

**CLASS X (2020-21)**  
**SCIENCE (CODE 086)**  
**SAMPLE PAPER-4**

**Time : 3 Hours****Maximum Marks : 80****General Instructions :**

- (i) The question paper comprises four sections A, B, C and D. There are 36 questions in the question paper. All questions are compulsory.
- (ii) Section–A - question no. 1 to 20 - all questions and parts thereof are of one mark each. These questions contain multiple choice questions (MCQs), very short answer questions and assertion - reason type questions. Answers to these should be given in one word or one sentence.
- (iii) Section–B - question no. 21 to 26 are short answer type questions, carrying 2 marks each. Answers to these questions should be in the range of 30 to 50 words.
- (iv) Section–C - question no. 27 to 33 are short answer type questions, carrying 3 marks each. Answers to these questions should be in the range of 50 to 80 words.
- (v) Section–D - question no. 34 to 36 are long answer type questions carrying 5 marks each. Answer to these questions should be in the range of 80 to 120 words.
- (vi) There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
- (vii) Wherever necessary, neat and properly labelled diagrams should be drawn.

## Section A

1. How will the tendency to gain electrons change as we go from left to right across a period ? Why ? [1]

**Ans :**

On moving from left to right across a period, metallic character decreases and non-metallic character increases.

Since metals tend to lose electrons and non-metals tend to gain electrons, the tendency to gain electrons increases as we move from left to right across a period.

**or**

Out of the three elements P, Q and R having atomic numbers 11, 17 and 19 respectively, which two elements will show similar properties and why?

**Ans :**

P(11): 2, 8, 1 Q(17): 2, 8, 7 R(19): 2, 8, 8, 1

P and R will show similar chemical properties because they have the same number of valence electrons.

2. A shiny brown coloured element X' on heating in air becomes black in colour. Name the element X' and the black compound formed. [1]

**Ans :**

The shiny brown element is metal copper. The black compound formed is copper (II) oxide.

3. Why do ionic compounds have high melting point? [1]

**Ans :**

It is due to strong forces of attraction between positively charged and negatively charged ions.

4. The radius of curvature of a spherical mirror is 20 cm. What is its focal length? [1]

**Ans :**

Focal length,  $f = \frac{R}{2} = \frac{20}{2} = 10 \text{ cm}$

5. Write down four important characteristics of image formed by a plane mirror. [1]

**Ans :**

Image is virtual, erect, laterally inverted and of same size as object.

6. What is twinkling of stars due to? [1]

**Ans :**

Twinkling of star is due to atmosphere refraction.

**or**

Name the two phenomena involved in the formation of rainbow.

**Ans :**

The phenomena involved in formation of rainbow are dispersion and total internal reflection and refraction.

7. State the observation made by Oersted on the basis of his experiment with current carrying conductors. [1]

**Ans :**

A magnetic field is produced near a current carrying conductor which last so long till there is current in the conductor on reversing the current the direction of magnetic field is also reversed.

8. What constitutes the field of a magnet? [1]

**Ans :**

The magnetic field is created by the magnet or when a charge particle is moving with some velocity in both cases they produce a magnetic field around them. The magnetic field is due to current or magnetic material.

9. What happens to the resistance of a conductor when temperature is increased? [1]

**Ans :**

The resistance of a conductor increases with rise in temperature.

**or**

Out of the two, a toaster of 1 kW and an electric

heater of 2 kW, which has a greater resistance?

**Ans :**

As  $R = \frac{V^2}{P}$ . If  $V$  is constant. Then  $R \propto \frac{1}{P}$  i.e. more power, lesser be the resistance and vice-versa. Toaster has lesser power (1 KW) than electric heater (2 KW) therefore resistance of toaster is more than resistances of heater.

10. Name mode of nutrition in the following organisms:

- a. Fungi
- b. Amoeba [1]

**Ans :**

- a. Fungi - saprophytic
- b. Amoeba — animal like nutrition

11. What will happen to a plant shoot if sunlight falls on it from one direction only? What do you call this movement? [1]

**Ans :**

Shoot will bend towards light. Phototropism.

