Omega$

We know that,

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

$$l = \frac{RA}{\rho}$$

$$l = \frac{10 \times 3.14 \times \left(\frac{0.0005}{2}\right)^2}{1.6 \times 10^{-8}}$$

$$l = \frac{10 \times 3.14 \times 25}{4 \times 1.6}$$

$$l = 122.72 \text{ m}$$

Therefore, the length of the wire is 122.72 m.

So, if the diameter of the wire is doubled, the new diameter = $2 \times 0.0005 = 0.001 \text{ m}$

Let the new resistance be R' .

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

$$R' = \frac{1.6 \times 10^{-8} \times 122.72}{\pi \left(\frac{1}{2} \times 10^{-3}\right)^2}$$

$$R' = \frac{1.6 \times 10^{-8} \times 122.72 \times 4}{3.14 \times 10^{-6}}$$

$$R' = 250.2 \times 10^{-2} = 2.5 \Omega$$

Therefore, the new resistance is 2.5Ω .

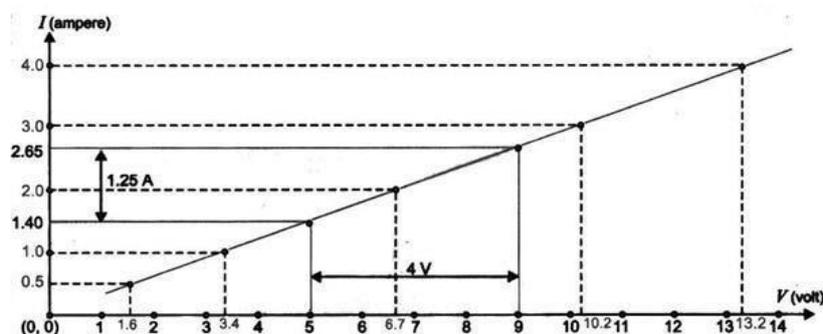
The values of current I flowing in a given resistor for the corresponding values of potential difference V across the resistor are given below –

I (amperes)	0.5	1.0	2.0	3.0	4.0
V (volts)	1.6	3.4	6.7	10.2	13.2

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

• Solution 7

The VI graph is shown below. The voltage is plotted on x -axis and current is plotted on y -axis.



For $V = 4 \text{ V}$ (i.e. $9 \text{ V} - 5 \text{ V}$), $I = 1.25 \text{ A}$ (i.e. $2.65 \text{ A} - 1.40 \text{ A}$)

So, the value of resistance (R) is

$$R = \frac{V}{I} = \frac{4}{1.25} = 3.2 \Omega$$

Therefore, the resistance of the resistor is 3.2Ω .

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

• **Solution 8**

Resistance (R) of a resistor is given by Ohm's law as,

$$V = IR$$

$$R = V/I$$

Where,

Potential difference, $V = 12 \text{ V}$

Current in the circuit, $I = 2.5 \text{ mA} = 2.5 \times 10^{-3} \text{ A}$

Concept Insight: Convert all the quantities in the same unit system and then proceed to calculations.

$$R = \frac{12}{2.5 \times 10^{-3}} = 4800 \Omega = 4.8 \text{ k}\Omega$$

Therefore, the resistance of the resistor is 4.8 k Ω .

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

• **Solution 9**

Concept Insight: In a series combination, current flowing through all the components of the circuit is the same.

There is no current division occurring in a series circuit. Current flow through all the components is the same, given by Ohm's law as

$$V = IR$$

Where,

V = Potential difference

I = Current through the circuit

R = Resistance of the circuit

Let, R be the equivalent resistance of resistances 0.2 ohm, 0.3 ohm, 0.4 ohm, 0.5 ohm and 12 ohm.

These are connected in series. Hence, the sum of the resistance will give the value of R .

$$R = 0.2 + 0.3 + 0.4 + 0.5 + 12 = 13.4 \text{ ohm}$$

Potential difference, $V = 9 \text{ V}$

Therefore, the current that would flow through the circuit and hence 12 ohm resistor is $I = V/R = 9/13.4 = 0.67 \text{ A}$

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

• **Solution 10**

Let x number of resistors of resistance 176Ω are connected in parallel to each other, then the equivalent resistance of the resistors connected in parallel is given by

$$R = \frac{176}{x}$$

According to Ohm's law,

$$V = IR$$

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

where,

Supply voltage, $V = 220 \text{ V}$

Current, $I = 5 \text{ A}$

$$\text{Resistance, } R = \frac{176}{x}$$

$$\Rightarrow 220 = 5 \times \frac{176}{x}$$

$$\therefore x = \frac{5 \times 176}{220} = 4$$

Therefore, four resistors of 176Ω (in parallel) are required to carry 5 A in 220 V line.

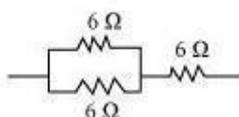
Show how you would connect three resistors, each of resistance $6\ \Omega$, so that the combination has a resistance of (i) $9\ \Omega$, (ii) $4\ \Omega$.

• **Solution 11**

If we connect the resistors in series, then the equivalent resistance will be the sum of the resistors, i.e., $6\ \Omega + 6\ \Omega + 6\ \Omega = 18\ \Omega$, which is not desired. If we connect the resistors in parallel, then the equivalent resistance will be $\frac{6}{3} = 2\ \Omega$, which is also not desired.

Concept Insight:- As the range within which resistances can be obtained by these three resistors is $2\ \Omega$ (parallel connection) to $18\ \Omega$ (series connection). Thus we need to try different combinations of these three resistors so as to get the required equivalent resistance of $9\ \Omega$ and $4\ \Omega$.

(i) Two resistors are in parallel and this parallel combination is in series with the third resistor:



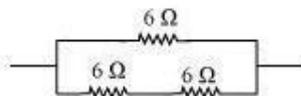
Two $6\ \Omega$ resistors are connected in parallel. Their equivalent resistance will be

$$\frac{1}{\frac{1}{6} + \frac{1}{6}} = \frac{6}{2} = 3\ \Omega$$

The third $6\ \Omega$ resistor is in series with $3\ \Omega$. Hence, the equivalent resistance of the circuit is

$$6\ \Omega + 3\ \Omega = 9\ \Omega.$$

(ii) Two resistors are in series and this series combination is in parallel with the third resistor:



Two $6\ \Omega$ resistors are connected in series. Their equivalent resistance will be the sum $6+6 = 12\ \Omega$

The third $6\ \Omega$ resistor is in parallel with $12\ \Omega$. Hence, equivalent resistance will be

$$\frac{1}{\frac{1}{12} + \frac{1}{6}} = \frac{12}{3} = 4\ \Omega$$

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

• **Solution 12**

Resistance R_1 of each bulb is given by the expression,

$$P_1 = \frac{V^2}{R_1}$$
$$R_1 = \frac{V^2}{P_1}$$

where,

Supply voltage, $V = 220 \text{ V}$

Rating of an electric bulb, $P_1 = 10 \text{ W}$

$$R_1 = \frac{(220)^2}{10} = 4840 \Omega$$

Let x be the number of bulbs (each of resistance R_1) to be connected in parallel to obtain a resistance R .

$$\therefore R = \frac{R_1}{x}$$

According to Ohm's law,

$$V = I R$$

where,

I is the maximum allowable current i.e. 5 A

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

$$\therefore R = \frac{R_1}{x} = 44$$

$$\frac{4840}{x} = 44$$

$$x = 110$$

Therefore, 110 electric bulbs can be connected in parallel with each other across two wires of 220 V line if the maximum allowable current is 5 A.

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

- **Solution 13**

Supply voltage, $V = 220 \text{ V}$

Resistance of each coil, $R = 24 \Omega$

(i) Coils are used separately:

According to Ohm's law,

$$V = I_1 R_1$$

where,

I_1 is the current flowing through each coil.

$$I_1 = \frac{V}{R_1} = \frac{220}{24} = 9.166 \text{ A}$$

Therefore, 9.16 A current will flow through each coil when used separately.

(ii) Coils are connected in series:

For resistances (R_1, R_2, \dots, R_n) in series combination, equivalent resistance is

$$R = R_1 + R_2 + R_3 + \dots + R_n$$

When two coils A and B are connected in series, total resistance is

$$R_2 = 24 \Omega + 24 \Omega = 48 \Omega$$

According to Ohm's law,

$$V = I_2 R_2$$

where,

I_2 is the current flowing through the series circuit.

$$I_2 = \frac{V}{R_2} = \frac{220}{48} = 4.58 \text{ A}$$

Therefore, 4.58 A current will flow through the circuit when the coils are connected in series.

(iii) Coils are connected in parallel:

For resistances (R_1, R_2, \dots, R_n) in parallel combination, equivalent resistance is

$$(1/R) = (1/R_1) + (1/R_2) + (1/R_3) + \dots + (1/R_n)$$

When two coils A and B are connected in parallel, total resistance is

$$R_3 = \frac{1}{\frac{1}{24} + \frac{1}{24}} = \frac{24}{2} = 12 \Omega$$

According to Ohm's law,

$$V = I_3 R_3$$

where,

I_3 is the current flowing through the circuit.

$$I_3 = \frac{V}{R_3} = \frac{220}{12} = 18.33 \text{ A}$$

Therefore, 18.33 A current will flow through the circuit when coils are connected in parallel.

Compare the power used in the $2\ \Omega$ resistor in each of the following circuits: (i) a $6\ \text{V}$ battery in series with $1\ \Omega$ and $2\ \Omega$ resistors, and (ii) a $4\ \text{V}$ battery in parallel with $12\ \Omega$ and $2\ \Omega$ resistors.

• **Solution 14**

(i) Potential difference, $V = 6\ \text{V}$

$1\ \Omega$ and $2\ \Omega$ resistors are connected in series.

For resistances (R_1, R_2, \dots, R_n) in series combination, equivalent resistance is

$$R = R_1 + R_2 + R_3 + \dots + R_n$$

Therefore, equivalent resistance of the circuit, $R = 1 + 2 = 3\ \Omega$

According to Ohm's law,

$$V = IR$$

where,

I is the current through the circuit

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

This current will flow through each component of the circuit because there is no division of current in series circuits. Hence, current flowing through the $2\ \Omega$ resistor is $2\ \text{A}$. Power is given by the expression,

$$P_s = I^2 R = (2)^2 \times 2 = 8\ \text{W} \text{ -----(1)}$$

(ii) Potential difference, $V = 4\ \text{V}$

$12\ \Omega$ and $2\ \Omega$ resistors are connected in parallel.

The voltage across each component of a parallel circuit remains the same. Hence, the voltage across $2\ \Omega$ resistor will be $4\ \text{V}$.

Power consumed by $2\ \Omega$ resistor is given by

$$P_p = \frac{V^2}{R} = \frac{4^2}{2} = 8\ \text{W} \text{ -----(2)}$$

Therefore, the power used by $2\ \Omega$ resistor is $8\ \text{W}$.

From eqs. (1) and (2),

$$P_s = P_p$$

i.e. The $2\ \Omega$ resistor uses equal power in both the circuits.

Chapter 12 - Electricity Exercise 222

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

• Solution 1

Concept Insight: The voltage across each component of a parallel circuit remains the same.

Both the bulbs are connected in parallel. Therefore, potential difference across each of them will be 220 V, because no division of voltage occurs in a parallel circuit.

We know, Power = Voltage x Current

Current drawn by the bulb of rating 100 W is given by,

Current =

$$\frac{\text{Power}}{\text{Voltage}} = \frac{100}{220} \text{ A}$$

Similarly, current drawn by the bulb of rating 60 W is given by,

Current =

$$\frac{\text{Power}}{\text{Voltage}} = \frac{60}{220} \text{ A}$$

Hence, current drawn from the line =

$$\frac{100}{220} + \frac{60}{220} = 0.727 \text{ A}$$

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

• Solution 2

Concept Insight: Energy consumed by an electrical appliance is given by the expression,

$$H = Pt$$

Where,

P = Power of the appliance

T = Time

Energy consumed by a TV set of power 250 W in 1 h = $250 \times 3600 = 9 \times 10^5 \text{ J}$

Energy consumed by a toaster of power 1200 W in 10 minutes

$$= 1200 \times 600 = 7.2 \times 10^5 \text{ J}$$

Therefore, the energy consumed by a 250 W TV set in 1 h is more than the energy consumed by a toaster of power 1200 W in 10 minutes.

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

• Solution 3

Concept Insight: Rate of heat produced by a device is given by the expression for power as

$$P = I^2R$$

Resistance of the electric heater, $R = 8 \text{ ohm}$

Current drawn, $I = 15 \text{ A}$

$$P = (15)^2 \times 8 = 1800 \text{ J/s}$$

Therefore, heat is produced by the heater at the rate of 1800 J/s.

Explain the following.

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

• **Solution 4**

(a) The melting point of tungsten is very high, so the tungsten filament can be kept white-hot without melting away. Hence, tungsten is mainly used almost exclusively for filament of incandescent lamps.

(b) The conductors of electric heating devices such as bread toasters and electric irons are made of alloy because resistivity of an alloy is generally more than that of pure metals of which it is made. It produces a large amount of heat. Moreover, at high temperatures, the alloys do not melt readily.

(c) In a series arrangement, if any one of the appliances fails or is switched off, then the flow of current through the entire circuit stops and all other appliances stop working. Thus series arrangement is not used for domestic circuits.

(d) Resistance (R) of a wire is inversely proportional to its area of cross-section A .

(e) Copper and aluminum wires have low resistivity. They are good conductors of electricity. Hence, they are usually employed for electricity transmission.

CHAPTER - 9 Heredity and Evolution

Page No. 143

1. **If a trait A exists in 10% of a population of an asexually reproducing species and a trait B exists in 60% of the same population, which trait is likely to have arisen earlier? (To be done in textbook)**

Ans. Trait B.

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

Ans. Depending on the nature of variations different individuals would have different kinds of advantage to adjust in particular habitat. Variations help the individual to have different traits that may lead to better adaptability of the organisms in changing environment.

Page No. 147

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

Ans. In Monohybrid cross of Mendel between pure tall and pure dwarf pea plant, all progeny in F₁ generation are tall and in F₂ generation, 75% of pea plants are tall but 25% are dwarf. This shows that traits are dominant or recessive. In F₁ generation both the traits were present but dwarfness couldn't express itself in the presence of tallness. This shows that tallness is a dominant character.

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

Ans When a pea plant having round green seeds is crossed with a pea plant having wrinkled yellow seeds in F₁ generation all the plants have round yellow seeds. But in F₂ generation two new combinations of traits that is round yellow and wrinkled green appeared. The new combinations are possible only when traits are inherited independently.

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

Ans. No, the information is not enough. Either can be possible. In this case, there are two possibilities.

Possibility 1

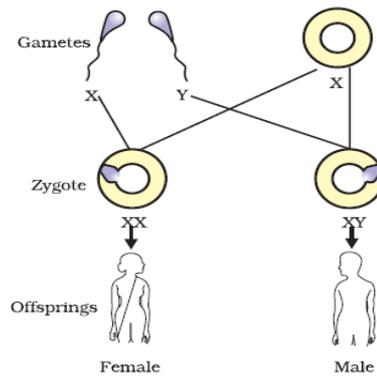
Blood group A is dominant and blood group O is recessive. The blood group O in daughter can appear only when both the recessive alleles occur together in mother and father has one allele of A and other allele of O blood group.

Possibility 2

blood group O is dominant and blood group A is recessive. In this father must carry both alleles of blood group A while mother may be having either both alleles of O or one of A blood group and other of blood group O. In this case also the daughter can have blood group O.

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

Ans. There are 23 pairs of chromosomes in human beings. 23rd pair of chromosome is sex chromosome. In male it is XY and female it is XX. Therefore males are heterogametic - Produce two types of sperms (X and Y), while females are homogametic- Produce same type of eggs (X). A child which inherits X containing sperm from her father will be a girl and one who inherits Y-sperm from him will be a boy.



