

**CLASS X (2020-21)**  
**SCIENCE (CODE 086)**  
**SAMPLE PAPER-1**

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

**Ans :** Electric cell or electric battery.

**or**

Which metal has lowest resistivity?

**Ans :** Silver

2. What change in colour is observed when white silver chloride is left exposed to sunlight? What type of chemical reaction is this? [1]

**Ans :**

The white solid turns grey.

Type of chemical reaction is photo-decomposition.

3. If the charge on an electron be  $1.6 \times 10^{-19} \text{C}$ , find the approximate number of electrons in 1 C. [1]

**Ans :**

$1.6 \times 10^{-19} \text{C}$  charge is of = 1 electron and

$$1 \text{ C charge is of} = \frac{1}{1.6 \times 10^{-19}} \text{ electron}$$

$$\text{No. of electrons} = 6.25 \times 10^{18}$$

4. When is potential difference between two points said to be 1 volt? [1]

**Ans :**

Potential difference between two point is said to be 1 volt if the amount of work done in bringing 1 C charge between them is 1 J.

5. Name two specialised tissues that provide control and coordination in multicellular organisms. [1]

**Ans :** Nervous and muscular tissues.

6. Name the method by which Spirogyra reproduce under favourable conditions. Is this method sexual or

asexual?

[1]

**Ans :** Fragmentation. Asexual

**or**

When a cell reproduces, what happens to its DNA?

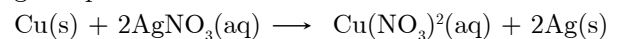
**Ans :**

Its DNA first doubles up followed by its equal and accurate division between two daughter cells.

7. What can be seen when a strip of copper metal is placed in a solution of silver nitrate? [1]

**Ans :**

The solution will become blue, shiny silver metal will get deposited.



8. Hydrogen being a highly inflammable gas and oxygen being a supporter of combustion, yet water a compound made up of hydrogen and oxygen is used to extinguish fire. Why? [1]

**Ans :**

$\text{H}_2\text{O}$  is a compound constituted of hydrogen of oxygen elements and being a compound it has different properties as compared to its constituting elements.

9. What is meant by water of crystallisation in a substance? [1]

**Ans :**

The water molecules associated with a crystalline solid are called water of crystallisation.

**or**

What effect does an increase in concentration of  $\text{H}^+(\text{aq})$  ions in a solution have on pH of solution?

**Ans :**

Increase in  $\text{H}^+$  concentration will lead to decrease in pH.

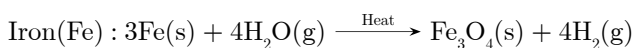
- 10.** At what pH in the mouth is tooth decay faster and why? [1]

**Ans :**

At pH lower than 5.5, tooth decay becomes faster because calcium phosphate (enamel) reacts with acid and gets corroded.

- 11.** Name any one metal which reacts neither with cold water nor with hot water but reacts with heated steam to produce hydrogen gas. [1]

**Ans :**



or

Name one metal and one non-metal in liquid state at room temperature.

**Ans :**

Mercury is a metal and Bromine is a non-metal present as a liquid at room temperature.

- 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

What is heredity?

**Ans :**

Transmission of characters and traits from one generation to the next.

- 13.** Name the sensory receptors found in the nose and on the tongue. [1]

**Ans :**

Olfactory receptors, gustatory receptors.

**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 :** Respiration in living beings is called exothermic reaction. [1]

**Reason :** Respiration in living beings involves with absorption of heat energy.

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

- 15. Assertion :** Copper is used to make hot water tanks and not steel. [1]

**Reason :** Copper is a better conductor of heat than steel and it is fairly resistant to corrosion than steel.

**Ans :** (a) Both A and R are true and R is correct explanation of the assertion.

or

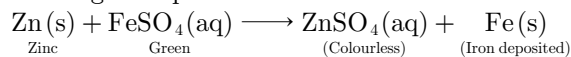
**Assertion :** When zinc is added to a solution of iron (II) sulphate, no change is observed.