**or**

How is spinal cord protected?

**Ans :**

Vertebral column made by vertebrae protects the spinal cord.

12. Mendel observed a contrasting trait in relation to position of flowers. Mention the trait. [1]

**Ans :**

Axial flower position (dominant), terminal flower position (recessive).

**or**

Name the term used for the traits that are exhibited externally.

**Ans :** Phenotype.

13. Mention two ways in which food gets oxidized in organisms. [1]

**Ans :**

Aerobic respiration and anaerobic respiration.

**For question numbers 14, 15 and 16, two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below :**

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

14. **Assertion :** Copper reacts with silver nitrate solution.

**Reason :** Copper is placed higher in the metal activity series than silver. Thus, it can displace silver from silver nitrate solution [1]

**Ans :** (a) Assertion is true and reason is correct explanation of assertion.

15. **Assertion :** A mineral is called ore, when metal is

extracted from it conveniently and economically.

**Reason :** All ores are minerals but all minerals are not ores. [1]

**Ans :** (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

Minerals are naturally occurring chemical substance in the earth's crust obtained by mining. But a mineral is called an ore only when the metal can be extracted from it conveniently and economically. Thus, all ores minerals but all minerals are not ores.

**or**

**Assertion :** Gold is isolated from other impurities by Arndt forest cyanide process.

**Reason :** The cyanide which is used here dissolve all possible impurities.

**Ans :** (c) Assertion (A) is true but reason (R) is false. The cyanide dissolves gold by forming a complex.

16. **Assertion :** Reflex actions are automatic and rapid responses to stimuli.

**Reason :** These actions are controlled by brain. [1]

**Ans :** (c) A is true but R is false.

17. **Read the following and answer any four question from (17.1) to (17.5) :** 1 × 4

S. No.	Solution	pH limit
1.	Saliva	6.5-7.5
2.	Lemon juice	2.2-2.4
3.	Tomato juice	4.0-4.4
4.	Coffee	4.5-5.5

17.1 When drops of tomato juice are dropped on litmus paper than litmus paper will turn

- (a) red (b) yellow
- (c) green (d) black

**Ans :** (a) red

17.2 The nature of saliva in given table is

- (a) acidic
- (b) basic
- (c) Neither acidic nor basic
- (d) cannot be define

**Ans :** (c) Neither acidic nor basic

17.3 The effect of acid on litmus paper is

- (a) blue to red in colour
- (b) red to blue in colour
- (c) red to green in colour
- (d) green to red on colour

**Ans :** (a) blue to red in colour

17.4 The effect of base on litmus paper is

- (a) Turns red litmus to blue in colour
- (b) Turns blue litmus to blue in colour
- (c) Turns red litmus to orange
- (d) None of these

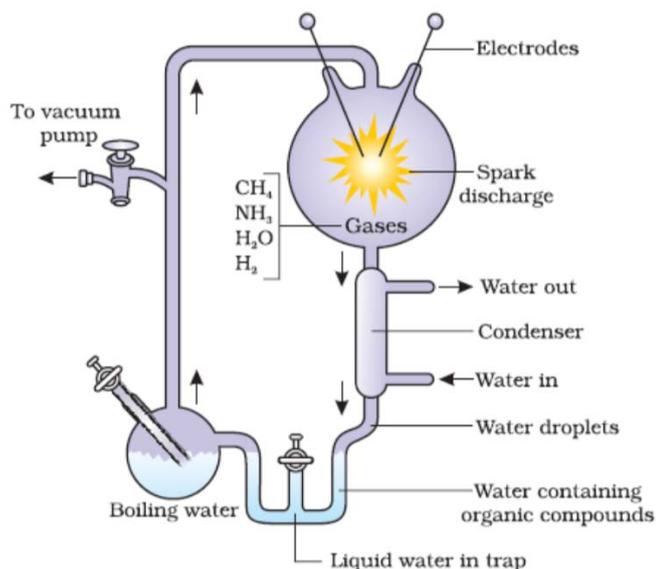
**Ans :** (a) Turns red litmus to blue in colour

