

***CLASS - X***

***SUBJECT– SCIENCE***

***SESSION 2019-20***

# CLASS – X

# SCIENCE

<b>UNIT</b>	<b>NAME OF THE CHAPTER</b>	<b>PAGE</b>
1	<i>Chemical Reactions and Equations</i>	3 – 7
2	<i>Acids, Bases and Salts</i>	8 – 11
3	<i>Metals and Non-metals</i>	12 – 16
4	<i>Carbon and its Compounds</i>	17 – 23
5	<i>Periodic Classification of Elements</i>	24 – 29
6	<i>Life Processes</i>	30 -32
7	<i>Control and Coordination</i>	33 – 37
8	<i>How do Organisms Reproduce?</i>	38 – 53
9	<i>Heredity and Evolution</i>	54 – 63
10	<i>Light-Reflection and Refraction</i>	64 – 69
11	<i>The Human Eye and Colourful World</i>	70 – 73
12	<i>Electricity</i>	74 – 80
13	<i>Magnetic Effects of Electric Current</i>	81 – 89
14	<i>Sources of Energy</i>	90 – 92
15	<i>Our Environment</i>	93 – 95
16	<i>Sustainable Management of Natural resources</i>	96 – 98

## UNIT 1. CHEMICAL REACTIONS AND EQUATIONS

### Very short answer questions (MCQ):

1. The equation  
$$\text{Cu} + x\text{HNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + y\text{NO}_2 + 2\text{H}_2\text{O}$$

The values of x and y are

  - a) 3 and 5
  - b) 8 and 6
  - c) 4 and 2
  - d) 7 and 1
2. Formation of CuO from Cu and Oxygen denotes:
  - a. Reduction
  - b. oxidation
  - c. Redox reaction
  - d. None of these.
3. Rahul took some Zn granules in a test tube and added dil HCl to it. He observed that the colour of Zn granules changed to
  - a. Yellow
  - b. Brown
  - c. Black
  - d. White
4. Four students were asked to study the reaction between aq. Solutions of barium chloride and sodium sulphate. On mixing the solution of the two salts in a test tube, they reported their experiments as follows:
  - a. The colour of the mixture became brown.
  - b. The solution formed separate layers.
  - c. A colourless mixture is obtained.
  - d. A white substance settles at the bottom.

5.  $2\text{KClO}_3 \rightarrow 2\text{KCl} + 3\text{O}_2$  is:

- a. *Decomposition reaction.*
- b. *Combination reaction.*
- c. *Displacement reaction.*
- d. *Redox reaction.*

6. *In the following questions a statement of assertion (A) is followed by statement of reason (R).*

*choose the correct option out of the choices given below each question.*

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

1. Assertion:  $\text{PbO} + \text{C} \rightarrow \text{Pb} + \text{CO}$  is a redox reaction.

Reason:  $\text{PbO}$  is reduced and C is oxidised.

2. Assertion: combustion of substance is a redox reaction.

Reason: this is because both oxidation and reduction are the reactions that occur during respiration.

3. Assertion:  $\text{C} + \text{O}_2 \rightarrow \text{CO}_2 + \text{Heat}$  is an exothermic reaction.

Reason: In the above reaction heat energy is absorbed.

4. Assertion: iron articles get rusted in moist air.

Reason: Moisture and oxygen are required for rusting.

5.  $\text{Zn(s)} + \text{CuSO}_4(\text{aq}) \rightarrow \text{ZnSO}_4(\text{aq}) + \text{Cu(s)}$  is a combination reaction.

Reason: Cu is more reactive than Zn.

**Short answer questions:**

1. A metal 'X' acquires green colour coating on its surface on exposure to air.
  - (i) Identify the metal 'X' and name the process responsible for this change.
  - (ii) Name and write chemical formula of the green coating formed on the metal.
  - (iii) List any two methods to prevent the process.
2. In the electrolysis of water:
  - (i) Name the gas collected at the cathode and anode respectively.
  - (ii) Why is the volume of gas collected at one electrode is double than the other.
  - (iii) Define the type of reaction involved.
3. Decomposition reactions require energy in the form of heat, light or electricity for breaking down the reactants. Write one equation each for decomposition reaction where energy is supplied in the form of heat, light and electricity.
4. A solution of substance 'X' is used for whitewashing.
  - (i) Identify the substance 'X' and write its formula.
  - (ii) Write the reaction of the substance 'X' with water and also identify the kind of reaction occurring.
5. "A solution of potassium chloride when mixed with silver nitrate solution, an insoluble substance is formed".
  - (i) Translate the above statement to a chemical equation.
  - (ii) State two names for this type of reaction.
6. Can corrosion be both destructive and protective? Explain with examples.
7. (i) Give two examples from everyday life situations where redox reactions are taking place.  
  
(ii) Give four similarities between rusting and burning.

**Long answer questions:**

1. Translate the following statements into balanced chemical equations:
  - (i) Hydrogen gas combines with nitrogen to form ammonia.
  - (ii) Hydrogen sulphide gas burns in air to give water and sulphur dioxide.
  - (iii) Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate.
  - (iv) Potassium metal reacts with water to give potassium hydroxide and hydrogen gas.
2. During the reaction of some metals with dilute HCl, following observations were made:
  - (i) Silver metal does not show any change.
  - (ii) The reaction of sodium metal is highly explosive.
  - (iii) The temperature of the reaction mixture rises when aluminium is added.
  - (iv) Some bubbles of a gas are seen when lead is reacted with the acid

Explain these observations giving suitable reasons.

**ANSWERS****MCQ:**

1. (c)    2.(b)    3.(d)    4.(d)    5.(a)    6.(d)    7.(a)    8.(c)    9.(a)    10.(d)

**Short answer questions:**

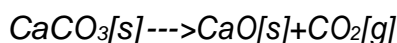
1. [i] X is copper. The process of corrosion is responsible for this.  
[ii] Green coating is of basic copper carbonate.  
[iii] By greasing, by oiling, painting, galvanising, chrome plating or alloying.
2. The electrolysis of water is  
$$2\text{H}_2\text{O}[\text{l}] \rightarrow 2\text{H}_2[\text{g}] + \text{O}_2[\text{g}]$$
  
[i] Gas produced at cathode :  $\text{H}_2$ , gas produced at anode:  $\text{O}_2$

[ii] From above reaction it is clear that  $H_2$  and  $O_2$  are produced in the ratio 2:1 by volume. So the volume of hydrogen gas produced at cathode is double the volume of oxygen gas collected at anode.

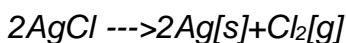
[iii] It is a decomposition reaction.

The reaction in which a compound breaks up into two or more simpler substances is known as decomposition reaction.

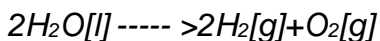
3. [i] Decomposition by heat



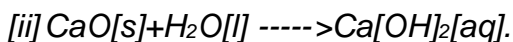
[ii] Decomposition by light



[iii] Decomposition by electricity



4. [i] 'X' is calcium oxide [quick lime] and its formula is  $CaO$ .



5. [i]  $KCl + AgNO_3 \rightarrow AgCl + KNO_3$

[ii] Double displacement, precipitation reaction

6. Destructive nature of corrosion in case of iron is well known. Iron surface reacts with atmospheric oxygen in presence of moisture and forms rust. Rust crumbles and peels off leaving fresh iron surface exposed, which again rusts. This ultimately leads to complete destruction of iron articles.

However, exposed surface of Al reacts with atmospheric oxygen to form a protective layer of  $Al_2O_3$  on its surface. Unlike rust, it does not crumble away and protects the inner layer of Al from further corrosion. Such corrosion is actually helpful to us.

7.A) (i) photosynthesis of carbohydrates

(ii) combustion reactions.

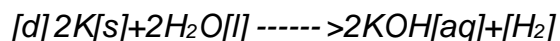
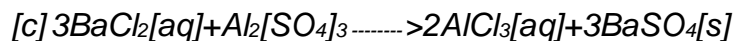
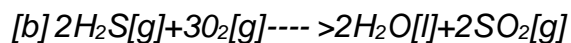
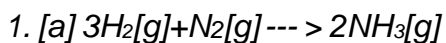
(b) (i) Both require oxygen.

(ii) Both produce oxides.

(iii) Both produce heat energy

(iv) Both are chemical changes.

#### LONG QUESTION ANSWER



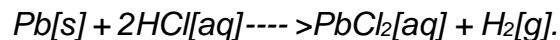
2. [a] Silver metal does not react with dilute HCl because it lies below hydrogen in the activity

series.

[b] Because it is an exothermic reaction.

[c] Because it is an exothermic reaction.

[d] Bubbles of  $\text{H}_2$  are produced due to the reaction.





## **UNIT 2: ACID, BASES AND SALTS**

- 1 Which sodium compound is used as antacid in medicine?
- 2 Ammonia is a base but does not contain hydroxyl group. Comment
- 3 When we mix 30 mL of water and 5 mL of HCl in a liquid, then this process is called?
- 4 Constituents of baking powder are sodium hydrogen carbonate and\_\_\_\_\_.
- 5 A knife, which is used to cut a fruit, was immediately dipped into water containing few drops of blue litmus solutions. If the colour of the solution is changed to red, what inference can be drawn about the nature of the fruit and why?
- 6 What is tooth enamel chemically? What is the nature of it? State the condition when it starts corroding. Why do doctors suggest use of toothpaste to prevent tooth decay?
- 7 A gas 'A' reacts with lime water and forms compound 'B' which is used in paper industry as a bleaching agent. Identify A and B. Give the chemical equation of the reaction involved.
- 8 In a gas jar containing HCl gas, a dry blue litmus paper is dropped. What change is observed? Now a blue litmus paper is moistened and dropped into the gas jar. State what is observed and give a reason for this.
- 9 When a blue colour substance's crystals are heated in a closed test tube, they become dirty white but regain its colour when they were allowed to cool down. Name the substance and write its formula and explain the phenomenon involved.
- 10 The crystals of a compound are used to remove permanent hardness from water and its solution in water gives blue colour with red litmus.
  - (a) Identify the substance and write its formula for its crystalline form
  - (b) From the given information, identify the nature of the substance.
  - (c) Write one more use of the substance.

- 11 (i) What are the constituents of brine solution?
- (ii) When electricity is passed through brine solution it forms a solution 'A' which has 14pH.
- (a) Identify the solution 'A'
- (b) Write the chemical equation
- (c) Name the process.
- (d) Name the type of reaction occurs when 'A' is treated with dilute hydrochloric acid.
- 12 A white powder 'X' which can be used as antacid and also used in soda acid fire extinguisher. Identify the salt and write a chemical equation for its formation. Explain how this salt can be used in baking industry? What makes the cake soft and spongy?
- 13 (a) A first aid manual suggests that vinegar should be used to treat wasp sting and baking soda for beestings.
- (i) What does this information tell you about the chemical nature of the wasp stings?
- (ii) If there were no baking soda in the house, what other household substance could you use to treat bee stings?
- (b) The oxide of a metal was soluble in water and when a blue litmus strip dipped in it, it did not go with any colour change. Predict the nature of oxide. Explain with the help of chemical equation.
- 14 A road tanker carrying an acid was involved in an accident and its contents spilled on the road. At the side of the road, iron drain covers began melting and fizzing as the acid ran over them. A specialist was called to see if the acid actually leaked into the nearby river.
- (a) Explain how the specialist could carry out a simple test to see if the river water contains some acid or not.
- (b) The word melting is incorrectly used in the report. Suggest a better name that should

have been used.

(c) Explain why drain covers began fizzing as the acid rain over them. Explain by giving a chemical reaction.

- 15 A substance 'X' is used as a building material and is insoluble in water. When reacted with dilute HCl, it produces a gas which turns lime water milky. Predict the substance 'X' and gas evolved. Write the chemical equations involved.

## ANSWERS

1 Sodium hydrogen carbonate

2 Ammonia dissolves in water and forms OH<sup>-</sup>. Therefore it is basic in nature.

3 Dilution

4 Tartaric acid

5 Since the colour of the blue litmus has changed to red, which means fruit juice is acidic in nature

6 It is made up of calcium phosphate.

It is basic in nature.

It starts corroding due to acid formed in the mouth.

Toothpaste is basic in nature and neutralize acid formed in mouth which prevents tooth decay.

7 A is chlorine

B is bleaching powder



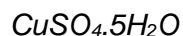
8 Dry blue litmus remains unchanged in colour

*Because hydrogen chloride gas does not release  $H^+$  ions and cannot behave as acid*

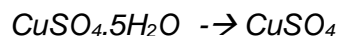
*Moistened blue litmus changes its colour to red*

*Because hydrogen chloride gas dissolves in moisture and ionises to releases  $H^+$  ions and behave as acid thus changes the colour blue litmus to red*

9      *Copper sulphate pentahydrate*



*$CuSO_4 \cdot 5H_2O$  is a blue crystalline solid and it becomes dirty white on heating due to loss of water molecules*



*Blue                      dirty white*

*It regains its colour by absorbing water from atmosphere and becomes blue in colour*

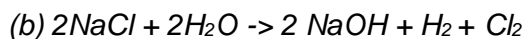
10      (a) *Washing soda ang its chemical formula is  $Na_2CO_3 \cdot 10H_2O$*

(b) *Basic in nature*

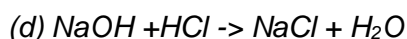
(c) *It is used in laundry for washing clothes*

11      (i)      *Constituents of brine solution are sodium chloride and water*

(ii)      (a) *'A' is sodium hydroxide  $NaOH$*



(c) *Chlor- alkali process*



*Neutralisation reaction*

12      *Salt 'X' is sodium hydrogen carbonate*

*Manufacture of baking soda is*



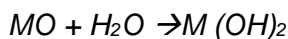
*The salt can be used in baking industry by converting into baking powder by adding starch and tartaric acid.*

*Baking powder gives carbon dioxide gas which makes the cake soft and spongy.*

- 13 (a) (i) *Since vinegar (acetic acid) is used to heal or neutralize the effect of wasp stings this means that the chemical present in the stings must be some base.*



(b) *The Metal oxide (MO) is of basic in nature. It dissolves in water to form metal hydroxide as*



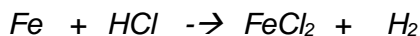
*blue litmus does not undergo any change in colour in the basic medium.*

- 14 (a) *By dipping a strip of blue litmus paper in to the sample of river water. If the colour changes*

*to red this means that some acid has gone in to the river.*

(b) *Corrosion.*

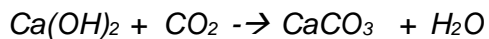
(c) *Iron reacts with acid to evolve hydrogen gas.*



- 15 *Substance 'X' is calcium carbonate*

*On reacting with dilute HCl it produces CO<sub>2</sub> gas*





### **UNIT 3. METALS AND NON -METALS**

Q1. Reaction between X AND Y forms compound Z. X loses electrons Y gains electron.  
Which

*of the following properties is not shown by Z.*

- (a) Has high melting point*
- (b) Has low melting point*
- (c) Occurs as solid*
- (d) Conduct electricity in molten state*

Q2. Generally metals react with acids to give salt and hydrogen gas. Which of the following

*acids does not give hydrogen gas on reacting with metals (except Mn and Mg)?*

- (a) H<sub>2</sub>SO<sub>4</sub> (b) HCl (c) HNO<sub>3</sub> d) All of these*

Q3. 2 mL each of concentrated HCl, HNO<sub>3</sub> and a mixture of concentrated HCl and concentrated HNO<sub>3</sub> in the ratio of 3 : 1 were taken in test tubes labelled as A, B and C. A

*small piece of metal was put in each test tube. No change occurred in test tubes A and B*

*but the metal got dissolved in test tube C respectively. The metal could be*

- a. *Al*
- b. *Au*
- c. *Cu*
- d. *Pt*

*Q4. Silver articles becomes black on prolonged exposure to air .This is due to the formation*

*(a)  $\text{Ag}_2\text{S}$*

*(b)  $\text{Ag}_2\text{O}$*

*(c)  $\text{Ag}_3\text{N}$*

*(d)  $\text{Ag}_2\text{S}$  and  $\text{Ag}_3\text{N}$*

*Q5. Alloys are homogenous mixture of metal with a metal or nonmetal. Which among the*

*following alloys contain non-metal as one of its constituents?*

*(a) Brass*

*(b) Bronze*

*(c) Amalgam*

*(d) Steel*

*Q6. There are three unknown metals – A, B and C. C displaces B from its oxides while with oxide of A, there is no reaction. Give the reactivity order of A, B and C.*

*Q7. A metal M does not liberate hydrogen from acid but react with oxygen to give black colored compound. Identify M and black compound.*

*Q8. Royal water is prepared by mixing two acids 'A' and 'B'. It can dissolve gold and platinum. it is highly corrosive and fuming liquid. Identify 'A' and 'B'. What is the ratio in which A and B are mixed?*

Q9. A non-metal X exists in two different forms Y and Z. Y is the hardest natural substance,

whereas Z is good conductor of electricity. Identify X, Y and Z.

Q10. When a metal 'X' is treated with cold water, it gives a base 'Y' with molecular formula

XOH (molecular mass = 40) and liberate a gas 'Z' which easily catches fire. Identify X, Y and Z.

Q11. Suggest a method of reduction for the following metals during their metallurgical processes:

(a) Metal 'A' which is one of the second or third last position in reactivity.

(b) Metal 'B' which give vigorous reaction even with water and air.

(c) Metal 'C' which is kept in the middle of activity series.

Q12. In the formation compound between two atoms A and B, A loses two electrons and B

gains one electron.

(a) What is the nature of bond between A and B?

(b) Suggest the formula of the compound formed between A and B.

(c) On the similar lines show the formation of calcium chloride.

Q13. A yellow coloured powder 'X' is soluble in carbon disulfide. It burns with a blue flame

forming suffocating smelling gas which turns moist blue litmus red. Identify 'X' and gives

chemical reaction. Identify is it metal or non metal?

Q14. A metal 'A', which is used in thermite process, when heated with oxygen gives an oxide

'B', which is amphoteric in nature. Identify A and B. Write down the reactions of oxide B

with HCl and NaOH.

Q15. An element is located on the left side of the periodic table. It reacts spontaneously with air

and water at room temperature.



(a) Name the element and write its symbol.

(b) Write the formula of its oxide.

(c) What is the nature of its oxide?

Q16. A non-metal A which is the largest constituent of air, when heated with  $H_2$  in 1:3 ratio in

the presence of catalyst (Fe) gives a gas B. On heating with  $O_2$ , it gives an oxide C. If this

oxide is passed into water in the presence of air, it gives an acid D which acts as a strong

oxidizing agent.

(a) Identify A,B,C AND C

(b) To which group of periodic table does this non-metal belong?

Q17. Riya took Zn, Al, Cu, Fe ,Mg, Na metals and put each metal in cold water and then in hot

water. She reacted the metal with steam

(a) Name the metal which react with cold water.

(b) Which of the above metals react with steam?

(c) Name the metal which reacts with hot water.

(d) Arrange these metals in order of increasing reactivity.

Q18. An element M burns in oxygen to form an electrovalent compound MO. What compounds

do you expect if this element is the made to combine with chlorine and sulphur?

Q19. A yellow malleable alloy is made up of the metals 'A' and 'B' .On treatment with dil. sulphuric acid, 'A' dissolve from the surface of the alloy to form a colourless solution. 'B'

remains undissolved and is found to have reddish –brown colour.

(a) Identify the metals A and (b) Name the alloy containing A and B

(c) Write chemical equation for the reactions involved.

Q20. A Copper coin is kept immersed in a solution of silver nitrate for some time .What will happen to the coin and the colour of solution?