**Reason :** Zinc is less reactive than iron.

**Ans :** (d) Assertion (A) is false but reason (R) is true.

Both Assertion and Reason are false. Zinc being more reactive than iron displaces iron from iron (II) sulphate solution.

Thus, the green colour of the solution fades and iron metal gets deposited.



- 16. Assertion :** During fertilization only head of spermatozoa enters egg. [1]

**Reason :** If several spermatozoa hit the egg at same time, all can enter the egg.

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

- 17. Read the following and answer any four questions from 17.1 to 17.5. 1 × 4**

Energy is needed to maintain a state of order in our body. The source of energy and materials is the food we eat. Some organisms use simple food material obtained from inorganic sources and other organisms utilise complex substances. These complex substances have to be broken down into simpler ones before they can be used for the upkeep and growth of the body.

**17.1**All non-green organisms fall under the category of

- (a) autotrophs
- (b) heterotrophs
- (c) saprobes
- (d) chemotrophs

**Ans :** (b) heterotrophs

All non-green organisms fall under the category of heterotrophs as they depend on other organisms in order to obtain food.

**17.2**The diagram below is an experiment conducted to study a factor necessary for photosynthesis.



(A)

(B)

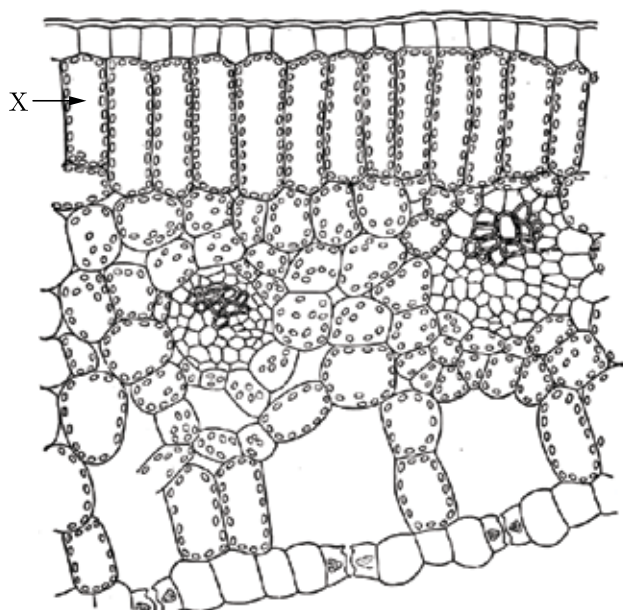
The test performed on the leaf and the solution used for the test are respectively

- (a) starch test and potassium iodide
- (b) chlorophyll test and ethyl alcohol
- (c) photosynthesis test and potassium iodide
- (d) starch test and ethyl alcohol

**Ans :** (b) chlorophyll test and ethyl alcohol

The given diagram indicates that starch test is performed on the leaf and potassium iodide is used for the test.

**17.3** Below given diagram represents the cross section of a leaf.



Identify "X" and choose the correct combination of plots provided in the following table.

	X	Description	Function
(a)	Chlorophyll	A green coloured pigment	Essential for photosynthesis
(b)	Chloroplast	A cell organelle	Conducts photosynthesis
(c)	Vascular bundle	Vascular tissue	Transportation in plants
(d)	Chloroplast	A green coloured pigment	Essential for photosynthesis

**Ans :** (b)

In the given diagram "X" represents the chloroplast, i.e., the cell organelles that contain chlorophyll.

**17.4** Which of the following statement(s) is (are) true about stomata?

- These are the tiny pores present on the surface of the leaves.
- Through these, massive amounts of gaseous exchange take place.
- Plants open these pores when carbon dioxide is not required for photosynthesis.
- Guard cells operate the opening and closing of these pores.

- (a) I and II only (b) I and III only  
(c) I, II and III only (d) I, II and IV only

**Ans :** (d) I, II and IV only

Since large amounts of water can also be lost through the stomata, the plant closes these pores when it does not need carbon dioxide for photosynthesis.