TEXTBOOK EXERCISES

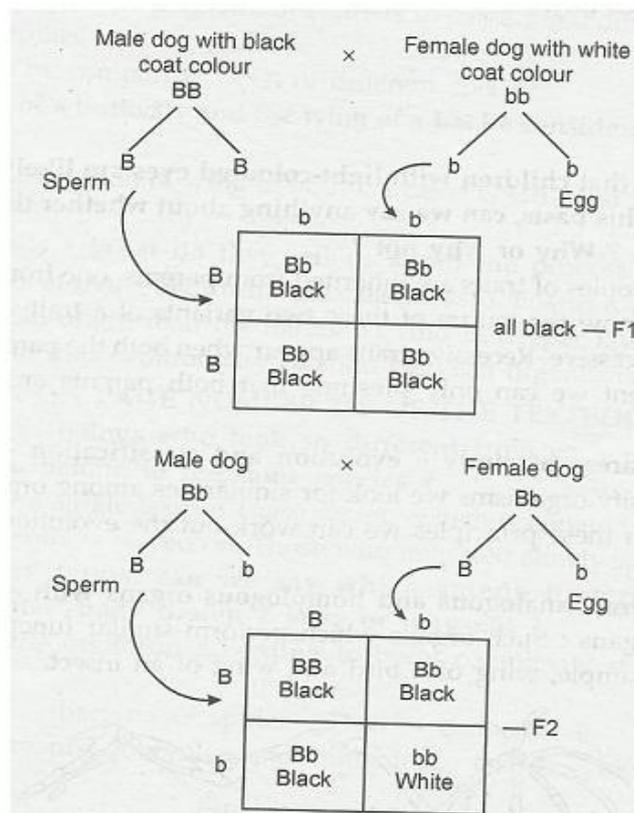
Q1 to be done in the textbook.

- 4. A study found that children with light-coloured eyes are likely to have parents with light coloured eyes. On this basis, can we say anything about whether the light eye colour trait is dominant or recessive? Why or why not? (To be done in textbook)**

Ans. No, since two copies of traits are inherited from parents, one from mother and the other from father. Unless we know the nature of these two variants of traits we cannot tell which is dominant and which is recessive. Recessive traits appear when both the parents contribute recessive allele. From this statement we can only presume that both parents are contributing recessive allele.

- 7. Outline a project which aims to find the dominant coat colour in dogs.**

Ans. A male dog pure for black coat colour is crossed with a female dog pure for white coat colour. If all the puppies in F1 generation have black coat colour then black coat colour is dominant over white colour. This can further be established by cross between male and female of F1 gen. The cross is depicted below:



8. Explain the importance of fossils in deciding evolutionary relationship.

- Ans.** (i) Study of fossils allow us to make estimates of how far back evolutionary relationship go between organisms.
(ii) Study of age of fossils allows us to know which organisms evolved earlier and which later. Thus help us in tracing the path of evolution.
(iii) They tell us about the characters and age of the fossil organism.
(iv) They tell us about the time period.

9. What evidence do we have for the origin of life from inanimate matter?

- Ans.** The evidence was given by Stanley L. Miller and Harold C. Urey in 1953. They recreated primitive earth's atmosphere inside an apparatus. Inside a glass chamber they took mixture of gases- CH_4 ; NH_3 ; H_2 and added H_2O . This was maintained by them at a temperature just below 100 degree Celsius and sparks were passed through the mixture of gases to stimulus lightening. At the end of a week, they found that 15% of the carbon had been converted to simple compounds of carbon including amino acids which make up protein molecules.

10. Explain how sexual reproduction gives rise to more viable variations than asexual reproduction. How does this affect the evolution of those organisms that reproduce sexually?

- Ans.** Variations arise either because of errors in DNA copying or as a result of sexual reproduction. Due to sexual reproduction genetic variability increases in the population from one generation to another. This happens due to the fact that- (i) sexually reproducing organism inherits half the genes from each parent. (ii) Crossing over during gamete formation. (iii) Random fertilization of gametes. These variations are very important for the process of evolution.

11. Only variations that confer an advantage to an individual organism will survive in a population. Do you agree with this statement? Why or why not?

- Ans.** No, depending on the nature of variations different individuals have been different kinds of advantages. When a drastic change occurs in environment, only those organisms in the population will survive which have an advantageous variation in that population to survive in changed environment. Whereas in case of genetic drift the variations even though don't provide survival advantage, still persist in the population.

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

- Ans.** Equal contribution of male and female parents is ensured in progeny during sexual reproduction. Each trait of progeny is determined by a pair of alleles and gametes of male and female contain one allele (due to meiosis). Each allele pairs during fertilisation combine together to determine traits. Thus, the traits of progeny are determined by equal genes from male and female.

CHAPTER - 15
Our Environment

Page No. 260

1. What are trophic levels? Give an example of a food chain and state the different trophic levels in it.

Ans. Each step in a food chain constitutes a trophic level. For example,
Grass \longrightarrow Dear \longrightarrow Lion
Trophic level 1 Trophic level 2 Trophic level 3

2. What is the role of decomposers in the ecosystem? (To be done in textbook)

Ans. (i) They clean up environment by decompose dead remains of plants and animals and their wastes.
(ii) They help in recycling of materials.
(iii) They create space for new organisms.

Page No. 262

1. Why are some substances biodegradable and some non-biodegradable?

Ans. Substances which can be acted upon by micro-organism (decomposer) are called biodegradable. For example- vegetable wastes, paper, cotton etc.
On the other hand, materials which are not acted upon by decomposers are called non-biodegradable. For example- plastic, glass, polyethene etc.

2. Give any two ways in which biodegradable substances would affect the environment.

Ans. (a) They will serve as breeding ground for flies and mosquitoes which are carriers of disease like cholera, malaria etc.
(b) They produce foul smell, thus causing air pollution.

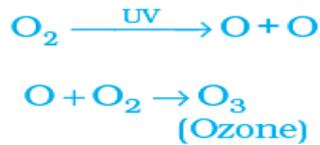
3. Give any two ways in which non-biodegradable substances would affect the environment. (To be done in textbook)

Ans. (a) Excess use of non-biodegradable pesticide and fertilizers run off with rain water to water bodies causes water pollution.
(b) They may choke the sewer system of city or town that may overflow over roads.

Page No. 264

1. What is ozone and how does it affects any ecosystem?

Ans. Ozone is a form of oxygen. It has the molecular formula O_3 . It is deadly poisonous. It is present at a higher level in the atmosphere. It protects the ecosystem from the harmful effects of ultraviolet rays coming from the Sun. UV rays may cause skin cancer, cataract to us.
It is produced in the upper layers of the atmosphere by the action of UV radiation, which splits some molecules of oxygen into two atoms of oxygen. One atom of oxygen combines with one molecule of oxygen to form the ozone (as shown below).



2. How can you help in reducing the problems of waste disposal? Give any two methods.

Ans. The following measures can be adopted for reducing the problem of waste disposal:

- (i) Reduce the volume of wastes by burning in incinerator.
- (ii) The biodegradable waste can be put in a pit and left there for composting.
- (iii) Solid wastes can be buried in landfills in urban areas.
- (iv) Some solid wastes can be recycled and articles like paper bags, plastic bags and buckets can be reused.

TEXTBOOK EXERCISES

1. Which of the following groups contain only biodegradable items? (To be done in textbook)

- (a) Grass, flowers and leather
- (b) Grass, wood and plastic
- (c) Fruit peels, cake and lime-juice
- (d) Cake, wood and grass

Ans. Groups (a), (c) and (d).

2. Which of the following constitute a food chain? (To be done in textbook)

- (a) Grass, wheat and mango
- (b) Grass, goat and human
- (c) Goat, cow and elephant
- (d) Grass, fish and goat.

Ans. (b) Grass, goat, human

3. Which of the following are environment-friendly practices?(To be done in textbook)

- (a) Carrying cloth-bag to put purchases in while shopping.
- (b) Switching off unnecessary lights and fans.
- (c) Walking to school instead of getting your mother to drop you on her scooter.
- (d) All of the above.

Ans. (d) All of the above.

4. What will happen if we kill all the organisms in one trophic level? (To be done in textbook)

Ans. If we kill all the organisms in one trophic level, the number of individuals in the next trophic level will decrease due to non-availability of food. Also, the number of individuals in the previous trophic levels will increase because there is no one to feed on them. This will cause imbalance in the environment.

5. Will the impact of removing all the organisms in a trophic level be different for different trophic levels? Can the organisms of any trophic level be removed without causing any damage to the ecosystem?

Ans. Yes, the impact of removing all the organisms of a trophic level will be different for different trophic levels. The effect will be time related. If we remove all the producers, primary consumers will be affected instantly. Secondary consumers will be affected after a gap and tertiary consumers after a longer gap. No, the organisms of any trophic level can't be removed without causing any damage to the ecosystem because they are connected with others through a food chain.

6. What is biological magnification? Will the levels of this magnification be different at different levels of the ecosystem?

Ans. The phenomenon of progressive increase in concentration of certain harmful non-biodegradable chemicals such as DDT at different trophic levels of food chain is called biological magnification.

The concentration of harmful chemicals will be different at different trophic levels. It will be lowest in the first trophic level and highest in the last trophic level of the food chain.

7. What are the problems caused by non-biodegradable wastes that we generate?

Ans. (i) Non-biodegradable pesticides and fertilizers run off to water bodies to cause water pollution.

(ii) Some of the non-biodegradable pesticides like DDT enter the food chain and cause bio-magnification in humans and other animals.

8. If all the wastes we generate is biodegradable, will this have no impact on the environment? (To be done in textbook)

Ans. It will have only short term impact on environment, the action of decomposers will slow down and some air/water pollution will be caused. However, in longer term, there will be no impact of biodegradable wastes on the environment.

9. Why is damage to the ozone layer a cause for concern? What steps are being taken to limit this damage?

Ans. Ozone layer prevents ultraviolet radiations from the Sun from reaching the earth.

Ultraviolet rays cause cancer, cataract and damage to the immune system of human beings, decrease rate of photosynthesis.

In 1987, United Nations Environment Programme (UNEP) succeeded in forging an agreement between nations to freeze chlorofluorocarbons (CFCs) production to 1986 levels. CFCs are the main cause of ozone layer depletion.

CHAPTER-3 METALS AND NONMETALS

Pg. No. 40 (to be discussed in class)

Q.1

Give an example of metal which:

(i) is a liquid at room temperature

(ii) can be easily cut with knife

(iii) is best conductor of heat.

(iv) is poor conductor of heat. (To be discussed/Marked)

Ans

(i) Mercury (ii) Sodium (iii) Silver (iv) Lead

Q.2

Explain the meaning of malleable and ductile.

Ans

A substance that can be beaten into thin sheets is said to be malleable. For example, iron, copper etc.

A substance that can be drawn into wires is called ductile. For example, gold, silver etc.

Pg. No. 46

Q.1

Why sodium is kept immersed in kerosene oil?

Ans.

Sodium is highly reactive metal, so it reacts vigorously with oxygen and moisture present in the air and catches fire when kept in the opens. Hence, to prevent accidental fires, it is kept immersed in kerosene oil.

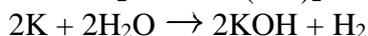
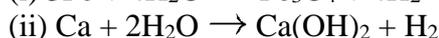
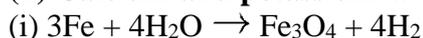
Q.2

Write equation for the reaction of

(i) Iron with steam.

(ii) Calcium and potassium with water.

Ans



Q.3

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

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

Use the Table above to answer the following questions:

(i) Which is the most reactive metal?

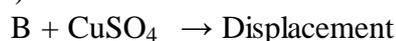
(ii) What would you observe if B is added to a solution of copper (II) sulphate?

(iii) Arrange the metals A, B, C and D in the order of decreasing reactivity.

(To be discussed/Marked)

(i) B is the most reactive metal.

(ii) If B is added to a solution of copper (II) sulphate, then it would displace copper.



(iii) The arrangement of the metals in the order of decreasing reactivity is:



Q.4

Which gas is produced when dilute hydrochloric acid is added to reactive metal?

Write the chemical reaction when iron reacts with dilute H_2SO_4 .

Ans Hydrogen gas is produced when dilute hydrochloric acid is added to a reactive metal.

$$\text{Fe}_{(s)} + \text{H}_2\text{SO}_{4(aq)} \longrightarrow \text{FeSO}_{4(aq)} + \text{H}_{2(g)}$$

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

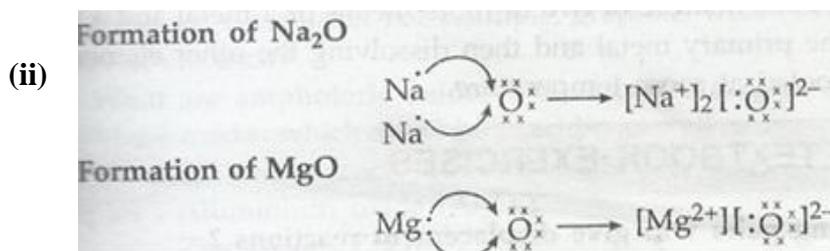
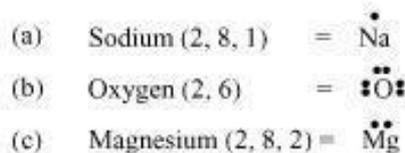
Ans As zinc is more reactive than iron, displacement reaction will take place

$$\text{Zn} + \text{FeSO}_4 \longrightarrow \text{ZnSO}_4 + \text{Fe}$$

Pg. No. 49

Q.1 (i) Write the electro-dot structures for sodium, oxygen, and magnesium.
 (ii) Show the formation of Na₂O and MgO by the transfer of electrons.
 (iii) What are the ions present in these compounds?

Ans (i) Electron-dot structure for sodium, oxygen and magnesium are



(iii) Ions present in Na₂O are Na⁺ and O²⁻
 Ions present in MgO are Mg²⁺ and O²⁻

Q.2 Why do ionic compounds have high melting points?

Ans Ionic compounds have strong electrostatic forces of attraction between the ions. Therefore, it requires a lot of energy to overcome these forces. That is why ionic compounds have high melting points.

Pg. No. 53 Deleted Portion

Pg. No. 55 Q.2 and Q.3 Deleted

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

Metal	Zinc	Magnesium	Copper
Zinc oxide	-	-	-
Magnesium oxide	-	-	-
Copper oxide	-	-	-

**In which cases will you find displacement reactions taking place?
 (to be discussed in class)**

Ans

Metal	Zinc	Magnesium	Copper
Zinc oxide	No reaction	Displacement	No reaction
Magnesium oxide	No reaction	No reaction	No reaction
Copper oxide	Displacement	Displacement	No reaction

EXERCISES

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

- NaCl solution and copper metal
- MgCl₂ solution and aluminium metal
- FeSO₄ solution and silver metal

(d) **AgNO₃ solution and copper metal.**
Ans (d) AgNO₃ solution and copper metal
Q.2 Deleted
Q.3 **An element reacts with oxygen to give a compound with a high melting point. This compound is also soluble in water. The element is likely to be**

- (a) calcium
 - (b) carbon
 - (c) silicon
 - (d) iron
- (a) The element is likely to be calcium

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

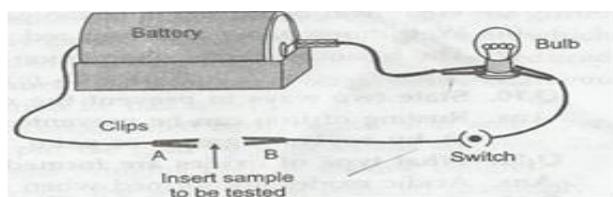
- (a) **zinc is costlier than tin.**
- (b) **zinc has a higher melting point than tin.**
- (c) **zinc is more reactive than tin.**
- (d) **zinc is less reactive than tin.**

Ans (c) zinc is more reactive than tin.

Q.5 (a) **You are given a hammer, a battery, a bulb, wires and switch.**
How could you use them to distinguish between samples of metals and non-metals?

(b) **Asses the usefulness of these tests in distinguish in between metals and non-metals?**

Ans (a) Place the sample on an iron block. Strike with hammer. If the sample takes the shape of a sheet, it is a metal. If it breaks into pieces, it is a non-metal.
Set up the arrangement by using a bulb, a battery, wires and switch. Insert the samples of metals and non-metals in the clips one by one and turn the switch on. If the bulb glows, the sample is a metal, if not, then the sample is non-metal.



(b) The above two methods can, in general, be used to distinguish between metals and non-metals.

Q.6 **What are amphoteric oxides? Give two examples of amphoteric oxides.**

Ans Metal oxides which show both acidic as well as basic behaviour are called amphoteric oxides. Such metal oxides react with both acids and bases.

Example: Aluminum oxide, zinc oxide

Q.7 **Name two metals which will displace hydrogen from dilute acids, and two metals which will not.**

Ans Magnesium and zinc metals displace hydrogen from dilute acids. Copper and silver do not displace hydrogen from dilute acids.

