

### Section – A

1. A Mendelian experiment consisted of breeding pea plants bearing violet flowers with pea plants bearing white flowers. What will be the result in F<sub>1</sub> progeny ?

**Ans.** Violet flowers

2. Write the energy conversion that takes place in a hydropower plant.

**Ans.** Potential /Kinetic/ Mechanical Energy into Electrical energy

3. A compound 'X' on heating with excess conc. sulphuric acid at 443 K gives an unsaturated compound 'Y'. 'X' also reacts with sodium metal to evolve a colourless gas 'Z'. Identify 'X', 'Y' and 'Z'. Write the equation of the chemical reaction of formation of 'Y' and also write the role of sulphuric acid in the reaction.

**Ans.**

- X-Ethanol/ (C<sub>2</sub> H<sub>5</sub>OH)/Ethyl Alcohol
- Y- Ethene / (C<sub>2</sub> H<sub>4</sub>)
- Z- Hydrogen/ (H<sub>2</sub>)
- $\text{CH}_3\text{-CH}_2\text{OH} \xrightarrow{\text{concH}_2\text{SO}_4} \text{CH}_2=\text{CH}_2 + \text{H}_2\text{O}$
- Role of sulphuric acid - dehydrating agent

4.

- a. Name one gustatory receptor and one olfactory receptor present in human beings.
- b. Write a and b in the given flow chart of neuron through which information travels as an electrical impulse.

**Dendrite** →→ **a** →→ **b** →→ **End point of Neuron**

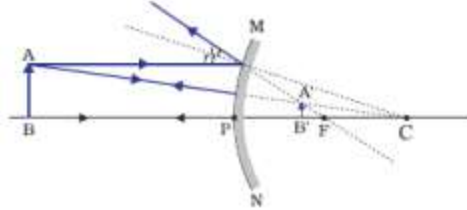
**Ans.**

- a. Due to ambiguity in the question award 1 mark whether attempted or not.
- b.
- a. Axon
  - b. Cell body/ cyton

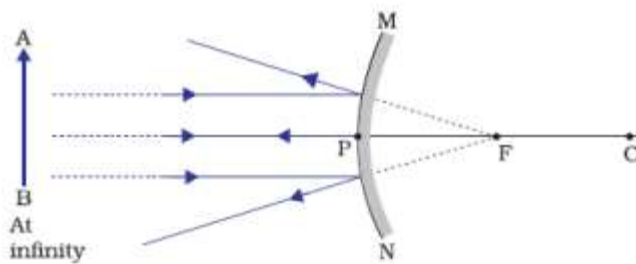
5. If the image formed by a spherical mirror for all positions of the object placed in front of it is always erect and diminished, what type of mirror is it? Draw a labelled ray diagram to support your answer.

Ans.

- Convex Mirror
- Labelled Ray diagram for any position of object



OR



6. Decomposition reactions require energy either in the form of heat or light or electricity for breaking down the reactants. Write one equation each for decomposition reactions where energy is supplied in the form of heat, light and electricity.

Ans.

- $$\text{CaCO}_3 \xrightarrow{\text{heat}} \text{CaO} + \text{CO}_2$$

$$2\text{FeSO}_4 \xrightarrow{\text{heat}} \text{Fe}_2\text{O}_3 + \text{SO}_2 + \text{SO}_3$$

$$2\text{Pb}(\text{NO}_3)_2 \xrightarrow{\text{heat}} 2\text{PbO} + 4\text{NO}_2 + \text{O}_2$$
  - $$2\text{AgCl} \xrightarrow{\text{sunlight}} 2\text{Ag} + \text{Cl}_2$$

$$2\text{AgBr} \xrightarrow{\text{Sunlight}} 2\text{Ag} + \text{Br}_2$$
  - $$2\text{H}_2\text{O} \xrightarrow{\text{electricity}} 2\text{H}_2 + \text{O}_2$$
- (or any other equation for above decomposition reaction.)