**17.5** Study the table below and select the row that has the incorrect information.

	Organism	Type of heterotrophic nutrition
(a)	Amoeba	Holozoic
(b)	Mushroom	Saprophytic
(c)	Lice	Parasitic

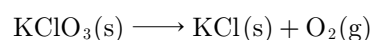
	Organism	Type of heterotrophic nutrition
(d)	Lion	Parasitic

**Ans :** (d)

Lion show holozoic type of nutrition. In such type of nutrition, the digestion of food follows after the ingestion of food. Thus, digestion takes place inside the body of the organism while parasitic nutrition is a mode of heterotrophic nutrition where an organism lives on the body surface or inside the body of another type of organism. The parasite obtains nutrition directly from the body of the host. The parasites derive their nourishment from their host.

**18. Read the following and answer any four questions from 18.1 to 18.5.**  $1 \times 4$

Oxygen is prepared by catalytic decomposition of potassium chlorate ( $\text{KClO}_3$ ). Decomposition of potassium chlorate gives potassium chloride ( $\text{KCl}$ ) and oxygen ( $\text{O}_2$ ). The following reaction takes place :



**18.1** How many moles of  $\text{KClO}_3$  are required to produce 2.4 moles of  $\text{O}_2$ ?

- (a) 1.6 mole (b) 2.6 moles  
(c) 2.1 mole (d) 1.9 moles

**Ans :** (a) 1.6 mole

3 moles of  $\text{O}_2$  are formed by 2 moles of  $\text{KClO}_3$

2.4 moles of  $\text{O}_2$  will be formed by

$$\frac{2}{3} \times 2.4 = 1.6 \text{ moles of } \text{KClO}_3$$

**18.2** Which element is reduced in the given reaction.

- (a) oxygen (b) potassium  
(c) chlorine (d) None of these

**Ans :** (c) Chlorine

**18.3** How many moles of  $\text{KClO}_3$  give 3 moles of oxygen?

- (a) 2 mole (b) 1 moles  
(c) 4 mole (d) 5 moles

**Ans :** (a) 2 moles

**18.4** The oxidation state of chlorine in potassium chlorate is

- (a) +2 (b) +3  
(c) +4 (d) +5

**Ans :** (d) Oxidation state chlorine is +5.

**18.5** Decomposition of potassium chlorate gives

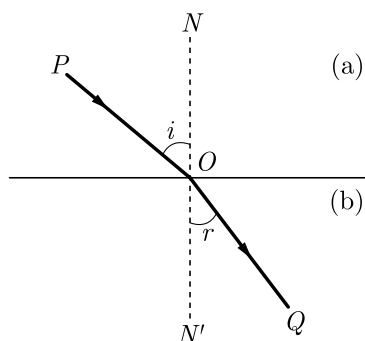
- (a)  $\text{KCl}$  (b)  $\text{O}_2$   
(c)  $\text{KCl, O}_2$  (d)  $\text{KCl}_3$

**Ans :** (c)  $\text{KCl, O}_2$

**19. Read the following and answer any four questions from 19.1 to 19.5.**  $1 \times 4$

Sunita wants to observe the phenomenon of refraction of light when she performed the experiment of refraction of light. She observed that when light ray goes from one transparent medium to another transparent medium, it suffers a change in direction, into second medium. The extent of the change in direction suffered by the phenomenon of change in the path of light rays when going from one medium to

another medium is known as refraction. Ray is a given pair of media can be expressed in terms of refractive index. The refractive index is related to an important physical quantity in the relative speed of light in different media.