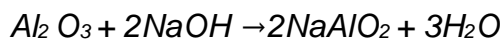
## ANSWER KEY

1 B

2 C

3 B

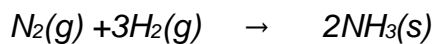
- 4 A
- 5 D
- 6  $B < C < A$
- 7 M is copper , Black colored compound is copper oxide
- 8  $3HCl : HNO_3$
- 9 'X' is carbon , 'Y' is diamond and 'Z' is graphite.
- 10 'X' is sodium , Y is sodium hydroxide , Z is hydrogen gas.
- 11 (a) 'A' can be obtain by chemical reduction by using carbon or carbon monoxide as a deducing agent
- (b) 'B' can be obtained by electrolytic reduction.
- (c) 'C' can be reduced by reducing agent like 'Al'.
- 12 (a) Ionic bond
- (b)  $(A^{2+}) (:B::)^-_2$  i.e.  $AB_2$
- (c) Cl=2,8,7 Ca=2,8,8,2
- $$Ca \rightarrow Ca^{2+} + 2e^-$$
- $$2Cl + 2e^- \rightarrow 2Cl^-$$
- Correct electron dot structure.
- 13 'X' is Sulphur
- $$S + O_2 \rightarrow SO_2$$
- It is non metal.
- 14 A is form aluminium (Al).it reacts with oxygen to form aluminium oxide,  $Al_2O_3$ .
- B is  $Al_2O_3$
- $$Al_2O_3 + 6HCl \rightarrow 2AlCl_3 + 3H_2O$$



15 (a) The element may be sodium. Symbol Na

(b) The formula of sodium oxide  $Na_2O$

16 (a)  $N_2$  is largest constituent of air, when heated in the ratio of 1:3 in presence of catalyst (Fe) gives a gas  $NH_3$  (B)

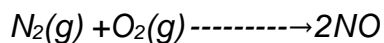


'A'

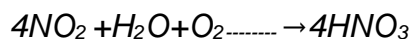
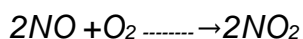
'B'

1 : 3

heat



'C'



'D'

'A' is  $N_2$ , 'B' is  $NH_3$ , 'C' is NO and 'D' is  $HNO_3$

(b) Group 15

17 (a) Na

(b) Al, Zn, Fe

(c) Mg

(d)  $Na > Mg > Al > Zn > Fe > Cu$

18 The electronic configuration of oxygen is 2,6. Oxygen atom requires 2e- to attain stability.

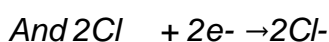
Since the compound MO is electrovalent compound, there should be a transfer of 2e-

from the atom M to O. It means that the valency of M is 2+.

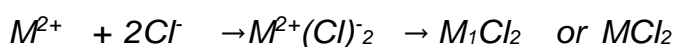
So, the Atom M loses 2e- to acquire a stable configuration

(a) When the element M is made to react with chlorine, one atom of M would lose two

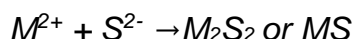
e-, while each atom of chlorine gains one e- so, to form a compound between M and Cl, for each atom of M, 2 atoms of Cl are required, i. e.



This gives

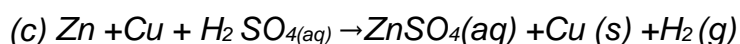


(b) When the element M combines with sulphur, it should give its sulphide. In sulphides, sulphur exists as  $S^{2-}$  ion. So, the compound formed is

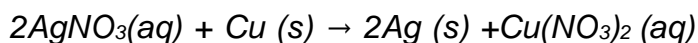


19 (a) Metal A : Zinc Metal B: Copper

(b) Name of alloy : Brass



20 Copper is placed above the silver in the reactivity series which indicates that copper is more reactive than silver. When a copper coin or strip is kept immersed in a solution of silver nitrate, silver from its solution will deposit on copper coin.



Colourless

blue

*Copper slowly displaces silver from the  $\text{AgNO}_3$  solution and the copper solution changes from colourless to blue due to formation of copper nitrate. The copper coin will disappear and silver will precipitate out.*

#### **UNIT 4. CARBON AND ITS COMPOUNDS**

**Q1.** *The general formula of three compounds A, B and C is  $\text{C}_n\text{H}_{2n+2}$ . Their boiling points are*

*- 162°C , -42°C, -0.5°C respectively*

*(a) What type of compounds are A, B and C?*

*(b) Which of these has the maximum number of carbon atoms?*

*(c) to which homologous series do A and B belong ?*

**Q2.** *Two compounds containing four carbon atoms each, have the same molecular formula but different structural arrangements of atoms in them.*

*(a) What is the special name given to such compounds?*

*(b) Name the two compounds.*

*(c) Draw the structural formula of the compounds*

**Q3.** *Two alkanes A and B have 4 and 6 carbon atoms in their molecules respectively.*

*(a) Name both the alkanes*

*(b) In which physical state will they occur at room temperature?*

*(c) What happens when A is burnt in excess of air?*

**Q4.** *A gas containing only one carbon atom in its molecule is collected by downward*

displacement of water. It burns in air with blue flame and the resulting gas turns limewater milky.

- (a) Name the gas
- (b) State its two properties based on the observations stated above
- (c) Write the chemical equation for the reaction that takes place during burning of the gas
- (d) Name the gas produced during burning and write chemical equation for the reaction between this gas and lime water.

**Q5.** Hydrogen is passed through mustard oil in the presence of nickel.

- (a) Mention one difference between the physical properties of mustard oil and the product formed
- (b) Name the process

**Q6.** Sugar cane juice mixed with yeast is kept in an airtight pot. After a few days this juice starts giving a strong smell.

- (a) Name the process involved
- (b) Name the method used for separating the main product from this mixture.
- (c) Write chemical equations describing the changes during this reaction.

**Q7.** An organic compound 'A' is a constituent of wine and beer. The compound on heating with potassium dichromate or oxygen forms another compound 'B'.

- (a) Identify the compound 'A'.
- (b) Write the chemical equation of the reaction that takes place to form compound 'B'.
- (c) Name the compound 'B'.

**Q8.** An organic compound A of molecular formula  $C_2H_6O$  on oxidation gives an acid 'B' with the same number of carbon atoms as in molecule 'A'. Compound 'A' is often used for sterilization of skin by doctors. Name the compounds A and B write the chemical equation involved in the formation of B from A.

**Q9.** Write two tests to demonstrate that acetic acid is acidic in nature

**Q10.** A test tube contains a brown liquid in it. When methane is bubbled through this

liquid the colour remains the same, but when ethene is passed through it, the brown colour disappears. (a) Name the brown liquid

(b) Write the reaction between ethene and brown liquid

(c) What conclusion do you draw from this experiment ?

**Q11.** A small quantity of sugarcane juice is mixed with yeast and kept in an airtight container. After a few days the juice starts frothing and gives strong smell.

(a) Name the process

(b) Describe the process and the changes taking place

(c) Name the main product formed

(d) How can you recover the product from the reaction mixture?

**Q12.** An organic substance 'X' shows the following characteristics. It turns blue litmus red and gives strong effervescence when added to the solution of sodium hydrogen carbonate.

(a) What is the nature of the substance X ? Write its probable name

(b) What causes effervescence ?

(c) Write the chemical equation between X and sodium hydrogen carbonate

**Q13.** An organic acid X is a liquid which often freezes during winter time in cold countries, has molecular formula  $C_2H_4O_2$ . On warming it with ethanol in the presence of a few drops of concentrated  $H_2SO_4$  a compound with a sweet smell is formed.

(a) Identify 'X' and 'Y'

(b) Write chemical equation for the reaction involved.

**Q14.** Give reasons for the following observations

(a) Air holes of a gas burner have to be adjusted when the heated vessels get blackened by the flame

(b) Use of synthetic detergents causes pollution of water

**Q15.** An element of group 14 has two common allotropes 'A' and 'B'. 'A' is very hard and is a bad conductor of electricity while 'B' is soft to touch and good conductor of electricity. Identify the element and its allotropes. Explain reasons for their different properties.

**Q16.** An organic compound A on heating with concentrated  $H_2SO_4$  forms a compound B which on addition of 1 mole of hydrogen in presence of nickel forms a compound C. One mole of compound C on combustion forms 2 moles of  $CO_2$  and 3 moles of  $H_2O$ . Identify compounds A, B and C and write the chemical equations of reactions involved.

**Q17.** You have three unlabelled test tubes containing ethanol, ethanoic acid and soap solution. Explain the method you would use to identify the compounds in different test tubes by chemical test using litmus Paper and sodium metal

**Q18.** Why is scum formed only with hard water? Mention the disadvantages of the formation of scum.

**Q19.** Why is a mixture of water and alcohol used instead of water in radiators of vehicles in cold countries? Give two reasons.

**Q20.** Write the molecular formula of the third and fifth members of the homologous series of carbon compounds represented by  $C_nH_{2n-2}$ .

### ANSWERS

**Ans1:-** (a) A, B and C are alkanes

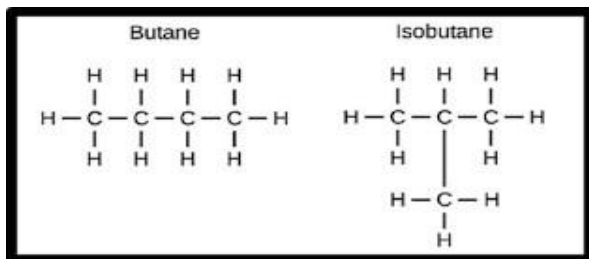
(b) The alkane C has highest boiling point. Therefore the alkane C has maximum number of carbon atoms.

(c) A, B and C belong to alkane series

**Ans2:-** (a) These are called isomers

(b) They are named n-Butane(Butane) and Iso- Butane(2-Methylepropane)

(c)



**Ans3:-** (a) A is butane B is Hexane

(b) A is gas b is liquid



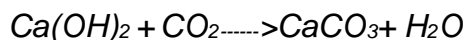
- (c) i. when A is burnt in excess of air. Carbon dioxide and water are formed.  
 ii. Lot of heat is liberated  
 iii. A burns with a blue flame and B burns with a yellow flame.

**Ans4:-** (a) the gas is methane

(b) The gas is insoluble in water and forms an explosive mixture with air



(d) During burning of methane carbon dioxide is produced the gas turns limewater milky.



**Ans5:-**(a) Mustard oil is liquid at room temperature the product formed by passing hydrogen

gas is solid at room temperature.

(b) The process is called hydrogenation of oil.

**Ans6:-** (a) fermentation

(b) the main product ethyl alcohol can be obtained from the mixture by distillation

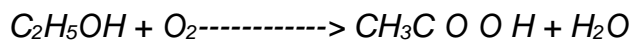


**Ans7:-** (a) Ethanol



(c) The compound B is ethanoic acid

**Ans8:-** The compound B is an organic acid containing two carbon atoms. B should contain one  $-\text{COOH}$  group. Therefore acid B is acetic acid a carboxylic acid can be obtained by the oxidation of alcohol. Ethyl alcohol is commonly used for sterilization of skin so compound A that is  $\text{C}_2\text{H}_6\text{O}$  is an alcohol therefore A is  $(\text{C}_2\text{H}_5\text{OH})$  ethanol.



**Ans9:-** (a) **Litmus test:-** To a small amount of acetic acid add a few drops of litmus solution. Blue litmus turns red indicating that acetic acid is acidic in nature.

(b) **Sodium hydrogen carbonate test:-** To a small sample of acetic acid add a few drops of sodium hydrogen carbonate solution. Brisk effervescence due to the evolution of carbon dioxide confirms the acidic nature of acetic acid.

**Ans10:-**(a) The brown liquid is bromine water

(b) The equation is  $\text{CH}_2=\text{CH}_2 + \text{Br}_2 \longrightarrow \text{CH}_2\text{Br}-\text{CH}_2\text{Br}$

(c) Unsaturated compounds decolourise the colour of bromine

**Ans11:-** (a) The process is called fermentation

(b) The enzyme invertase present in Yeast breaks down the sugar present in sugarcane juice to glucose and fructose. The enzyme zymase converts glucose into ethanol and carbon dioxide. The evolution of carbon dioxide causes froth, and ethanol smells strongly.

(c) The main product during fermentation of sugar is ethanol.

(d) Ethanol can be recovered by fractional distillation.

**Ans12:** (a) The substance X is acidic in nature. It may be ethanoic acid.

(b) Rapid evolution of  $\text{CO}_2$  gas causes effervescence

(c)  $\text{CH}_3\text{COOH} + \text{Na}_2\text{CO}_3 \longrightarrow \text{CH}_3\text{COONa} + \text{H}_2\text{O} + \text{CO}_2$

(b) Write chemical equation for the reaction involved.

**Ans13 (a)** 'X' is ethanoic acid  $\text{CH}_3\text{COOH}$  'Y' is ethyl ethanoate  $\text{CH}_3\text{COOC}_2\text{H}_5$

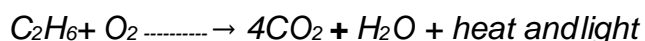
(b)  $\text{CH}_3\text{COOH} + \text{C}_2\text{H}_5\text{OH} \xrightarrow{\text{H}_2\text{SO}_4} \text{CH}_3\text{COOC}_2\text{H}_5 + \text{H}_2\text{O}$

**Ans14:-**(a) We need to adjust air holes of gas burner so that sufficient oxygen rich mixture is burnt to give a clean blue flame for complete combustion.

(b) Synthetic detergents are generally non-biodegradable, that is, they are not decomposed by microorganisms like bacteria. Use of synthetic detergents cause water pollution in lakes and rivers.

**Ans15:-** The element is carbon and the two allotropes are diamond and graphite. Diamond has three dimensional rigid structure and does not have any free electrons. Hence it is hard and bad conductor of electricity. Graphite forms hexagonal sheet like structure and one valency with carbon is free. Hence, graphite is soft and good conductor of electricity

**Ans16:-** Since compound C gives 2 moles of  $\text{CO}_2$  and 3 moles of  $\text{H}_2\text{O}$ , it shows that it has the molecular formula  $\text{C}_2\text{H}_6$  (ethane). C is obtained by the addition of 1 mole of hydrogen to compound B so that the molecular formula of B should be  $\text{C}_2\text{H}_4$  (ethene). Compound B is obtained by heating compound A with concentrated  $\text{H}_2\text{SO}_4$  which shows it to be an alcohol compound. So compound A could be  $\text{C}_2\text{H}_5\text{OH}$  (ethanol).



**Ans17:-** Ethanol will not be affected by blue litmus as well as red litmus Paper. Ethanoic acid will turn blue litmus red whereas red litmus paper will remain as it is. Soap solution will turn red litmus paper into blue but blue litmus will remain as it is. Sodium metal will liberate hydrogen gas with ethanol as well as Ethanoic acid. Soap solution will not react with sodium metal.

**Ans18:-**  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$  present in hard water react with soap to form scum which is insoluble in  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$  salts of fatty acids.

(a) It is deposited on heating rods of boilers and make them less effective.

(b) Soap goes waste and soap forms less lather in hard water.

**Ans19:-** water is used in the radiators of automobiles to keep the engine cool. Water freezes at zero degree Celsius. In cold countries where the temperature may fall below zero degree Celsius, water cannot be used in radiators. Under these conditions, a mixture of water and alcohol is used in radiators.

Alcohol is used because,

(a) alcohol and water mixture is homogenous that is alcohol and water are completely miscible in all proportions.

(b) alcohol and water mixture (generally 1:1 by volume) has much lower freezing point than water. So it does not freeze under low temperature conditions.

**Ans 20:-** The given compound is an alkyne. So the first member of this homologous series should contain two carbon atoms bonded by triple Bond. Therefore the third

*member should have 4 and fifth member should have 6 carbon atoms, that is,*

*for third number  $n = 4$  and for 5th member  $n = 6$*

*then, formula of third member is **C<sub>4</sub>H<sub>6</sub>***

*formula of fifth member is **C<sub>6</sub>H<sub>10</sub>***

## **UNIT 5. PERIODIC CLASSIFICATION OF ELEMENTS**

- 1 *Write the formula of oxides of H and Al as predicted by Mendeleev.*
- 2 *Atomic mass of Cl, I and Br is 35.5, 126.9 and 79.9 respectively. In what sequence you will arrange these three elements in Dobereiner's triads and why?*
- 3 *Name the scientist who used the musical notes with classification of elements.*
- 4 *Name the elements (any two) whose atomic mass was corrected by Mendeleev.*
- 5 *Why the position of hydrogen element is not satisfactory in periodic table?*
- 6 *If an element is placed in group 14 of modern periodic table, what will be the formula of its chloride?*

- 7 Give an account of process/steps/methodology adopted by Mendeleev for the classification of the elements.
- 8 Identify the metal and non-metal whose electronic configuration is given below. Justify your answer.
- a) 2,8,2
  - b) 2,8,7
  - c) 2,1
- 9 X has 12 protons and 12 electrons  
Y has 12 protons and 10 electrons.  
Compare the atomic radius of X and Y.  
Also justify your answer.
- 10 Mendeleev left the spaces/gaps in his periodic table. It was considered as achievement as well as limitation by contemporary scientists/chemists. Why?
- 11 Both magnesium and oxygen have a valency of 2. Are they chemically similar? Justify your answer.
- 12
- a) Element belongs to group 17 of modern periodic table, used in purification of water. (across)
  - b) First element of group of Inert gases (down)
  - c) Metal ribbon burns with dazzling white flame, salt used as antacid.(across)
  - d) Element with atomic number 30, used to protect iron from rust (across)
  - e) Lustrous nonmetal(down)
  - f) Element belong to 2<sup>nd</sup> period, 18<sup>th</sup> group, Inert gas group (down)

<i>d</i>	<i>e</i>											
			<i>a</i>	<i>b</i>					<i>f</i>			
				<i>c</i>								

13 An element 'X' belongs to third period of Modern periodic table. Because of its high reactivity, this element is stored under kerosene.

- Identify the element.
- How many energy shells will be there?
- What will be its valency?
- Is it a metal/metalloid/non metal? Justify your answer.

- e) Write the chemical equation of reaction of 'X' with water and air.
- 14 An element 'P' has two shells and show catenation and allotropy to great extent.
- An element 'Q' has three shells and belongs to 17<sup>th</sup> group in modern periodic table.
- a) Identify 'P' and write the electronic configuration.
- b) Identify 'Q' and write its electronic configuration.
- c) If 'P' and 'Q' reacts, what type of bonds they will form ? Show the formation of bonds with Lewis dot structure.
- d) Write any two properties of the type of the compounds formed by the 'P' and 'Q'.
- 15 Atoms of eight elements A,B,C,D,E,,F,G and H have three shells but different number of electrons. It was found that elements A and G combine to form an ionic compound. This compound is added to food items. Oxides of elements A and B are basic in nature whereas E and F are acidic.
- Based on this information, answer the following questions:
- a) To which period of the periodic table these elements belong?
- b) What would be the nature of the compound formed by combination of element B and F?
- c) Which element is most likely to be an inert element and why?
- d) Which two elements could definitely be metals and why?
- e) What will be the atomic number of element B?
- 16 Answer the following question with explanation:
- a) Predict the valency of B and D

b) What type of compounds will be formed by E and F?

c) State whether C is a metal/metalloid/non metal?

d) Compare the atomic radius, valency of P and Q.

e) Which properties are common for A, P and B

Period	Group 1	Group 2	Group16	Group 17	Group 18
1	A				
2	P	Q			E
3	B		C	D	
4					F

17 Two elements X and Y belongs to group 1 and 17 respectively in same period.

Compare with respect to

a) The number of the valence electrons

b) Valency

c) Metallic character

d) Size of atoms

e) Nature of oxides

18. An element P (2, 8, 2) combines separately with  $\text{NO}_3^-$  and  $(\text{SO}_4)^{2-}$  radicals. Write the formula of the compound of the two compounds formed.

To which group and period does this element belong?



*Will it form covalent or ionic compound? Why?*

## **ANSWERS**

1.  $H_2O$   
 $Al_2O_3$
2.  $Cl, Br, I$   
*Atomic mass of Br =  $(35.5 + 126.9) / 2 = 81.2u \approx 79.9$*
3. *Sir John Alexander Newlands, an English scientist*
4. *Beryllium, Gold, Platinum (any two)*
5. *The position of hydrogen in periodic table is controversial.*  
*It resembles alkali in some properties and halogens in some other properties.*
6.  $XCl_4$
7.
  1. *Mendeleev started his work with classification of elements, 63 elements were known. He studied the chemical as well as physical properties of elements.*
  2. *He took 63 cards and on each card he wrote down the properties of one element and formulae of hydrides and oxide.*
  3. *Then he sorted out the elements with similar properties and pinned their cards together one after the other in vertical column.*
8.
  - a) *Metal*  
*The element has 2 valence electrons. It can lose 2 electrons to become stable.*
  - b) *Non metal*  
*The element has 7 valence electrons. It can gain 1 electron to become stable.*

c) Metal

the element has 1 valence electron. It can lose 1 electron to become stable.

9. Electronic configuration of X = 2,8,2

Y = 2,8

Since X has three shells and Y has only two shells, the size of X is large than Y.

10 Achievement:

Mendeleev left gaps in the periodic table for those elements which were not known at that time. He made the bold prediction that these elements would be discovered in the future. He even predicted the properties of these elements in light of the properties of elements already present in the group.

Limitation/Drawback

In Mendeleev's periodic table, the elements were arranged in increasing order of atomic masses. But the atomic masses do not increase in regular manner in going from one element to another. It is not possible to predict how many elements could be discovered between two known elements.