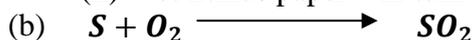
Q.8 Deleted

Q.9 **Pratyush took Sulphur powder on spatula and heated it. He collected the gas evolved by inverting a test tube over it as shown in fig. 3.12 below:**

- (a) **What will be the action of gas on**
 - (i) **Dry litmus paper?**
 - (ii) **Moist litmus paper?**
- (b) **Write a balanced chemical equation for the reaction taking place.**

Ans (a) Sulphur is a non-metal. Oxides of non-metals are acidic. In this case sulphur dioxide is produced which is acidic.

- (i) No action of the gas
(ii) Wet litmus paper will turn red.



Q.10

Deleted

Q.11

What types of oxides are formed when non-metals combine with oxygen?

Ans

Acidic oxides are formed when non-metals combine with oxygen.

Q.12

Give reasons:

- (a) **Platinum, gold and silver are used to make jewellery.**
(b) **Sodium, potassium and lithium are stored under oil.**
(c) **Aluminum is highly reactive metal, yet it is used to make utensils for cooking.**
(d) **Deleted**

Ans

- (a) These metals are un-reactive. They do not react with oxygen and other gases present in air and with moisture. Thus, their shine is maintained. That is why these metals are used to make jewellery.
(b) Reaction of sodium, potassium and lithium with oxygen is so violent that they catch fire. To prevent accidental fire, they are stored under kerosene oil.
(c) This is because aluminum is a good conductor of heat. Aluminum forms a layer of aluminum oxide at high temperature which prevents the further corrosion.

Q.13

You must have seen tarnished copper vessels being cleaned with lemon or tamarind juice. Explain why these sour substances are effective in cleaning the vessels.

Ans

Copper, on keeping in air reacts with atmospheric carbon dioxide to form a green layer of copper carbonate. Copper carbonate reacts with citric acid present in lemon or tartaric acid present in tamarind to form soluble copper citrate or copper tartarate. The vessels are thus cleaned using water.

Q.14

Differentiate between metal and non-metal on the basis of their chemical properties.

Ans

Metals and non-metals can be differentiated on the basis of following chemical properties.

Metal	Non-metal
Metals are electropositive.	Non-metals are electronegative.
They react with oxygen to form basic oxides. $4Na + O_2 \longrightarrow 2Na_2O$	They react with oxygen to form acidic or neutral oxides. $C + O_2 \longrightarrow CO_2$
These have ionic bonds.	These have covalent bonds.
They react with water to form oxides and hydroxides. Some metals react with cold water,	They do not react with water.

Q.15

A man went door to door posing as a goldsmith. He promised to bring back the glitter of the old and dull ornaments. An unsuspecting lady gave a set of gold bangles to him which he dipped in a particular solution. The bangles sparkled like new but their weight was reduced drastically. The lady was upset but after a futile argument the man beat a hasty retreat. Can you play the detective to find out the nature of the solution he had used?

Ans

Aqua regia, which is a mixture of three parts concentrated hydrochloric acid and one part of concentrated nitric acid, which dissolves gold. The man put the gold bangles in this solution. The outer dirty layer of gold bangles dissolved in aqua regia brings out the shining bangles.

As the outer layer of bangles dissolved in aqua regia, the weight was reduced drastically.

Q.16

Deleted

CHAPTER-2

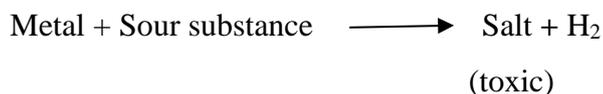
ACIDS, BASES AND SALTS

Pg. No. 18

- Q.1 **You have been provided with three test tubes. One of them contains distilled water and the other two contain an acidic solution and a basic solution, respectively. If you are given only red litmus paper, how will you identify the contents of each test tube?**
- A.1
1. Let us mark the three test tubes as A, B, and C. A drop of the solution from A is put on the red litmus paper. Same is repeated with solution B and C.
 2. If either of them changes colour to blue, then it is basic. Therefore, out of three, one is eliminated. Out of the remaining two, anyone can be acidic or neutral.
 3. Now again drop from the remaining test tubes is dropped on this blue litmus.
 4. If the colour change to red then that test tube has acidic solution and remaining third one will have distilled water.

Pg. No. 22

- Q.1 **Why should curd and sour substances not be kept in brass and copper vessels?**
- A.1 Curd and other sour substances are acidic in nature and brass and copper are metals. Therefore, when they are kept in brass and copper vessels, the metal reacts with the acid to liberate hydrogen gas and harmful products, thereby spoiling the food.

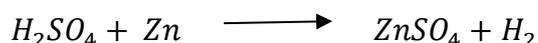


- Q.2 **Which gas is usually liberated when an acid reacts with a metal? Illustrate with an example. How will you test for the presence of this gas? (to be done in text book)**

- A.2 Hydrogen gas is usually liberated when an acid reacts with a metal.

Take few pieces of zinc granules and add 5 ml of dilute H_2SO_4 . Shake it and pass the gas produced into a soap solution. The bubbles of the soap solution are formed. These soap bubbles contain hydrogen gas.

We can test the evolved hydrogen gas by its burning with a pop sound when a candle is brought near the soap bubbles.



- Q.3 **Metal compound A reacts with dilute hydrochloric acid to produce effervescence. The gas evolved extinguishes a burning candle. Write a balanced chemical equation for the reaction if one of the compounds formed is calcium chloride.**

A.3 The compound A is Calcium carbonate and when it reacts with HCl it produces CO₂ which extinguishes the fire.



Pg.No.25

Q.1 **Why do HCl, HNO₃ etc. show acidic characters in aqueous solution while solutions of compounds like alcohol and glucose do not show acidic character?**

A.1 Compounds like HCl and HNO₃ release hydrogen ions in solution, therefore they show acidic character.

While compounds like alcohol and glucose do not release hydrogen ions.

Therefore, they do not show acidic properties.

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

A.2 Electricity is conducted in a solution by ions.

Acid release H⁺ ions in a solution so, it conducts electricity

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

A.3 Colour of litmus paper changes only when it come in contact of H⁺ ions and H⁺ ions is produced only when HCl gas comes in contact with water.

Therefore, dry HCl do not change the colour of dry litmus paper.

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

A.4 Addition of water to acid is an exothermic reaction.

If we add water to acid lot of heat is produced that may breaks the glass container or sprout to burns the person adding it.

But when acid is added to water with constant stirring, the heat produced is absorbed by water and no harm occurs.

Q.5 **How is concentration of hydronium ions (H₃O⁺) affected when a solution of acid is diluted?**

A.5 Concentration of hydronium ions decreased when the solution of an acid is diluted.

Q.6 **How is concentration of hydroxide ions (OH⁻) affected when excess base is dissolved in a solution of sodium hydroxide?**

A.6 Excess base dissolved in a solution of sodium hydroxide will release more hydroxide (OH⁻) ions. Therefore, concentration of hydroxide ions (OH⁻) will increase.

Pg.No.28

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

A.1 A pH value of less than 7 indicates an acidic solution, while greater than 7 indicates a basic solution. Therefore, the solution with pH = 6 is acidic and has more hydrogen ion concentration than the solution of pH = 8 which is basic.

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

A.2 Concentration of H⁺ (aq) can have a varied effect on the nature of the solution. With an increase in H⁺ ion concentration, the solution becomes more acidic, while a decrease of H⁺ ion causes an increase in the basicity of the solution.

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

A.3 Yes, basic solution also has H⁺ ions. However, their concentration is less as compared to the concentration of OH⁻ ions that makes the solution basic.

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

A.4 If the soil is acidic and improper for cultivation, then to increase the basicity of soil, the farmer would treat the soil with quick lime or slaked lime or chalk.

Pg.No.33 (Q.1 to Q.3 to be done in text book)

Q.1 **What is the common name of the compound CaOCl₂?**

A.1 The common name of the compound CaOCl₂ is bleaching powder.

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

A.2 Calcium hydroxide [Ca(OH)₂], on treatment with chlorine, yields bleaching

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

A.3 Washing soda (Na₂CO₃.10H₂O) is used for softening hard water.

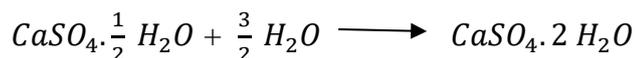
Q.4 **What will happen if a solution of sodium hydrogencarbonate is heated? Give the equation of the reaction involved.**

A.4 When a solution of sodium hydrogencarbonate (sodium hydrogencarbonate) is heated, sodium carbonate and water are formed with the evolution of carbon dioxide gas.



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

A.5 The chemical equation for the reaction of Plaster of Paris and water can be represented as



Plaster of Paris

Gypsum

Exercises (Q.1 to Q.4 to be done in text book)

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

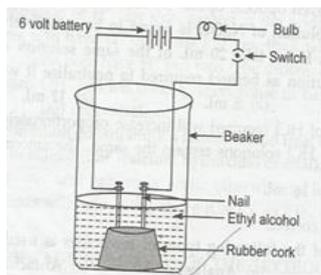
(a) 1

(b) 4

- (c) 5
(d) 10
- A.1 (d) 10
- Q.2 A solution reacts with crushed egg-shells to give a gas that turns lime-water milky.
The solution contains
- (a) NaCl
(b) HCl
(c) LiCl
(d) KCl
- A.2 (b) HCl
- Q.3 10 ml of a solution of NaOH is found to be completely neutralized by 8 mL of a given solution of HCl. If we take 20 ml of same solution of NaOH, the amount of HCl solution required to neutralize it will be
- (a) 4 ml
(b) 8 ml
(c) 12 ml
(d) 16ml
- A.3 (d) 16 ml
- Q.4 Which one of the following types of medicines is used for treating indigestion?
- (a) Antibiotics
(b) Analgesic
(c) Antacid
(d) Antiseptic
- A.4 (c) Antacid
- Q.5 Write word equations and then balanced equations for the reaction taking place when:
- (a) Dilute Sulphuric acid reacts with zinc granules.
(b) Dilute hydrochloric acid reacts with magnesium ribbon.
(c) Dilute Sulphuric acid reacts with aluminum powder
(d) Dilute hydrochloric acid reacts with iron filings.
- A.5 (a) $H_2SO_4 + Zn \longrightarrow ZnSO_4 + H_2$
(b) $Mg + 2HCl \longrightarrow MgCl_2 + H_2$
(c) $2Al + 3H_2SO_4 \longrightarrow Al_2(SO_4)_3 + 3H_2$
(d) $2HCl + Fe \longrightarrow FeCl_2 + H_2$

Q.6 **Compound such as alcohols and glucose also contain hydrogen but are not categorized as acids. Describe an activity.**

A.6



Solutions: -

Two nails are fitted on a cork and are kept it in a 100 mL beaker. The nails are then connected to the two terminals of a 6-volt battery through a bulb and a switch. Some dilute HCl is poured in the beaker and the current is switched on. The same experiment is then performed with glucose solution and alcohol solution.

Observations:

It will be observed that the bulb glows in the HCl solution and does not glow in the glucose solution.

Result:

HCl dissociates into H^+ and Cl^- ions. These ions conduct electricity in the solution resulting in the glowing of the bulb. On the other hand, the glucose solution does not dissociate into ions. Therefore, it does not conduct electricity.

Conclusion:

From this activity, it can be concluded that all acids contain hydrogen but not all compounds containing hydrogen are acids.

That is why, though alcohols and glucose contain hydrogen, they are not categorised as acids.

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

A.7 Rain water contains small amount of acid because of which it conducts electricity.

Distilled water is pure water. It does not contain ions.

Therefore, it does not conduct electricity.

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

A.8 Acids produce hydrogen ions or hydronium ions only in presence of water.

Therefore, it shows acidic behaviour only in the presence of water.

- Q.9 **Five solutions A, B, C, D and E when tested with universal indicators showed pH as 4, 1, 11, 7 and 9 respectively. Which solution is:**
- (a) neutral?
 - (b) strongly alkaline?
 - (c) strongly acidic
 - (d) weakly acidic?
 - (e) weakly alkaline
- A.9
- (a) D
 - (b) C
 - (c) B
 - (d) A
 - (e) E
- Q.10 **Equal lengths of magnesium ribbons are taken in test tubes A and B. hydrochloric acid is added to test tube A, while acetic acid is added to test B. In which test tube will the fizzing occur more vigorously and why?**
- A.10 HCl is stronger acid than CH_3COOH .
Therefore, H^+ ions concentration in test tube A will be more than that in test tube B. Hence, reaction will take place faster in test tube A than in test tube B. so, fizzing will occur more vigorously in test tube A.
- Q.11 **Fresh milk has a pH of 6. How do you think the pH will change as it turns into curd? Explain your answer.**
- A.11 Bacteria change the fresh milk into curd by producing lactic acid. Because of the presence of lactic acid in curd, the pH will come down from 6 to lower value.
- Q.12 **A milkman adds a very small amount of baking soda to fresh milk.**
- (a) **Why does he shift the pH of the milk from 6 to slightly alkaline?**
 - (b) **Why does this milk take a long time to set a curd?**
- A.12
- (a) The pH of milk changes from 6 to slightly alkaline on addition of a very small amount of baking soda. This is because sodium hydrogen carbonate (baking soda) is basic in nature. This prevents the milk from souring.
 - (b) Lactic acid formed as a result of fermentation, is neutralized by sodium hydrogen carbonate. This prolongs the time taken by milk to set as curd.
- Q.13 **Plaster of Paris should be stored in moisture-proof container. Explain why?**
- A.13 Plaster of Paris reacts with moisture to form gypsum and sets to a hard mass. Therefore, it should be stored in moisture-proof container
- Q.14 **What is a neutralization reaction? Give two examples.**

A.14 The reaction between an acid and a base to give salt and water is called neutralization reaction.



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

A.15 **Uses of washing soda:**

- (i) As cleansing agent.
- (ii) Removing permanent hardness of water.
- (iii) Used in glass, soap and paper industries.

Uses of baking soda:

- (i) For making baking powder.
- (ii) As ingredient of antacid.

CHAPTER - 8

How Do Organisms Reproduce?

Page No. 128

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

Ans. DNA present in nucleus of cells are the information source for making protein. If information is different, different protein will be made that lead to altered body design. During reproduction there is formation of new cells which must carry the same amount & type of heredity information (DNA) as present in the parent cells.

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

Ans. Many variations are pre-adaptations which may have no immediate benefit to individual, however they remain in population. If the niche/environment is drastically altered the pre-adaptations in some members allow them to survive & multiply. Thus, variation is useful to species but not necessarily for the individual.

Page No. 133

1. How does binary fission differ from multiple fission?

Ans. Difference between binary fission and multiple fission:

	BINARY FISSION	MULTIPLE FISSION
1.	Give rise to two individuals.	Forms more than two individuals.
2.	Occurs under favorable conditions.	Occurs both under favorable and unfavorable conditions.
3.	No residue left.	Residue left.
	Eg. Amoeba	Eg. Plasmodium

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

Ans. (i) The spores are covered by thick walls that protect them until they come into contact with suitable moist surface and can begin to grow.
(ii) Large numbers of spores also provide survival benefits/Perennation.
(iii) Spores are means of dispersal.

3. Can you think of reasons why more complex organism cannot give rise to new individuals through regeneration? (To be done in textbook)

Ans Complex organisms are not merely random collection of cells. Specialized cells are organized in them as tissues are organized in organs. These organs have to be placed at definite positions in the body. Most of cells in simple organisms can differentiate into specialized cells that can develop into entire organism. Whereas in complex organisms only limited cells have this property.

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

Ans. (i) Plants raised by vegetative propagation can bear flower and fruits earlier than those produced from seeds.
(ii) Such methods also make possible the propagation of plants such as banana, orange, rose and jasmine that have lost the capacity to produce seeds.
(iii) All plants produced by this method are genetically similar enough to the parent plant to have its all characteristics.
(iv) Survival rate is nearly 100%.

5. Why is DNA copying essential part of the process of reproduction? (To be done in textbook)

Ans. DNA contains information for the inheritance of features from parents to next generation. DNA presents in nucleus of cells are the information source for making protein. If information is different, different protein will be made that lead to altered body design.