17.5 The pH limit of coffee is

- (a) 4.5-5.5
- (b) 6.5-7.5
- (c) 1.4-2.5
- (d) 2.9-3.9

Ans : (a) 4.5-5.5

18. Question numbers 18.1-18.4 are based on the given experiment. Study the given experimental setup and answer the questions that follow.  $1 \times 4$



18.1 The name of experiment which is shown in the figure.

- (a) Miler and Urey’s experiment
- (b) Hen’s berg experiment
- (c) Millican oil drop experiment
- (d) None of these

Ans : (a) Miler and Urey’s experiment

18.2 The gaseous mixture used in the experiment comprised of

- (a) methane, ammonia, hydrogen, water vapours
- (b) methane, nitrogen, hydrogen, water vapours
- (c) ammonia, carbon dioxide, nitrogen, water vapours
- (d) methane, ammonia, nitrogen, water vapours

Ans : (a) Stanley Miller used methane, ammonia, hydrogen in the ratio of 2 : 1 : 2 and water vapours to demonstrate simple organic molecules like amino acids formation on primitive earth.

18.3 Under this experiment, electric discharge was created in a closed flask containing mixture of gases at

- (a) 50°C
- (b) 250°C
- (c) 800°C
- (d) 500°C

Ans : (c) 800°C

18.4 The organic compounds found in this experiment is.

- (a) Amino acid
- (b) HCL
- (c) CCl<sub>4</sub>
- (d) SO<sub>2</sub>

Ans : (a) Amino acid

19. Analyse the following observation table showing variation of image-distance (*v*) with object-distance (*u*) in case of a convex lens and answer the questions

that follow without doing any calculations :  $1 \times 4$

S.No.	Object-Distance <i>u</i> (cm)	Image-Distance <i>v</i> (cm)
1.	-60	+12
2.	-30	+15
3.	-20	+20
4.	-15	+30
5.	-12	+60
6.	-9	+90

19.1 The focal length of convex lens is

- (a) 5 cm
- (b) 10 cm
- (c) 15 cm
- (d) 20 cm

Ans : (b) 10 cm

19.2 For what object-distance (*u*) is the corresponding image-distance (*v*) not correct?

- (a) 1<sup>st</sup> observation
- (b) 2<sup>nd</sup> observation
- (c) 6<sup>th</sup> observation
- (d) 5<sup>th</sup> observation

Ans : (c) 6<sup>th</sup> observation

19.3 A concave mirror gives real, inverted and same size image if the object is placed

- (a) At focus
- (b) At infinity
- (c) At C i.e. centre of curvature
- (d) Beyond centre of curvature

Ans : (c) At C i.e. centre of curvature

The image formed by the concave mirror is inverted and of the same size if the object is placed at the centre of curvature.

19.4 Focal length of plane mirror is :

- (a) At infinity
- (b) Zero
- (c) Negative
- (d) None of these

Ans : (a) At infinity

The focal length of a plane mirror is infinity as the image can be formed at infinite distance inside the mirror. This is due to the parallel rays other reflection through a plane mirror meet again at infinity.

19.5 The relation between focal length, image distance and object distance is

- (a)  $\frac{1}{v} = \frac{1}{v} - \frac{1}{u}$
- (b)  $\frac{1}{v} = \frac{1}{f} + \frac{1}{u}$
- (c)  $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$
- (d)  $\frac{1}{f} = \frac{1}{u} - \frac{1}{v}$

Ans : (a)  $\frac{1}{v} = \frac{1}{v} - \frac{1}{u}$

20. Question numbers 20.1-20.5 are based on the table given below. Study the table and answer the following questions. The table given below shows the resistivity of conductors and alloys.  $1 \times 4$