7. 2 mL of sodium hydroxide solution is added to a few pieces of granulated zinc metal taken in a test tube. When the contents are warmed, a gas evolves which is bubbled through a soap solution before testing. Write the equation of the chemical reaction involved and the test to detect the gas. Name the gas which will be evolved when the same metal reacts with dilute solution of a strong acid.

OR

The pH of a salt used to make tasty and crispy pakoras is 14. Identify the salt and write a chemical equation for its formation. List its two uses.

Ans.

- $\text{Zn} + 2\text{NaOH} \rightarrow \text{Na}_2\text{ZnO}_2 + \text{H}_2$
- When a burning splinter is brought near the gas, it burns with a Pop Sound.
- Gas – Hydrogen /  $\text{H}_2$

OR

- $\text{NaHCO}_3$  (Sodium Hydrogen Carbonate/ Sodium Bicarbonate)
- $\text{NaCl} + \text{H}_2\text{O} + \text{CO}_2 + \text{NH}_3 \rightarrow \text{NH}_4\text{Cl} + \text{NaHCO}_3$

Uses:

For making baking powder

As ingredient of antacid.

Soda-acid fire extinguishers (Any two)

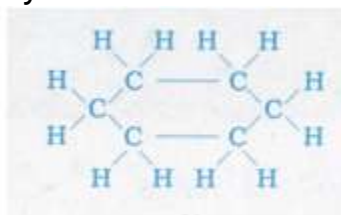
8.

- a. Why are most carbon compounds poor conductors of electricity ?
- b. Write the name and structure of a saturated compound in which the carbon atoms are arranged in a ring. Give the number of single bonds present in this compound.

Ans.

- a. Carbon compounds form Covalent bonds/ do not dissociate into ions/ do not have charged particles (ions)

b. Cyclohexane



Total No. of single bonds=18

(OR any other cycloalkane with corresponding number of bonds)

9. **Name the hormones secreted by the following endocrine glands and specify one function of each :**

- a. **Thyroid**
- b. **Pituitary**
- c. **Pancreas**

**Ans.**

- d. Thyroxine, regulates carbohydrate protein and fat metabolism/ controls metabolism for balance of body growth
- e. Growth hormone, regulates growth and development of body (or any other correct answer)
- f. Insulin, regulates/ decreases blood sugar level

**OR**

Glucagon, regulates / increases blood sugar

10. **Write one main difference between asexual and sexual mode of reproduction. Which species is likely to have comparatively better chances of survival – the one reproducing asexually or the one reproducing sexually ? Give reason to justify your answer.**

**Ans.** Any one of the following difference:

- i. In sexual reproduction two opposite sexes are involved where as in asexual reproduction only one individual is involved.
- ii. In sexual reproduction male and female gamete formation takes place where as in asexual no gamete formation occurs.
  - Sexually reproducing organisms have better chances of survival
  - Because more variations are generated.

11. State the laws of refraction of light. Explain the term 'absolute refractive index of a medium' and write an expression to relate it with the speed of light in vacuum.

OR

**What is meant by power of a lens ? Write its SI unit. A student uses a lens of focal length 40 cm and another of – 20 cm. Write the nature and power of each lens.**

**Ans.** 1st law: the incident ray, refracted ray and normal to the interface at the point of incidence lie in the same plane.

2nd law: The sine of angle of incidence bears a constant ratio with sine of angle of refraction for a given pair of media.