Page No. 140

1. How is process of pollination different from fertilization?

Ans. Distinction between pollination and fertilization:

	POLLINATION	FERTILIZATION
1.	Transfer of pollen grains from anther to the stigma of a flower.	It is the fusion of male and female gametes.
2.	It is a physical process.	It is a physico-chemical process.
3.	Occurs in plants.	Occurs in plants and animals.

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

Ans. Secretions of seminal vesicles provide nutrition to sperms and activates them. Secretions of prostate gland help in sperm movement in female genital tract.

3. What are the changes seen in girls at the time of puberty? (To be done in textbook)

Ans. They attain feminine body shape, deposition of fat in thigh region and start of menstrual cycle around this time.

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

Ans. The embryo gets nutrition from the mother's blood with the help of a special tissue called placenta. This is a disc which is embedded in the wall of uterus. It contains finger-like projections villi on the embryo's side of the tissue. On mother's sides are blood spaces, which surround the villi. This provides a large surface area for glucose and oxygen to pass the mother to the embryo and waste products from embryo to mother.

5. If a woman is using a Copper-T, will it help in protecting her from sexually transmitted diseases? (To be done in textbook)

Ans. Copper-T cannot protect the woman from acquiring sexually transmitted disease. It will protect her from only unwanted pregnancy.

TEXTBOOK EXERCISE

QUESTION 1,2 AND 3 ARE MCQ'S (TO BE MARKED IN THE TEXTBOOK)

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

Ans. Sexual reproduction leads to variation due to recombination of genetic material DNA. These variations are essential for better adaptability and also lead to evolution. On the contrary, asexual reproduction does not bring about variations.

5. What are the functions performed by the testis in human beings? (To be done in textbook)

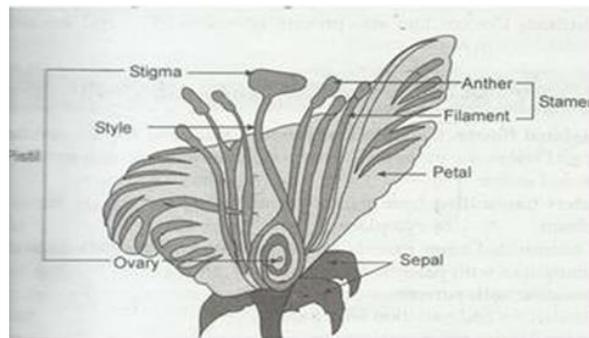
Ans. In human beings, testes perform dual function:
(i) Production of sperms
(ii) Secretion of male hormone testosterone.

6. Why does menstruation occur? (To be done in textbook)

Ans. When in human female, egg is not fertilized; it lives for about one day. Since the ovary releases one egg every month, the uterus also prepares itself every month to receive a fertilized egg. Thus, its lining becomes thick and spongy. This would be required for nourishing the embryo if had fertilized. However, this lining is not required any longer if fertilization has not occurred. So, the lining slowly breaks and comes out through the vagina as blood and mucous. This cycle takes roughly every month and is known as menstruation.

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

Ans.



8. What are the different methods of contraception?

Ans. Various methods used for regulation of child birth can broadly categories as:

- (i) **Barrier methods:** In this method, physical devices such as condom, diaphragm, cervical cap are used.
- (ii) **Chemical method:** Use of spermicidal jelly by woman, oral pills and vaginal pills.
- (iii) **Surgical method:** In surgical method, a small portion of vas deferens in male and the oviduct of female, is surgically removed or ligated. It is called vasectomy in male and Tubectomy in females.
- (iv) **IUCD** – These devices are placed inside the uterine cavity of a female. The presence of these devices prevents the implantation of an embryo in the uterus.eg, loops, copper- T

9. How are the modes of reproduction different in unicellular and multicellular organism? (To be done in textbook)

Ans. In unicellular organisms, cell division, or fusion leads to the creation of new individuals. In multicellular organisms with simple body organization budding, fragmentation may work but in complex multicellular organisms only sexual reproduction takes place.

10. How does reproduction help in providing stability to populations of species? (To be done in textbook)

Ans. The consistency of DNA copying during reproduction is important for the maintenance of body design and other features that allow the organism to use the particular niche. Reproduction is, therefore, linked to the stability to populations of species. Generally Number of deaths \approx Number of births, so population size is maintained.

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

Ans. (i) Some contraceptive methods like condom also prevent spread of STDs and lethal diseases like HIV-AIDS.

- (ii) Help in population control.
- (iii) Help in maintaining gap between children and also restricts number of children.
- (iv) Ensure good reproductive health.

CH 11-THE HUMAN EYE AND THE COLOURFUL WORLD

QUESTION-ANSWERS

Exercise question –answers (pg-198)

Q.1 Why do stars twinkle?

Solution

Stars emit their own light and they twinkle due to the atmospheric refraction of light. Stars are very far away from the earth. Hence, they are considered as point sources of light.

When the light coming from stars enters the earth's atmosphere, it gets refracted at different levels because of the variation in the air density at different levels of the atmosphere.

When the atmosphere refracts more star-light towards us, the star appears to be bright and when the atmosphere refracts less star-light, then the star appears to be dim. Therefore, it appears as if the stars are twinkling at night.

Q.2 Explain why the planets do not twinkle?

Solution

Planets do not twinkle because they appear larger in size than the stars as they are relatively closer to Earth.

Planets can be considered as a collection of a large number of point-size sources of light. The different parts of these planets produce either brighter or dimmer effects in such a way that the average of brighter and dimmer effects is zero. Hence, planets do not twinkle.

Q.3 Why does the sun appear reddish early in the morning?

Solution

During sunrise, the light rays coming from the Sun have to travel a greater distance in the earth's atmosphere before reaching our eyes.

In this journey, the shorter wavelengths of lights are scattered out and only longer wavelengths are able to reach our eyes.

Since blue colour has a shorter wavelength and red colour has a longer wavelength, the red colour is scattered the least and is able to reach our eyes after the atmospheric scattering of light. Therefore, the Sun appears reddish early in the morning.

Q.4 Why does the sky appear dark instead of blue to an astronaut?

Solution

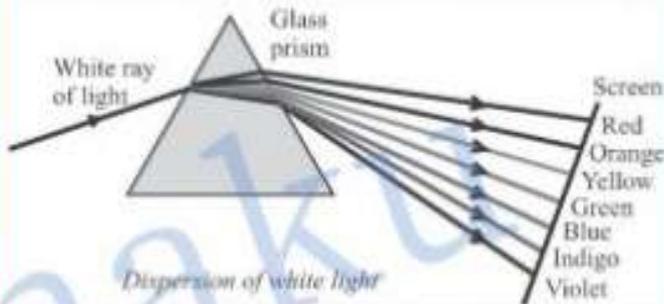
The sky appears dark instead of blue to an astronaut because there is no atmosphere in the outer space that can scatter the sunlight. As the sunlight is not scattered, no scattered light reaches the eyes of the astronauts and the sky appears black to them.

Refraction

Bending of light when it passes obliquely from one medium to another medium

Dispersion

Splitting of white light into its component colours – VIBGYOR.
Red colour deviates least and violet deviates most



Cause of Dispersion

Refractive index of material for different wavelengths is different.

$$\mu \propto \frac{1}{\lambda} \quad \mu_v > \mu_r$$

Spectrum

Band of seven component colours VIBGYOR on a white screen

Rainbow

Seven colours band of sunlight in the form of bow in the sky. It is formed due to reflection, refraction and dispersion of sunlight by tiny water droplets. To observe rainbow, observer should stand with its back towards sun

Primary Rainbow

- Two refraction and one total internal reflection
- Subtends an angle of 42° at the eye of the observer
- Innermost arc is violet and outermost is red
- More bright

Secondary Rainbow

- Two refraction and two total internal reflection
- Subtends an angle of 52.5° at the eye
- Innermost arc is red and outermost is violet
- Less bright in comparison to primary rainbow

Atmospheric Refraction

Phenomena due to Refraction of light by atmosphere

Twinkling of stars

Stars seen higher than they actually are

Advance sunrise and delayed sunset

Flattering of the sun at morning and evening

Scattering of Light

Rayleigh scattering
Intensity of scattered light $\propto 1/\lambda^4$

Tyndall effect
The smoke particles become visible

The reddening of the sun at sunrise and sunset

Blue colour of sky

The sky looks dark in absence of atmosphere

Danger signals are of red coloured

Colour

The sensation received by the eye (rod cells of the eye) due to light coming from an object.

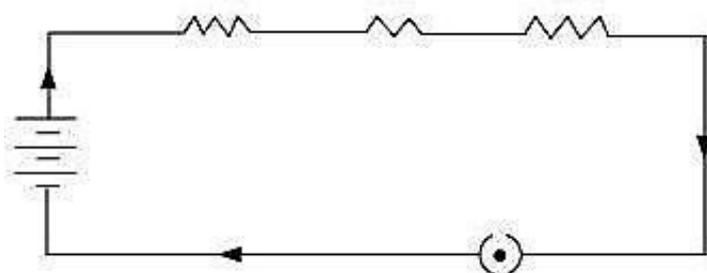
Ch 12 Electricity

Chapter 12 - Electricity Exercise 200

What does an electric circuit mean?

An electric circuit is a continuous conducting path that consists of electric devices, switching devices, source of electricity, etc. connected by conducting wires.

Concept Insight: The figure given below is an example of an electric circuit.



Define the unit of current.

The unit of electric current is ampere (A).

1 ampere is defined as the flow of 1 coulomb of charge through a wire in 1 second.

Calculate the number of electrons constituting one coulomb of charge.

One electron possesses a charge of 1.6×10^{-19} C, i.e., 1.6×10^{-19} C of charge is contained in 1 electron.

1 C of charge is contained in $\frac{1}{1.6 \times 10^{-19}} = 6.25 \times 10^{18}$ electrons
Therefore, 6.25×10^{18} electrons constitute one coulomb of charge.

Chapter 12 - Electricity Exercise 202

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

A source of electricity such as cell, battery, power supply, etc. helps to maintain a potential difference across a conductor.

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

If 1 J of work is done to move a charge of amount 1 C from one point to another, then it is said that the potential difference between the two points is 1 V.

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

The amount of work is given by the expression,

$$\text{Potential difference} = \frac{\text{Work done}}{\text{Charge}}$$

$$\text{Work Done} = \text{Potential Difference} \times \text{Charge}$$

Here,

$$\text{Charge} = 1 \text{ C}$$

$$\text{Potential difference} = 6 \text{ V}$$

$$\text{Work Done} = 6 \times 1 = 6 \text{ J}$$

Therefore, 6 J of energy is given to each coulomb of charge passing through a battery of 6 V.

Chapter 10 - Light: Reflection and Refraction

Exercise (Page No.176)

A ray of light travelling in air enters obliquely into water. Does the light ray bend towards the normal or away from the normal? Why?

- **Solution**

The light ray bends towards the normal.

Reason: When a ray of light travels from an optically rarer medium to an optically denser medium, it gets bent towards the normal. Since water is optically denser than air, a ray of light travelling from air into the water will bend towards the normal.

Concept insight: Air is rarer medium & water is denser medium. The direction of bending of light depends on whether the light is moving from rarer to denser medium or vice versa.

Light enters from air to glass having refractive index 1.50. What is the speed of light in the glass? The speed of light in vacuum is $3 \times 10^8 \text{ m s}^{-1}$.

- **Solution**

Refractive index of a medium n_m is given by,

$$n_m = \frac{\text{Speed of light in vacuum}}{\text{Speed of light in the medium}} = \frac{c}{v}$$

Given:

Speed of light in vacuum, $c = 3 \times 10^8 \text{ ms}^{-1}$

Refractive index of glass, $n_g = 1.50$

Speed of light in the glass,

$$v = \frac{c}{n_g} = \frac{3 \times 10^8}{1.50} = 2 \times 10^8 \text{ ms}^{-1}$$

Concept insight: Remember this formula for refractive index of a medium.

The refractive index of medium 2 with respect to medium 1 is given as,

$$n_{21} = \frac{\text{Speed of light in medium 1}}{\text{Speed of light in medium 2}} = \frac{v_1}{v_2}$$

The refractive index of medium 1 with respect to medium 2 is given as,

$$n_{12} = \frac{\text{Speed of light in medium 2}}{\text{Speed of light in medium 1}} = \frac{v_2}{v_1}$$

Find out, from Table 10.3, the medium having highest optical density. Also find the medium with lowest optical density.

- **Solution**

Highest optical density = Diamond

Lowest optical density = Air

Optical density of a medium is directly related with the refractive index of that medium. A medium which has the highest refractive index will have the highest optical density and vice-versa.

It can be observed from the table that diamond and air respectively have the highest and lowest refractive indices. Therefore, diamond has the highest optical density and air has the lowest optical density.

You are given kerosene, turpentine and water. In which of these does the light travel fastest? Use the information given in Table 10.3.

- **Solution**

Speed of light in a medium is given by the relation for refractive index (n_m). The relation is given as

$$n_m = \frac{\text{Speed of light in air}}{\text{Speed of light in the medium}} = \frac{c}{v}$$

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

$$v \propto \frac{1}{n_m}$$

It can be inferred from the relation that light will travel the slowest in the material which has the highest refractive index and will travel the fastest in the material which has the lowest refractive index.

It can be observed from the table that the refractive indices of kerosene, turpentine, and water are 1.44, 1.47, and 1.33 respectively. Therefore, light travels the fastest in water.

Concept Insight: Higher is the refractive index of a medium, less is the speed of light in the medium.

The refractive index of diamond is 2.42. What is the meaning of this statement?

• **Solution 5**

Refractive index of a medium n_m is related to the speed of light in that medium v by the relation:

$$n_m = \frac{\text{Speed of light in air}}{\text{Speed of light in the medium}} = \frac{c}{v}$$

Where, c is the speed of light in vacuum/air

The refractive index of diamond is 2.42. This suggests that a light ray travelling in air and entering diamond gets slowed down and its speed becomes $1/2.42$ times that in air.

Exercise (Page No. 184)

Define 1 dioptre of power of a lens.

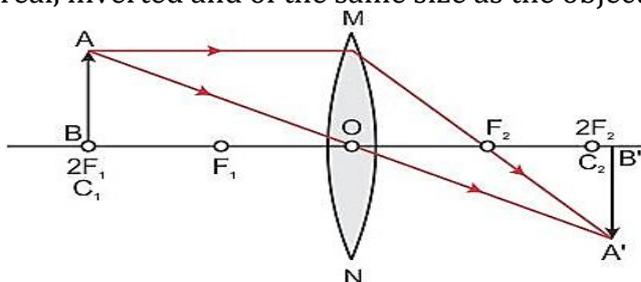
• **Solution**

1 diopter is defined as the power of a lens of focal length 1 metre.

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

• **Solution**

When an object is placed at the centre of curvature, $2F_1$, of a convex lens, its image is formed at the centre of curvature, $2F_2$, on the other side of the lens. The image formed is real, inverted and of the same size as the object, as shown in the given figure.



It is given that the image of the needle is formed at a distance of 50 cm from the convex lens. Hence, the needle must be placed in front of the lens at a distance of 50 cm.

Object distance, $u = -50$ cm

Image distance, $v = 50$ cm

Focal length = f

According to the lens formula,

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

$$\frac{1}{f} = \frac{1}{50} - \frac{1}{(-50)}$$

$$\frac{1}{f} = \frac{1}{50} + \frac{1}{50}$$

$$\frac{1}{f} = \frac{2}{50} = \frac{1}{25}$$

$$\therefore f = 25 \text{ cm} = 0.25 \text{ m}$$

$$\text{Power of lens, } P = \frac{1}{f \text{ (in metres)}} = \frac{1}{0.25} = +4 \text{ D}$$

Hence, the power of the given lens is +4 D.

Concept Insight - One should extremely be careful while substituting the values of u , v and f without forgetting to put the appropriate sign conventions.

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

• **Solution**

Focal length of concave lens, $f = -2$ m

$$\text{Power of lens} = \frac{1}{f \text{ (in metres)}} = \frac{1}{-2} = -0.5 \text{ D}$$

Here, negative sign arises due to the divergent nature of concave lens.

Concept Insight:

While using the formula of power, one should be careful to use the value of focal length expressed in meters only.

Exercise (Page No. 185)

Which one of the following materials cannot be used to make a lens?

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

• **Solution 1** (d) Clay

Concept Insight: A lens allows light to pass through it. Since clay does not show such property, it cannot be used to make a lens.