11. Atomic number of Magnesium is 12 and electronic configuration = 2,8,2

Atomic number of oxygen is 8 and electronic configuration = 2,6

The valency of Magnesium and Oxygen is same i.e 2, but both elements do not have similar chemical properties. The Magnesium has a tendency to lose 2 electrons to gain noble gas configuration. Hence it is a metal. But Oxygen will gain 2 electrons to become stable. Hence it is a non metal. Therefore, both will have different properties.

12.

Z	I	N	C									
	O		C	H	L	O	R	I	N	E		
	D			E					E			
	I			L					O			
	N			I	34				N			
	E			U								
				M	A	G	N	E	S	I	U	M

13. a) The element X is Sodium  
b) The atomic number of Sodium is 11

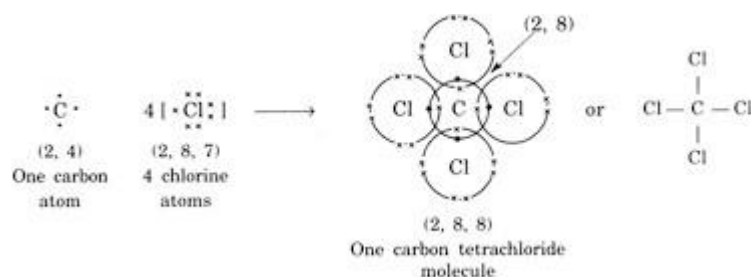
Electronic configuration=2,8,1

There are three energy shells.

- c) The valency of sodium is 1.  
d) Sodium has a tendency to lose 1 electron to gain noble gas configuration, hence it is a metal.



14. a) Element P is Carbon. The atomic number is 6. The electronic configuration is 2,4  
b) Element Q is Chlorine. The atomic number is 17. The electronic configuration is 2,8,7  
c) If Carbon and Chlorine reacts, they will form ionic compound.



- d) Two properties of ionic compounds:

- 1) They have high melting and boiling points.
- 2) In solid state, ionic compounds do not conduct electricity.

Or any two properties of ionic compounds.

15. a) All the elements belong to the third period. They have three shells K, L and N and the number of electrons vary.

b) B and F will form ionic compound.

c) H element must be an inert element as it will have a complete octet.

d) A and B are surely metals because elements present in group 1 and 2 are all metals.

e) The atomic number of B is 12.

16. a) The valency of B is 1

The valency of D is 1

b) The elements in Group 18 are noble gases (have complete octet), therefore E and F will not form compound as they are stable.

c) C is non metal.

d) Atomic radius of P is smaller than Q

The valency of P is 1

The valency of Q is 2

e) A, P and B belong to same group. So they will have same number of valence electrons and same valency.

17.

Property	Group 1	Group 17
Number of valence electrons	1	7
Valency	1 (can lose 1 electron)	1 (can gain 1 electron)
Metallic character	Metal	Non metal
Size of atom	Larger	Smaller
Nature of Oxides	Basic oxide	Acidic oxide

18. The element P(2,8,2) has two electrons in the valence shell, therefore its valency is 2.

The valencies of  $\text{NO}_3^-$  and  $(\text{SO}_4)^{2-}$  radicals are 1 and 2 respectively.

Therefore the formula of the compounds of

*P with  $\text{NO}_3^-$  is  $\text{P}(\text{NO}_3)_2$  and*

*P with  $\text{SO}_4$  is  $\text{P SO}_4$*

*The element P belongs to third period and second group.*

*Since the element can lose two electrons to acquire the stable electronic configuration, it will form ionic compounds.*

### **UNIT 6. LIFE PROCESSES**

- 1 Name the ultimate end parts of respiratory passages in mammalian lungs.*
- 2 Why are the digestive enzymes called as hydrolases?*
- 3 What is the path of translocation of food in plants?*
- 4 Bile juice does not contain any digestive enzymes, yet it is essential for digestion. Why so?*
- 5 What happens to the glucose which enters the nephron along with the filtrate?*
- 6 In which form do living beings obtain nitrogen from nature?*
- 7 Why are we suggested not to sleep under a dense tree at night?*
- 8 Which part of the human heart is considered as pacemaker? Why is it called so?*
- 9 Two green plants are kept separately in oxygen free containers, one in the dark and the other in the continuous light. Which one will live longer? Give reason.*
- 10 How are leaves adapted for photosynthesis?*

- 11 *Why is the rate of breathing in aquatic organisms much faster than in terrestrial organisms?*
- 12 *It is often observed in severe winters in hilly stations that people burn sigrhi in their bedrooms. Sometimes the whole family is found dead in the morning. Can you find a reason? Justify.*
- 13 *Give reasons for the following:*
- a) Stomata of the desert plants remain closed during daytime.*
  - b) A piece of bread taste sweet when chewed for some time.*
  - c) Pancreas acts both as endocrine and exocrine gland.*
  - d) The volume of glomerular filtrate is 18 L but the volume of the urine excreted is only 1 to 2 L.*
  - e) The water reaches to the top most part of a tree due to the transpirational pull during day*  
*time. What makes water rise upwards during night?*
- 14 *i) What are the factors that affect the rate of photosynthesis?*
- ii) What will happen to the rate of photosynthesis in the following situations:*
- a) On a cloudy day*
  - b) When there is no rainfall for a long time in the area*
  - c) Good manuring in the area*
  - d) Stomata get covered due to dust*
- 15 *What is lymph? How is lymph different from blood? What is the direction of its flow? List 2 functions of lymphatic system?*

## **ANSWERS**

- 1 Alveoli
- 2 *It is because they catalyse the breakdown of larger organic molecules with addition of water.*
- 3 *Food materials produced in the leaves are translocated in downward direction to roots as well as in upward direction to the developing fruits, flowers, growing stem tips etc., through phloem tissues i.e. sieve tubes and companion cells.*
- 4 *Bile contains bile salts which are important for digestion and absorption of fats.*
- 5 *The fluid part of the filtrate is diffused into the uriniferous tubule while the useful part like glucose remains there which is again carried to renal veins.*
- 6 *In the form of nitrates, nitrite and ammonium ions.*
- 7 *Because the carbon-di-oxide produced during night is not utilized for photosynthesis due to the unavailability of sunlight.*
- 8 Sino-atrial node.  
  
*It is also called as pacemaker because it determines the rate of heartbeat by determining the rate of discharge of cardiac impulse.*
- 9 *The one kept continuously in light will live longer because it will be able to manufacture food as well as produce oxygen required for respiration.*
- 10
  1. Leaf has a large surface area to absorb maximum light.
  2. Leaf has numerous stomata for exchange of gases.
  3. Arrangement of leaves is such that it absorbs maximum light.

*( any other relevant answer)*
- 11 *Because the amount of oxygen present in water is only 4% (much lower than present in air).*  
  
*Moreover the respiration is done with the help of gills which are able to absorb*

*less oxygen as compared to the lungs in terrestrial animals.*

- 12 *Due to the closed doors and windows, the incomplete combustion of coal takes place in “sigrhi”. This cause the production of CO which combines with hemoglobin molecules to produce a stable compound called carboxy-hemoglobin. This prevents the combining of oxygen with hemoglobin and the death may occur due to the lack of enrgy production.*
- 13     *a) It is to prevent the loss of water from the plant body due to the scorching heat in deserts.*
- b) Because the starch present in the bread starts getting converted into maltose by the action*
- of salivary amylase present in saliva. Maltose is sweet in taste.*
- c) Pancreas secretes hormones such as insulin and glucagon. It also secretes enzymes for the*
- digestion of food*
- d) It is because the remaining filtrate is reabsorbed in the kidney tubules.*
- e) The root pressure helps the water rise upwards during night.*
- 14   *i) a) Intensity of sunlight b) CO<sub>2</sub> concentration   c) Temperature d) Water and salts*
- ii) a) It will decrease due to low intensity of light*
- b) It will decrease due to wilting of leaves and closure of stomata*
- c) It will increase due to the availability of more salts*
- d) It will decrease due to blocked stomata which affects gaseous exchange*
- 15 *It is a colorless/slightly yellowish viscous fluid which is derived from tissue fluid and is present inside lymph vessels.*
1. *Lymph has 94% water whereas blood contains 92% water.*
2. *Protein content in lymph is 3 to 4.5% but in blood it is 6 to 8%.*
3. *Fibrinogen content is high in lymph as compared to blood.*



4. *Lymph is rich in food and waste material but blood is not.*
5. *Lymph flows in one direction while blood in a cyclic manner.*

*It flows from tissues to subclavian vein, in one direction.*

*Its functions are-*

*It removes excess fluid from tissues.*

*It carries digested fats from intestine.*

## **UNIT 7. CONTROL AND COORDINATION**

- 1 *How the chemical coordination takes place in animals?*
- 2 *Define feedback mechanism of hormones.*
- 3 *Mention the part of the brain which controls the involuntary actions like blood pressure,  
salivation etc.*
- 4 *Give an example of Chemotropism.*
- 5 *Name the part of neuron through which the information travels as an electric impulse.*
- 6 *How is the spinal Cord protected in human body?*
- 7 *List two body functions that will be affected if cerebellum gets damaged*

- 8 *Name the parts of the brain that perform the following functions:*
- (i) *Maintaining the posture and balance of the body.*
  - (ii) *Regulating blood pressure*
  - (iii) *Sensation of hunger or feeling full.*
  - (iv) *Seeing*
- 9 *What is reflex arc? Why have reflex arcs evolved in animals?*
- 10 *Distinguish between Cerebrum and Spinal Cord.*
- 11 *“Both overproduction and under production of growth hormone leads to disorders in the body.” Explain.*
- 12 *A motor cycle rider without helmet met with an accident and suffered a spinal cord injury. In this case which signals will get disrupted and why?*
- 13 *How are involuntary actions and reflex actions different from each other.*
- 14 *Compare and contrast nervous and hormonal mechanism for control and coordination in animals.*
- 15 *What is the difference between the manner in which movement takes places in a sensitive plant and movement in our legs?*
- 16 *Answer the following*
- (a) *Name an endocrine gland associated with brain.*
  - (b) *Which gland secretes digestive enzymes as well as hormones.*
  - (c) *Name the endocrine gland associated with kidneys.*
  - (d) *Which endocrine gland is present in males but not in females.*
- 17 *Name two tissues which provide control and coordination in animals.*
- 18 *Explain photoperiodism.*
- 19 *Differentiate between the following pairs by giving one example each.*
- (i) *Tropic movement and nastic movements*
  - (ii) *Phototropism and photoperiodism*

- 20 Give the scientific terms used to represent the following
- (i) Bending of shoot towards light.
  - (ii) Growing of roots towards the earth
  - (iii) Growth of pollen tube towards female gamete
- 21 Name the disease by which a person is likely to suffer due to the deficiency of Iodine.
- 22 Differentiate between
- (a) Hormones and enzymes
  - (b) endocrine glands and exocrine glands
- 23 Write the main functions of the following:
- (a) Sensory neuron
  - (b) Vertebral Column
  - (c) Motor neuron

### **Answers**

- 1 Chemical coordination takes place by the hormones which are secreted by special glands called endocrine glands.
- 2 The mechanism that controls the flow of hormones is called feedback mechanism of hormones.
- 3 Medulla is hind brain.
- 4 The growth of pollen tube towards ovule.
- 5 Axon
- 6 Spinal Cord is enclosed in a bony cage called vertebral column.
- 7
- (i) Walking in a straight line.
  - (ii) Picking up a thing from ground.
- 8
- (i) Hind Brain

(ii) Hind Brain

(iii) Fore Brain

(iv) Fore Brain

9 A reflex arc is a neural path way that controls a reflex action.

*Reflex arcs have evolved in animals, in order to perform quick responses, as the thinking process of brain is not fast enough.*

10

Cerebrum	Spinal Cord
<i>It contains cell bodies of neurons outside and axons of the neuron inside.</i>	<i>It contains axons outside and cell bodies inside.</i>

11 *It means that Deficiency of hormone is also not good as well as excess of hormone is also not good. For example, Deficiency of growth hormone causes dwarfism. Excess secretion of growth hormone causes gigantism.*

12 *In a case of spinal cord injury, signals for reflex action and involuntary action will get disrupted. Reflex actions are monitored and controlled through the spinal cord of nervous system and not by the brain. In fact, nerves from all over the body meet in a bundle in the spinal cord on their way to the brain. In case of any injury to spinal cord, the signal coming from nerves as well as signals coming to the receptors will be disrupted.*

13

<i>Involuntary Action</i>	<i>Reflex Action</i>
<i>They involve autonomous nervous system.</i>	<i>They involve all parts of voluntary nervous system</i>
<i>They usually occur in response to internal stimuli.</i>	<i>They operate against harmful stimuli which are generally external and may cause injury.</i>
<i>They are connected with functioning of internal body parts.</i>	<i>They are connected with emergency.</i>
<i>They are regulated by medulla(hind brain)</i>	<i>Reflex action is generally controlled by spinal cord.</i>
<i>The speed of response is slower than reflex action.</i>	<i>The speed of response is very fast.</i>
<i>Example: beating of heart muscle.</i>	<i>Example: Removal of hand with jerk when someone touches a hot object accidentally.</i>

14

<i>Nervous Control</i>	<i>Hormonal Control</i>
<i>Information is passed as electrochemical conduction</i>	<i>Information is sent as a chemical substance through the blood stream.</i>
<i>Regulates metabolism</i>	<i>Cannot regulate metabolism</i>
<i>Information travels rapidly; in milliseconds</i>	<i>Information travel slowly</i>
<i>Response is rapid</i>	<i>It is slow</i>
<i>Its effects are short lived</i>	<i>Its effects are generally more prolonged</i>

15

<i>Movement in sensitive plant</i>	<i>Movement in legs</i>
------------------------------------	-------------------------

<i>It occurs in response to an external stimulus like touch and shock</i>	<i>It occurs in response to our requirement and is determined by will</i>
<i>Plant cells change shape by changing the amount of water ( turgor changes)</i>	<i>Movement in our legs is voluntary action which is controlled by cerebellum part of hind-brain.</i>
<i>No nerves are involved</i>	<i>Nerves carry the message for movement of legs</i>
<i>It is controlled by plant hormones.</i>	<i>It is controlled by nerves and cerebellum part of hind-brain.</i>

16 (a) Pituitary

(b) Pancreas

(c) Adrenal

(d) Testes

17 Nervous and muscular tissues.

18 The phenomenon of regulation of flowering and germination of seeds by photoperiodic stimulus is called photoperiodism.

19

(i)

<i>Tropic Movements</i>	<i>Nastic Movements</i>
<i>It is movement of a plant(or its specific organ) in the direction of stimulus.</i>	<i>When the movement of its neither towards nor away from the stimulus, it is called nastic movement</i>
<i>Example: Downward movement of roots in response to gravitational force</i>	<i>Example: Bending and drooping of ' touch-me not' leaves on touching</i>

(ii)

<i>Phototropism</i>	<i>Photoperiodism</i>
<i>It is the movement of a plant in the</i>	<i>It is response of a plant regarding period</i>

<i>direction of light stimulus</i>	<i>of light available. It is with respect to flowering and germination of seeds.</i>
<i>No pigment is required for phototropism</i>	<i>A very small quantity pigment phytochrome is necessary for photoperiodic response.</i>
<i>When unidirectional (light) stimulus is applied plant shows phototropism. Thus, the direction of stimulus is very important.</i>	<i>Plants show response to the stimulus, duration of light available.</i>

- 20      (i)      *Phototropism*
- (ii)      *Geotropism*
- (iii)      *Chemotropism*

21      *Goitre*

<i>Hormones</i>	<i>Enzymes</i>
<i>They are produced by ductless glands</i>	<i>They are produced by glands which have ducts.</i>
<i>Hormones may be other than proteins e.g. steroids , amines</i>	<i>These are always proteinic in nature.</i>
<i>They are specific chemical messengers which act on specific tissue or organ.</i>	<i>They are biocatalysts which regulate the rate of biochemical reaction.</i>

<i>Endocrine glands</i>	<i>Exocrine Glands</i>
<i>These glands do not have ducts and pour their secretions directly into the blood.</i>	<i>These glands have ducts which carry their secretions at the site of action.</i>
<i>They secrete chemical messengers called hormones.</i>	<i>They secrete biocatalysts called enzymes.</i>
<i>Their secretions (hormones) help in control and coordination of the body.</i>	<i>Their secretions (enzymes) help in catalyzing biochemical reactions (mostly digestion of food.)</i>

- 23
- (i) To pass information from receptors to brain
  - (ii) Bony box which protects the Spinal Cord.
  - (iii) To transmit information from brain or spinal cord to effector organ.

## **UNIT 8. HOW DO ORGANISMS REPRODUCE**

### **Section A**



Q1. "The offsprings produced by asexual reproduction are referred to as clones". Why?

Q2. Mention the site where syngamy occurs in amphibians and reptiles respectively.

Q3. Unicellular organisms are immortal, whereas multicellular organisms are not.

Justify.

Q4. Banana crop is cultivated by farmers without sowing of seeds. Explain how the plant is propagated?

Q5. Write two adaptations in animals exhibiting external fertilisation?

Q6. In the list of organisms given below, those that reproduce by the asexual method are

(i) Banana (ii) dog (iii) yeast (iv) Amoeba

(a) (ii) and (iv)

(b) (i), (iii) and (iv)

(c) (i) and (iv)

(d) (ii), (iii) and (iv)

**Q7.** In Rhizopus, tubular thread-like structures bearing sporangia at their tips are called

(a) filaments

(b) hyphae

(c) rhizoids

(d) roots

Q8. Length of pollen tube depends on the distance between

(a) pollen grain and upper surface of stigma

(b) pollen grain on upper surface of stigma and ovule

(c) pollen grain in anther and upper surface of stigma

(d) upper surface of stigma and lower part of style

Q9. Is the chromosome number of zygote, embryonal cells and adult of a particular organism always constant? How is the constancy maintained in these three stages?

Q10. Reproduction is linked to stability of population of a species. Justify the statement.

**Q11. Which of the following statements are true for flowers?**

(i) Flowers are always bisexual

(ii) They are the sexual reproductive organs

(iii) They are produced in all groups of plants

(iv) After fertilisation they give rise to fruits

(a) (i) and (iv)

(b) (ii) and (iii)

(c) (i) and (iii)

(d) (ii) and (iv)

**Q12. Which among the following is not the function of testes at puberty?**

(i) formation of germ cells

(ii) secretion of testosterone

(iii) development of placenta

(iv) secretion of estrogen

(a) (i) and (ii)

(b) (ii) and (iii)

(c) (iii) and (iv)

(d) (i) and (iv)

**Q13. The correct sequence of organs in the male reproductive system for transport of sperms is**

(a) testis – vasdeferens - urethra

(b) testis - ureter - urethra

(c) testis - urethra - ureter

(d) testis – vasdeferens - ureter

**Q14. Offspring formed as a result of sexual reproduction exhibit more variations because**

(a) sexual reproduction is a lengthy process

(b) genetic material comes from two parents of the same species

(c) genetic material comes from two parents of different species

(d) genetic material comes from many parents

**Q15. Which among the following statements are true for sexual reproduction in flowering plants?**

(i) It requires two types of gametes

(ii) Fertilisation is a compulsory event

(iii) It always results in formation of zygote

(iv) Offspring formed are clones

(a) (i) and (iv)

(b) (i), (ii) and (iv)

(c) (i), (ii) and (iii)

(d) (i), (ii) and (iv)

### **Section B**

Q16. Describe the layering method for artificial propagation of plants. Illustrate your answer with the help of a labelled diagram. Name any five plants which are propagated by the layering method.

Q17. (a) What changes are observed in the uterus if fertilisation does not occur?

(b) What changes are observed in the uterus subsequent to implantation of young embryo?

Q18. (a) Can you consider cell division as a type of reproduction in unicellular organisms? Give Reason.