Electrical Resistivity of Some Substances at 20°C

	Material	Resistivity (Ω-m)
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Conductors	Silver	$1.60 \times 10^{-8}$
	Copper	$1.62 \times 10^{-8}$
	Aluminium	$2.63 \times 10^{-8}$
	Tungsten	$5.20 \times 10^{-8}$
	Nickel	$6.84 \times 10^{-8}$
	Iron	$10.0 \times 10^{-8}$
	Chromium	$12.9 \times 10^{-8}$
	Mercury	$94.0 \times 10^{-8}$
	Manganese	$1.84 \times 10^{-8}$
Alloys	Constantan (Cu + Ni)	$49 \times 10^{-6}$
	Manganin (Cu+Mn+Ni)	$44 \times 10^{-6}$
	Nichrome (Ni+Cr+Mn+Fe)	$100 \times 10^{-6}$
Insulators	Glass	$10^{10} - 10^{14}$
	Hard rubber	$10^{13} - 10^{16}$
	Ebonite	$10^{15} - 10^{17}$
	Diamond	$10^{12} - 10^{13}$
	Dry paper	$10^{12}$

**20.1** In the given material which one is the better conductor-  
 (a) Nickel (b) Copper  
 (c) Iron (d) Mercury

**Ans :** (b) Copper

**20.2** From the above table, the most popular material used in the heater is  
 (a) Copper (b) Nichrome  
 (c) Ebonite (d) Nickel

**Ans :** (b) Nichrome

Nichrome is an alloy which has a higher resistivity than their constituent metals. They do not oxidise or burn at higher temperatures as they have high melting point. Thus, they are used to make coils of electric heating devices like electric heater.

**20.3** The resistance of a copper wire of length 2 m and area of cross-section  $1.7 \times 10^{-6} \text{ m}^2$  is

- (a)  $1.9 \times 10^{-2} \Omega$  (b)  $2 \times 10^{-2} \Omega$   
 (c)  $1.6 \times 10^{-2} \Omega$  (d)  $1.5 \times 10^{-2} \Omega$

**Ans :** (a)  $1.9 \times 10^{-2} \Omega$

From the above table,

$$\rho \text{ of Cu} = 1.62 \times 10^{-8} \Omega\text{-m}$$

$$l \text{ of copper} = 2 \text{ m}$$

$$A \text{ of copper} = 1.7 \times 10^{-6} \text{ m}^2$$

As,

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

$$= \frac{1.62 \times 10^{-8} \times 2}{1.7 \times 10^{-6}}$$

$$= 1.9 \times 10^{-2} \Omega$$

**20.4** Nichrome is the mixture of-  
 (a) Cu + Ni (b) Cu + Mn + Ni  
 (c) Ni + Cr + Mn + Fe (d) Ni + Cr

**Ans :** (c) Ni + Cr + Mn + Fe

**20.5** In the following insulator which one has the large resistivity-

- (a) Glass (b) Diamond  
 (c) Dry paper (d) Ebonite

**Ans :** (c) Dry paper

## Section B

**21.** List two ways in which plants can get rid of the wastes. [2]

**Ans :**

They can throw gases and excess water through stomata through diffusion. They can store wastes like gums and resins in old xylem tissue (wood).

**or**

What is the role of acid and mucus in stomach?

**Ans :**

It kills germs in food and provides acidic medium for the action of pepsin enzyme to digest the proteins in stomach.

Mucus protects the wall of stomach from the action of acid and pepsin.

**22.** How does feedback mechanism regulate the hormone secretion? [2]

**Ans :**

The feedback mechanism regulates the timing and amount of hormone to be secreted, e.g., if a person has more sugar in his blood, this is detected by the cells of the pancreas. As a result, more insulin will be secreted to oxidise the sugar. In a reverse situation, the secretion of insulin will be reduced.