The image formed by a concave mirror is observed to be virtual, erect and larger than the object. Where should be the position of the object?

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

• **Solution 2** (d) Between the pole of the mirror and its principal focus.

Concept Insight: When an object is placed between the pole and principal focus of a concave mirror, the image formed is virtual, erect and larger than the object.

Where should an object be placed in front of a convex lens to get a real image of the size of the object?

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

- **Solution 3** (b) At twice the focal length

Concept Insight: When an object is placed at a distance equal to twice the focal length in front of a convex lens, its image is formed at a distance of twice the focal length on the other side of the lens. The image formed is real, inverted, and of the same size as the object.

A spherical mirror and a thin spherical lens have each a focal length of -15 cm. The mirror and the lens are likely to be

- (a) both concave.
- (b) both convex.
- (c) the mirror is concave and the lens is convex.
- (d) the mirror is convex, but the lens is concave.

- **Solution 4** (a) both concave

Concept Insight: By convention, the focal lengths of a concave mirror and a concave lens are taken as negative. Hence, both, the spherical mirror and the thin spherical lens are concave in nature.

Exercise (Page no. 186)

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.

- **Solution 1** (d) either plane or convex

Concept Insight: A convex mirror always gives a virtual and erect image of smaller size than the object placed in front of it. Similarly, a plane mirror always gives a virtual and erect image of the same size as that of the object placed in front of it. Therefore, the given mirror could be either plane or convex.

Which of the following lenses would you prefer to use while reading small letters found in a dictionary?

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

- **Solution 2** (c) A convex lens of focal length 5 cm.

Concept Insight: A convex lens gives an erect and magnified image of an object when it is placed between the optical centre and focus of the lens. Also, magnification is more for convex lenses having shorter focal length. Therefore, for reading small letters, a convex lens of focal length 5 cm should be used.

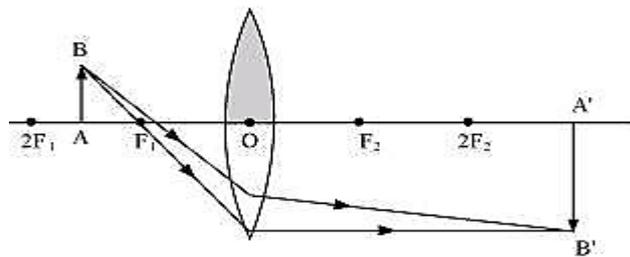
One-half of a convex lens is covered with a black paper. Will this lens produce a complete image of the object? Verify your answer experimentally. Explain your observations.

• **Solution**

The convex lens will form a complete image of an object, even if its one-half is covered with black paper. It can be understood by the following two cases.

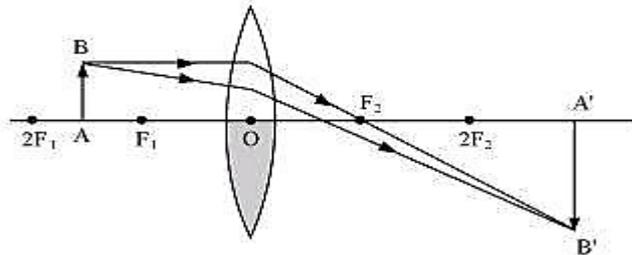
• **Case I-When the upper half of the lens is covered:**

In this case, the rays of light coming from the object will be refracted by the lower half of the lens. These rays meet at the other side of the lens to form the image of the given object, as shown in the following figure.



• **Case II-When the lower half of the lens is covered:**

In this case, a ray of light coming from the object is refracted by the upper half of the lens. These rays meet at the other side of the lens to form the image of the given object, as shown in the following figure.



Concept Insight: In case of the half covered lens, the number of rays used up to make the image on the other side of the lens will be reduced to half.

An object 5 cm in length is held 25 cm away from a converging lens of focal length 10 cm. Draw the ray diagram and find the position, size and the nature of the image formed.

• **Solution**

Object distance, $u = -25$ cm

Object height, $h_o = 5$ cm

Focal length, $f = +10$ cm

According to the lens formula,

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

$$\frac{1}{v} = \frac{1}{f} + \frac{1}{u} = \frac{1}{10} - \frac{1}{25} = \frac{15}{250}$$

$$v = \frac{250}{15} = 16.66 \text{ cm}$$

The positive value of v shows that the image is formed on the other side of the lens.

Magnification for lens, $m = \frac{\text{image distance}}{\text{object distance}} = \frac{v}{u}$

$$\therefore m = \frac{v}{u} = \frac{16.66}{(-25)} = -0.66$$

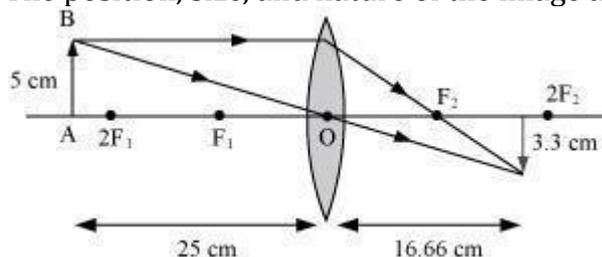
The negative sign shows that the image is real and formed behind the lens.

Magnification, $m = \frac{\text{Image height}}{\text{Object height}} = \frac{h_i}{h_o} = \frac{h_i}{5}$

$$h_i = m \times h_o = -0.66 \times 5 = -3.3 \text{ cm}$$

The negative value of image height indicates that the image formed is inverted.

The position, size, and nature of the image are shown in the following ray diagram.



Concept Insight: Remember to use appropriate sign conventions while substituting the values in lens formula.

A concave lens of focal length 15 cm forms an image 10 cm from the lens. How far is the object placed from the lens? Draw the ray diagram.

• **Solution**

Focal length (OF_1) of the concave lens is $f = -15 \text{ cm}$

Image distance, $v = -10 \text{ cm}$

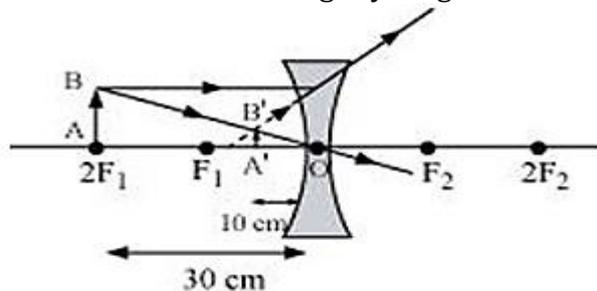
According to the lens formula,

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

$$\frac{1}{u} = \frac{1}{v} - \frac{1}{f} = \frac{-1}{10} - \frac{1}{(-15)} = \frac{-1}{10} + \frac{1}{15} = \frac{-5}{150}$$

$$u = -30 \text{ cm}$$

The negative value of u indicates that the object is placed 30 cm in front of the lens. This is shown in the following ray diagram.



Concept Insight: Remember to use appropriate sign conventions while substituting the values in lens formula.

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

• **Solution**

$$\text{Power of a lens, } P = \frac{1}{f \text{ (in metres)}}$$

$$P = -2 \text{ D}$$

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

$$f = \frac{1}{-2}$$

$$f = -0.5 \text{ m}$$

The focal length is negative. Hence, it is a concave lens.

Concept Insight - The value of the focal length should be written in metre when substituting in the formula:

$$\text{Power} = \frac{1}{\text{Focal length}}$$

A doctor has prescribed a corrective lens of power +1.5 D. Find the focal length of the lens. Is the prescribed lens diverging or converging?

• **Solution**

$$\text{Power of a lens, } P = \frac{1}{f \text{ (in metres)}}$$

$$\text{Power, } P = 1.5 \text{ D}$$

$$f = \frac{1}{1.5} = \frac{10}{15} = 0.66 \text{ m}$$

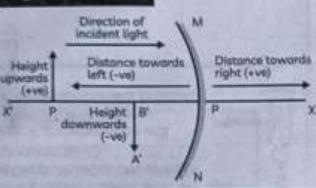
A convex lens has a positive focal length. Hence, it is a convex lens or a converging lens.

Concept Insight: Positive focal length corresponds to convex lens and negative focal length corresponds to concave lens.

Ch 10 : Light - Reflection and Refraction

Objective Section MAP

Sign Convention



OBJECT	INFINITY	BEYOND C	AT C	B/W C & F	AT F	B/W F & P
IMAGE	Focus	B/W F & C	AT C	Beyond	At Infinity	Behind Mirror
SIZE	Point Sized	Diminished	Same Size	Enlarged	Highly Enlarged	Enlarged
NATURE	Real & Inverted				Virtual & Erect	

INFINITY	FINITE DISTANCE
At Focus (Behind the mirror)	B/W F & P
Point Sized	Diminished
Virtual & Erect	

Mirror Formula

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

R = Radius of Curvature
 u = object distance
 v = image distance
 f = focal length = $\frac{R}{2}$

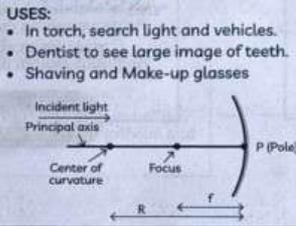
Magnification

$$m = \frac{h}{h_o} = -\frac{v}{u}$$

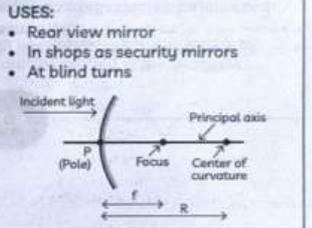
h = Size of image
 h_o = Size of object

- If m is +ve, image is virtual & erect
- If m is -ve, image is real & inverted
- If m > 1, image is magnified
- If m < 1, image is diminished

Concave Mirror



Convex Mirror



Type of Spherical Mirrors

Image Formation

It is a point at which atleast two light rays actually meet or appears to meet.

Type of Image

Virtual Image

- When light rays appear to meet.
- Cannot be obtained on screen.
- Erect image is formed.

Real Image

- When light rays actually meet.
- Can be obtained on screen.
- Inverted image is formed.

Laws of Reflection

- The angle of incidence is equal to the angle of reflection.
- The incident ray, the reflected ray and the normal to the mirror at the point of incidence all lie in the same plane.

REFLECTION

When light falls on a polished surface, it is reflected back into the same medium, we say reflection has taken place.

Spherical Mirrors

Spherical mirrors are the part of glass sphere whose inner or outer side is polished and reflecting.

Plane Mirror

- Virtual and Erect.
- Same size as of the object.
- At equal distance behind the mirror.
- Laterally inverted image is formed.
- Magnification = +1

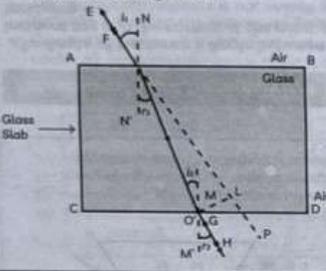
LIGHT - REFLECTION AND REFRACTION

REFRACTION

The phenomenon of bending of light when it travels from one medium to another is called as 'refraction'.
Cause: Speed of light changes when it enters from one medium to another medium.

Refraction through Glass Slab

- Light bends towards normal when it enters a denser medium.
- Light bends away from normal when it enters a rarer medium.
- $\angle i = \angle e$
- Emergent ray is parallel to incident ray but is laterally shifted.



Laws of Refraction

- The incident ray, the refracted ray and the normal to the interface of two transparent media at the point of incidence, all lie in the same plane.
- Snell's Law: $\frac{\sin i}{\sin r} = \text{Constant or Refractive Index}$

Spherical Lenses

A lens is a part of a transparent thick glass which is bounded by two spherical surfaces.

Refractive Index

$n_{21} = \frac{\text{Speed of light in medium 1}}{\text{Speed of light in medium 2}}$
 Medium in which speed of light is less is called optically rarer medium and in which speed is more is optically denser.

Power of Lens

- Power of lens is the reciprocal of its focal length.
- SI unit of power is Dioptre (D).
- 1 dioptre is the power of a lens whose focal length is 1 meter.
- The power of a convex lens is positive (+ve) and the power of a concave lens is negative (-ve).
- $P = \frac{1}{f(m)} ; f = \frac{1}{P}$
- Power of combination of lenses
 $P = P_1 + P_2 + P_3 + \dots$

Absolute Refractive Index

$$n_m = \frac{\text{Speed of light in air}}{\text{Speed of light in any medium}} = \frac{c}{v}$$

Convex Lens

- Thick from centre.
- Thin from corners.
- Converging lens.

Concave Lens

- Thin from centre.
- Thick from corners.
- Diverging lens.

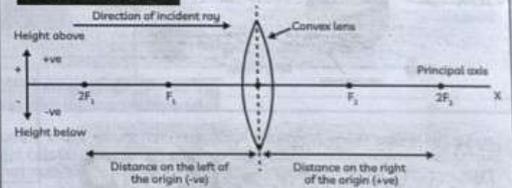
Magnification

$$m = \frac{h_i}{h_o} = \frac{v}{u}$$

Lens Formula

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

Sign Convention



OBJECT	INFINITY	BEYOND $2F_1$	AT $2F_1$	B/W $2F_1$ & F_1	AT F_1	B/W F_1 & O	INFINITY	FINITE DISTANCE	
IMAGE	At F_2	B/W F_2 & $2F_2$	At $2F_2$	Beyond $2F_2$	Infinity	Same side of Lens	At F_1	B/W F_2 & O	
SIZE	Point Sized	Diminished	Same Sized	Enlarged	Highly Enlarged	Enlarged	Point Sized	Diminished	
NATURE	Real & Inverted					Virtual & Erect		Virtual & Erect	

CHAPTER 6 Life Processes

No. of Periods: 17

Page No. 95

Q.1 Why is diffusion insufficient to meet the oxygen requirements of multicellular organisms like humans? (To be done in textbook)

Ans. As in multicellular organisms, all the cells are not in direct contact with environment, simple diffusion does not meet the requirement of all the body cells to get sufficient oxygen.

Q.2 What criteria do we use to decide whether something is alive?

Ans. Something can be considered alive if following features are present:

(i) Movements-

Visible movements like growth, breathing, etc.

Invisible movements - All the living organism must have movement at molecular level like respiration.

(ii) Life process- Occurrence of processes like nutrition, respiration, transportation and excretion to be called alive.

(iii) Growth

(iv) Reproduction

(v) Response to stimuli

Q.3 What are outside raw materials used for by an organism? (To be done in textbook)

Ans. Outside raw materials used for by an organism includes:

(a) Water (b) Oxygen (c) CO₂ (d) sunlight and (e) Nutrients/Minerals

These raw materials are used by an organism for various purposes like respiration, growth and maintenance.

Q.4. What processes would you consider essential for maintaining life? (To be done in textbook)

Ans. The processes essential for maintaining life are

- a. Nutrition
- b. Respiration
- c. Transportation
- d. Excretion

Page No. 101

Q.1 What are the differences between autotrophic and heterotrophic nutrition. (To be done in textbook)

Autotrophic Nutrition	Heterotrophic Nutrition
Organism prepares its own food using simple inorganic molecules.	Organism obtain food from other organism
Energy required for synthesis of food	No energy required
Digestion of food does not occur	Generally digestion of food occur
Organisms act as producer	Organisms act as consumer
Generally photosynthetic pigment (Chlorophyll) Present	Photosynthetic pigment (Chlorophyll) absent
Ex- Green plants ; Some bacteria and Some Protista	Ex- Animals, Fungi, Some bacteria, Some

Q.2 Where do plants get each of the raw materials required for photosynthesis? (To be done in textbook)

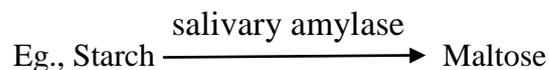
- Ans.** (a) Carbon dioxide from atmosphere.
 (b) Light from Sun
 (c) Water from Soil
 (d) Minerals from soil

Q.3 What is the role of the acids in our stomach?

- Ans.** HCl plays following role in our stomach:
 (a) Make the medium acidic for action of enzyme pepsin.
 (b) Kills the harmful bacteria present in food
 (c) Prevents fermentation of food
 (d) Softens food

Q.4 What is the function of digestive enzymes? Give one example

- Ans.** Digestive enzymes break-down the various complex components of food into simple and soluble components so that they can be absorbed easily.



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

- Ans.** (i) The inner lining of small intestine has numerous finger-like projections called villi which in turn have microvilli that increase the surface area for absorption.
 (ii) The villi are richly supplied with blood vessels which transport the absorbed food to each and every cell of the body.