(b) What is a clone? Why do off springs produced by asexual reproduction exhibit

*remarkable similarity?*

Q19. (a) *The yeast cell fails to multiply in water but they multiply rapidly in sugar solution. Give one reason for it.*

(b) *Why does bread mould grow profusely on a moist slice of bread but not on a dry slice of bread?*

Q20. (a) *Describe the grafting method for the artificial propagation of plants.*

(b) *Define 'stock' and 'scion'.*

Q21. (a) *What is tissue culture?*

(b) *Name any four types of ornamental plants which are being produced by tissue culture technique.*

(c) *How is micro propagation different from tissue culture?*

Q22. (a) *What is the difference between the two asexual methods of reproduction: regeneration and fragmentation.*

(b) *What is the difference between binary fission and multiple fission?*

Q23. (a) *What is meant by regeneration? Name two animals which can regenerate fully from their cut body parts.*

(b) *Explain why more complex multi cellular organisms cannot give rise to new organisms through regeneration.*

Q24. *Describe the various steps involved in the sexual reproduction in animals.*

*Provide diagram to show fertilisation of an ovum by a sperm to form a zygote.*

Q25. (a) *Write the various steps involved in the sexual reproduction in plants.*

(b) *Name two plants which reproduce by sexual reproduction method and two by asexual reproduction.*

Q26. (a) *What is puberty? Who attains puberty at an early age in human beings: male or female?*

(b) *Mention two functions each of (i) human testes, and (ii) human ovaries.*

Q27. *What are three types of methods used for birth control? Give one example of each type.*

Q28. (a) *What is the name of surgical method of birth control in human males?*

(b) *What is the name of surgical method of birth control in human females?*

(c) *Which method of contraception prevents fertilised egg from being implanted in the uterus?*

Q29. (a) *What are the sexually transmitted diseases? Give two examples of such diseases.*

(b) *What are the precautions that need to be taken to stop the sexually transmitted diseases.*

Q30. *Explain how, off springs and parents of organisms reproducing sexually have the same number of chromosomes.*

- Q31. (a) What would be the ratio of chromosome number between an egg and its zygote?  
 (b) Distinguish between a gamete and a zygote.  
 (c) Name the place of formation of zygote.
- Q32. Which structures in the human female are equivalent to the following structures in the male? (a) testes (b) vas deferens (c) penis.
- Q33. (a) What is meant by 'unisexual flowers' and 'bisexual flowers'? Give two examples of each.  
 (b) Describe the process of double fertilisation.  
 (c) Describe the post fertilisation changes in a flower.
- Q34. (a) What changes are seen in boys at the time of puberty?  
 (b) Different between sperm and semen.  
 (c) What is the role of seminal vesicles and prostate gland in human male reproductive system?
- Q35. (a) What is ovulation? Name the hormone responsible for it.  
 (b) Explain why, not every intercourse leads to pregnancy.  
 (c) What joins embryo to placenta in mother's body?

### **Section C**

- Q36. There are four tiny organisms A, B, C and D. The organism A is a parasitic protozoan which causes kala-azar. The organism B is a microscopic single-celled animal which causes malaria disease in human beings. The organism C is a unicellular animal which can change its body shape according to the need, it has no fixed shape. The organism D is also a unicellular animal which is slipper-shaped having a large number of tiny hairs all around its body.
- (a) Name all the organisms.  
 (b) Name one characteristic body feature of organism A.  
 (c) Name the insect which carries organism B and transmits it from one person to another.  
 (d) What name is given to asexual method of reproduction of (i) organism A, and (ii) organism B?  
 (e) Where do organisms C and D live?
- Q37. Two very small organisms X and Y both reproduce by the method of budding. Organism X is industrially very important because it is used in making alcohol from sugar. It is also used in making bread. Organism Y lives in freshwater. If organism Y gets cut into a number of parts accidentally, each cut part can grow to form complete organism.
- (a) What are organisms X and Y?

- (b) What is the name of the process in which X converts sugar into alcohol?
- (c) To which class of organism does X belong?
- (d) Name an important body feature of organism Y
- (e) Which organism is multicellular and which one is unicellular?

Q38. When a broken piece of the stem of a plant X is planted in the soil, a new plant grows from it in a week's time. The leaves of plant X also have many small entities Y in their margins which can fall to the ground alone or along with leaves and grow into new plants.

- (a) Name a plant which X could be.
- (b) What are the entities Y?
- (c) Name a plant other than X which can be reproduced from its leaves.
- (d) Name a common plant grown in many homes which can be propagated from its broken stems like plant X.
- (e) Name the kind of dormant organs present in dry stems of old grass plants lying in the fields which get activated and produce green grass plants after the rains.

Q39. What is placenta? Mention its role during pregnancy.

Q40. A thickened underground stem X of a plant which is swollen with stored food has a number of points Y on its surface. When the old stem X is planted in the soil of a field in the next growing season, then each point Y present on its surface grows into a new plant.

- (a) What is the general name of the underground stem like X?
- (b) Give one example of X.
- (c) What are points Y present on X known as?
- (d) Is it necessary to plant the whole of stem X in the ground to obtain its new plants?

Explain.

- (e) What is the name of this method of reproduction?

Q41. Reproduction is essentially a phenomenon that is not for survival of an individual but for the stability of a species. Justify.

Q42. When the branches of a plant growing in the field are pulled towards the ground and a part of them is covered with moist soil (leaving the tips of the branches exposed above the ground), then after some time new roots develop from the parts of branches buried in soil. On cutting these branches from the parent plant, new plants are produced from the cut parts of branches which had developed roots.

- (a) What is the method of propagation of plants known as?
- (b) What type of branches should a plant have to be able to propagate by this

method?

- (c) Name any two such plants which are grown for their flowers.
- (d) Name any two such plants which are grown for their fruits.
- (e) Name one plant which gets propagated by this method naturally by forming runners.

Q43. A flask shaped organ A at the centre of a flower is surrounded by a number of little stalks B having swollen tops which lie just inside the ring of petals.

- (a) Name A; what are the various parts of A?
- (b) Which part of A contains gametes?
- (c) Name B. What is the swollen top of B known as?
- (d) What does the top of B contain?
- (e) Out of A and B, which one is (i) male part, and (ii) female part of the flower?

Q44. In the surgical method of birth control available for males, the structures A in the reproductive system are cut and ligated at both ends. This prevents the reproductive cells B from coming out from the organs C where they are made in the male body.

Since B cannot come out from the male body, they cannot fuse with cell D in the body of a female and hence pregnancy is prevented.

- (a) What are structures A?
- (b) What are cells B?
- (c) Name the organ C
- (d) what is cell D?
- (e) what is the name of this surgical procedure?

Q45. Distinguish between pollination and fertilisation. Mention the site and product of fertilisation in a flower.

Draw a neat, labelled diagram of a pistil showing pollen tube growth and its entry into the ovule.

Q46. A, B and C are three common STDs. A and C are caused by bacteria whereas B is caused by a virus D. The virus D reduces the immunity of the infected person to such a low level that the person can die of even very mild diseases.

- (a) What could A and C be?
- (b) What is B?
- (c) Name the virus D.
- (d) How can A, B and C be caused?
- (e) Out of A, B and C, which one does not have a definite cure as yet?

Q47. The germ cell A produced by a person X is round in shape and it fuses with another germ cell B having a long tail and produced by a person Y. The fusion of A and B produces a new cell C. The cell C divides repeatedly and grows inside the organ D of person X to form E in which the body features of the unborn baby are not much

developed. *E* grows further to form *F* in which the various body features of the unborn

baby can be identified. *F* grows further and ultimately forms a baby.

(a) What are *A*, *B*, *C*, *D*, *E*, and *F*?

(b) Out of the two persons *X* and *Y*, which one is male and which one is female?

Q48. When a fertilised egg *E* formed in the oviduct of a human female divides repeatedly to form an embryo, the embryo gets implanted in the thick and soft lining of the uterus.

After this a disc-like special tissue *T* develops between the uterus wall and embryo

through which all the requirements of the developing embryo are met from the mother's

body. The embryo is connected to the tissue *T* through a string like structure *S*.

(a) What is the other name of fertilised egg cell *E*?

(b) What is the name of tissue *T*?

(c) Name the string like structure *S*.

(d) Name two substances which pass from mother's blood to embryo through tissue *T* and, one type of substance which passes from embryo to mother's blood.

(e) What happens to *S* when the baby is born?

Q49. When a human female reaches a certain age then vaginal bleeding occurs for a few days after regular time intervals.

(a) What is the process known as (i) in scientific terms. Describe the hormonal changes during this process.

(b) Name the onset of the process and what does this signify?

(c) At which particular event in the life of human female this process stops temporarily but starts again?

Q50. In a bisexual flower, in spite of the young stamens being removed artificially, the flower produces fruit. Explain.

## **ANSWERS**

### **Section A**

A1. During asexual reproduction, there is no fusion of gametes and a single parent divides and re divides to produce the off springs. Hence, the off springs are morphologically and genetically similar to the parents and therefore referred to as clones.

A2. In amphibians, it occurs in the medium of water i.e. external fertilisation.

In reptiles, it occurs inside the body of the female animals, i.e. internal fertilisation.

A3. Since single celled organisms reproduce by cell division, there is no natural death

*for them, they are considered immortal. In multi cellular organisms, reproduction occurs in specialised organs involving specialised cells, their body as a whole dies due to ageing and senescence.*

*A4. In banana, the modified underground stem is called rhizome. Small plantlets arise from the buds present in the nodes and tips of branches, when come in contact with the damp soil or water. These plantlets are then separated and grown as new individual plants.*

*A5. (i) There is great synchrony between the two sexes, i.e. they release the mature gametes simultaneously.*

*(ii) They release a large number of gametes in the surrounding medium (water) to enhance the chances of syngamy.*

*A6. Option b*

*A7. Option b*

*A8. Option b*

*A9. Yes; the zygote, embryonal cell and the adult individual are diploid cellular organisms. They all have arrived from the zygote through the process of mitosis.*

*A10. Sexual reproduction occurs as a result of genetic recombination which often leads to mutation, variation and eventually the variation that confers the maximum survival advantage leads to natural selection and evolution which increases the chances of more stability.*

*A11. Option d*

*A12. Option c*

*A13. Option a*

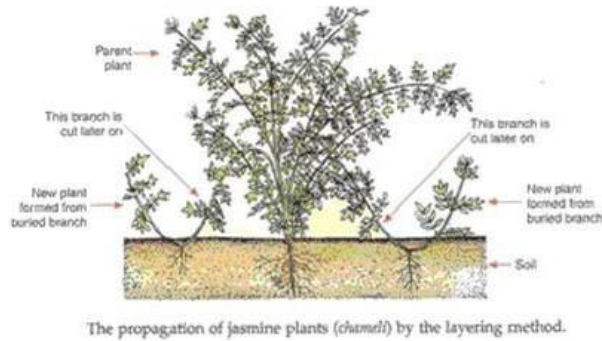
*A14. Option b*

*A15. Option c*

### **Section B**

*A16. Layering – In this method, a branch of the plant is pulled towards the ground and the part of it is covered with moist soil leaving the tip of the branch exposed above the ground. After some time, new roots develop from the part of the branch buried in the soil. The branch is then cut off from the parent plant. The part of the plant which has developed roots grows to become a new plant. The layering method is used for the propagation of plants like Jasmine, Strawberry, Raspberry, Lemon and Guava.*





A17. (a) If fertilisation does not occur, the thickened inner mucus lining (endometrial layer) of the uterus shreds off along with the ovum and blood by the process of menstruation over a period of 4-5 days.

(b) As soon as implantation occurs, the thickened mucus lining (endometrial layer) of the uterus is maintained for pregnancy; a flat tissue called placenta develops which provides nutrients, oxygen to the embryo and takes the waste products of the same.

A18. (a) Yes, because it leads to the formation two daughter cells.

(b) The new organisms produced by one parent through asexual reproduction (which are genetically identical to the parent) are called clones. The offspring's formed by asexual reproduction exhibit remarkably similarity because the replication of DNA in the cells is done by certain biochemical reactions which synthesise more of genetic material. When the DNA already present in the nucleus of the parent cell is replicated by making more DNA at the time of asexual reproduction then slight variations come in the two copies formed. Due to this the two DNA molecules formed will be similar but not identical.

A19. (a) Water does not provide any energy to the yeast cells. So, yeast cells fail to multiply in water due to inadequate energy in its cells. Sugar provides energy to them to carry out reproduction by multiplying rapidly.

(b) Moisture is necessary for the growth of bread mould. The moist slice of bread provides both moisture and nutrients due to which bread mould grows profusely. On the other hand, the dry slice of bread provides nutrients but no moisture. So, in the absence of moisture, bread mould does not grow on the dry slice of bread.

A20. (a) In grafting, two plants are chosen which are used as scion and stock. First the stem is removed from the plant chosen to be made scion by giving a slanting cut. The scion is placed over the stock and is fitted together by binding tightly by a piece of

cloth or plastic sheet. The cut soon heals and the stock and scion of two plants grow together to become one plant.

(b) The cut stem of a plant having roots is called stock and the cut stem of the other plant without roots is called scion.

A21. (a) The production of new plants from a small piece of plant tissue (or cells) removed from the growing tips of a plant in a suitable growth medium is called tissue culture.

(b) Orchids, dahlia, carnation, chrysanthemum.

(c) Tissue culture can create a plant directly, whereas micropropagation must use tissue cultures to create a new plant.

A22. (a) Fragmentation is when an organism is split into fragments, and each fragment grows into complete, individual organisms that are clones of the original organism.

Regeneration is the process of regrowth that organisms that allows for partial or complete regrowth of tissue after a damaging event.

The difference is that fragmentation specifies two parts each growing into complete organisms, but regeneration is simply a general process of regrowth. Few species are capable of fragmentation, but ALL species undergo regeneration, to varying degrees.

(b) **Binary Fission:** An organism is divided into two individuals. Mitotic division takes place resulting in two identical individuals or daughter cells. e.g., Amoeba.

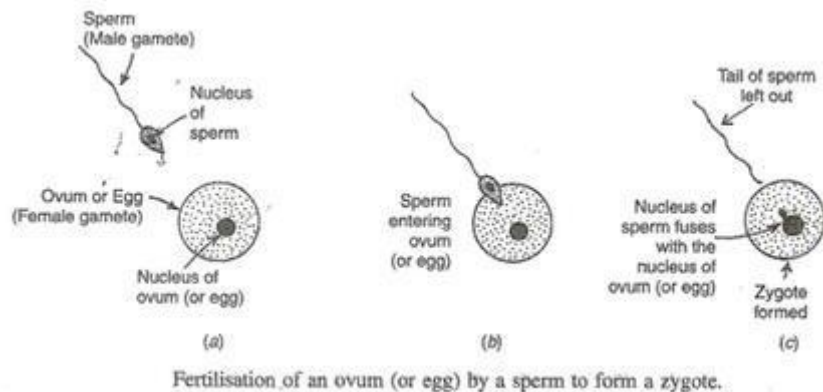
**Multiple Fission:** Mitotic division takes place. The nucleus divides repeatedly to form a number of equal sized and similar individuals. e.g., Plasmodium

A23. (a) The process of getting back a full organism from its body parts is called regeneration. The two animals which can regenerate fully from the cut body parts are Planaria and Hydra.

(b) In complex multi cellular organisms, specialized cells make up tissues; tissues make up organs; organs make up organ systems and finally organ systems make up organisms. Since complex Multi cellular organisms have a high degree of organisation in their body, they cannot be reproduced from their cut body parts by the process of regeneration.

A24. The sexual reproduction in animals takes place in the following steps: (i) The male parent produces male gamete called sperms. The sperm is a small cell with a long tail (flagellum) for movement.

- (ii) The female parent produces female gamete called ova which is much bigger cell than the sperm, having a lot of cytoplasm.
- (iii) The sperm enters into the ovum and fuses with it to form a new cell called zygote and this process is called fertilisation.
- (iv) The zygote then divides again and again to form a large number of cells and ultimately the zygote grows and develops to form a baby.



- A25. (a) The sexual reproduction in plants takes place in the following steps: (i) The male organ of flower called 'stamen' makes the male gametes of the flower. These male gametes are present in pollen grains. (ii) The female organ of a flower called 'carpel' makes the female gametes present in the ovules and are called ova or egg. (iii) The male gametes present in the pollen grains fertilises the female gametes or egg cells present in the ovules. (iv) The fertilised egg cells grow within ovules and become seeds. (v) The seeds produce new plants on germination.
- (b) Sexual reproduction: Wheat plant and sunflower plant;  
Asexual reproduction: Ferns and mosses.

- A26. (a) The age at which the sex hormones begin to be produced and the boy and girl become sexually mature (able to reproduce) is called puberty. Females attain puberty at an age of 10-12 years.
- (b) (i) The function of testes is to make sex cells called sperms and to make sex hormone called testosterone. (ii) The function of the ovaries is to make mature female sex cell called ova or egg and also to make female sex hormones called oestrogen and progesterone.

- A27. Birth control could be achieved in the following ways-

#### **Barrier Method**

This method involves putting up a barrier between the male and the female sex

cells (sperms and ova). It blocks the sperms from reaching the ovary, thus preventing fertilization. The barrier method can be used by both men and women.

Women could use items like the contraceptive sponge, diaphragm, female condom, cervical shield or cervical cap to prevent the sperm reaching the egg.

### **Hormonal Method**

The hormonal method of birth control interferes with the hormonal balance in a woman's body in order to hamper fertilization, ovulation or fertilized egg implantation. It could be done with the help of contraceptive pills, estrogen and progestin-releasing patches or vaginal rings. Birth control injections are also available nowadays.

### **Intrauterine Devices (IUD)**

Intrauterine devices or IUDs are small T-shaped devices that are planted in the uterus. There are two types of IUDs.

- **Copper IUD**– Releases small amounts of copper in the uterus which prevents sperms from reaching the ovary.
- **Hormonal IUD**– Releases progestin in the body which prevents the formulation of eggs.

### **Surgical Methods**

Both men and women could be surgically operated to become infertile. For women, the process is called Tubal ligation and for men, it is called Vasectomy. In tubal ligation, the fallopian tube is either cut or sealed so that eggs do not reach the uterus at all. Vasectomy involves the cutting and sealing of the Vas deferens so that sperms do not enter the ejaculation stream.

A28. (a) Vasectomy. (b) Tubectomy. (c) IUCD (Copper – T).

A29. (a) The diseases which are spread by sexual contact with an infected person are called Sexually Transmitted Diseases. Example: Aids, Syphilis.

(b) Sexually Transmitted Diseases are the infectious diseases that are transmitted during unprotected sexual intercourse from infected partner. Example: bacterial infections like gonorrhoea and syphilis, and viral infections like warts and HIV-AIDS. STD caused by bacteria infection (e.g., chlamydia, gonorrhea, and syphilis) are treatable with antibiotics. To prevent STDs, the following precautions can be taken.

- (i) Practices involving protected sexual intercourse reduce the risk in STD.
- (ii) Avoid multiple sex partners and maintain personal hygiene.

A30. The offsprings and parents of organisms reproducing sexually have same number of chromosomes due to reduction division (meiosis) during gamete formation which reduces the number of chromosomes into half in both male and

female gametes. During fertilisation when male and female gametes fuse the original numbers of chromosomes as in parents is restored in the offspring.

A31. (a) 1:2.

(b) Gamete Gamete represents the sex cell or germ cell in sexual reproduction and it is of two types: Male gametes (Sperm) and Female gamete (Egg). Zygote is the product of fertilization in which a male and a female gamete fuse with each other.

(c) Fallopian Tube

A32. (a) Ovaries in female; both make gametes. (b) Oviducts in females; both transport gametes. (c) Vagina in female; Both are copulatory organs

A33. (a) The flowers which contain only one sex organ, either stamens or carpels are called unisexual flowers like Papaya and watermelon plants. The flowers which contain both the sex organs i.e. both the stamen and the carpel are called bisexual flowers like Hibiscus and Mustard plant.

(b) When a pollen grain falls on the stigma of the carpel, it bursts open and grows into a pollen tube downwards through the style towards the female gamete in the ovary. A male gamete moves down the pollen tube and enters the ovule in the ovary. The tip of the pollen tube bursts open and male gamete comes out of the pollen tube which combines with the nucleus of the female gamete present in the ovule to form a fertilised egg called zygote.

(c) After fertilisation all the whorls of the flower shed away except the ovary. The ovary ripens to form the fruit; the ovules inside the ovary form the seed.

A34. (a) The changes observed in boys during puberty are: Hair grows under armpits, pubic region between the thighs, chest and face. Body becomes more muscular due to the development of muscles. The voice deepens. Chest and shoulder broaden. The penis and testes become larger. Feelings and sexual drives associated with adulthood begin to develop.

(b) Sperm is the motile microscopic male reproductive cell which is transmitted into the female reproductive system through a process of sexual intercourse.

On the other hand the seminal fluid is white, slightly grey or yellow in colour.

(c) The secretions of seminal vesicles and prostate gland provide nutrition to the sperms and also make their transportation easier by secreting a thick liquid.

A35. (a) The release of an ovum from an ovary is called ovulation. In human females

the

hormone is Oestrogen

(b) Fertilisation is possible if mating takes place during the middle of menstrual cycle because in a normal healthy girl the ovulation takes place on the 14th day of the beginning of menstrual cycle of 28 days.

(c) Umbilical cord.

### **Section C**

A36. (a) A – Leishmania, B – Plasmodium, C – Amoeba, D – Paramecium

(b) A has a whip like structure called flagellum at its one end

(c) Female Anopheles mosquito.