**19.1** When light goes from one medium to another than which parameter of light wave remain constant?

- (a) Frequency
- (b) Wavelength
- (c) Velocity
- (d) Amplitude

**Ans :** (a) Frequency

**19.2** Refractive indices of water, sulphuric acid, glass and carbon disulphide are 1.33, 1.43, 1.53 and 1.63 respectively. The light travels slowest in

- (a) sulphuric acid
- (b) glass
- (c) water
- (d) carbon disulphide

**Ans :** (d) carbon disulphide

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

- (a)  $2 \times 10^8 \text{ ms}^{-1}$
- (b)  $3 \times 10^9 \text{ ms}^{-1}$
- (c)  $4 \times 10^8 \text{ ms}^{-1}$
- (d)  $2.5 \times 10^8 \text{ ms}^{-1}$

**Ans :** (a)  $2 \times 10^8 \text{ ms}^{-1}$

Refractive index of a medium is given by,

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

Here, Speed of light in vacuum,

$$c = 3 \times 10^8 \text{ ms}^{-1}$$

Refractive index of glass,

$$n_g = 1.50$$

Speed of light in the glass,

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

**19.4** The unit of refractive index?

- (a) m/s
- (b)  $\text{m}^2/\text{s}$
- (c) Unit less
- (d) m – s

**Ans :** (c) Unit less

**19.5** A ray of light passes from a medium A to another medium B. No bending of light occurs if the ray of light his the boundary of medium B at an angle of

- (a)  $0^\circ$
- (b)  $45^\circ$
- (c)  $90^\circ$
- (d)  $120^\circ$

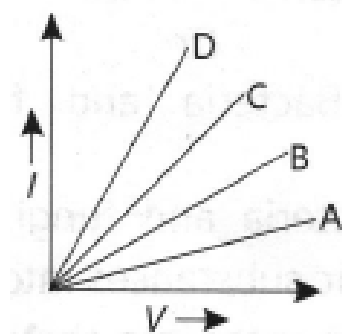
**Ans :** (c)  $90^\circ$

**20. Read the following and answer any four questions from 20.1 to 20.5.**

**$1 \times 4$**

Ohm s law gives a relationship between current and potential difference. According to this Law, at constant temperature, the current flowing through a conductor is directly proportional. to the potential difference across its ends. The ratio of potential difference applied between the ends of a conductor and the current flowing through it is a constant quantity called resistance.

The following graph is obtained by a researcher while doing an experiment to study Ohm s law. The *I* - *V* graph for four conductors A, B, C and D having resistance  $R_A, R_B, R_C$  and  $R_D$  respectively are shown in the graph.



**20.1** If all the conductors are of same length and same material, which is the thickest ?

- (a) C
- (b) D
- (c) A
- (d) B

**Ans :** (b) D

**20.2** If all the conductors are of same thickness and of same material, which is the longest ?

- (a) B
- (b) C
- (c) A
- (d) D

**Ans :** (c) A

**20.3** Which one of the following relations is true for these conductors ?

- (a)  $R_A > R_B > R_C > R_D$
- (b)  $R_A = R_B < R_C < R_D$
- (c)  $R_A < R_B < R_C < R_D$
- (d)  $R_A = R_B = R_C = R_D$

**Ans :** (a)  $R_A > R_B > R_C > R_D$

**20.4** If conductors A and B are connected in series and *I* - *V* graph is plotted for the combination, its slope would be:

- (a) more than that of A
- (b) between A and B
- (c) more than that of D
- (d) less than that of A

**Ans :** (d) less than that of A

**20.5** If conductors C and D are connected in parallel and *I* - *V* graph is plotted for the combination, its slope would be:

- (a) between C and D
- (b) lesser than that of A
- (c) more than that of D
- (d) between B and C

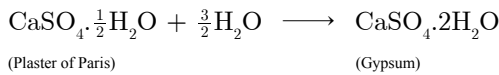
**Ans :** (c) more than that of D

## Section B

21. A white chemical compound becomes hard on mixing proper quantity of water. It is also used to maintain joints in fixed position. Name the chemical compound and write its chemical formula. Write the chemical equation to show what happens when water is added to this compound in proper quantity. [2]

Ans :

$\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$  is the formula of the compound. The name of compound is 'Plaster of Paris' (Calcium sulphate hemihydrate).



or

Two solutions 'A' and 'B' have pH value 3.0 and 10.5 respectively. Which of these will turn

- a. Blue litmus solution to red,
- b. Phenolphthalein from colourless to pink? Justify your answer in each case.