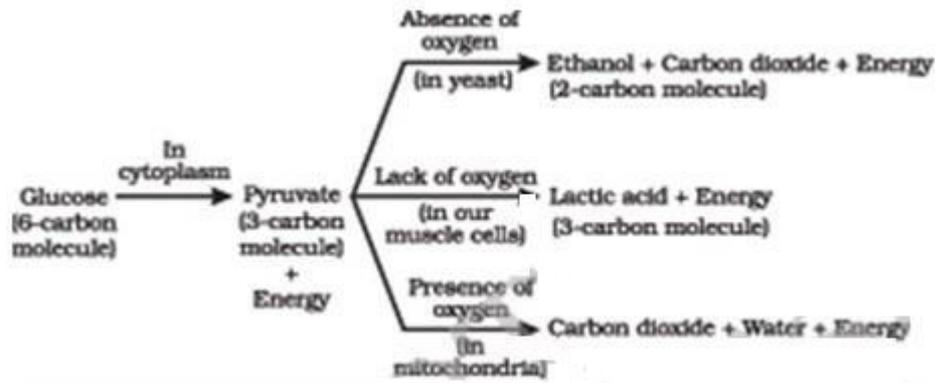
Page No. 105

Q.1 What advantage over an aquatic organism does a terrestrial organism have with regard to obtaining oxygen for respiration? (To be done in textbook)

- Ans.** The rate of breathing is slower in terrestrial organisms as compared to aquatic organisms. This is due to the fact that in water, the amount of oxygen is less as compared to air so, in aquatic organisms the rate of breathing is faster.

Q.2 What are different ways in which glucose is oxidized to provide energy in various organisms? (To be done in textbook)

- Ans.** The pathways of break-down of glucose in various organisms are as below:



3. How is oxygen and carbon dioxide transported in human beings? (To be done in textbook)

Ans. The body size of animals is large, so the diffusion pressure alone cannot take care of oxygen delivery to all parts of the body.

The respiratory pigment haemoglobin which is present in the red blood corpuscles has a very high affinity for oxygen, therefore it take up oxygen from the air in the lungs and carry it to tissues which are deficient in oxygen before releasing it.

Carbon dioxide is more soluble in water than oxygen is and hence is mostly transported in the dissolved form in our blood.

Q.4 How are the lungs designed in human beings to maximize the area for exchange of gases?

- Ans.** (i) In lungs, the bronchioles terminate in balloon-like structures called alveoli that increase the surface area for exchange of gases.
(ii) The alveoli contain network of blood capillaries for easy exchange of gases.

Page No. 110

Q.1 What are the components of the transport system in human beings? What are the functions of these components?

Ans. There are two major types of transport system in humans:

I] Blood Vascular system: It's main components are-

- (a) Heart- receives and pumps the blood.
- (b) Blood Vessels:- **Arteries**- carry oxygenated blood away from the heart to various organs.
Veins- Bring back blood to heart.
Capillaries- exchange of various materials and gases between blood and tissues.

(c) Blood – It consists of RBC's, WBC's and blood platelets. RBC helps in oxygen transportation. WBC protects from infection. Blood platelets help in blood clotting during injury

II] Lymphatic System – It's main components are lymph (Middle man between blood and tissue), lymph vessels (Carries lymph), lymph nodes (Kills pathogens).

Q.2 Why is it necessary to separate oxygenated and deoxygenated blood in mammals and birds? (To be done in textbook)

Ans. The separation of the right and left side of heart is useful to prevent oxygenated blood and deoxygenated blood from mixing. Such separation allows a highly efficient supply of

oxygen to the body. This is useful in animals that have high energy needs, such as birds and mammals that constantly use the energy to maintain their body temperature.

Q.3 What are the components of transport system in highly organized plants? (To be done in textbook)

Ans. The transport system of higher plants consists of xylem and phloem.

Xylem- It comprises of vessels, tracheids, xylem parenchyma and xylem fibers. It helps to transport water and minerals from root to other part of the plants.

Phloem- It consists of sieve tubes, companion cells, phloem parenchyma and phloem fibers. It helps to transport food from leaves to storage organs and other parts of plant.

Q.4 How are water and minerals transported in plants?

Ans. **Root Pressure** – At the roots, cells in contact with the soil actively takes up ions. This creates a difference in the concentration of these ions between the root and the soil. Water, therefore moves into the root from the soil to eliminate this difference. This water then moves into the Xylem and creates the water column that pushes water upwards.

Suction Pull – Transpiration of water vapour through stomata of a leaf creates a chain of suction pull that pulls water from the xylem cells of leaf which in turn pull water from the xylem of root. Thus transpiration pull helps in the absorption and upward movement of water and minerals dissolved in it from roots to the leaves through xylem.

Q.5 How is food transported in plants?

Ans. Food in form of sucrose is transferred into phloem by utilizing ATP. This increases the osmotic pressure of the tissue causing water to move into it. Thus, the generated physical pressure allows the movement of materials from phloem (of leaf) to the tissues which have less pressure (Less sucrose so lesser water, e.g. Root or storage organs). This allows phloem to move materials through phloem as per the plant's need.

Page No. 112

Q.1 Describe the structure and functioning of nephron.

Ans. Structure- A nephron has two structural components: (i) A cup shaped Bowman's capsule associated with a cluster of very thin-walled blood capillaries called glomerulus.

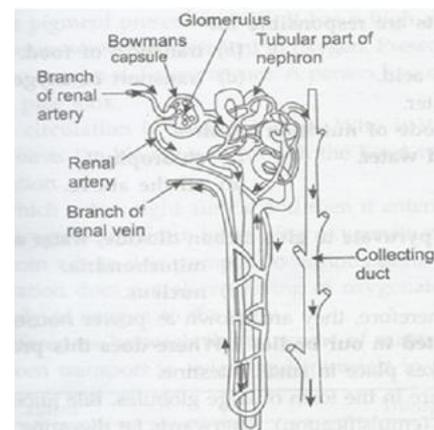
(ii) Tubular part of nephron which opens into collecting duct.

Functions - Nephron filters the blood in order to remove nitrogenous waste. It forms urine in following steps:

(i) Ultrafiltration- Filtration of blood in Bowman's capsule.

(ii) Selective reabsorption- Tubular part absorbs some useful substance such as glucose, amino acids, minerals and major amount of water from filtrate.

(iii) Tubular secretion- Some components are added into the filtrate by tubular part.



Q.2 What are the methods used by plants to get rid of excretory products? (To be done in textbook)

Ans. (i) Plant produces carbon dioxide as wastes during respiration and oxygen as waste during photosynthesis.

(ii) Excess of water is removed through transpiration.

(iii) Some waste products like gums and resins are stored in older xylem tissue.

(iv) Waste products may be stored in leaves that fall.

Q.3 How is amount of urine produced regulated?

Ans. The amount of urine depends on- (i) amount of excess water in the body; (ii) amount of water soluble waste is to be excreted out.

If the amount of water and dissolved wastes in body are more than amount of urine produced will be more. If amount of water is less then amount of urine produced will be less.

TEXTBOOK EXERCISE

(Multiple choice questions to be done in the textbook)

Q.5 How are fats digested in our bodies? Where does this process take place?

Ans. Digestion of fats takes place in small intestine. Fats entering in intestine are in the form of large globules. Bile juice breaks down these large globules into smaller globules (Emulsification). After that fat digesting enzyme lipase present in pancreatic juice and intestinal juice converts it into fatty acids and glycerol.

Q.6 What is the role of saliva in the digestion of food? (To be done in textbook)

Ans. (i) The saliva contains an enzyme called salivary amylase that breaks down starch which is complex molecule into glucose.
(ii) Moistening & softening of food for easy chewing & mixing.
(iii) Helps in formation of slippery bolus for easy swallowing.

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

Ans. Conditions necessary for autotrophic nutrition are:
Light, Chlorophyll, Water, Carbon dioxide and Proper temperature.
By-products are: Oxygen and Water

Q.8 What are differences between aerobic and anaerobic respiration? Name some organisms that use anaerobic mode of respiration.

Ans. Difference between aerobic and anaerobic respiration:

Aerobic respiration	Anaerobic respiration
(i) Takes place in presence of oxygen.	(i) Takes place in absence of oxygen
(ii) Complete oxidation of glucose occurs.	(ii) Incomplete oxidation of glucose occurs.
(iii) More energy is produced.	(iii) Less energy is produced

Anaerobic respiration takes place in yeast, some bacteria and some internal parasites like tapeworm.

Q.9 How are the alveoli designed to maximize the exchange of gases? (To be done in textbook)

Ans. (i) The wall of the alveoli is folded and has large surface areas.
(ii) It contains an extensive network of blood vessels which provide a surface where the exchange of gases can take place.
(iii) Wall of alveoli is thin/delicate & moist.

**Q.10 What would be the consequence of a deficiency of haemoglobin in our bodies?
(To be done in textbook)**

Ans. Presence of less hemoglobin will result in less supply of oxygen to tissues. A person having less haemoglobin will get tired soon and will have a pale look. Deficiency of haemoglobin may cause **anaemia**.

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

Ans. In mammals and birds the blood goes through the heart twice during each cycle. This is known as double circulation. Deoxygenated blood which enters right auricle and then it enters the right ventricle from where it is pumped to lungs for oxygenation. From lungs after oxygenation it comes to left auricle and then enters left ventricle from where it is pumped to various parts of body.

Such system of circulation does not allow mixing of oxygenated and deoxygenated blood which allows efficient supply of oxygen to the body.

Q.12 What are differences between the transport of materials in xylem and phloem?

Ans. Difference between transport in xylem and phloem:

Xylem	Phloem
Transports water and minerals	Transports organic nutrients
Transport is unidirectional	Bidirectional transport
Transport is mainly passive	Active transport (Utilize ATP)
Transporting elements are tracheids & vessels	Translocation occurs through sieve tubes with help of companion cells

Q.13 Compare the functioning of alveoli in the lungs and nephron in the kidneys with respect to their structure and functioning.

Ans. Comparison between alveoli and nephron:

	ALVEOLI	NEPHRON
Structure		
1.	Balloon like structure present in the lungs.	Tubular structure present in the kidneys.
Function		
1.	Removal of gaseous wastes.	Removal of nitrogenous wastes from blood.

ASSIGNMENT QUESTIONS

- Q.1 How do the guard cells regulate opening and closing of stomatal pores?
 Q.2 Why is small intestine in herbivores longer than in carnivores?
 Q.3 What causes movement of food inside the alimentary canal?
 Q.4 Why do veins have thin walls as compared to arteries?
 Q.5 Draw a well labeled diagram of: heart, nephron.
 Q.6 Explain the statement “Bile does not contain any enzyme but it is essential for digestion”.
 Q.7 Give reasons for the followings:
 a) The alveoli present in the lungs are covered with blood capillaries.

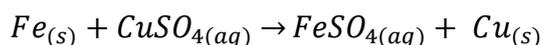
- b) The wall of trachea is supported by cartilage rings.
- Q.8 What is the function of epiglottis in humans?
- Q.9 Describe the process of nutrition in amoeba.
- Q.10 How does the length of small intestine related to the kind of food an organism eat?

CHAPTER-1
CHEMICAL REACTIONS AND EQUATIONS

---continued Pg. No. 13

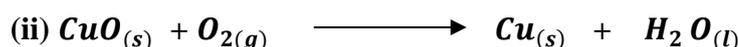
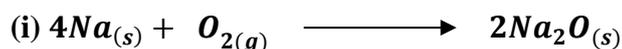
Q.1 Why does the colour of copper sulphate solution change when an iron nail is dipped in it?

A.1 When an iron nail is dipped copper sulphate, displacement reaction takes place. Iron displaces copper from copper sulphate solution as iron is more reactive than copper. Hence the colour of copper sulphate solution changes from blue to green.

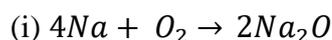


Q.2 Give an example of a double displacement reaction other than the one given in Activity 1.10. (to be done in text book)

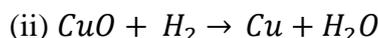
Q.3 Identify the substances that are oxidized and the substances that are reduced in the following reactions.



A.3



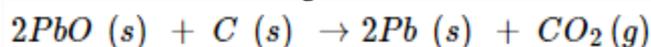
In this reaction, Na is oxidised because it combines with oxygen and oxygen is reduced.



In this reaction, CuO is reduced because it loses oxygen. And H₂ is oxidized.

Exercises (Q.1 to Q.4 to be done in text book)

Q.1 Which of the following statement about the reaction below are incorrect?



- (a) Lead is getting reduced.
 - (b) Carbon dioxide is getting oxidized
 - (c) Lead oxide is getting oxidized
 - (d) Lead is getting reduced
- i. (a) and (b)
ii. (a) and (c)
iii. (a), (b) and (c)
iv. All

A.1 As statement (a) and (b) are incorrect, answer (i) is correct



The above reaction is an example of a:

- (a) combination reaction
- (b) double displacement reaction
- (c) decomposition reaction
- (d) displacement reaction

A.2 This is an example of displacement reaction because Fe in FeO₃ has been displaced by Al.
Hence correct answer is (d).

Q.3 **What happens when dilute hydrochloric acid is added to iron filing? Tick the correct answer**

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

(a) is correct.

Q.4 **What is balanced chemical equation? Why should chemical equation be balanced?**

A.4 The reaction in which the number of atoms of each element is equal on the reactant side and product side is called balanced equation.

Chemical reaction should be balanced because only a balanced equation tells us the relative quantities of different reactants and products involved in the reaction.

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

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

A.5 (a) $3H_2 + N_2 \rightarrow 2NH_3$

(b) $2H_2S + 3O_2 \rightarrow 2H_2O + 2SO_2$

(c) $3BaCl_2 + Al_2(SO_4)_3 \rightarrow 2AlCl_3 + 3BaSO_4$

(d) $2K + 2H_2O \rightarrow 2KOH + H_2$

Q.6 **Balance the following chemical equations:**

(a) $HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + H_2O$

(b) $NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$

(c) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$

(d) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + HCl$

Balanced chemical equations are:

A.6 (a) $2HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + 2H_2O$

(b) $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

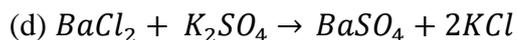
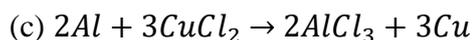
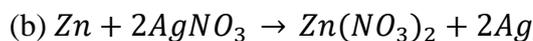
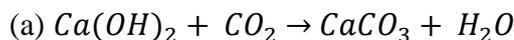
(c) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$

(d) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$

Q.7 **Write the balanced chemical equations for the following reactions.**

- (a) **Calcium hydroxide + Carbon dioxide → Calcium carbonate + Water**
 (b) **Zinc + Silver nitrate → Zinc nitrate + Silver**
 (c) **Aluminum + Copper chloride → Aluminum chloride + Copper**
 (d) **Barium chloride + Potassium sulphate → Barium sulphate + potassium chloride**

A.7 Balanced chemical equations are:



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

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

A.8 (a) $2KBr + BaI_2 \rightarrow 2KI + BaBr_2$ (Double displacement reaction)

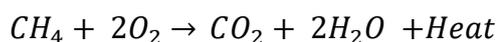
(b) $ZnCO_3 \rightarrow ZnO + CO_2$ (Decomposition reaction)

(c) $H_2 + Cl_2 \rightarrow 2HCl$ (Combination reaction)

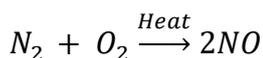
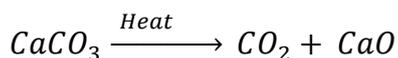
(d) $Mg + 2HCl \rightarrow MgCl_2 + H_2$ (Displacement reaction)

Q.9 **What does one mean by exothermic and endothermic reactions? Give examples.**

A.9 A reaction in which energy is released in the form of heat or light is called exothermic reaction. Example of exothermic reaction are:



A reaction in which energy is absorbed from the surrounding and cooling is produced is called endothermic reaction. Example of endothermic reaction are:



Q.10 **Why respiration is considered an exothermic reaction? Explain. (to be discussed in class)**

A.10 During respiration, we inhale oxygen from the atmosphere which reacts with glucose in our body cells to produce carbon dioxide water and heat.

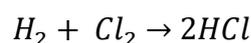
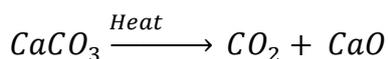


Heat is released in this process; hence respiration is considered an exothermic reaction.