(d) (i) Binary fission (ii) Multiple fission

(e) in pond water

A37. (a) X is yeast and Y is hydra

(b) fermentation

(c) fungi

(d) Y has tentacles

(e) Y – multicellular, X – unicellular

A38. (a) Bryophyllum

(b) Buds

(c) Begonia

(d) Money plant

(e) Buds

A39. The placenta is a disk like tissue formed by uterus wall as some embryonic part.

Placenta is, therefore a special tissue of two individual). It is made up of finger like projection or villi of embryonal tissue, which are present on blood filled spaces of mother's tissue (uterine wall). Villi, like intestinal villi, provide a large surface area for

exchange of material between the mother's blood and the embryo.

1. through placenta the developing embryo gets oxygen and nutrients like glucose.

2. waste generated by the embryo are transferred to mother's blood through this placenta.

3. Embryo/foetus get some immune power against diseases from mother through this placenta.

A40. (a) Stem tubers

- (b) *Potato tuber*
- (c) *eyes or buds*
- (d) *No; even cut pieces of X can be planted in soil to obtain new plants provided each cut piece has a bud on it.*
- (e) *vegetative propagation*

*A41. For survival, an individual needs energy which it obtains from life processes such as nutrition and respiration. Reproduction does not provide energy for survival. Instead, reproduction ensures transfer of genetic material from one generation to the next which helps in continuation of species. Hence, it is an important phenomenon for maintaining continuity of species.*

*A42. (a) layering*

- (b) *slender branches*
- (c) *Jasmine and China Rose*
- (d) *Lemon and Guava*
- (e) *Strawberry*

*A43. (a) A is carpel (or pistil); stigma, style and ovary.*

- (b) *Ovary*
- (c) *B is stamen; Anther*
- (d) *Pollen grains*
- (e) *(i) B (ii) A*

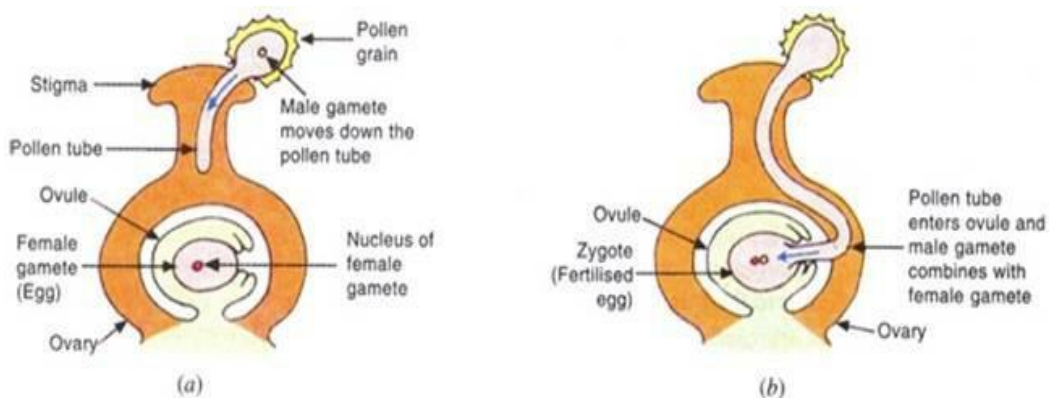
*A44. (a) Sperm ducts (Vas deferens)*

- (b) *sperms*
- (c) *Testes*
- (d) *Egg cell (ovum)*
- (e) *Vasectomy*

*A45. Difference between pollination and fertilization:*

Pollination	Fertilization
The transfer of pollen grains from the anther of a flower to the stigma of the same or another flower is known as pollination.	The fusion of male and female gametes to form zygote is known as fertilisation.
It is a physical process; no new substance is formed.	It is a biological process in which a new structure called zygote is formed.
It is two types- self-pollination and cross-pollination.	The modes of fertilisation in nature are internal fertilisation and external fertilisation.

*Ovary is the site of fertilization and embryo is the product of fertilization. The following figure shows fertilization in plant:*





- A46. (a) Syphilis and Gonorrhoea  
 (b) AIDS  
 (c) HIV  
 (d) by sexual contacts with infected persons  
 (e) B(AIDS)
- A47. (a) A is ovum; B is sperm; C is zygote; D is uterus; E is embryo; F is foetus  
 (b) Y is male; X is female
- A48. (a) Zygote  
 (b) Placenta  
 (c) Umbilical cord  
 (d) from mother's blood to embryo – Oxygen and nutrients; from embryo to mother's blood – wastes  
 (e) S (Umbilical cord) is tied and then cut; to separate the new born from the mother
- A49. (a) Menstruation; menstrual cycle is a 28day cycle with ovulation happening on the 14<sup>th</sup> day. Follicle Stimulating Hormone (FSH) secreted from the pituitary gland stimulates the ovary to secrete Oestrogen and thickening of the endometrial layer of the uterus. When ovulation happens on the 14<sup>th</sup> day, Oestrogen is at its peak and the production stops. At the same time LH (from the pituitary gland) is also at its peak. This causes the release of Progesterone which is required to sustain the pregnancy.  
 (b) Menarche; it signifies that the human female has reached puberty and the body has started the process of sexual maturation.  
 (c) Beginning of pregnancy.
- A50. Though stamens have been removed but the female organ 'carpel' of the flower is intact. Cross-pollination has occurred in this flower leading to the formation of fruit.

## **UNIT 9. HEREDITY AND EVOLUTION**

**QUESTIONNO1. Choose the most appropriate answer from the given choice of answers :**

1. Two pea plants, one with round green seeds (RRyy) and another with wrinkled yellow (rrYY) seeds produce F<sub>1</sub> progeny that have round, yellow (RrYy) seeds. When F<sub>1</sub> plants are selfed, the F<sub>2</sub> progeny will have new combination of characters. Choose the new combination from the following.

- (i) Round, yellow
  - (ii) Round, green
  - (iii) Wrinkled, yellow
  - (iv) Wrinkled, green
    - (a) (i) and (ii)
    - (b) (i) and (iv)
    - (c) (ii) and (iii)
    - (d) (i) and (iii)
2. A basket of vegetables contains carrot, potato, radish and tomato. Which of them represent the correct homologous structures?
- (a) Carrot and potato
  - (b) Carrot and tomato
  - (c) Radish and carrot
  - (d) Radish and potato
3. If the fossil of an organism is found in the deeper layers of earth, then we can predict that
- (a) The extinction of organism has occurred recently
  - (b) The extinction of organism has occurred thousands of years ago
  - (c) The fossil position in the layers of earth is not related to its time of extinction
  - (d) Time of extinction cannot be determined
4. Which of the following statements is not true with respect to variation?
- (a) All variations in a species have equal chances of survival.
  - (b) Change in genetic composition results in variation.
  - (c) Selection of variants by environmental factors forms the basis of evolutionary processes.
  - (d) Variation is minimum in asexual reproduction.
5. According to the evolutionary theory, formation of a new species is generally due to
- (a) Sudden creation by nature
  - (b) Accumulation of variations over several generations
  - (c) Clones formed during asexual reproduction
  - (d) Movement of individuals from one habitat to another
6. From the list given below, select the character which can be acquired but not inherited
- (a) Colour of eye
  - (b) Colour of skin
  - (c) Size of body
  - (d) Nature of hair
7. Select the statements that describe characteristics of genes
- (i) Genes are specific sequence of bases in a DNA molecule
  - (ii) A gene does not code for proteins

- (iii) *In individuals of a given species, a specific gene is located on a particular Chromosome*
  - (iv) *Each chromosome has only one gene*
  - (a) *(i) and (ii)*
  - (b) *(i) and (iii)*
  - (c) *(i) and (iv)*
  - (d) *(iii) and (iv)*
8. **Question. 23** *The number of pair(s) of sex chromosomes in the zygote of humans is*
- (a) *One*
  - (b) *Two*
  - (c) *Three*
  - (d) *Four*
9. **Question. 25** *Some dinosaurs had feathers although they could not fly but birds have feathers that help them to fly. In the context of evolution this means that*
- (a) *Reptiles have evolved from birds*
  - (b) *There is no evolutionary connection between reptiles and birds*
  - (c) *Feathers are homologous structures in both the organisms*
  - (d) *Birds have evolved from reptiles*
10. *Which of the following is totally impossible outcome of Mendel's Experiment?*
- a. *3 tall 1 short plant*
  - b. *24 tall and 8 short plants*
  - c. *8 tall and 0 short plants*
  - d. *4 tall plants and 1 medium height plant.*
11. *Which of the following is not a direct conclusion that can be drawn from Mendel's experiment?*
- a. *Only one parental trait is expressed*
  - b. *Two copies of each trait is inherited in sexually reproducing organism*
  - c. *For recessive trait to be expressed, both copies should be identical*
  - d. *Natural selection can alter frequency of an inherited trait.*
12. *Which one is a possible progeny in F2 generation of pure bred tall plant with round seed and short plant with wrinkled seeds?*
- a. *Tall plant with round seeds*
  - b. *Tall plant with wrinkled seeds*
  - c. *Short plant with round seed*
  - d. *All of the above*
13. *Which section of DNA provides information for one protein*
- a. *Nucleus*
  - b. *Chromosomes*

- c. Trait
  - d. Gene
14. Which of the following is not controlled by genes?
    1. Weight of a person
    2. Height of a person
    - a. only 1    b. only 2
    - c. both 1 and 2
    - d. sometimes 1 and sometimes 2
  15. What is the probability that the male progeny will be a boy?
    - a. 50%
    - b. 56%
    - c. 47.43%
    - d. It varies
  16. Who have a perfect pair of sex chromosomes?
    - a. Girls only
    - b. Boys only
    - c. Both girls and boys
    - d. It depends on many other factors
  17. With whom you can associate theory of evolution?
    - a. Charles Darwin
    - b. Mendel
    - c. Stanley miller
    - d. Harold Urey
  18. Which of the following can be called a characteristic?
    - a. Plants can photosynthesis
    - b. We have 2 eyes
    - c. Mango tree is multicellular
    - d. All of these
  19. Homologous organ have
    - a. Same structure, same function
    - b. Different structure, different function
    - c. Same structure, different function
    - d. different structure, same function
  20. Exchange of genetic material takes place in
    - (a) Vegetative reproduction    (b) Asexual reproduction    (c) Sexual reproduction
    - (d) Budding

QUESTION NO . 2

**ANSWER IN ONE WORD OR IN ONE SENTENCE**

- I) Which of the processes, sexual reproduction or asexual reproduction, bring about maximum variations in the offsprings?
- II) Name one variation in humans connected with ears.
- III) If the 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?
- IV) Mendel said that the characteristics or traits of organisms are carried from one generation to the next by internal factors which occur in pairs. What is the modern name for these factors?
- V) The gene for red hair is recessive to the gene for black hair. What will be the hair colour of a person if he inherits a gene for red hair from his mother and a gene for black hair from his father?

**QUESTION NO.3**

Fill in the following blanks with suitable words :

- (a) Genes always work in .....
- (b) In pea plants, the gene for dwarfness is ..... whereas that for tallness is .....
- (c) Most people have ..... earlobes but some have ..... earlobes.
- (d) A human gamete contains ..... chromosomes whereas a normal body cell has ..... chromosomes in it.
- (e) All races of man have ..... blood groups.
- (f) The ..... chromosomes for a ..... are XX whereas that for a ..... are XY.

**QUESTION NO.4 ( THREE MARK QUESTIONS )**

- I) Explain with an example, how genes control the characteristics (or traits).
- II) (a) State one advantage of variation to a species.  
(b) What are sex chromosomes? How many sex chromosomes are there? Name them.
- III) (a) What is the genotype of dwarf plants which always produced dwarf offspring?  
(b) What is the genotype of tall plants which always produced tall offspring?  
(c) What is the genotype of (i) dwarf plants, and (ii) tall plants, whose parental cross always produces tall offspring?
- IV) (a) If a normal human cell has 46 chromosomes, how many chromosomes will be there in a human (i) sperm cell, and (ii) zygote?  
(b) What sizes of plants are produced if both parents have genes Tt?

- V) (a) How do Mendel's experiments show that traits may be dominant or recessive?  
 (b) How do Mendel's experiments show that traits are inherited independently?
- VI) (a) Define 'speciation'. Explain how speciation occurs.  
 (b) Will geographical isolation be a major factor in the speciation of a self-pollinating plant species? Give reason for your answer.

QUESTION NO. 5 (FIVE MARKS QUESTIONS )

- I) There are five animals A, B, C, D and E. The animal A uses its modified forelimbs for flying. The animal B uses its forelimbs for running whereas the animal C uses its forelimbs for grasping. The animal D can live on land as well as in water and uses its forelimbs to prop up the front end of its body when at rest. The animal E which respire by using spiracles and tracheae uses wings for flying but its wings are analogous to the modified forelimbs of animal A.
- (a) What could the animals A, B, C, D and E be?  
 (b) Why are the forelimbs of animals A, B, C and D called homologous organs?
- (c) What does the existence of homologous organs in animals A, B, C and D tell us about their ancestors ?  
 (d) Why are the modified forelimbs of animal A and the wings of animal E called analogous organs?  
 (e) State whether animals A and E have a common ancestor or not.
- II) X, Y, and Z are three animals. The animal X can fly but animal Y can only run on ground or walls. The forelimbs of animals X and Y have the same basic design but they are used for different purposes such as flying and running respectively. The animal Z became extinct a long time ago. The study of fossils of Z tells us that it had some features like those of X and some like those of Y. In fact, Z is said to form a connecting link in the evolutionary chain of X and Y.
- (a) What could the animals X, Y and Z be?  
 (b) What name is given to the forelimbs like those of X and Y which have the same basic design but different functions?  
 (c) Name one feature in which Z resembled X.  
 (d) Name one feature in which Z resembled Y.  
 (e) Which is the correct evolutionary chain involving X, Y and Z :  $X \rightarrow Z \rightarrow Y$  or  $Y \rightarrow Z \rightarrow X$ ?
- III) A population of red beetles lives in green bushes in a garden. Once during the process of breeding, a green beetle is produced.
- (a) State whether the change in colour of beetle is a process of evolution or

not.

(b) Can the new colour of green beetle be passed on to its next generations?

(c) What will be the advantage (if any) of the green colour to the beetle?

(d) State whether the production of green colour involved a change in genetic material or not.

IV) The organs P and Q of two animals have different structures but similar functions. On the other hand, the two organs R and S of two other animals have the same basic structure but different functions.

(a) What are the organs like P and Q known as?

(b) Name the organs like P and Q. Also name the animals which have such organs.

(c) What are the organs like R and S called?

(d) Name the organs like R and S. Also name the animals which have such organs.

### Answers

#### QUESTION NO1. Choose the most appropriate answer from the given choice of answers

∴

1. . (b)

**Explanation:** The new combination in  $F_2$  progeny will be offspring showing phenotype other than aren't ones (round and green; wrinkled yellow). Hence, the recombinant progeny will be one with round yellow and wrinkled green seeds.

2. (c) **Explanation:** Homologous organs perform different functions and have different appearance but share common basic structural plan and origin

3. (b)

**Explanation:** Depth of each stratum signifies the relative age of fossils present in it. The deeper the stratum, the older the rock and the fossils present in it.

4. (a)

**Explanation:** Variations that impart reproductive or survival advantage to organisms are being favoured during evolution.

5. (b)

**Explanation:** Accumulation of variations over several generations serve as raw material on which evolutionary force (natural selection) acts upon to create new species.

6. (c)

**Explanation:** Environmentally determined traits are acquired. Size of body

*depends on nutritional status, health conditions etc.*

**(b)**

**Explanation:** Genes are stretches of DNA located on specific locus on a particular chromosome in individuals of a given species.

7. **(a)**

**Explanation:** Zygote is diploid structure and has one pair of sex chromosome (XX or XY).

8. **(d)**

**Explanation:** Development of flight feathers in reptilian ancestors of birds lead to evolution of birds (Aves).

9. **(d)**

**Explanation:** Development of flight feathers in reptilian ancestors of birds lead to evolution of birds (Aves).

10. **d** d. 4 tall plants and 1 medium height plant.

11. d. Natural selection can alter frequency of an inherited trait.

12. d. All of the above

13. d. Gene

14. a. only 1

15. a. 50%

16. a. Girls only

17. a. Charles Darwin

18. d. All of these

19. c. Same structure, different function

20. **(c)**

**Explanation:** Sexual reproduction involves meiosis in gamete mother cells to form gametes and fusion of male and female gametes into zygote.

QUESTION NO . 2

ANSWER IN ONE WORD OR IN ONE SENTENCE

- i) Maximum variations in the offsprings occur in the process of sexual reproduction.
- ii) In ears, free earlobes and attached earlobes are an example of variation in humans.
- iii) Trait B is likely to have arisen earlier, as it is prevalent in a greater proportion in the population.



- iv) The modern name of these factors is genes.
- v) The hair colour of the person will be black because the gene for red hair is recessive compared to black.

### QUESTION NO. 3

Fill in the blanks:

- (a) Genes always work in pairs.
- (b) In pea plants, the gene for dwarfness is recessive, whereas that for tallness is dominant.
- (c) Most people have free earlobes but some have attached earlobes.
- (d) A human gamete contains 23 chromosomes, whereas a normal body cell has 46 chromosomes in it.
- (e) All races of man have different blood groups.
- (f) The sex chromosomes for a female are XX, whereas that for a male are XY.

### QUESTION NO 4 ( THREE MARK QUESTIONS )

- I) A gene is the section of DNA on a chromosome that codes the formation of a protein controlling a specific characteristic of the organism.  
Suppose, a plant progeny possesses gene for the characteristic called 'tallness'. The gene for tallness will give instructions to the plant cells to generate many plant-growth hormones due to which the plant will grow tall. On the other hand, if the plant has the gene for shortness, less plant-growth hormones will be produced, due to which the plant will not grow much and remain a dwarf plant.
- II) (a) The one advantage of variation to a species is that it increases the chances of the species' survival in a changing environment.  
(b) The chromosomes that determine the sex of a person are called sex chromosomes. There are two types of sex chromosomes, the X chromosome and the Y chromosome.
- III) (a) *tt* is the genotype of dwarf plants which always produces a dwarf offspring.  
(b) *TT* is the genotype of tall plants which always produces a tall offspring.  
(c) (i) *tt* is the genotype of dwarf plants; and,  
(ii) *TT* is the genotype of tall plants. The parental cross of (ii) always produces a tall offspring.
- IV) a) (i) A sperm cell will have half the number of chromosomes than present in a normal cell. Hence, the number of chromosomes present in it will be 23.  
(ii) Number of chromosomes in a zygote will be same as present in a normal cell. Hence, the number of chromosomes present in it will be 46.  
(b) Tall and dwarf plants will be produced in the ratio 3:1.
- V) (a) Mendel crossed pure-bred tall pea plants with pure-bred dwarf pea plants

and found that only tall pea plants were produced in the  $F_1$  generation. From this, Mendel concluded that the  $F_1$  generation showed the traits of only one of the parents: tallness. The trait of other parent plant, dwarfness, did not show in the progeny of the first generation. When tall pea plants of the first generation were crossed, then in  $F_2$  generation, tall plants and dwarf plants were obtained in the ratio 3:1.

From these experiments, Mendel concluded that the trait for dwarfness of one of the parent pea plant had not been lost. It was merely concealed or suppressed in the first generation to reemerge in the second generation.

(b) Mendel chose two contrasting characters: shape and colour of seeds. The pea plants had round-yellow seeds and wrinkled green seeds. Mendel first crossed pure-bred pea plants with round-yellow seeds with pure-bred pea plants having wrinkled-green seeds and found that only round-yellow seeds were produced in the first generation. From this, he concluded that round shape and yellow colour of the seeds were dominant traits over the wrinkled shape and green colour of the seeds. When the  $F_1$  generation pea plants with round-yellow seeds were cross-bred by self pollination, then four types of seeds with different combinations of shape and colour were obtained in the  $F_2$  generation. Mendel observed that he had started with two combinations of characteristics in seeds and two new combinations of characteristics had appeared in the  $F_2$  generation i.e. round-green and wrinkled-yellow. On the basis of this observation, Mendel concluded that though the two pairs of original characteristics combine in the  $F_1$  generation, they separate and behave independently in subsequent generations.