**23.** Why is lithium with atomic number 3 and potassium with atomic number 19 are placed in group one? What will be atomic number of the first two elements in the second group? [2]

**Ans :**

Group 1

Group 2

Li(3): 2,1

Be(4): 2, 2

K(19):2,8, 1

Mg (12): 2, 8, 2

Li and K are placed in group 1 due to same number of valence electrons. In second group the atomic number of first two elements will be 4 and 12 respectively.

**or**

Calcium is an element with atomic number 20.

- a. Will it be a metal/non-metal?  
 b. What will be its valency?  
 c. What would be the formula of its chloride?  
 d. Will it be smaller/larger than K?

**Ans :**

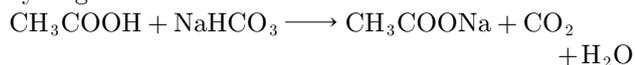
Ca(20) : 2, 8, 8, 2

- It will be a metal.
- Its valency is equal to 2.
- CaCl<sub>2</sub> is the formula of its chloride.
- It will be smaller than K.

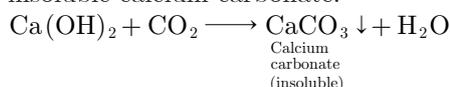
24. A gas is liberated immediately with a brisk effervescence, when you add acetic acid to sodium hydrogen carbonate powder in a test tube. Name the gas and describe the test that confirms the identity of the gas. [2]

**Ans :**

Carbon dioxide gas is liberated with a brisk effervescence when acetic acid is added to sodium hydrogen carbonate.



The gas is carbon dioxide which when passed through lime water turns it milky due to the formation of insoluble calcium carbonate.



25. An object of height 4.0 cm is placed at a distance of 30 cm from the optical centre 'O' of a convex lens of focal length 20 cm. Draw a ray diagram to find the position and size of the image formed. Mark optical centre 'O' and principal focus 'F' on the diagram. Also find the approximate ratio of size of the image to the size of the object. [2]

**Ans :**

Given,

Height of object,  $h_o = 4.0 \text{ cm}$

Focal length,  $f = + 20 \text{ cm}$

Object distance,  $u = - 30 \text{ cm}$

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

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

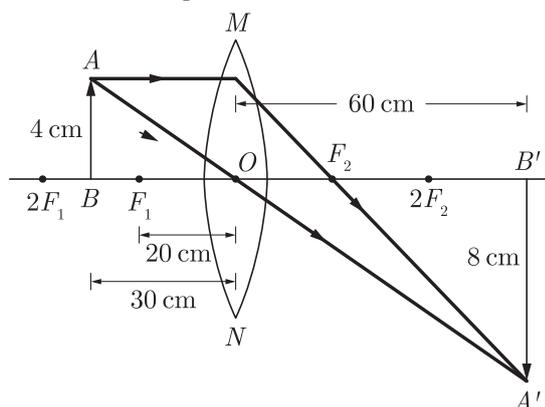
$$= \frac{1}{20} - \frac{1}{30} = \frac{3-2}{60} = \frac{1}{60}$$

$$v = + 60 \text{ cm}$$

Magnification,  $m = \frac{v}{u} = \frac{60}{-30} = - 2$

Image is real, inverted and magnified.

$$\text{Size of image} = mh_o = - 2 \times 4 = - 8 \text{ cm}$$



26. Give reason for the following:

- Tungsten used almost exclusively for filament of electric lamp.
- Why do we use copper and aluminium wires for transmission of electric current? [2]

**Ans :**

- Tungsten is used in making the filament of electric lamp because it has high resistivity and high melting point.
- The copper and aluminium have low resistivity and high conductivity.

## Section C

27. Give two uses each of the products obtained by the electrolysis of sodium chloride. [3]

**Ans :**

**Hydrogen :** It is used for cutting and welding purpose in the oxy-hydrogen flame.

**Chlorine :**

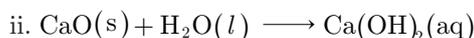
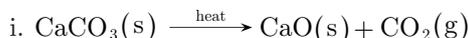
- It is used for the sterilisation of drinking water.
- It is used in the preparation of pesticides and insecticides.