Q.11 **Why decomposition reactions are called the opposite of combination reactions? Write equations for these reactions. (to be done in text book)**

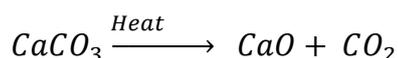
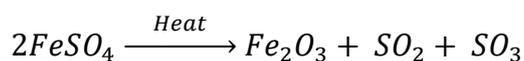
A.11 In a decomposition reaction, a single substance breaks down into two or more substances while in a combination reaction, two or more substances react to produce one substance. Therefore, decomposition reactions are called opposite of combination reactions.

Example of decomposition reaction: Example of combination reaction:

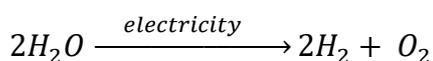


Q.12 **Write one equation each for decomposition reactions where energy is supplied in the form of heat, light or electricity.**

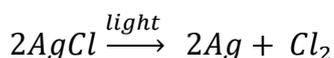
A.12 Decomposition by heat: (Thermal decomposition)



Decomposition by electricity: (Electrolytic decomposition)

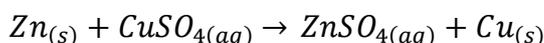


Decomposition by light: (Photolytic decomposition)

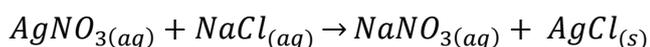


Q.13 **What is difference between displacement and double displacement reactions? Write equations for these reactions.**

A.13 In displacement reaction, more reactive element displaces the less reactive element from its compound. For example:

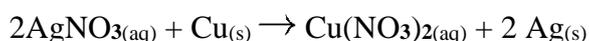


But in double displacement reaction, exchange of ions takes place. For example:



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

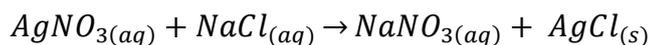
A.14 The reaction involved is:



Copper + Silver nitrate \rightarrow Copper nitrate + Silver

Q.15 **What do you mean by a precipitation reaction? Explain by giving examples.**

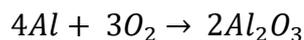
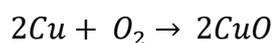
A.15 A chemical reaction in which an insoluble substance (precipitate) is formed is called precipitation reaction. For example,



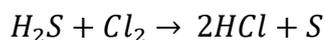
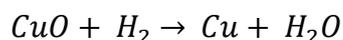
Q.16 **Explain the following in terms of gain and loss of oxygen with two examples each?**

a. Oxidation b. Reduction

A.16 **Oxidation-** addition of oxygen or removal of hydrogen in a chemical reaction is called oxidation reaction. For example

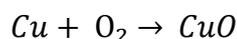


Reduction- addition of hydrogen or removal of oxygen in a chemical reaction is called oxidation reaction. For example



Q.17 **A shiny brown coloured element 'X' on heating in air becomes black in colour. Name the element 'X' and the black coloured compound formed.**

A.17 The brown coloured element 'X' is copper. On heating in air it forms copper oxide, which is black in colour.



Q.18 **Why do we apply paint on iron articles? (to be done in text book)**

A.18 We apply paint on iron articles to prevent rusting. Iron articles do not come in contact of atmospheric oxygen and moisture and thus the rusting is prevented.

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

A.19 Oil and fat containing items get rancid due to oxidation with atmospheric oxygen. To prevent rancidity food items are flushed with nitrogen. Nitrogen do not reacts with oil and fat containing items as it is inert in nature.

Q.20 **Explain the following terms with one example each.**

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

A.20 **Corrosion-** action of air, water, acid or other substance on metal surface to form oxides and carbonates is called corrosion. Corrosion of iron is called rusting. Green coating on copper and black coating on silver is examples of corrosion.

Rancidity-change in smell of food item containing fat and oil when kept open for longer time due to oxidation is called rancidity. To prevent rancidity food items are flushed with nitrogen or kept in airtight containers.

CHAPTER-1

CHEMICAL REACTIONS AND EQUATIONS

Pg. No. 6

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

A.1 Magnesium is a reactive metal, so when kept in air for long it forms an inert layer of magnesium oxide (MgO) on its surface. This inert layer of MgO prevents it from reacting so this layer is removed before burning.

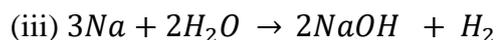
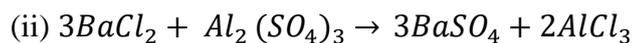
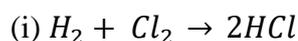
Q.2 Write the balance equation for the following reactions.

(i) Hydrogen + Chlorine → Hydrogen chloride

(ii) Barium chloride + Aluminium sulphate → Barium sulphate + Aluminium chloride

(iii) Sodium + Water → Sodium hydroxide + Hydrogen

A.2 The chemical equations are as follows-

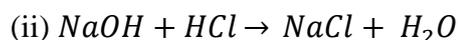
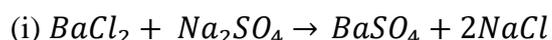


Q.3 Write the balanced chemical equation with state symbols for the following reactions?

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

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

A.3 Balance chemical reaction with state symbols are as follows:



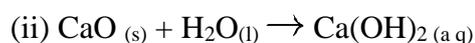
Pg. No. 10

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

(i) Name the substance 'X' and writes its formula.

(ii) Write the reaction of the substance 'X' named in (i) above with water

(i) The substance whose solution in water is used for white washing is calcium oxide. Its formula is CaO.



Q.2 Why the amount of gas collected in one of the tubes in Activity 1.7 double of the amount collected in the other? Name this gas.

The gas which is collected in double the amount in the electrolysis of water experiment is hydrogen. This is because water contains two parts of hydrogen element as compared to only one part of oxygen element.

CLASS X : CHAPTER - 6
Life Processes

Page No. 95

Q.1 Why is diffusion insufficient to meet the oxygen requirements of multicellular organisms like humans? (To be marked in textbook)

Ans. As in multicellular organisms, all the cells are not in direct contact with environment, simple diffusion does not meet the requirement of all the body cells to get sufficient oxygen.

Q.2 What criteria do we use to decide whether something is alive?

Ans. Something can be considered alive if following features are present:

(i) Movements-

Visible movements like growth, breathing, etc.

Invisible movements - All the living organism must have movement at molecular level like respiration.

(ii) Life process- Occurrence of processes like nutrition, respiration, transportation and excretion to be called alive.

(iii) Growth

(iv) Reproduction

(v) Response to stimuli

Q.3 What are outside raw materials used for by an organism? (To be discussed)

Ans. Outside raw materials used for by an organism includes:

(a) Water (b) Oxygen (c) CO₂ (d) sunlight and (e) Nutrients/Minerals

These raw materials are used by an organism for various purposes like respiration, growth and maintenance.

Q.4. What processes would you consider essential for maintaining life? (To be discussed)

Ans. The processes essential for maintaining life are

- a. Nutrition
- b. Respiration
- c. Transportation
- d. Excretion

Page No. 101

Q.1 What are the differences between autotrophic and heterotrophic nutrition. (To be discussed)

Autotrophic Nutrition	Heterotrophic Nutrition
Organism prepares its own food using simple inorganic molecules.	Organism obtain food from other organism
Energy required for synthesis of food	No energy required
Digestion of food does not occur	Generally digestion of food occur
Organisms act as producer	Organisms act as consumer
Generally photosynthetic pigment (Chlorophyll) present	Photosynthetic pigment (Chlorophyll) absent
Ex- Green plants ; Some bacteria and Some Protista	Ex- Animals, Fungi, Some bacteria, Some Protista and Some non green plants

Q.2 Where do plants get each of the raw materials required for photosynthesis? (To be discussed)

Ans. (a) Carbon dioxide from atmosphere.
 (b) Light from Sun
 (c) Water from Soil
 (d) Minerals from soil

Q.3 What is the role of the acids in our stomach?

Ans. HCl plays following role in our stomach:
 (a) Make the medium acidic for action of enzyme pepsin.
 (b) Kills the harmful bacteria present in food
 (c) Prevents fermentation of food
 (d) Softening of food

Q.4 What is the function of digestive enzymes? Give one example

Ans. Digestive enzymes break-down the various complex components of food into simple and soluble components so that they can be absorbed easily.
 Eg., Starch $\xrightarrow{\text{salivary amylase}}$ Maltose

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

Ans. (i) The inner lining of small intestine has numerous finger-like projections called villi which in turn have microvilli that increase the surface area for absorption.
 (ii) The villi are richly supplied with blood vessels and Lacteals which transport the absorbed food to each and every cells of the body.

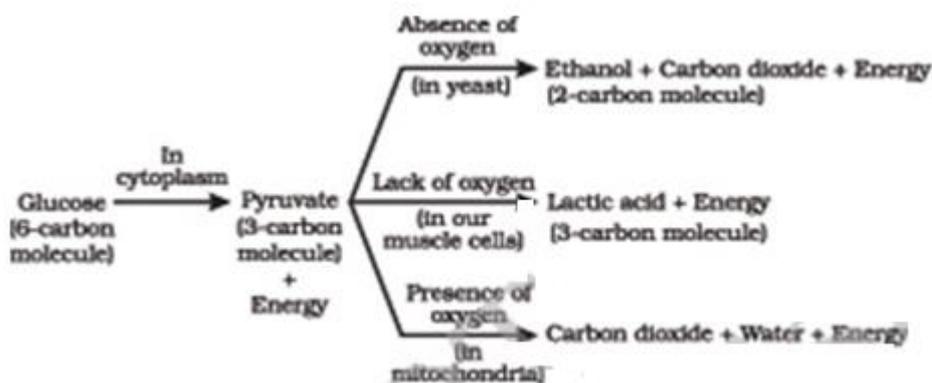
Page No. 105

Q.1 What advantage over an aquatic organism does a terrestrial organism have with regard to obtaining oxygen for respiration? (to be marked in the textbook)

Ans. The rate of breathing is slower in terrestrial organisms as compared to aquatic organisms. This is due to the fact that in water, the amount of oxygen is less as compared to air so, in aquatic organisms the rate of breathing is faster.

Q.2 What are different ways in which glucose is oxidized to provide energy in various organisms? (To be discussed)

Ans. The pathways of break-down of glucose in various organisms are as below:



3. How is oxygen and carbon dioxide transported in human beings? (to be marked in the textbook)

Ans. Transport of Oxygen:
 (i) 97% carried in combined form with Haemoglobin.
 (ii) 3% dissolved in plasma.

Transport of Carbon dioxide:

- (i) 70% as Bicarbonate ion in plasma
 - (ii) 23% in combined state with Haemoglobin.
 - (iii) Upto 7% dissolved state in plasma.
-

Q.4 How are the lungs designed in human beings to maximize the area for exchange of gases?

- Ans.** (i) In lungs, the bronchioles terminate in balloon-like structures called alveoli that increase the surface area for exchange of gases.
- (ii) The alveoli contain network of blood capillaries for easy exchange of gases.

TEXTBOOK EXERCISE

(Multiple choice questions to be done in the textbook)

Q.5 How are fats digested in our bodies? Where does this process take place?

Ans. Digestion of fats takes place in small intestine. Fats entering in intestine are in the form of large globules. Bile juice breaks down these large globules into smaller globules (Emulsification). After that fat digesting enzyme lipase present in pancreatic juice and intestinal juice converts it into fatty acids and glycerol.

Q.6 What is the role of saliva in the digestion of food? (in the textbook)

- Ans.** (i) The saliva contains an enzyme called salivary amylase that breaks down starch which is complex molecule into glucose.
- (ii) Moistening & softening of food for easy chewing & mixing.
- (iii) Helps in formation of slippery bolus for easy swallowing.

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

Ans. Conditions necessary for autotrophic nutrition are:
Light, Chlorophyll, Water, Carbon dioxide and Proper temperature.
By-products are: Oxygen and Water

Q.8 What are differences between aerobic and anaerobic respiration? Name some organisms that use anaerobic mode of respiration.

Ans. Difference between aerobic and anaerobic respiration:

Aerobic respiration	Anaerobic respiration
(i) Takes place in presence of oxygen.	(i) Takes place in absence of oxygen
(ii) Complete oxidation of glucose occurs.	(ii) Incomplete oxidation of glucose occurs.
(iii) More energy is produced.	(iii) Less energy is produced

Anaerobic respiration takes place in yeast, some bacteria and some internal parasites like tapeworm.

Q.9 How are the alveoli designed to maximize the exchange of gases? (To be discussed)

- Ans.** (i) The wall of the alveoli is folded and has large surface areas.
- (ii) It contains an extensive network of blood vessels which provide a surface where the exchange of gases can take place.
- (iii) Wall of alveoli is thin/delicate & moist.

DELHI PUBLIC SCHOOL, GANDHINAGAR
ACADEMIC SESSION: 2021-22

Chapter 10 - Light: Reflection and Refraction

Exercise 168

Define the principal focus of a concave mirror.

• **Solution 1**

Light rays that are parallel to the principal axis of a concave mirror converge at a specific point on its principal axis after reflecting from the mirror. This point is known as the principal focus of the concave mirror.

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

• **Solution 2**

Radius of curvature, $R = 20$ cm

Radius of curvature of a spherical mirror = $2 \times$ Focal length (f)

$$R = 2f$$

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

Hence, the focal length of the given spherical mirror is 10 cm.

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

• **Solution 3**

A concave mirror can give an erect and enlarged image of an object.

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

• **Solution 4**

A convex mirror is preferred as a rear-view mirror in vehicles because it gives virtual, erect, and diminished image of the objects placed in front of it. Also, a convex mirror has a wider field of view, which allows the driver to see most of the traffic behind him.

Chapter 10 - Light: Reflection and Refraction Exercise 171

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

• **Solution 1**

Radius of curvature, $R = 32$ cm

Radius of curvature = $2 \times$ Focal length (f)

$$R = 2f$$

$$f = \frac{R}{2} = \frac{32}{2} = 16 \text{ cm}$$

Hence, the focal length of the given convex mirror is 16 cm.

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

• **Solution 2**

Magnification produced by a spherical mirror is given by the relation,

$$m = \frac{\text{Height of the image}}{\text{Height of the object}} = - \frac{\text{Image distance}}{\text{Object distance}}$$

$$m = \frac{h_1}{h_0} = - \frac{v}{u}$$

Let the height of the object, $h_0 = h$

Then the height of the image, $h_1 = -3h$ (Image formed is real)

$$\frac{-3h}{h} = - \frac{v}{u}$$

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

Object distance, $u = -10$ cm

$$v = 3 \times (-10) = -30$$
 cm

Here, the negative sign indicates that an inverted image is formed at a distance of 30 cm in front of the given concave mirror.

Exercise questions (Page 185-186)

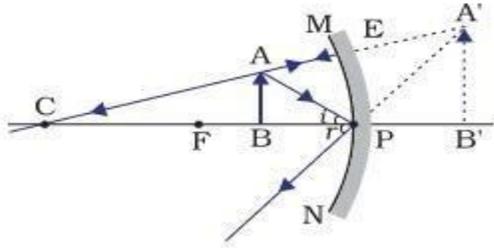
Q.7

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.

• **Solution**

Range of object distance = 0 cm to 15 cm

- A concave mirror gives an erect image when an object is placed between its pole (P) and the principal focus (F).
- Hence, to obtain an erect image of an object from a concave mirror of focal length 15 cm, the object must be placed anywhere between the pole and the focus (i.e. within 15 cm from the mirror). The image formed will be virtual, erect, and magnified in nature, as shown in the given figure.



FP = 15 cm

Q.8

Name the type of mirror used in the following situations.

- (a) Headlights of a car.
- (b) Side/rear-view mirror of a vehicle.
- (c) Solar furnace.

Support your answer with reason.

• **Solution**

(a) Concave (b) Convex (c) Concave

Explanation:

(a) Concave mirror is used in the headlights of a car. This is because concave mirrors can produce powerful parallel beams of light when the light source is placed at their principal focus.

(b) Convex mirror is used in the side/rear view mirror of a vehicle because convex mirrors give a virtual, erect, and diminished image of the objects placed in front of them and have a wide field of view. It enables the driver to see most of the traffic behind him/her.

(c) Concave mirrors are converging mirrors. That is why they are used to construct solar furnaces. Concave mirrors converge the light incident on them at a single point known as principal focus. Hence, they can be used to produce a large amount of heat at that point.