- VI) (a) The process by which new species develop from the existing ones is known as speciation. Speciation occurs when the population of the same species splits into two separate groups, which then get isolated from each other geographically by barriers such as mountain ranges, rivers or the sea. The geographical isolation of the two groups of population lead to their reproductive isolation due to which no genes are exchanged between them. However, breeding continues within the isolated populations producing more and more generations. Over the generations, the processes of genetic drift and natural selection operate in different ways in the two isolated groups of population and make them more and more different from each other. After thousands of years, the individuals of these isolated groups of population become so different that they will be incapable of reproducing with each other, even if they happen to meet again. In this way,

*two new species have been formed.*

*(b) Geographical isolation cannot be a major factor in the speciation of self-pollinating plant species, as it does not have to look to other plants for its process of reproduction to be carried out.*

**QUESTION NO. 5( FIVE MARKS QUESTIONS )**

- I) *There are five animals A, B, C, D and E. The animal A uses its modified forelimbs for flying. The animal B uses its forelimbs for running whereas the animal C uses its forelimbs for grasping. The animal D can live on land as well as in water and uses its forelimbs to prop up the front end of its body when at rest. The animal E which respire by using spiracles and tracheae uses wings for flying but its wings are analogous to the modified forelimbs of animal A.*
- (a) What could the animals A, B, C, D and E be?*
- (b) Why are the forelimbs of animals A, B, C and D called homologous organs?*
- (c) What does the existence of homologous organs in animals A, B, C and D tell us about their ancestors ?*
- (d) Why are the modified forelimbs of animal A and the wings of animal E called analogous organs?*
- (e) State whether animals A and E have a common ancestor or not.*
- II) *(a) X is birds, Y is reptiles and Z is Archaeopteryx.*
- (b) Forelimbs like those of X and Y are called homologous organs.*
- (c) X and Z had feathers.*
- (d) Z had teeth and tail like Y.*
- (e) The correct evolutionary sequence is  $Y \rightarrow Z \rightarrow X$ .*
- III) *(a) It is a process of evolution.*
- (b) The green colour of the beetle is an inherited trait, which can be passed on to the next generation.*
- (c) It helps in survival of green beetle as it can mixing with green bushes, and hide from predators.*
- (d) The production of green colour has been brought about by a change in the DNA of the reproductive cells.*
- IV) *(a) Organs P and Q are known as analogous organs.*
- (b) Wings of an insect and a bird are like P and Q.*
- (c) Organs R and S are called homologous organs.*
- (d) Forelimbs of humans and wings of birds are like R and S.*

### **UNIT 10 -LIGHT: REFLECTION AND REFRACTION**

1. *Draw a labelled diagram to show the path of reflected ray corresponding to an incident ray of light, parallel to principal axis of a convex mirror. Mark the angle of incidence and angle of reflection on it.*
2. *Draw a labelled diagram to show the path of reflected ray corresponding to ray which is directed towards principal focus of a convex mirror. Mark the angle of reflection on it.*
3. *When a ray of light passes from a denser medium to rarer medium which angle is greater: angle of incidence or angle of refraction? Justify your answer.*
4. *What will happen to a ray of light when it falls normally on a surface?*
5. *Sonali is standing in front of a magic mirror. She finds the image of her head bigger, the middle portion of her body of the same size and that of the legs smaller. The following is the order of combinations for the magic mirror from the top.*

*(a) Plane, convex and concave*  
*(c) Concave, plane and convex*

*(b) Convex, concave and plane*  
*(d) Convex, plane and concave*
6. *Wavelength of radiation 850nm falls on a surface. Will this surface be visible or not? Explain.*
7. *Why does a coin dipped in water appear to be raised when it is viewed obliquely?*
8. *One half of convex lens is covered with the black paper yet the lens produces the complete image. Why?*
9. *A converging lens is kept coaxially with the diverging lens, both the lenses of being equal*

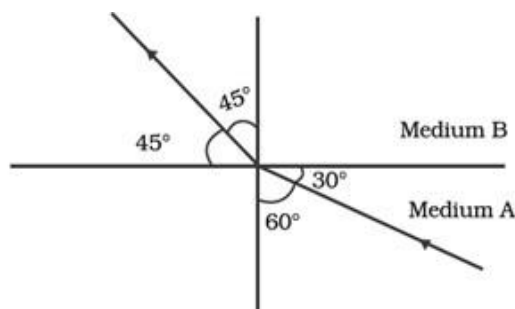
*focal length. What is focal length of combination?*

10. *Refractive indices of kerosene, turpentine and water are 1.44, 1.47 and 1.33 respectively. Through which of these media light travels fastest? Justify your answer.*
11. *How the power and focal length of a lens are related? You are provided with two lenses of focal lengths 20cm and 40cm respectively. Which lens will you use to obtain more convergent light?*
12. *Why does a light ray incident on the rectangular slab immersed in any medium emerge parallel to itself?*
13. *A spherical mirror produces image of magnification - 1 on screen placed at a distance of 50cm from mirror.*
  - a) *Write the type of mirror.*
  - b) *Find the distance of image from object.*
  - c) *Write the focal length of mirror.*
  - d) *Draw a ray diagram to show image formation.*
14. *It is desired to obtain an erect image of an object using concave mirror of focal length 15cm.*
  - a) *What will be the range of distance of an object placed in front of mirror?*
  - b) *Will the image be smaller or larger than the object? Draw a ray diagram to show the image formation.*
  - c) *Where will the image of this object be, if object is placed 30cm in front of mirror? Draw the diagram for the same.*
15. *How is the refractive index of a medium related to speed of light? Obtain an expression for refractive index of a medium with respect to another in terms of speed of light in these two media.*
16. *Explain why a ray of light passing through the centre of curvature of a concave mirror, gets reflected along the same path?*
17. *Which of the following can make a parallel beam of light when light from a point source is incident on it?*
  - (a) *Concave mirror as well as convex lens*
  - (b) *Convex mirror as well as concave lens*
  - (c) *Two plane mirrors placed at  $90^\circ$  to each other*
  - (d) *Concave mirror as well as concave lens*

18. A 10 mm long pin is placed vertically in front of a concave mirror. A 5 mm long image of the pin is formed at 30 cm in front of the mirror. The focal length of this mirror is

- (a) – 30 cm                      (b) – 20 cm                      (c) – 40 cm                      (d) – 60 cm

19. Figure shows a ray of light as it travels from medium A to medium B. Refractive index of the medium B relative to medium A is

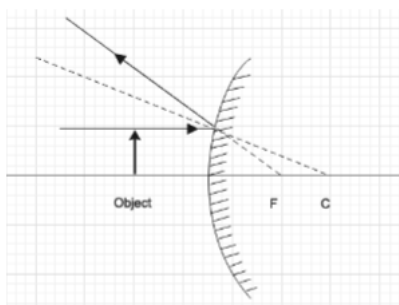


- (a)  $\frac{\sqrt{3}}{2}$                       (b)  $\frac{\sqrt{2}}{\sqrt{3}}$                       (c)  $\frac{1}{\sqrt{2}}$                       (d)  $\sqrt{2}$

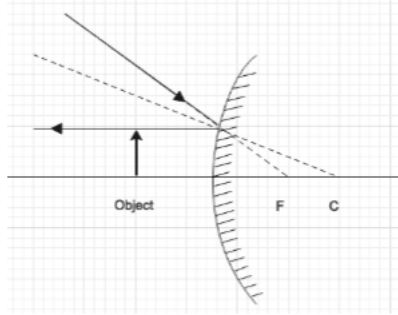
20. Refractive index of diamond with respect to glass is 1.6 and absolute refractive index of glass is 1.5. Find out the absolute refractive index of diamond.

### ANSWERS

A1.



A2.



A3. Angle of refraction, because speed of light increases in rarer medium so it bends away from the normal.

A4. No bending of light ray occurs. It means the light ray goes straight from one medium to another.

A5. **(c) Explanation:** Her head appears large; it means concave mirror of large focal length is used at the top. Her middle body appears of the same size in the mirror. It means plane mirror is used in the middle. Her legs appear smaller. It means convex mirror is used below plane mirror.

A6. The surface is not visible since the radiation incident is more wavelength than visible range,

i.e., the incident radiation is an infrared radiation which is invisible.

A7. This is due to the phenomenon of refraction of light. When a Ray of light moves from air to water it bend towards the normal and then suffers reflection at the coin. To an observer this appears to come from a raised position.

A8. When one half of a convex lens is covered with a black paper, the lens will produce the complete image because the light rays incident on the other part of the lens will converge and form the image though the intensity and brightness of image is reduced..

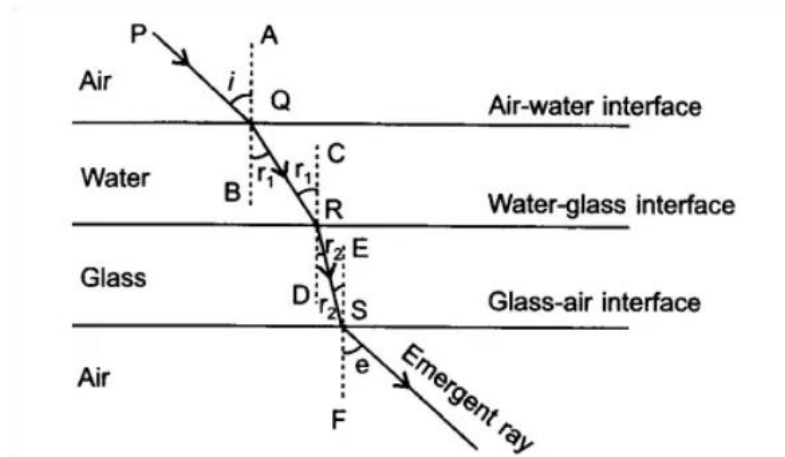
A9. Focal length of the combination will be infinity. ( $1/F = 1/f_1 + 1/f_2 = 1/f + 1/(-f) = 0$ ). F is infinity.

A10.  $v = c/n$ . Where  $n$  is refractive index of medium,  $c$  is speed of light and  $v$  is the speed of light in medium. Since refractive index of water is least so light travels fastest in it.

A11. Power of a lens is defined as the reciprocal of the focal length.

So the lens of 20cm focal length will converge more.

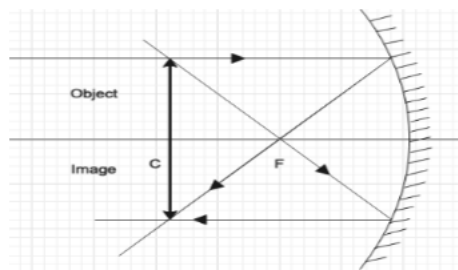
- A6. Due to variation in speed of light in different medium, light bends as it moves from one medium to another. Since, there are two surfaces for refraction which are parallel, the light ray should bend in opposite sense in them equally, so emergent ray is always parallel to the incident ray.



- A8. a) As magnification is negative, hence the image is real. So, mirror is concave.  
 b)  $m = -v/u = -1$ .  $v = u = 50$  cm.  
 c) Since Object at C i.e. at 50 cm, so  $f = C/2 = 50/2 = 25$  cm OR

Using mirror formula,  $1/f = 1/v + 1/u = 1/(-50) + 1/(-50) = -1/25$ . So,  $f = 25$  cm.

d)



a) Range is 0-15

b) Obtained image

Then the real ↓

cm.

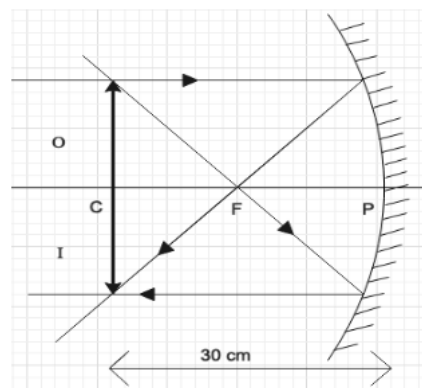
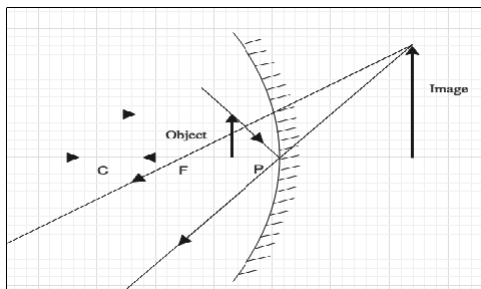
will be larger than the object.

inverted image ↓ of same size

will be formed.

c)





A9. The refractive index of a medium  $n_m$  is given by :

$$n_m = \text{speed of light in vacuum} / \text{speed of light in the medium} = c / v.$$

The refractive index of medium 1 with respect to medium 2 is given by ratio of speed of light in medium 1 to speed of light in medium 2, that is :

$$n_{21} = \text{speed of light in the medium 1} / \text{speed of light in the medium 2} = v_1 / v_2$$

A10. A ray is passing through the centre of curvature incident to mirror along the normal,

$$\text{So, } \angle i = \angle r = 0.$$

A11. (a) Explanation: When a point light source is placed at the focus of concave mirror then all light rays after reflection through mirror will become parallel to the principal axis. When this point light source is placed at the focus of convex lens then after falling on convex lens it will become parallel to the principal axis.

A12. (b) **Explanation:** Here, size of object  $= O = + 10.0 \text{ mm} = + 1.0 \text{ cm}$  (as,  $1 \text{ cm} = 10 \text{ mm}$ )

$$\text{Size of Image size} = I = 5.0 \text{ mm} = 0.5 \text{ cm}$$

$$\text{Image distance, } v = - 30 \text{ cm (as image is real)}$$

A13. Let, object distance  $= u$  Focal length,  $f = ?$

$$\text{Now, Magnification, } m = \frac{I(\text{size of image})}{O(\text{size of object})}$$

$$\text{Magnification is also give by, } m = \frac{-v}{u}$$

$$\Rightarrow \frac{I}{O} = \frac{-v}{u}$$

$$\Rightarrow \frac{0.5}{1} = \frac{-30}{u} \Rightarrow u = -60 \text{ cm}$$

$$\text{Now, by mirror formula, focal length (f) is given by, } \frac{1}{f} = \frac{1}{v} + \frac{1}{u}$$

$$\Rightarrow \frac{1}{f} = \left( \frac{1}{-30} \right) + \left( \frac{1}{-60} \right) = \frac{-2-1}{60} = \frac{-3}{60}$$

$$\Rightarrow f = -20 \text{ cm.}$$

A19. **(a) Explanation:** Here, angle of incidence  $= i = 60^\circ$

Angle of refraction  $= r = 45^\circ$

Refractive index of the medium B relative to medium A

$$= n_{BA} = \frac{\sin i}{\sin r} = \frac{\sin 60^\circ}{\sin 45^\circ} = \frac{\left( \frac{\sqrt{3}}{2} \right)}{\left( \frac{1}{\sqrt{2}} \right)} = \frac{\sqrt{3}}{\sqrt{2}}$$

A20. Let, refractive index of diamond with respect to air  $= n_{da}$  = absolute refractive index of diamond  $= 1.6$

refractive index of glass with respect to air  $= n_{ga}$  = absolute refractive index of glass  $= 1.5$

refractive index of diamond with respect to glass  $= n_{dg} = ?$

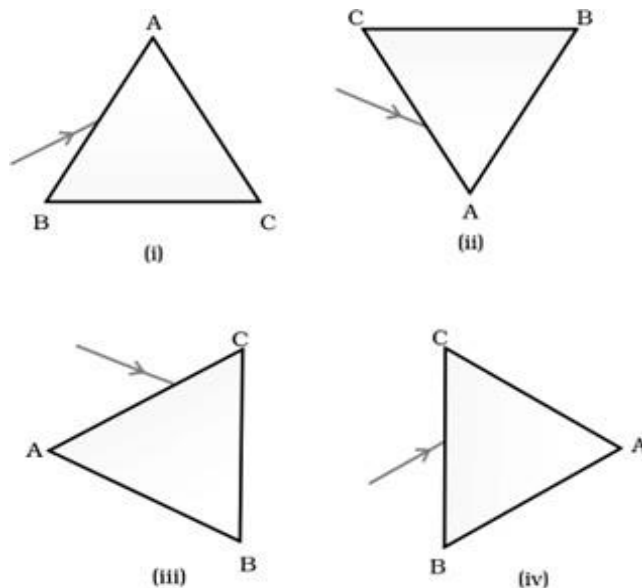
$$\text{Now, } n_{DG} = \frac{n_{DA}}{n_{GA}}$$

$$\Rightarrow n_{DA} = n_{DG} \times n_{GA}$$

$$\Rightarrow n_{DA} = 1.6 \times 1.5 = 2.4$$

### UNIT 11 : HUMAN EYE AND THE COLOURFUL WORLD

- Q1. A prism ABC (with BC as base) is placed in different orientations. A narrow beam of white light is incident on the prism as shown in figure. In which of the following cases, after dispersion, the third colour from the top corresponds to the colour of the sky?

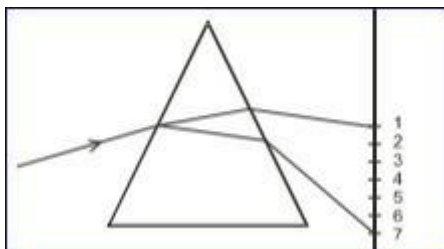


- Q2. At noon the sun appears white as  
(a) light is least scattered  
(b) all the colours of the white light are scattered away  
(c) blue colour is scattered the most  
(d) red colour is scattered the most
- Q3. The sun near the horizon appears flattened at the sun set and sun rise. Explain why.
- Q4. Explain why, when the sun is overhead at noon, it appears white?
- Q5. A person with myopic eye cannot see objects beyond 1.2 metre distinctly. What should be the nature of corrective lenses to restore proper vision?
- Q6. A beam of white light falling on a glass prism gets split up into seven colours marked 1 to 7 as shown in the diagram. A student makes the following statements about the spectrum observed on the screen:

(a) The colours at positions marked 3 and 5 are similar to the colour of the sky and the colour of gold metal respectively. Is the above statement made by the student correct or incorrect? Justify.

(b) Which two positions correspond closely to the colour of:

(i) Brinjal (ii) 'danger' or stop signal lights?



- Q7. A glass prism is able to produce a spectrum when white light passes through it but a glass slab does not produce any spectrum. Explain. Why is it so?
- Q8. The far point of a myopic the person is 80 cm in front of the eye. What is the nature and power of the lens required to correct the problem?
- Q9. The near point of a hypermetropic eye is 1m. What is the power of the lens required to correct this defect? Assume that the near point of the normal eye is 25 cm.
- Q10. Why do stars twinkle?
- Q11. Explain why the planets do not twinkle.
- Q12. Why does the Sun appear reddish early in the morning?

## ANSWERS

- A1. **(ii) Explanation:** Inverted position of prism (II) gives the same colour (blue) at third top as that of sky.
- A2. **(a) Explanation:** Sun is directly overhead and sunlight travel relatively shorter distance causing only little of the blue and violet colours to be scattered.
- A3. This is due to atmospheric refraction. The density and refractive index of the atmosphere decreases with altitude, so the rays from the top and bottom portion of the sun on horizon are refracted by different degrees. This causes the apparent flattening of the sun. But the rays from the sides of the sun on a horizontal plane are generally refracted by the same amount, so the sun still appears circular along the sides.
- A4. When the sun is overhead at noon, then the light coming from the sun has to

travel a relatively shorter distance through the atmosphere to reach us. As a result, only a little of the blue colour of the white light is scattered (most of the blue light remains in it). Since the light coming from the overhead sun has almost all its components colours in the right proportion, therefore, the sun appears white.

- A5. To correct, the object at infinity has to be brought to image at 1.2 m or

$$v = -120 \text{ cm}, \quad u = -\infty$$

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

$$\frac{1}{f} = \frac{1}{-120} - \frac{1}{\infty}$$

$$\therefore f = -120 \text{ cm}$$

$$P = \frac{100}{f} = \frac{100}{-120} = -0.83 \text{ D}$$

- A6. The position marked on number 3<sup>rd</sup> is YELLOW. Yellow is not the colour of the sky. Similarly, the position marked on number 5<sup>th</sup> is BLUE. Blue is not the colour of the core of the hard-boiled egg. Hence, the statement made by the student of no 3<sup>rd</sup> as the colour of sky and no. 5<sup>th</sup> as the colour of the core of the hard-boiled egg is incorrect.

- A7. A glass prism is able to produce a spectrum, which is a patch of light obtained due to dispersion. This is because the opposite refracting faces of a glass prism are not parallel. Thus, the incident ray is not parallel to the emergent ray and is deviated by the angle of deviation.

A glass slab is a rectangular structure in which the opposite refracting faces are parallel to each other. The result is that, the emergent is parallel to the incident ray but is literally displaced from it.

Thus, a rectangular glass slab is unable to produce a spectrum due to the refracting faces being parallel to each other.

- A8. To correct the myopia the person concerned should use concave lens (diverging lens) of suitable focal length.