Ans :

- a. 'A' with  $\text{pH} = 3$ , will turn blue litmus red because it is acidic in nature.
- b. "B" with  $\text{pH} = 10.5$ , will turn phenolphthalein colourless to pink because 'B' is basic in nature.

22. State the changes that take place in the uterus when
- a. Implantation of embryo has occurred
  - b. female gamete/egg is not fertilized [2]

Ans :

- a. Uterus wall becomes thicker due to development of blood vessels and glands in it and placenta develops from the side of foetus so that it can derive nutrition from mother and pass the waste to mother's blood.
- b. Uterus lining gets peeled and shed off along with mucus, blood, dead ovum during menstruation.

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

Li(3): 2,1

K(19):2,8, 1

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

Group 2

Be(4): 2, 2

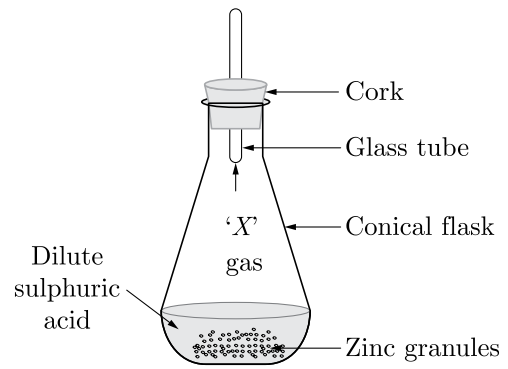
Mg (12): 2, 8, 2

- a. Name the element with atomic number 17.
- b. To which period does it belong to?
- c. To which group does it belong to?
- d. Write its electronic configuration.

Ans :

- a. Chlorine (17): 2, 8, 7
- b. It belongs to 3rd period.
- c. It belongs to group 17.
- d. 2, 8, 7 is the electronic configuration of chlorine.

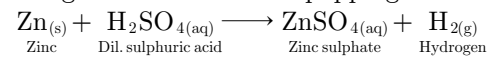
24. Observe the given figure and answer the questions that follow:



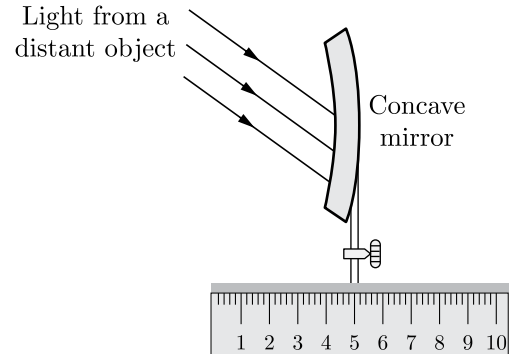
- a. Identify the gas 'X'.
- b. How will you test for the gas which is liberated in the experiment? [2]

Ans :

- a. 'X' is hydrogen gas.
- b. The gas liberated is hydrogen and it can be tested by taking a burning matchstick near the mouth of the test tube in which the reaction is taking place. The gas will burn with a popping sound.



25. In the below set-up, the focal length of the concave mirror is 4.0 cm. Where should the screen be placed on the scale to obtain a sharp image? [2]



Ans :

When the object is kept at infinity in front of a concave mirror, then its image is formed at focus. Here, the focal length of the concave mirror is 4.0 cm. Mirror stand is placed at 5.0 cm mark on the metre scale. Hence the screen should be placed at 1 cm mark on the scale to obtain a sharp image.

26. a. What material is used in making the filament of an electric bulb?  
b. Name the characteristics which make it suitable for this. [2]

Ans :

- a. Tungsten is used in making filament.
- b. Its high resistivity and high melting point.