Or  $\frac{\sin i}{\sin r} = \text{constant}$   $\frac{\sin i_0}{\sin r_0} = \text{constant}$

Absolute Refractive Index of a medium =  $\frac{\text{speed of light in air or vacuum}}{\text{speed of light in the medium}}$

(Award full marks if the same thing is given in the form of statement)

OR

Power of lens = Ability to converge/ diverge light rays passing through it/ reciprocal of the focal length in metres /  $\frac{1}{f}$  (in meters)

SI unit of power is Dioptre

Power of 1st lens  $P_1 = \frac{1}{f_1} = \frac{1}{0.40\text{m}} = +2.5 \text{ D}$

Nature: Converging lens / Convex lens

Power of 2nd lens  $P_2 = \frac{1}{f_2} = \frac{1}{-0.20\text{m}} = -5 \text{ D}$

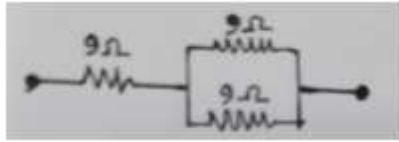
Nature: Diverging lens / Concave lens

12. Show how would you join three resistors, each of resistance  $9 \Omega$  so that the equivalent resistance of the combination is (i)  $13.5 \Omega$ , (ii)  $6 \Omega$  ?

OR

- Write Joule's law of heating.
- Two lamps, one rated 100 W; 220 V, and the other 60 W; 220 V, are connected in parallel to electric mains supply. Find the current drawn by two bulbs from the line, if the supply voltage is 220 V.

Ans.



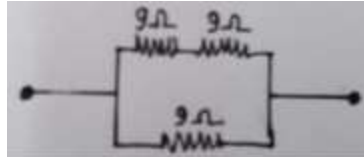
i.

Two 9 ohm resistors in parallel connected to one 9 ohms in series

$$1/R_2 = 1/9 + 1/9 = 2/9 \quad 1/R_2 = 1/9 + 1/9 = 2/9$$

$$\therefore R_p = 9/2 \Omega \therefore R_p = 4.5 \Omega$$

$$R = 9 \Omega + 4.5 \Omega = 13.5 \Omega \quad R = 9 \Omega + 4.5 \Omega = 13.5 \Omega$$



ii.

Two 9 ohm resistors in series connected to one 9 ohms in parallel

$$R_s = 9 \Omega + 9 \Omega = 18 \Omega \quad R_s = 9 \Omega + 9 \Omega = 18 \Omega$$

$$1/R = 1/18 + 1/9 = 3/18 \quad 1/R = 1/18 + 1/9 = 3/18 \therefore R = 6 \Omega \therefore R = 6 \Omega$$

OR

- a. Joule's law of heating – Heat produced in a resistor is (i) directly proportional to the square of current for a given resistance, (ii) directly proportional to the resistance for a given current and (iii) directly proportional to the time for which the current flows through the resistor /  $H = I^2 R t$  where, H = Heat produced, I = current, R = Resistance of the conductor and t = Time for which the current flows through the resistor
- b. Current in 1st bulb,  $I_1 = P_1/V = 100/220 = 0.45 \text{ A}$  or 0.45 A  
 Current in 2nd bulb,  $I_2 = P_2/V = 60/220 = 0.27 \text{ A}$  or 0.27 A

13.

- List the factors on which the resistance of a conductor in the shape of a wire depends.
- Why are metals good conductors of electricity whereas glass is a bad conductor of electricity? Give reason.
- Why are alloys commonly used in electrical heating devices? Give reason.

Ans.

- a. Factors on which resistance of a conductor depends:
    - i. Length of conductor [or  $R \propto l$ ]
    - ii. Area of cross-section of the conductor [or  $R \propto 1/A$ ]
  - b. Metals are good conductor of electricity – as they have low resistivity/ have free electrons  
Gass is a bad conductor of electricity – as it has high resistivity/have no free electrons
  - c. Reason: Alloys have high resistivity /high melting point / alloys do not oxidize (Or burn) readily at high temperatures. (anyone)
14. **Students in a school listened to the news read in the morning assembly that the mountain of garbage in Delhi, suddenly exploded and various vehicles got buried under it. Several people were also injured and there was traffic jam all around. In the brain storming session the teacher also discussed this issue and asked the students to find out a solution to the problem of garbage. Finally they arrived at two main points – one is self management of the garbage we produce and the second is to generate less garbage at individual level.**
- a. **Suggest two measures to manage the garbage we produce.**
  - b. **As an individual, what can we do to generate the least garbage ? Give two points.**
  - c. **List two values the teacher instilled in his students in this episode.**