For myopic eye: Far point of normal eye =  $u = \text{at infinity} \Rightarrow u = -\infty$  The virtual image is formed at the far point of myopic person  $\Rightarrow v = -80 \text{ cm}$

From lens formula,

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

$$\frac{1}{f} = \frac{1}{-80} - \frac{1}{\infty}$$

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

$$P = \frac{100}{f} = \frac{100}{-80} = -1.25 \text{ D}$$

- A9. Convex lens of suitable focal length is used for correction of hypermetropic eye. Object distance = near point of the normal eye = - 25 cm, Convex lens is used forms its virtual image at near point of hypermetropic eye  $\Rightarrow v = -1\text{m} = -100\text{ cm}$ . Using lens formula,

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

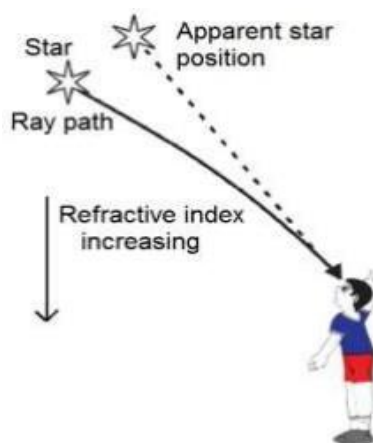
$$\frac{1}{f} = \frac{1}{-100} - \frac{1}{-25}$$

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

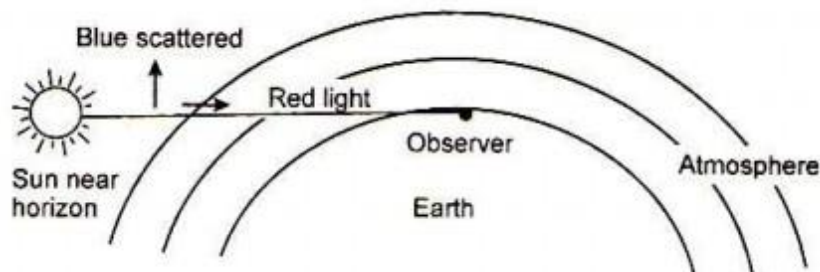
$$\therefore f = \frac{100}{3} \text{ cm} = \frac{1}{3} \text{ m}$$

$$P = \frac{1}{f} = \frac{1}{\frac{1}{3}} = 3\text{D}$$

- A10. Stars twinkle due to atmospheric refraction of starlight. The density of air varies place to place therefore, the path of rays of light coming from the star goes on varying slightly, the apparent position of the star formed randomly. Thus, the stars twinkle.



- A11. Planets are much closer to the earth so not much refraction occurs. Therefore, planets appear equally bright and there is no twinkling of planets.
- A12. In the early morning, the sun is situated near the horizon. Light from the Sun passes through thicker layers of air and cover larger distance before reaching our eyes. Therefore, blue light scattered the most and red light least. This is why the sun appears reddish early in the morning.



## **UNIT 12: ELECTRICITY**

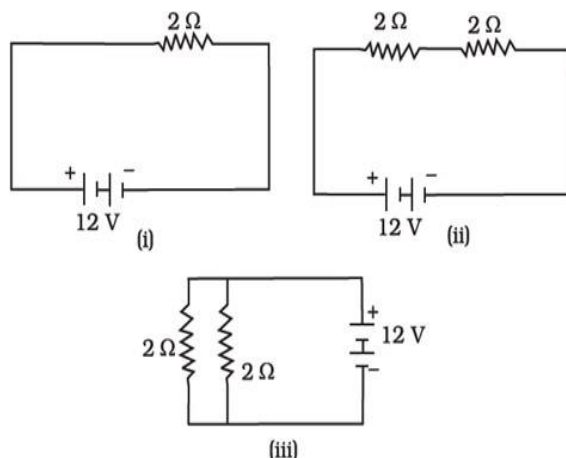
- Q1. Calculate the number of electrons constituting one coulomb of charge?
- Q2. A) Name a device that helps to maintain a potential difference across a conductor?
- B) How much energy is given to each coulomb of charge passing through a 6V battery?
- Q3. Will current flow more easily through a thick wire or a thin wire of the same material, when connected to same source? Why?
- Q4. Why are coils of electric toaster and electric irons made of an alloy rather than a pure metal?
- Q5. An electric lamp of 100 ohm, a toaster of resistance 50 ohm, and a water filter of resistance 500 ohm are connected 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 current through it?

- Q6. An electric iron consumes energy at a rate of  $840\text{W}$  when heating is at maximum rate and  $360\text{W}$  when the heating is at the minimum. The voltage is  $220\text{V}$ . What are the current and the resistance in each case?
- Q7. Why does the cord of an electric heater not glow while the heating element does?
- Q8. An electric iron of resistance  $20\text{ ohm}$  takes a current of  $5\text{ A}$ . Calculate the heat developed in  $30\text{ s}$ .
- Q9. What determines the rate at which energy is delivered by current?
- Q10. An electric motor takes  $5\text{A}$  from a  $220\text{V}$  line. Determine the power of the motor and the energy consumed in  $2\text{h}$ ?
- Q11. Show how you would connect three resistors, each of resistance  $6\text{ ohm}$ , so that the combination as has a resistance of (i)  $9\text{ohm}$  (ii)  $4\text{ohm}$ ?
- Q12. Two lamps, one rated  $100\text{W}$  at  $220\text{ V}$ , and the other  $60\text{W}$  at  $220\text{V}$ , are connected in parallel to electric main supply. What current is drawn from the line if the supply voltage is  $220\text{V}$ ?
- Q13. An electric heater of resistance  $8\text{ohm}$  draws  $15\text{A}$  from the service mains  $2\text{hrs}$ . calculate the rate at which heat is developed in the heater?
- Q14. What is (a) the highest, (b) the lowest total resistance that can be secured by combinations of 4 coils of resistance  $4\text{ ohm}$ ,  $8\text{ ohm}$ ,  $12\text{ ohm}$ ,  $24\text{ ohm}$ ?
- Q15. A wire of resistivity ' $\rho$ ' is stretched to double its length. How does it affect the  
(a) resistance (b) resistivity?
- Q16. Several electric bulbs designed to be used on a  $220\text{ V}$  electric supply line, are rated  $10\text{ W}$ . How many lamps can be connected in parallel with each other across the two wires of  $220\text{ V}$  line if the maximum allowable current is  $5\text{ A}$ ?
- Q17. Two fuse wires A and B of the same length are rated  $15\text{A}$  and  $5\text{A}$ . Which amongst the A and B will be thicker and why?



Q18. Should the resistance of an ammeter be low or high? Give reason.

Q19. In the following circuits, heat produced in the resistor or combination of resistors connected to a 12 V battery will be

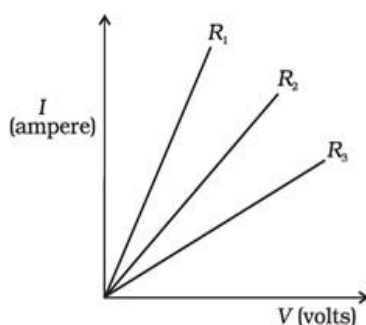


- (a) Same in all the cases                      (b) Maximum in case (i)
- (c) Maximum in case (ii)                      (d) Maximum in case (iii)

Q20. A student carries out an experiment and plots the  $V - I$  graph of three samples of nichrome wire with resistances  $R_1$ ,  $R_2$  and  $R_3$  respectively as shown in figure.

Which of the

following is true?



- (a)  $R_1 = R_2 = R_3$                       (b)  $R_1 > R_2 > R_3$                       (c)  $R_3 > R_2 > R_1$                       (d)  $R_2 > R_3 > R_1$

Q21. If the current  $I$  through a resistor is increased by 100% (assume that temperature remains unchanged), the increase in power dissipated will be

- (a) 100%                      (b) 200%                      (c) 300%                      (d) 400%

Q22. In an electrical circuit three incandescent bulbs A, B and C of rating 40W, 60 W

and 100 W, respectively are connected in parallel to an electric source. Which of the following is likely to happen regarding their brightness?

- (a) Brightness of all the bulbs will be the same
- (b) Brightness of bulb A will be the maximum
- (c) Brightness of bulb B will be more than that of A
- (d) Brightness of bulb C will be less than that of B

Q23. An Electric kettle Consumes 1 KW of electric power when operated at 220 V. A fuse wire of what rating must be used for it?

- (a) 1 A      (b) 2 A      (c) 4 A      (d) 5 A

#### ANSWERS

A1. Amount of charge on an electron,  $e=1.6 \times 10^{-19}$  C

Using  $Q=ne$ , we get,  $n=Q/e$  i.e.  $n=1/1.6 \times 10^{-19}$

$$=1/1.6 \times 10^{-19} = 6.25 \times 10^{18} \text{ electrons.}$$

A2. (a) A cell or a battery.

(b) We know that, 1 coulomb volt = 1 joule

$$1 \text{ coulomb} \times 6 \text{ volt} = 6 \text{ joule}$$

A3. Resistance  $R = \rho l/a$  i.e.  $R$  is inversely proportional to  $1/a$ .

A thicker wire has large area of cross-section ( $a$ ) so its resistance is lower. So, the current flows more easily through a thick wire.

A4. Alloys are used for making the coils in electric toaster and electric iron because

(i) Alloys have higher melting point than pure metal so the coils made from alloys don't spoil on heating.

(ii) Alloys do not oxidise readily at high temperature.

A5.  $1/R = 1/100 \text{ ohm} + 1/50 \text{ ohm} + 1/500 \text{ohm}$

$$= 5 + 10 + 1/500 \text{ ohm}$$

$$= 16/500 \text{ ohm}$$

$$R = 500 \text{ohm} / 16 = 31.25 \text{ ohm}.$$

We know that the power input is  $(P) = VI$  A6.

Thus, the current,  $I = \frac{P}{V}$

When heating is at the maximum rate,

$$I = \frac{840 \text{ W}}{220 \text{ V}} = 3.82 \text{ A}$$

and the resistance of the electric iron is

$$R = \frac{V}{I} = \frac{220 \text{ V}}{3.82 \text{ A}} = 57.59 \Omega$$

When heating is at the minimum rate,

$$I = \frac{360 \text{ W}}{220 \text{ V}} = 1.64 \text{ A}$$

and the resistance of the electric iron is

$$R = \frac{V}{I} = \frac{220 \text{ V}}{1.64 \text{ A}} = 134.15 \Omega$$

A7. *The cord of an electric heater is made of copper. Copper has low resistance, so very little heat is produced when current flows through the electric cord and it does not glow. Heating coil is made from a high resistivity material, such as nichrome. When electric current flows through it, large heat is produced and so it starts glowing.*

A8.  $\text{Heat generated} = I^2 R t = (5 \text{ A})^2 \times 20 \text{ ohm} \times 30 \text{ s} = 25 \times 20 \times 30 \text{ J} = 15000 \text{ J}$

A9. *Rate at which energy is delivered by a current is called electric power (denoted by P). It is determined by*

*i) The potential difference (denoted by V) across the conductor in volt*

*ii) The current (denoted by I) in ampere*

A10. Power,  $P = V \times I = 220V \times 5A$

$$= 1100VA = 1100W$$

$$= 1.1KW$$

Electrical energy consumed  $E = P \times t = 1.1 \times 2h = 2.2kWh$ .

A11. (A) We get 9 ohm by connecting 6 ohm and 3 ohm resistors in series. A parallel combination of two 6 ohm resistors gives 3 ohm.

(B) To get a combination of 4 ohm, we may connect two 6 ohm resistors in series and this combination to third 6 ohm in parallel.

A12. Total wattage,  $P = 100 + 60 = 160W$

Therefore, current,  $I = P/V = 160/220 = 7.27A$ .

A13. Time,  $t = 2h = 2 \times 60 \times 60s$

$$\text{Rate of heating} = I^2 R t / t = I^2 \times R = (15 A)^2 \times 8$$

$$= 225 \times 8 \text{ Js}^{-1} = 1800 \text{ Js}^{-1}$$

A14. (a) Highest resistance  $= R_1 + R_2 + R_3 + R_4 = 4\text{ohm} + 8\text{ohm} + 12\text{ohm} + 24\text{ohm} = 48\text{ohm}$ .

(b) For lowest resistance,

$$1/R = 1/R_1 + 1/R_2 + 1/R_3 + 1/R_4 = 1/4 + 1/8 + 1/12 + 1/24$$

$$= 6 + 3 + 2 + 1/24 \text{ ohm} = 12/24 \text{ ohm} = 1/2 \text{ ohm}$$

$$. \quad R = 2\text{ohm}$$

The lowest resistance of the combination  $= 2\text{ohm}$ .

A15. a) wire is stretched to double its length

So, New length of wire  $l' = 2l$

*New Area of cross section or thickness of wire  $A' = A/2$*

*New resistance  $= r = (\rho \times 2l) / (A/2) = 4\rho l / A = 4R$*

*Hence, new resistance  $= 4r$*

*(b) the resistivity is a property of a material and thus is a constant.*

*So, in this case, by increasing the length of the wire we are not altering its resistivity. It will remain the same,  $\rho$*

*A16. Resistance  $R_1$  of the bulb is given by the expression,*

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

*Maximum allowable current,  $I = 5\text{ A}$*

*Rating of an electric bulb  $P = 10\text{ watts}$*

*Because  $R = V^2 / P$*

$$R_1 = (220)^2 / 10 = 4840\ \Omega$$

*According to Ohm's law,*

$$V = I R$$

*Let  $R$  is the total resistance of the circuit for  $x$  number of electric bulbs*

$$R = V / I = 220 / 5 = 44\ \Omega$$

*Resistance of each electric bulb,  $R_1 = 4840\ \Omega$*

*According to Ohm's law,  $V = I R$*

*Let  $R$  is the total resistance of the circuit for  $x$  number of electric bulbs*

$$R = V / I = 220 / 5 = 44\ \Omega$$

*Resistance of each electric bulb,  $R_1 = 4840\ \Omega$*

$$\therefore \text{Number of electric bulbs connected in parallel} = 4840 / 44 = 110$$

*A17. The wire A with 15 A rating is thicker. It is because, thicker the wire, less is the resistance and hence it can carry more current.*

*A18. The resistance of an ammeter should be low. This is because an ammeter is connected in series with the circuit for the measurement of electric current. In case, its resistance is high, then some amount of current may be lost in heating it*

leading to the inaccurate reading. An ideal ammeter is one which has zero resistance.

- A19. (d) Net resistance in case (i) =  $R_1 = 2\Omega$   
 Net resistance in case (ii) =  $R_2 = 2 + 2 = 4\Omega$   
 Net resistance in case (iii) =  $\frac{1}{R_3} = \frac{1}{2} + \frac{1}{2} \Rightarrow R_3 = 1\Omega$   
 Since,  $H = \frac{(\text{Potential difference}) V^2}{(\text{Total Resistance}) R} \times (\text{time})$ , as voltage in the three cases for equivalent resistance is same.  
 So,  $H \propto \frac{1}{R}$ . Now, value of net resistance is minimum in case (iii), so heat produced will be maximum.

- A20. (c) Slope of VI graph is proportional to  $1/\text{Resistance}$ . It means when slope will be maximum, then resistance will be minimum.  
 From the figure, we can see that, slope of  $R_1$  is maximum; hence its resistance will be minimum.  
 As, slope of  $R_3$  is minimum so, its resistance will be maximum.  
 Therefore,  $R_3 > R_2 > R_1$

- A21. C) If  $I$  is current and  $R$  is resistance then, Power,  $P = I^2 R$   
 Power in first case,  $P_1 = I^2 R$  100% increase in current means that current becomes  $2I$

Power in second case,  $P_2 = (2I)^2 R = 4I^2 R$  Now,  
 increase in dissipated power =  $P_2 - P_1 = 4I^2 R - I^2 R = 3I^2 R$   
 Percentage increase in dissipated power =  $3P_1/P_1 \times 100 = 300\%$

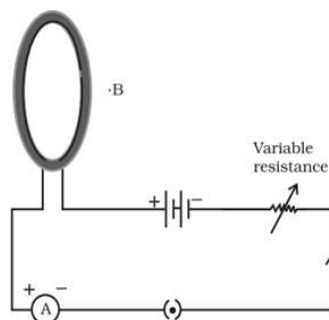
- A22. C) We know that power is defined as rate of doing work. A bulb consumes electric energy and produces heat and light. Now, bulb with more power rating will produce more heat and light or we can say that  
 Power rating of bulb is directly proportional to the brightness produced by bulb.  
 Therefore, brightness of bulb B with power rating 60 W will be more than the brightness of bulb A having power rating as 40W.

- A23. **(d)** Here, power =  $P = 1 \text{ KW} = 1000 \text{ W}$   
Voltage =  $V = 220 \text{ V}$   
Current =  $I = ?$   
Now,  $I = P/V = 1000/220 = 4.5 \text{ A}$   
Now rating of fuse wire must be slightly greater than 4.5 A i.e., 5 A.

### **UNIT 13: MAGNETIC EFFECTS OF CURRENT**

- Q1. If we pass AC current through a magnet, what will happen?
- Q2. Choose the incorrect statement from the following regarding magnetic lines of field
- (a) The direction of magnetic field at a point is taken to be the direction in which the North Pole of a magnetic compass needle points
  - (b) Magnetic field lines are closed curves
  - (c) If magnetic field lines are parallel and equidistant, they represent zero field strength
  - (d) Relative strength of magnetic field is shown by the degree of closeness of the field lines

- Q3. A circular loop placed in a plane perpendicular to the plane of paper carries a current when the key is ON. The current as seen from points A and B (in the plane of paper and on the axis of the coil) is anti-clockwise and clockwise respectively. The magnetic field lines point from B to A. The N-pole of the resultant magnet is on the face close to

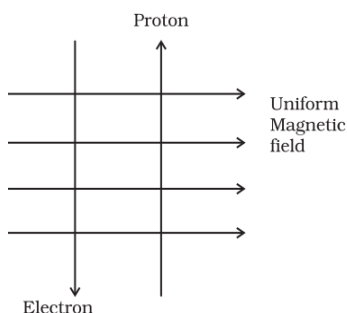


- (a) A                      (b) B
- (c) A if the current is small and B if the current is large
- (d) B if the current is small and A if the current is large
- Q4. A uniform magnetic field exists in the plane of paper pointing from left to right as shown in figure. In the field an electron and a proton move as shown. The electron and the proton experience.

- (a) Forces both pointing into the plane of paper
- (b) Forces both pointing out of the plane of paper

(c) Forces pointing into the plane of paper and out of the plane of paper,

(d) Force pointing opposite of the uniform magnetic

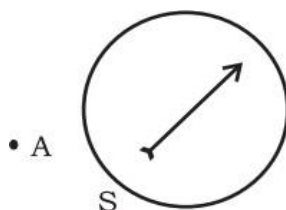


plane of paper and out respectively

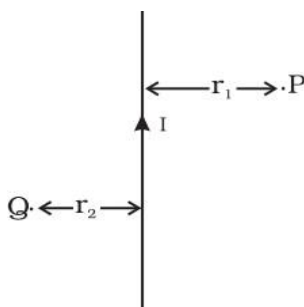
and along the direction of the field respectively



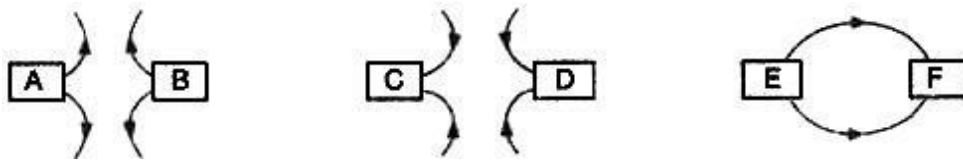
- Q5. A magnetic compass needle is placed in the plane of paper near point A as shown in figure. In which plane should a straight current carrying conductor be placed so that it passes through A and there is no change in the deflection of the compass? Under what condition is the deflection maximum and why?



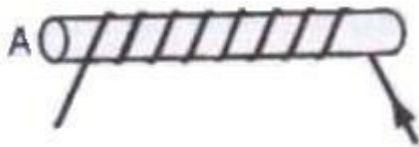
- Q6. AB is a current carrying conductor in the plane of the paper as shown in figure. What are the directions of magnetic fields produced by it at points P and Q? Given  $r_1 > r_2$ , where will the strength of the magnetic field be larger?



- Q7. It is established that an electric current through a metallic conductor produces a magnetic field around it. Is there a similar magnetic field produced around a thin beam of moving (i) alpha particles, (ii) neutrons? Justify your answer.
- Q8. The three diagrams in the following figure show the lines of force (field lines) between the poles of two magnets. Identify the poles A, B, C, D, E and F.



Q9. The figure shows a solenoid wound on a core of soft iron. Will the end A be a N pole or S pole when the current flows in the direction shown?