## Section C

27. 2 g of ferrous sulphate crystals were heated in a hard glass test tube and observations recorded.
- a. What type of odour is observed on heating ferrous sulphate crystals?
  - b. Name the products obtained on heating ferrous sulphate crystals.
  - c. What type of reaction is taking place. [3]

Ans :

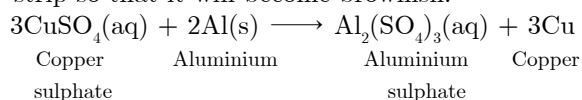
- a. As of burning sulphur.
- b. Ferric oxide, sulphur dioxide, sulphur trioxide.
- c. Decomposition reaction.

or

- a. Why metals are not found in their free state generally?
- b. If a strip of aluminium with scratched clean surface is dipped into an aqueous solution of copper sulphate for little time, surface of the strip becomes brownish. What is the reason for this? Write the balanced chemical equation for the reaction.

Ans :

- a. Most of the metals are found in the form of their compounds, i.e., in the combined state. It is because, their position is above hydrogen in the chemical reactivity series and hence, readily react with air, water, carbon dioxide, etc. They are found in the form of their sulphides, carbonates or oxides.
- b. When a strip of aluminium is dipped into an aqueous solution of copper sulphate it will displace copper and forms aluminium sulphate. Copper will deposit on the surface of aluminium strip so that it will become brownish.



28. How do guard cells regulate opening and closing of stomatal pores? [3]

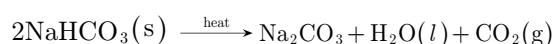
Ans :

The opening and closing of stomatal pore is a function of guard cells. Stomata act as turgor operated valves. The guard cells are thicker on the inner side and thinner on the outer side. The guard cells swell when water flow into them from the surrounding epidermal cells. They get curved out due to thick inner walls and produce a pore in between. Similarly, the pore closes when guard cells lose water to their surrounding cells and shrink back to their original position.

29. Write the chemical formula for washing soda. How may it be obtained from baking soda? Name an industrial use of washing soda other than washing clothes. [3]

Ans :

- a. The chemical formula of washing soda is  $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ .
- b. Baking soda ( $\text{NaHCO}_3$ ) is strongly heated to form soda ash.



The soda ash is dissolved in boiling hot water so as to obtain its saturated solution. The saturated solution so obtained is allowed to cool, when washing soda crystals separate out.



- c. Washing soda is used in the manufacture of glass.
30. Out of the elements H(1), Be(4), Na(11) and Mg(12).
- a. Write the pair of elements having similar chemical properties.
  - b. State the group number of each pair,
  - c. Name one another element belonging to each of these groups. [3]

Ans :

- a. Be(4) and Mg(12) have similar chemical properties. H(1) and Na(11) have similar chemical properties.
  - b. Be and Mg belong to group 2, H and Na belong to group 1.
  - c. K belongs to group 1 and Ca belongs to group 2.
31. What are covalent compounds? Why are they different from ionic compounds? List their three characteristic properties. [3]

Ans :

Covalent compounds are those compounds which are formed by sharing of electrons between two atoms and thus containing covalent bonds.

These compounds are different from ionic compounds because the ionic compounds are formed by the transference of electrons while covalent compounds by sharing of electrons.

Characteristics of covalent compounds :

- a. They have generally low melting and boiling points.
  - b. They are generally insoluble or less soluble in water but soluble in organic solvents like ethanol.
  - c. They do not conduct electricity.
32. Why does the sun appear reddish early in the morning? Will this phenomenon be observed by an observer on the moon? Justify your answer with a reason. [3]

Ans :

Early in the morning, the sun is near the horizon, sunlight reaches us after covering a longer distance through thick layers of atmosphere. So the most of the blue light and other light of shorter wavelengths are scattered away by the particles in the atmosphere. The light that reaches us is of longer wavelengths such as red light thus giving a reddish appearance.

This phenomenon will not be observed by an observer on the moon because of the absence of atmosphere on the moon.

33. Suggest three contraceptive methods to control the size of human population which is essential for the health and prosperity of a country. State the basic principle involved in each. [3]

Ans :

Three contraceptive methods are following :

- a. **Barrier method or mechanical method :** Condom or diaphragm is used to prevent the meeting of sperms and ova.
- b. **Chemical method :** Oral pills change the hormonal balance of the female partner so that the eggs are not released.