**Sodium hydroxide :**

- It is used in the manufacture of soap and detergents.
- It is used in making paper pulp in the paper industry.

or

Name the type of chemical reaction presented by the following equations:



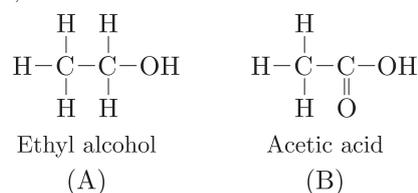
**Ans :**

- Chemical decomposition reactions.
- Chemical combination reaction.
- Chemical displacement reaction.

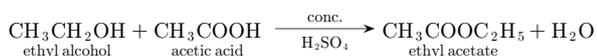
28. An organic compound 'A' is an essential constituent of wine and beer. Oxidation of 'A' yields an organic acid 'B' which is present in vinegar. Name the compounds 'A' and 'B' and write their structural formula. What happens when 'A' and 'B' react in the presence of an acid catalyst? Write the chemical equation for the reaction. [3]

**Ans :**

Ethyl alcohol is an essential constituent of wine and beer. Therefore, A is ethyl alcohol. Oxidation of ethyl alcohol gives acetic acid. Vinegar contains acetic acid. Therefore, B is acetic acid.



When A and B react in the presence of an acid catalyst, the ester, ethyl acetate is formed.



29. How do auxins promote the growth of a tendril around a support? [3]

**Ans :**

Auxins stimulate cell elongation and growth. It is observed that the shoot tips bend towards a unilateral source of light. The hormone synthesised at the shoot tips helps in the bending of shoots towards the light source. When light falls on one side of the plant, auxin diffuses towards the shady or dark side of the shoot. More concentration of auxin on the dark side stimulates more cell elongation on this side than the lighted side. As a result, the dark side grows more and the shoot bends towards light.

30. What are biodegradable substances? Describe two ways in which non-biodegradable substances affect our environment. [3]

**Ans :**

**Biodegradable substances :** The substances which can be degraded or decomposed by the bacteria and fungi are called biodegradable substances.

**Non-biodegradable substances :** The substances which cannot be decomposed by bacteria and fungi are called non-biodegradable substances.

The non-biodegradable substances affect our environment as :

- Non-biodegradable substances clog the sewage system and pollute the soil.
- Some of the non-biodegradable substances may be toxic for humans and produce various diseases.

31. (a) Name metals among the first five elements of the Modern Periodic Table.  
 (b) Write their symbols.  
 (c) Write the formula of their oxides.

**Ans :**

- Lithium and Beryllium are metals among the first five elements.
- Lithium (Li), Beryllium (Be).
- $\text{Li}_2\text{O}$  and  $\text{BeO}$  are the formulae of their oxides.

32. List and describe in brief any three ways devised to avoid pregnancy. [3]

**Ans :**

- Foam tablets, jellies, creams and spermicides are common chemicals used by females. These are placed in the vagina.
- Ovulation and fertilisation can be prevented by changing the hormonal balance of the body. It can be done by taking oral pills.
- Intrauterine Contraceptive Device (IUCD) such as the loop or the copper-T are placed in the uterus to prevent pregnancy. The drawbacks of these devices are bleeding and discomfort.

33. A 5.0 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 20 cm. The distance of the object from the lens is 30 cm. By calculation determine (i) the position and (ii) the size of the image formed. [3]

**Ans :**

Given, height of object,  $h_o = 5 \text{ cm}$

Focal length of lens,  $f = 20 \text{ cm}$

Image distance,  $u = -30 \text{ cm}$

(i) Applying,  $\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \Rightarrow \frac{1}{v} = \frac{1}{f} + \frac{1}{u}$

Focal length  $\frac{1}{v} = \frac{1}{20} + \frac{1}{-30}$

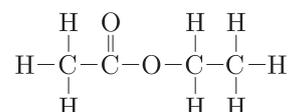
$$\frac{1}{v} = \frac{3-2}{60} = \frac{1}{60} \text{ or } v = 60 \text{ cm}$$

(ii) Applying,  $\frac{h_i}{h_o} = \frac{v}{u} \Rightarrow \frac{h_i}{5} = \frac{60}{-30}$

$$h_i = \frac{-60 \times 5}{30} = -10 \text{ cm}$$

## Section D

34. i. The structural formula of an ester is :



Write the structural formulae of the corresponding alcohol and the acid.