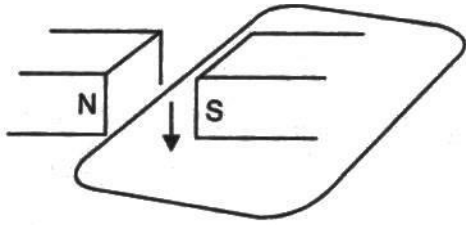
Q10. The directions of current flowing in the coil of an electromagnet at its two ends X and Y are as shown below:



- (a) What is the polarity of end X?
  - (b) What is the polarity of end Y?
  - (c) Name and state the rule which you have used to determine the polarities.
- Q11. The magnetic field associated with a current-carrying straight conductor is in anticlockwise direction. If the conductor was held along the east-west direction, what will be the direction of current through it? Name and state the rule applied to determine the direction of current?
- Q12. State two ways in which the current induced in the coil of a generator could be increased.
- Q13. (a) What is the difference between alternating current and direct current?
- (b) What type of current is given by (i) a dry cell, and (ii) a Power House

generator?

- Q14. *In what respect does the construction of an A.C. generator differ from that of a D.C. generator?*
- Q15. (a) *What do you understand by the terms 'direct current' and 'alternating current'?*  
(b) *Name some sources of direct current and some of alternating current.*  
(c) *State an important advantage of alternating current over direct current.*  
(d) *What is the frequency of A.C. supply in India?*
- Q16. *The wire in Figure below is being moved downwards through the magnetic field so as to produce induced current.*



*What would be the effect of:*

- (a) *moving the wire at a higher speed?*  
(b) *Moving the wire upwards rather than downwards?*  
(c) *Using a stronger magnet?*  
(d) *Holding the wire still in the magnetic field?*  
(e) *Moving the wire parallel to the magnetic field lines?*
- Q17. *What is the electric potential of the neutral wire in a mains supply cable?*
- Q18. *If fuses of 250 mA, 500 mA, 1 A, 5 A and 10 A were available, which one would be the most suitable for protecting an amplifier rated at 240 V, 180 W?*
- Q19. *What is the maximum number of 60 W bulbs that can be run from the mains supply of 220 volts if you do not want to overload a 5 A fuse?*
- Q20. *Three appliances are connected in parallel to the same source which provides a*

voltage of 220 V. A fuse connected to the source will blow if the current from the source exceeds 10 A. If the three appliances are rated 60 W, 500 W and 1200 W at 220 V, will the fuse blow?

- Q21. (a) Explain why, it is more dangerous to touch the live wire of a mains supply rather than the neutral wire .  
(b) Why is it safe for birds to sit on naked power lines fixed atop tall electric poles?

### ANSWERS

- A1. *It will get demagnetized*
- A2. **(c)** *Parallel and equidistant magnetic field lines represent uniform and constant field strength.*
- A3. **(a)** *When we see from point A, the direction of current will be anticlockwise and when we see the direction of current from point B then it will be clockwise. It means current is flowing as shown in the figure given below.*  
*By right-hand thumb rule, the magnetic field lines will enter from point B and come out from point A. As, the magnetic field lines emerge from North Pole and merge at the South Pole outside the magnet.*

*Hence, in this circuit face A represents North pole and face B represents south pole.*

- A4. **(a)** *Direction of current is taken as opposite to the flow of electron or in the direction of flow of protons.*  
*In the given figure, the proton and electron are moving in opposite direction to each other and in perpendicular to the direction of magnetic field. So, current due to both electron and proton are in same direction. Hence, the forces acting on both will be in the same direction. By Fleming's left hand rule the direction force is pointing into the plane of paper.*

- A5. We know that when the magnetic field and the direction of current are perpendicular to each other, the deflection is maximum. But when they are in the same plane, no deflection takes place. If we place the current carrying conductor in the plane of paper such that it passes through A then, the field produced by it is perpendicular to the plane of paper and parallel to the vertical axis of compass needle. As a result there will be no change in the deflection of compass needle. Deflection in compass needle will be maximum when the conductor passes through A and is perpendicular to the plane of paper.
- A6. By applying Right-hand thumb rule, the direction of Magnetic field is into the plane of the paper at P and coming out from the plane of paper at the point Q. The magnitude of magnetic field  $B$  is inversely proportional to distance  $r$ . Now  $r_1 > r_2$ , or point Q is closer than point P, so the magnetic field is stronger at point Q and weaker at point P.
- A7. Magnetic field is produced by a current carrying conductor due to the motion of charge particles or electron.
- (i) As, alpha particles are positively charged so their movement will also produce magnetic field.
- (ii) Neutrons do not carry any charge so their motion will not produce any magnetic field
- A8. A=N; B=N; C=S; D=S; E=N; F=S
- A9. End A will be a S-pole because current flows in the clockwise direction at A.
- A10. (a) End X is S-pole (because current flows in clockwise direction).
- (b) End Y is N-pole (because current flows in anticlockwise direction).
- (c) Clock face rule - Looking at the face of a loop, if the current around that face is in anticlockwise direction, the face has north polarity, while if the current at that face is in clockwise direction, the face has south polarity.
- A11. The direction of current will be from east to west.

*We have applied Maxwell's right hand thumb rule here.*

*According to Maxwell's right hand thumb rule: Imagine that you are grasping the current-carrying wire in your right hand so that your thumb points in the direction of current, then the direction in which your fingers encircle the wire will give the direction of magnetic field lines around the wire.*

*A12. Two ways in which the current induced in the coil of a generator could be increased are:*

*(i) by rotating the coil faster*

*(ii) by using a coil with a larger area*

*A13. (a) The difference between AC and DC is that DC flows in one direction only while AC reverses direction after equal intervals of time.*

*(i) DC current remains same with time in its value and direction.*

*(ii) AC current changes with time and changes its direction every time after a certain interval of time.*

*(b) (i) DC (ii) AC*

*A14. Construction-wise, the only difference between a D.C. generator and an A.C. generator is in the way the two ends of the generator coil are linked to the outer circuit. In a D.C. generator we connect the two ends of the coil to a commutator consisting of two half rings of copper. In an A.C. generator we connect the two ends of the coil to two full rings of copper called slip rings. There is no commutator in an A.C. generator.*

*A15. (a) If the current flows in one direction only, it is known as direct current; and if the current reverses direction after equal intervals of time, it is called alternating current.*

*(b) Source of DC are dry cell, car battery, DC generator etc.*

Source of AC are AC generator, bicycle dynamos etc.

(c) An important advantage of AC over DC is that AC can be transmitted over long distances without much loss of electrical energy.

(d) 50Hz

A16. (a) Current increased

(b) Current reversed

(c) Current increased

(d) Zero current

(e) Zero current

A17. Zero volt

A18.  $P = VI$

$$I = P/V = 180/240 = 0.75A$$

The fuse wire should be such that it is able to withstand only a little more current than 0.75A. So the fuse of 1A is the most suitable.

A19. Let the maximum number of bulbs be  $y$ .

Power of  $y$  bulbs,  $P=60y$

$$V=220V, I=5A$$

We know that

$$P = VI$$

$$60y = 220 \times 5$$

$$60y = 1100$$

$$y=18.33$$

So, number of bulbs required are 18.

A20.  $P_1=60\text{ W}$ ,  $P_2=1200W$ ,  $P_3=500W$

Fuse rating = 10A

$$V=220V$$

We have,  $P=VI$

$$\text{Total power}=60+1200+500=1760W$$

$$\text{Therefore, } 1760=220 \times I$$

$I=8A$

The required current is 8A and fuse rating is 10A. So, all the appliances will work normally and the fuse will not blow.

- A21. (a) It is more dangerous to touch the live wire rather than the neutral wire because live wire has a high potential of 220V, whereas neutral wire has zero potential.
- (b) Bird's body is not connected to the earth, so no current flows through its body into the earth. So, it is safe for birds to sit on naked power lines fixed atop tall electric poles.

## **UNIT 14: SOURCES OF ENERGY**

- Q1. Why is there a need for harnessing non-conventional sources of energy? How can energy be harnessed from the sea in different ways?
- Q2. Out of two solar cookers, one was covered and the other one was left open. Which one of the two will be more efficient and why?
- Q3. The surface area of concentrator type solar heater is  $5m^2$ . It can reflect 80% of solar radiation incident while it absorbs the rest. Calculate energy concentrated by heaters as it focus in 2 hours if solar energy was delivered to it at the rate of  $0.4 \text{ kJ/m}^2\text{s}$
- Q4. List three energy sources that are considered to be inexhaustible. State three reason in support of your answer.
- Q5. Why is there so much emphasis on changing over from petrol/diesel driven automobiles to CNG driven vehicles.
- Q6. What happens to waste of a nuclear plant system? How waste produced in nuclear power plants are different from those produced in thermal power plants?
- Q7. Which is the process used to harness nuclear energy these days? Explain it briefly.



- Q8. *How can solar energy be harnessed? Mention any two limitations in using solar energy. How are these limitations overcome?*
- Q9. *Make a list of conventional and non-conventional sources of energy. Give a brief description of harnessing one nonconventional source of energy.*
- Q10. *What are the environmental consequences of using fossil fuels? Suggest the steps to minimise the pollution caused by various sources of energy including non-conventional sources of energy.*

### ANSWERS

- A1. *The population of the world is increasing at a very rapid rate due to which demands for energy is increasing day by day. As, fossil fuels like coal, petroleum, are present in a limited amount which and are likely to finish one day so the need for alternative sources of energy is essential.*

*Use of conventional sources of energy (coal, petroleum etc.) causes pollution. To reduce pollution use of non-conventional sources of energy is essential.*

*The energy from the sea energy be harnessed from the sea in different ways:*

**Tidal Energy:** *Due to the gravitational pull of the moon on the earth, the level of water in the sea rises and falls producing high and low tides and the difference in sea-levels gives us tidal energy. Tidal energy is harnessed by constructing a dam across a narrow opening to the sea. A turbine fixed at the opening of the dam converts tidal energy to electricity.*

**Wave Energy:** *The kinetic energy possessed by huge waves near the seashore can be trapped to generate electricity. A wide variety of devices has been developed to trap wave energy for rotation of turbine and production of electricity.*

**Ocean Thermal Energy:** *The water at the surface of the sea or ocean is heated by the Sun while the water in deeper sections is relatively cold. This difference in temperature is exploited to obtain energy in ocean-thermal-energy conversion*

plants. These plants can operate if the temperature difference between the water at the surface and water at depths up to 2 km is 20°C or more.

A2. A solar cooker covered by a plane glass slab will be more efficient. This is because glass slab does not allow the heat radiation to escape from the solar cooker and hence the temperature of the solar cooker with glass slab increases more than the temperature of the solar cooker which is left open.

A3.  $\text{Energy concentrated} = \text{Reflecting percentage of energy} \times \text{Surface area} \times \text{Time} \times \text{Rate of solar energy delivered}$   
 $= 80/100 \times 5 \times (2 \times 60 \times 60) \times 0.4 \times 10^3$   
 $= 11520 \times 10^3 \text{ J}$

A4. The 3 energy sources are considered to be in exhaustible are  
(i) solar energy from sun which is present in an unlimited quantity  
(ii) wind energy harnessed by windmills can be used at the places with continuous flow of wind and is also non polluting .  
(iii) water energy from ocean can be used again and again.

A5. There is so much emphasis on changing over from petrol /diesel driven automobiles to CNG driven vehicles, because of the following reasons:  
(i) It does not produce smoke.  
(ii) On burning CNG it produces CO<sub>2</sub> and water.  
(iii) It does not leave in burnt hydrocarbons, lead particulates etc., which pollute the environment.

A6. A nuclear power plant is a thermal power station in which the heat source is a nuclear reactor. In its central part, the reactor's core produces heat due to nuclear fission. water reactor, the steam turbine is separated from the nuclear system. Cost estimates take into account station decommissioning and nuclear waste.

A7. Nuclear fission process is used to harness nuclear energy these days. The fission of an atom of uranium, for example, produces 10 million times the energy produced by the combustion of an atom of carbon from coal. The process in which nuclear energy is produced in the result of a series of steps:

1. Splitting of Atoms. Uranium atoms, in the form of ceramic-coated

*pellets, are placed in a reactor core.*

*2. Absorption. Control rods are used to absorb the free floating neutrons released during the fission process.*

*3. Heat.*

*4. Water and Piping.*

*A8. Solar energy can be harnessed directly by using solar cooker, solar heater or solar cells. In solar cells it is converted to electricity. Limitations in using solar energy are: Solar energy is not available in night or when the sun is hidden under clouds.*

*A9. Conventional sources of energy (e.g. coal, petroleum and natural gas) are non-renewable sources of energy. Non-conventional sources of energy (e.g. solar and wind energy) are renewable sources of energy. They have been in use since a long time. They do not cause any pollution (e.g. solar energy, geothermal energy etc.)*

*A10. Fossil fuels have the following environmental effects: Air pollution: Burning of fossil fuels release oxides and sulphides in the air and many other harmful gases like carbon monoxide, sulphur dioxide, etc. These cause various health problems and also lead to acid rain which further affects water and soil resources.*

## **UNIT 15: OUR ENVIRONMENT**

### **MULTIPLE CHOICE QUESTIONS:**

*1. An ecosystem includes.*

*a . all living organism*

*b . non living organism*

*c. both living organism and non-living objects*

*d. sometimes living organisms and sometimes nonliving objects*

2. In the given food chain, suppose the amount of energy at 4<sup>th</sup> trophic level is 5 kj, what will be

the energy available at the producer level?

Grass → grasshopper      frog      snake      hawk

(a) 5 kj   (b) 50 kj   (c) 500 kj   (d) 5000 kj

3. In an ecosystem, the 10% of energy available for transfer from one trophic level to the next is

in the form of-

(a) Heat energy   (b) light energy   (c) chemical energy   (d) mechanical energy

4. Flow of energy in an ecosystem is always

(a) Unidirectional   (b) bidirectional      (c) Multidirectional   (d) no specific direction

5. Which of the following limits the number of trophic levels in a food chain?

(a) Decrease in energy at higher trophic levels   (b) deficient food supply   (c) Polluted air  
(d) Water

**Very short answer questions.**

6. What is the function of ozone in upper atmosphere?

7. What is the % of solar energy trapped and utilized in terrestrial habitats and in aquatic eco

systems?

8. The first trophic level in the food chain is always a green plant .why?

9. Why is forest considered a natural ecosystem?

10. Why is improper disposal of waste curse to environment?

11. Why are crop fields known as artificial ecosystem?

12. Why does a food chain consist of only 3 to 4 steps?

13. Mention 3 harmful effects of using polythene bags on the environment .Suggest an effective

alternative to these bags?

14. Energy flow in food chains is always unidirectional? Justify this statement. Explain how the pesticides enter a food chain and subsequently get into our body?

15. Describe any 3 modes of disposal of waste?
16. Suggest any 5 activities in daily life which are ecofriendly?
17. Name the wastes which are generated in our house daily. What measures would you take for their disposal?
18. Explain some harmful effects of agricultural practices on environment?

## **Answers**

1. (c)
2. (d)
3. (c)
4. (a)
5. (a)
6. Ozone shields the surface of the earth from UV rays of sun.
7. 1% in terrestrial habitats and 0.2% in aquatic ecosystems is the % solar energy trapped and utilized.
8. The first trophic level is always a green plant because only plants can utilize the radiant energy of the sun and transform it to chemical form during photosynthesis.
9. A forest is a self-sustaining system, so it is considered as a natural ecosystem.
10. Wastes pollute our environment, air, soil and water, and cause harmful effect on all living organisms.
11. Crop fields are man-made and some biotic and abiotic components are manipulated by humans, so they are known as artificial ecosystem.
12. On an average, only 10% of the food available to a trophic level is transferred to the next trophic level so the amount of available energy keeps on becoming less as we move to higher trophic levels, so very little usable energy remains after 4 trophic levels.
13. Harmful effects of using polythene bags are:
  - (a) Increase soil temperature
  - (b) Land and animals die after consumption of these bags.
  - (c) It causes clogging of drains and even may cause flood like situation. alternative use of jute bags, paper bags, cloth bags.
14. In a food chain the energy moves progressively through the various trophic levels and is no longer available to the organisms of the previous trophic levels, pesticides used for crop protection when washed away go down into soil. These pesticides are absorbed by plants which are the producers. On consumption of this plants, the pesticides enter our food chain and get accumulated progressively and enter our body,

*this are non-biodegradable.*

15. (a) *disposing of biodegradable waste in biogas plant used to prepare biogas and manure.*

(b) *Solid wastes should buried in urban areas as a landfill.*

(c) *Some solid wastes (plastic, paper, metals) should be recycled.*

16. (a) *separation of biodegradable and non-biodegradable substances.*

(b) *Gardening*

(c) *Use of gunny bags/paper bags in place of plastic bags.*

(d) *Use of compost and vermicomposting in place of fertilizers*

(e) *Rain water harvesting*

17. (a) *kitchen wastes*

(b) *Paper wastes*

(c) *Plastic bags*

(d) *vegetable/fruits peels*

*Measure for disposal*

(a) *Segregation of biodegradable and non-biodegradable waste.*

(b) *Safe disposal of plastic bags.*

(c) *vegetable/fruit peels should be used as compost*

(d) *Paper waste for recycling*

(e) *Prepare a compost pit for kitchen wastes.*

18. (a) *excessive use of fertilizers changes the chemistry of soils and kills useful microbes.*

(b) *Excessive use of non-biodegradable chemical pesticides leads to biological magnification*

(c) *Excessive cropping causes loss of soil fertility.*

(d) *Excess use of ground water for agriculture lowers the water table.*

(e) *Damage to natural ecosystem/habitat*

## **UNIT 16: MANAGEMENT OF NATURAL RESOURCES**

- 1      *Which canal has brought greenery to considerable area of Rajasthan?*
- 2      *Mention one local system of canal irrigation used in Himachal Pradesh.*
- 3      *Name any two forest product, which is the basis for some industry?*
- 4      *State an instance where human intervention saved the forest from destruction.*
- 5      *Where are coliform bacteria found in human beings?*
- 6      *Why are forest considered 'biodiversity hotspot'?*
- 7      *How did the "Chipko andolan" benefited local people?*
- 8      *What is meant by exploitation of natural resources with short term aims?*
- 9      *List any two causes of our failure to sustain availability of underground water.*
- 10     *List any two indigenous methods of water harvesting.*
- 11     *How is reuse of waste material better than recycle?*
- 12     *Government is solely responsible for the protection of environment and individuals are not to be bothered about it. Give your comments on it.*
- 13     *Judicious use of oil and petroleum is very important. How can you achieve this?(Any three points)*
- 14     *An environmentalist on visit to your school suggested the use of 3R's to save the environment. Explain what he meant by 3R's and how you would follow his advice at home?*
- 15     *Which of the two is a better option I) to collect rainwater in ponds or artificial lakes or, ii) to let it recharge groundwater by water harvesting? List three advantages of the option to justify your answer.*

**S.NO****ANSWERS**

- 1     *Indira Gandhi canal.*
- 2     *Kulhs.*
- 3     *Pinewood for matchstick industry.*  
*Bamboo for paper industry.*
- 4     *Human intervention has saved Arabari forest in west Bengal from destruction.*
- 5     *Human intestines.*
- 6     *Because In forest a variety of life forms is found.*
- 7     *The movement helps in conserving forest thereby improving quality of soil and improving water resources. This wholesome helps in maintaining ecological balance.*
- 8     *Consumption of resources for immediate requirement without their conservation for future generation.*
- 9     *Increasing population and industrialization.*
- 10    *Construction of small earthen dams*  
*Dug small pit and lakes.*
- 11    *Reuse of material is better than recycling because recycling requires a*



large amount of energy and is very expensive, in **reuse** energy is not required. Reuse preserves the embodied energy that was originally used for manufacturing an item. Reuse creates less air and water pollution than recycling.

- 12 *Protection of environment is not the work of only government It is the responsibility of all individuals. I feel that nature is our home, and we individuals have to take up the responsibility to preserve our natural environment. Moreover, if one starts by taking responsibility to help in preserving nature, then naturally our other fellow human beings will join us in doing this noble deed. For instance, if I start preserving the environment by indulging in small things such as switching off electrical appliances when not in use, planting trees, saving water etc, then it is natural that those who live with me will also learn from me and join me in preserving the natural environment.*

- 13
1. *Using public transport.*
  2. *Using bulbs or fluorescent tubes for lighting.*
  3. *Wearing extra layer of sweater instead of using heater.*

- 14 *Reduce – It means to use less*

*Reuse – It means to use again*

*Recycle - It means to recycle things for again use.*

*We can follow this advice by following means:*

1. *Used envelopes can be reversed.*
2. *By switching off unnecessary items.*

15      *To allow rainwater to recharge by water harvesting is better option.*  
*Because*

1. *Groundwater does not evaporate*
2. *It does not pollute*
3. *It does not provide the breeding ground for mosquitoes.*
4. *It also helps in maintaining moisture in soil.*