- c. **Surgical method** : It is used to block the vas deferens in males or the fallopian tube (oviduct) in females, to prevent the transfer of sperms or eggs and hence no fertilization takes place.

## Section D

34. a. Give a chemical test to distinguish between saturated and unsaturated hydrocarbon.  
 b. Name the products formed when ethane burns in air. Write the balanced chemical equation for the reaction showing the types of energies liberated.  
 c. Why is reaction between methane and chlorine in the presence of sunlight considered a substitution reaction? [5]

**Ans :**

- a. **Chemical test to distinguish saturated and unsaturated hydrocarbons** : Pass the vapours of the samples of saturated and unsaturated hydrocarbons into bromine water taken in two separate test tubes. The one which discharges the colour of bromine water is that of unsaturated hydrocarbon and rest of the other represents saturated hydrocarbon.  
 b. On burning ethane in air, the products obtained are carbon dioxide and water, with heat and light.  

$$2\text{C}_2\text{H}_6(\text{g}) + 7\text{O}_2(\text{g}) \longrightarrow 4\text{CO}_2(\text{g}) + 6\text{H}_2\text{O}(\text{l}) + \text{Heat} + \text{Light}$$
  
 c. It is considered a substitution reaction because the hydrogen atoms of methane ( $\text{CH}_4$ ) are replaced by chlorine atoms one by one successively.

**or**

Account for the following.

- a. Dry HCl gas does not change the colour of dry blue litmus paper  
 b. Antacid tablets are used by a person suffering from stomach pain.  
 c. Toothpaste is used for cleaning teeth.

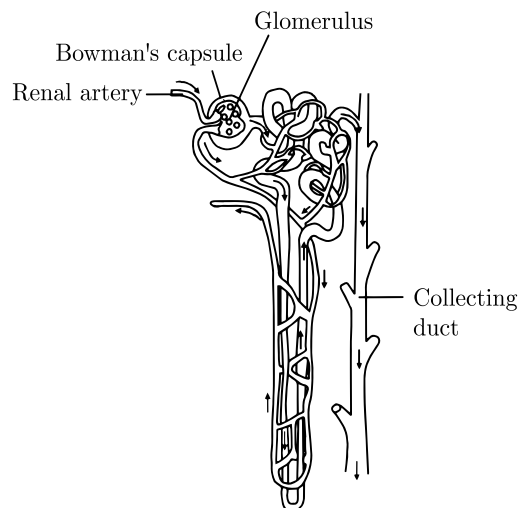
**Ans :**

- a. Dry HCl gas on coming in contact with dry blue litmus paper does not produce  $\text{H}^+$  ions and hence, the colour of litmus paper does not change.  
 b. Antacid tablets generally consists of magnesium hydroxide and aluminium hydroxide, which are mild bases. They react chemically with the hydrochloric acid produced in stomach and neutralise it.  
 c. All toothpaste contain some substances that are basic in nature and hence neutralise acids. So the best way to avoid cavities is to brush your teeth with some toothpaste.

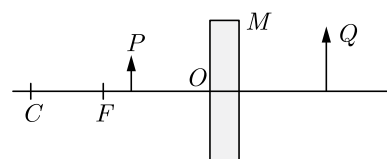
35. a. Draw a neat diagram of an excretory unit of a human kidney and label the following parts.  
 (i) Bowman's capsule  
 (ii) Renal artery  
 (iii) Glomerulus  
 (iv) Collecting duct  
 b. Give one advantage of having a large number of these highly coiled structures in our kidneys.  
 c. Mention any two substances which are selectively reabsorbed as the filtrate flows along the tubular part of this unit. [5]

**Ans :**

a.