Q.10

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

• **Solution**

Focal length of convex mirror, $f = +15$ cm

Object distance, $u = -10$ cm

According to the mirror formula,

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

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

$$\frac{1}{v} = \frac{1}{15} - \frac{1}{(-10)}$$

$$\frac{1}{v} = \frac{1}{15} + \frac{1}{10}$$

$$\frac{1}{v} = \frac{25}{150}$$

$$\frac{1}{v} = \frac{1}{6}$$

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

The positive value of v indicates that the image is formed behind the mirror.

$$\text{Magnification, } m = -\frac{\text{Image distance}}{\text{Object distance}} = -\frac{v}{u} = -\frac{6}{(-10)} = \frac{6}{10} = +0.6$$

The positive value of magnification indicates that the image formed is virtual and erect.

Q.13

The magnification produced by a plane mirror is +1. What does this mean?

- **Solution**

Magnification produced by a mirror is given by,

$$\text{Magnification, } m = \frac{\text{Image height } (H_i)}{\text{Object height } (H_o)}$$

The magnification produced by a plane mirror is +1. It shows that the image formed by the plane mirror is of the same size as that of the object. The positive sign shows that the image formed is virtual and erect.

Concept Insight - Positive magnification corresponds to virtual and erect image. The numeral value of magnification indicates that the size of the image is that many times the size of the object.

Q.14

An object 5.0 cm in length is placed at a distance of 20 cm in front of a convex mirror of radius of curvature 30 cm. Find the position of the image, its nature and size.

- **Solution**

Given:

Object distance, $u = -20 \text{ cm}$

Object height, $H = 5 \text{ cm}$

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

Radius of curvature = $2 \times$ Focal length

i.e., $R = 2f$

$$f = \frac{R}{2} = \frac{30}{2}$$

$$f = 15 \text{ cm}$$

According to the mirror formula,

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

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

$$\frac{1}{v} = \frac{1}{15} + \frac{1}{20} = \frac{4+3}{60} = \frac{7}{60}$$

$$v = \frac{60}{7}$$

$$v = 8.57 \text{ cm}$$

The positive value of v indicates that the image is formed behind the mirror.

$$\text{Magnification, } m = -\frac{\text{Image distance}}{\text{Object distance}} = -\frac{8.57}{(-20)} = \frac{8.57}{20} = 0.428$$

The positive value of magnification indicates that the image formed is virtual.

$$\text{Magnification, } m = \frac{\text{Height of the image}}{\text{Height of the object}} = \frac{h'}{h}$$

$$m = \frac{h'}{h}$$

$$h' = m \times h = 0.428 \times 5 = 2.14 \text{ cm}$$

The positive value of the image height indicates that the image formed is erect.

Therefore, the image formed is virtual, erect and smaller in size.

Q.15

An object of size 7.0 cm is placed at 27 cm in front of a concave mirror of focal length 18 cm. At what distance from the mirror should a screen be placed, so that a sharp focussed image can be obtained? Find the size and the nature of the image.

• **Solution**

Given:

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

Object height, $h = 7 \text{ cm}$

Focal length, $f = -18 \text{ cm}$

According to the mirror formula,

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

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

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

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

$$\frac{1}{v} = -\frac{1}{54}$$

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

The screen should be placed at a distance of 54 cm in front of the given mirror.

$$\text{Magnification, } m = -\frac{\text{Image distance}}{\text{Object distance}} = -\frac{54}{27} = -2$$

The negative value of magnification indicates that the image formed is real.

$$\text{Magnification, } m = \frac{\text{Height of the image}}{\text{Height of the object}} = \frac{h'}{h}$$

$$h' = h \times m$$

$$h' = 7 \times (-2) = -14 \text{ cm}$$

The negative value of the image height indicates that the image formed is inverted.

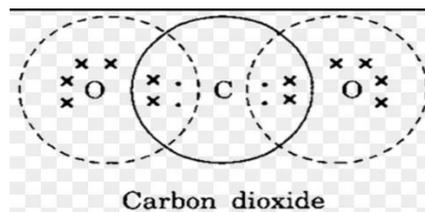
CHAPTER-4

CARBON AND ITS COMPOUNDS

Pg.No.61

Q.1 What would be the electron dot structure of carbon dioxide which has the formula CO₂?

Ans The electron dot structure of CO₂ is:

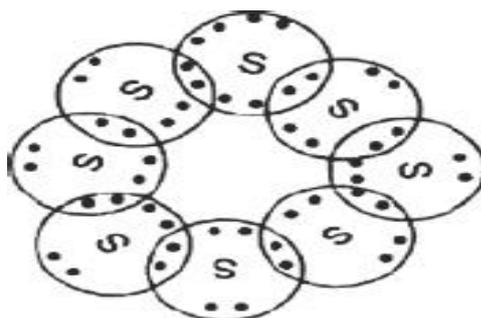


(OR)



Q.2 What would be the electron dot structure of a molecule of sulphur which is made up of eight atoms of sulphur?

Ans

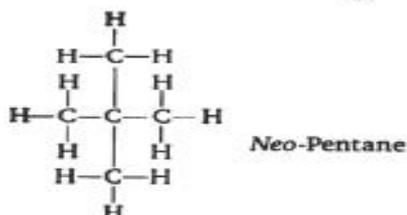
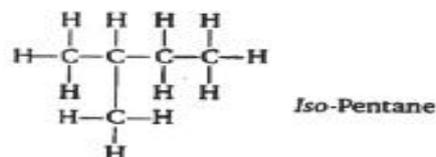
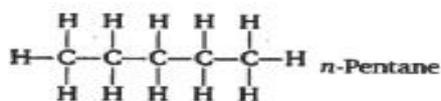


Pg.No.68

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

Ans Three structural isomers can be drawn from pentane.

Pentane: C₅H₁₂



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

Ans Carbon form large number of compounds due to the following properties:

(a) **Catenation** → Carbon shows the property of catenation that is the ability to form bonds with other carbon atoms forming long chains both branched and unbranched chains, and even rings.

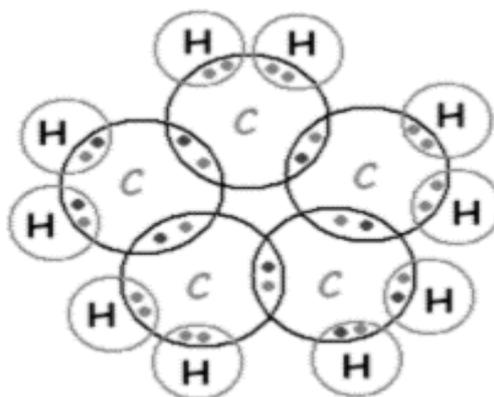
(b) **Tetravalency** → Carbon has valency 4, it is capable of bonding with 4 other carbon atoms or atoms of other non-covalent elements, giving rise to compounds with specific properties depending on the elements present in the compound.

(c) **Isomerism** → Carbon compounds show the property of isomerism that is compounds having same molecular formula but different structural formula.

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

Ans The formula of cyclopentane is C_5H_{10} .

The electron dot structure is:



Q.4 DELETED

Q.5 DELETED

Pg.No.71 DELETED

Pg.No.74 DELETED

Pg.No.76 DELETED

EXERCISE QUESTIONS (Pg.No.77)

Q.1 Ethane, with the molecular formula C_2H_6 has

(a) 6 covalent bonds. (b) 7 covalent bonds.

(c) 8 covalent bonds. (d) 9 covalent bonds.

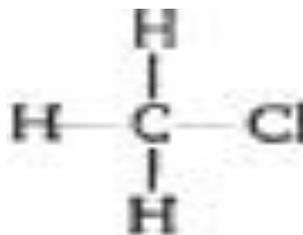
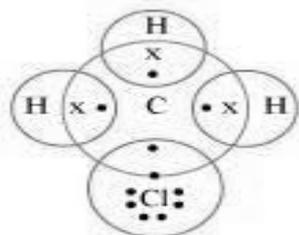
Ans (b) 7 covalent bonds.

Q.2 DELETED

Q.3 DELETED

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

Ans Covalent bond is formed by the sharing of electrons between two atoms. It is non-ionic in nature in CH_3Cl



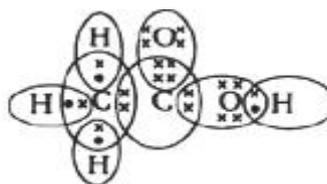
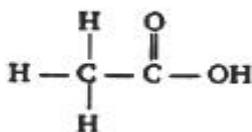
Q.5 Draw the electron dot structure for

(a) Ethanoic acid (b) H_2S .

(c) Propanone. (d) F_2 .

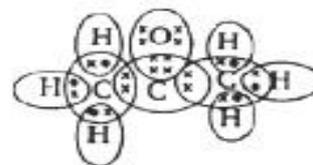
Ans The electron dot structure are as follows:

(a) Ethanoic acid - CH_3COOH



(b) H_2S

(c) Propanone



(d) F_2



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

Ans Series of compounds in which the same functional group substitutes for hydrogen in a carbon chain is called homologous series. It is a group of members of same class of organic compound having similar chemical properties, they have same general formula. They have same functional group, when arranged in the ascending order of molecular mass they differ by 14 u. or $-\text{CH}_2$ group.

Example: Alkane General formula $\text{C}_n\text{H}_{2n+2}$

Methane	CH_4
Ethane	C_2H_6
Propane	C_3H_8
Butane	C_4H_{10}

Q.7 to Q. 13 DELETED

CHAPTER - 9 Heredity and Evolution

Page No. 143

1. **If a trait A exists in 10% of a population of an asexually reproducing species and a trait B exists in 60% of the same population, which trait is likely to have arisen earlier? (To be done in textbook)**

Ans. Trait B.

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

Ans. Depending on the nature of variations different individuals would have different kinds of advantage to adjust in particular habitat. Variations help the individual to have different traits that may lead to better adaptability of the organisms in changing environment.

Page No. 147

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

Ans. In Monohybrid cross of Mendel between pure tall and pure dwarf pea plant, all progeny in F₁ generation are tall and in F₂ generation, 75% of pea plants are tall but 25% are dwarf. This shows that traits are dominant or recessive. In F₁ generation both the traits were present but dwarfness couldn't express itself in the presence of tallness. This shows that tallness is a dominant character.

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

Ans When a pea plant having round green seeds is crossed with a pea plant having wrinkled yellow seeds in F₁ generation all the plants have round yellow seeds. But in F₂ generation two new combinations of traits that is round yellow and wrinkled green appeared. The new combinations are possible only when traits are inherited independently.

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

Ans. No, the information is not enough. Either can be possible. In this case, there are two possibilities.

Possibility 1

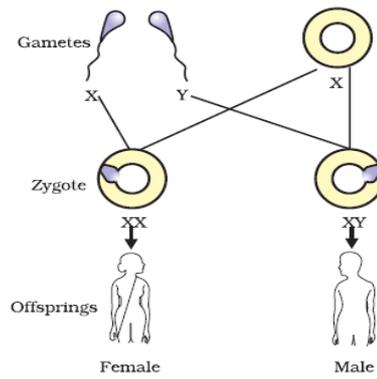
Blood group A is dominant and blood group O is recessive. The blood group O in daughter can appear only when both the recessive alleles occur together in mother and father has one allele of A and other allele of O blood group.

Possibility 2

blood group O is dominant and blood group A is recessive. In this father must carry both alleles of blood group A while mother may be having either both alleles of O or one of A blood group and other of blood group O. In this case also the daughter can have blood group O.

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

Ans. There are 23 pairs of chromosomes in human beings. 23rd pair of chromosome is sex chromosome. In male it is XY and female it is XX. Therefore males are heterogametic - Produce two types of sperms (X and Y), while females are homogametic- Produce same type of eggs (X). A child which inherits X containing sperm from her father will be a girl and one who inherits Y-sperm from him will be a boy.



TEXTBOOK EXERCISES

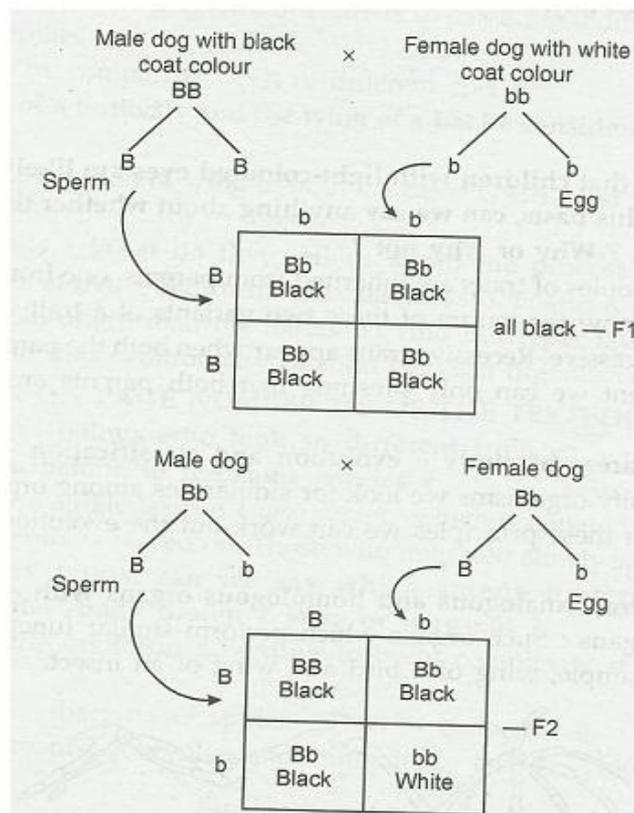
Q1 to be done in the textbook.

4. A study found that children with light-coloured eyes are likely to have parents with light coloured eyes. On this basis, can we say anything about whether the light eye colour trait is dominant or recessive? Why or why not? (To be done in textbook)

Ans. No, since two copies of traits are inherited from parents, one from mother and the other from father. Unless we know the nature of these two variants of traits we cannot tell which is dominant and which is recessive. Recessive traits appear when both the parents contribute recessive allele. From this statement we can only presume that both parents are contributing recessive allele.

7. Outline a project which aims to find the dominant coat colour in dogs.

Ans. A male dog pure for black coat colour is crossed with a female dog pure for white coat colour. If all the puppies in F1 generation have black coat colour then black coat colour is dominant over white colour. This can further be established by cross between male and female of F1 gen. The cross is depicted below:



8. Explain the importance of fossils in deciding evolutionary relationship.

- Ans.** (i) Study of fossils allow us to make estimates of how far back evolutionary relationship go between organisms.
(ii) Study of age of fossils allows us to know which organisms evolved earlier and which later. Thus help us in tracing the path of evolution.
(iii) They tell us about the characters and age of the fossil organism.
(iv) They tell us about the time period.

9. What evidence do we have for the origin of life from inanimate matter?

- Ans.** The evidence was given by Stanley L. Miller and Harold C. Urey in 1953. They recreated primitive earth's atmosphere inside an apparatus. Inside a glass chamber they took mixture of gases- CH₄; NH₃; H₂ and added H₂O. This was maintained by them at a temperature just below 100 degree Celsius and sparks were passed through the mixture of gases to stimulus lightening. At the end of a week, they found that 15% of the carbon had been converted to simple compounds of carbon including amino acids which make up protein molecules.

10. Explain how sexual reproduction gives rise to more viable variations than asexual reproduction. How does this affect the evolution of those organisms that reproduce sexually?

- Ans.** Variations arise either because of errors in DNA copying or as a result of sexual reproduction. Due to sexual reproduction genetic variability increases in the population from one generation to another. This happens due to the fact that- (i) sexually reproducing organism inherits half the genes from each parent. (ii) Crossing over during gamete formation. (iii) Random fertilization of gametes. These variations are very important for the process of evolution.

11. Only variations that confer an advantage to an individual organism will survive in a population. Do you agree with this statement? Why or why not?

- Ans.** No, depending on the nature of variations different individuals have been different kinds of advantages. When a drastic change occurs in environment, only those organisms in the population will survive which have an advantageous variation in that population to survive in changed environment. Whereas in case of genetic drift the variations even though don't provide survival advantage, still persist in the population.

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

- Ans.** Equal contribution of male and female parents is ensured in progeny during sexual reproduction. Each trait of progeny is determined by a pair of alleles and gametes of male and female contain one allele (due to meiosis). Each allele pairs during fertilisation combine together to determine traits. Thus, the traits of progeny are determined by equal genes from male and female.