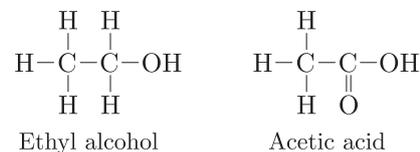
ii.

- Mention the experimental conditions involved in obtaining ethene from ethanol.
- Write the chemical equation for the above reaction.

- iii. Explain the cleansing action of soap. [5]

**Ans :**

i.

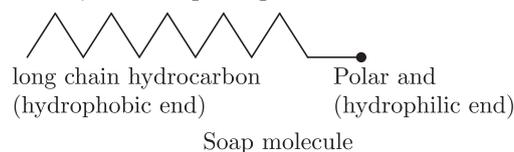


ii.

- When ethanol is heated with excess of concentrated sulphuric acid at 443 K, it gets dehydrated to form ethene.
- $\text{C}_2\text{H}_5\text{OH} + \text{H}_2\text{SO}_4 \xrightarrow[\text{Conc.}]{443\text{K}} \text{H}_2\text{C}=\text{CH}_2 + \text{H}_2\text{O}$   
ethene

- iii. A molecule of soap is made up of two parts:

- An ionic part which is hydrophilic, i.e., water soluble.
- A hydrocarbon chain which is hydrophobic, i.e., water-repelling and oil soluble.



When soap is at the surface of water, the hydrophobic tail protrudes out of water while the ionic end remains inside water. Inside water, the molecules form clusters with the hydrophobic tails in the interior of the cluster and the ionic ends on the surface of the cluster. This formation is called a micelle. Soap, in the form of micelle, collects the oily dirt in the centre of the micelle. The

micelles stay in solution as a colloid and do not precipitate due to ion-ion repulsion. Thus, the dirt suspended in water is washed away during rinsing.



Figure : A micelle entrapping grease particle

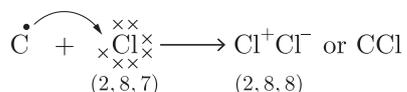
or

Atoms of seven elements A, B, C, D, E, F and G have a different number of electronic shells but have the same number of electrons in their outermost shells. The elements A and C combine with chlorine to form an acid and common salt respectively. The oxide of element A is a liquid at room temperature and is a neutral substance, while the oxides of the remaining six elements are basic in nature. Based on the above information answer the following questions.

- i. What could the element A be ?
- ii. Will elements A to G belong to the same period or same group of the periodic table ?
- iii. Write the formula of the compound formed by the reaction of element A with oxygen.
- iv. Show the formation of the compound by a combination of element C with chlorine with the help of an electronic structure.
- v. Which one of the given elements is likely to have the smallest atomic radius ? [5]

Ans :

- i. Hydrogen
- ii. Elements A to G belong to the same group of the periodic table since they contain the same number of electrons in their outermost shells.
- iii.  $2H_2 + O_2 \rightarrow 2H_2O$  (Since A is hydrogen)
- iv.



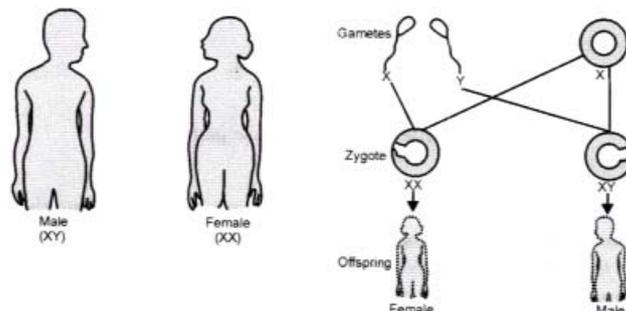
- v. Hydrogen (represented by A) is likely to have the smallest atomic radius amongst all the elements in a group. This is because the atomic radius increases while moving down the group.