- b. These help in increasing the surface area for filtration and proper re-absorption of useful substances.  
 c. Glucose, amino acids, salts, water (any two).
36. a. Define the following terms in the context of spherical mirrors:  
 (i) Pole  
 (ii) Centre of curvature  
 (iii) Principal axis  
 (iv) Principal focus  
 b. Draw ray diagrams to show the principal focus of a :  
 (i) Concave mirror  
 (ii) Convex mirror  
 c. Consider the following diagram in which  $M$  is a mirror and  $P$  is an object and  $Q$  is its magnified image formed by the mirror



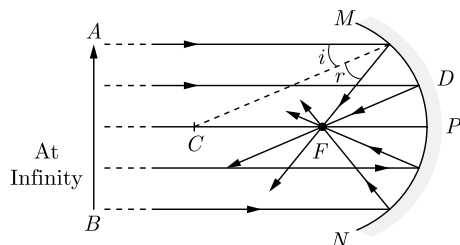
State the type of the mirror  $M$  and one characteristic property of the image  $Q$ . [5]

**Ans :**

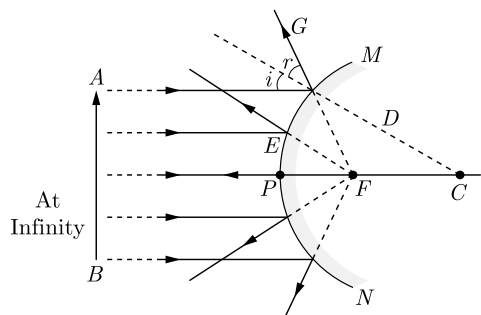
a.

- (i) **Pole** : The centre of the reflecting surface of the mirror is called pole.  
 (ii) **Centre of curvature** : The centre of the hollow sphere of which the reflecting surface of mirror forms a part is called centre of curvature.  
 (iii) **Principal axis** : The imaginary line passing through the pole and the centre of curvature of a spherical mirror is called principal axis.  
 (iv) **Principal focus** : When incident rays parallel to principal axis, after reflection, either converge to or appear to diverge from a fixed point on the principal axis called principal focus.

b. (i) Concave mirror



(ii) Convex mirror



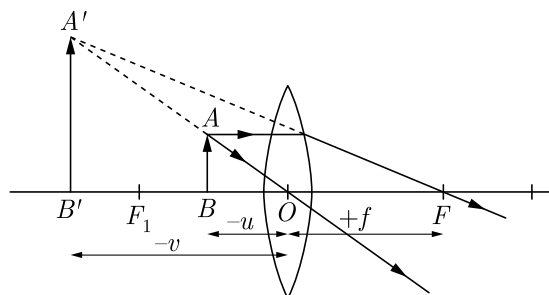
c. Concave mirror  
Image formed is virtual and erect.

or

- Draw a ray diagram to show the formation of image by a convex lens when an object is placed in front of the lens between its optical centre and principal focus.
- In the above ray diagram mark the object-distance ( $u$ ) and the image-distance ( $v$ ) with their proper signs (+ve or -ve as per the new Cartesian sign convention) and state how these distances are related to the focal length ( $f$ ) of the convex lens in the case.
- Find the power of a convex lens which forms a real, and inverted image of magnification  $-1$  of an object placed at a distance of 20 cm from its optical centre.

Ans :

a.



- Relation between object-distance ( $u$ ), image-distance ( $v$ ) and focal length ( $f$ ) is given by :

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

c. Here,  $m = -1$ ;  $u = -20$  cm;  $v = ?$   $f = ?$

$$m = \frac{v}{u} \Rightarrow -1 = \frac{v}{-20} \therefore v = 20 \text{ cm}$$

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} = \frac{1}{20} - \frac{1}{-20}$$

$$= \frac{1}{20} + \frac{1}{20} = \frac{2}{20} = \frac{1}{10}$$

$$f = 10 \text{ cm}$$

$$\begin{aligned} \text{Thus, Power of the lens, } P &= \frac{100}{f \text{ (in cm)}} \\ &= \frac{100}{10} = +10 \text{ D} \end{aligned}$$

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