35. i. What are chromosomes ? Where are they seated ?
- ii. What is a sex chromosome ?
- iii. Explain the mechanism of sex determination in human beings. [5]

Ans :

- i. **Chromosomes** : Chromosomes are the thread like structures found in the nucleus of a cell (plant and animal). These are composed of chromatin and carry the genes from one generation to the next generation.
- ii. A chromosome that helps in determining the sex of an individual is known as a sex chromosome.

- iii. **The mechanism of sex determination in human beings** : It is assumed that half the children of a couple will be girls and half will be boys. All children of the couple will inherit similar chromosomes (22 + X) from the mother but the sex of the children will depend on the chromosome they inherit from the father. If a child inherits 22 + X chromosomes from the father that will be a girl but when a child will inherit 22 + Y chromosomes from the father that will be a boy. Therefore, the sex of a child is determined by the inheritance of X or Y chromosome from the father.



36. i. Two identical resistors each of resistance  $10 \Omega$  are connected in :  
 (a) Series (b) Parallel  
 in turn to a battery of 6 V. Calculate the ratio of power consumed by the combination of resistor in the two cases
- ii. List two factors on which the resistance of a conductor depends.
- iii. Write a difference between an ammeter and voltmeter. [5]

Ans :

- i. (a) When resistors are connected in series.

Then, equivalent resistance,  $R_s = 10 \Omega + 10 \Omega = 20 \Omega$

Now, Power consumed,

$$P_s = \frac{V^2}{R_s} = \frac{6 \times 6}{20} = 1.8 \text{ W}$$

- (b) When resistors are connected in parallel than equivalent resistance,

$$\frac{1}{R_p} = \frac{1}{10} + \frac{1}{10} = \frac{2}{10} = \frac{1}{5}$$

$$R_p = 5 \Omega$$

Thus, power consumed,

$$P_p = \frac{V^2}{R_p} = \frac{6 \times 6}{5} = 7.2 \text{ W}$$

Then,

$$\frac{P_s}{P_p} = \frac{1.8 \text{ W}}{7.2 \text{ W}} = \frac{1}{4}$$

$$P_s : P_p = 1 : 4$$

- ii. Resistance of a conductor depends on:  
 (a) length of the conductor  
 (b) area of cross-section of conductor.

iii.

	Ammeter	Voltmeter
1.	It is used to measure the current in a circuit.	It is used to measure the potential difference in a circuit.

	<b>Ammeter</b>	<b>Voltmeter</b>
2.	It is always connected in series in the circuit	It is always connected in parallel in the circuit.

**or**

- i. State the commercial unit of electric energy and find its relation with its SI unit.
- ii. The current through a resistor is made three times its initial value. Calculate how it will affect the heat produced in the resistor.
- iii. Find the amount of heat generated in a conductor if another conductor of double resistance is connected in the circuit keeping all other factors unchanged.

**Ans :**

- i. Commercial unit of electric energy = kWh

$$1 \text{ kWh} = 3.6 \times 10^6 \text{ J}$$

- ii. Initial heat generated in the resistor,

$$H_1 = I^2 R t \quad \dots(1)$$

when current is made three times i.e.  $3I$  now heat generated

$$H_2 = (3I)^2 R t \quad \dots(2)$$

$$H_2 = 9I^2 R t$$

from equation (1), we get

$$H_2 = 9H_1$$

In later case, heat generated is 9 times the initial heat generated.

- iii. If another conductor of  $2R$  is connected in series then total resistance =  $R + 2R = 3R$ .

Now heat generated  $H = I^2(3R)t$

$$H = 3I^2 R t$$

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