**Ans.**

- a. Incineration/ Waste compaction/ Biogas generation/ Composting/ Segregation and safe disposal/Vermicomposting (Any other) (any two)
- b. Reuse of empty bottles, books etc. Reduce the use of non-biodegradable substances like polythene, thermocol etc. (Any other)
- c. Awareness about environment, scientific attitude, Concern for community health and personal health (Any two)

15. **What is a dam ? Why do we seek to build large dams ? While building large dams, which three main problems should particularly be addressed to maintain peace among local people ? Mention them.**

**Ans.**

- i. Dam is a barrier that is built across a river or a stream for storage of water.
- ii. Large dam can ensure the storage of adequate water for irrigation and also for generating electricity.
- iii. Social problem, economic problem and environmental problem

16.

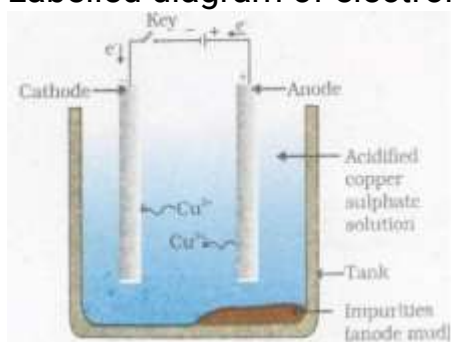
- a. **Write the steps involved in the extraction of pure metals in the middle of the activity series from their carbonate ores.**
- b. **How is copper extracted from its sulphide ore ? Explain the various steps supported by chemical equations. Draw labelled diagram for the electrolytic refining of copper.**

**Ans.**

- a.
  - i. Calcination
  - ii. Reduction
  - iii. Purification (in the given sequence only)
- b. Sulphide ore of copper is heated in air  

$$2\text{Cu}_2\text{S} + 3\text{O}_2 \rightarrow 2\text{Cu}_2\text{O} + 2\text{SO}_2$$

$$2\text{Cu}_2\text{O} + \text{Cu}_2\text{S} \rightarrow 6\text{Cu} + \text{SO}_2$$
 (Note: Full marks to be awarded even when only equations are written.)
- c. Labelled diagram of electrolytic refining of copper





17.

- a. **The modern periodic table has been evolved through the early attempts of Dobereiner, Newland and Mendeleev. List one advantage and one limitation of all the three attempts.**
- b. **Name the scientist who first of all showed that atomic number of an element is a more fundamental property than its atomic mass.**
- c. **State Modern periodic law.**

**Ans. Dobereiner Periodic Table**

Advantage: To predict the atomic mass of middle element in each triad

Limitation: Dobereiner could identify only three triads

**Newland Periodic table**

Advantage: Every eighth element had properties similar to that of first/ co-related the properties of elements with their atomic mass.,

Limitation: It was only applicable up to Calcium / only 56 elements and no future element

**Mendeleev's Periodic Table**

Advantage: Elements with similar properties could be grouped / He predicted the existence of new elements that had not been discovered at that time.

Limitation: No fixed position for hydrogen/ position of isotopes/ Atomic masses do not increase in a regular manner.

Henry Moseley

Properties of elements are a periodic function of their atomic number

18.

- a. **Mention any two components of blood.**
- b. **Trace the movement of oxygenated blood in the body.**
- c. **Write the function of valves present in between atria and ventricles.**
- d. **Write one structural difference between the composition of artery and veins.**

**OR**

- a. **Define excretion.**
- b. **Name the basic filtration unit present in the kidney.**
- c. **Draw excretory system in human beings and label the following organs of excretory system which perform following functions :**
  - i. **form urine.**

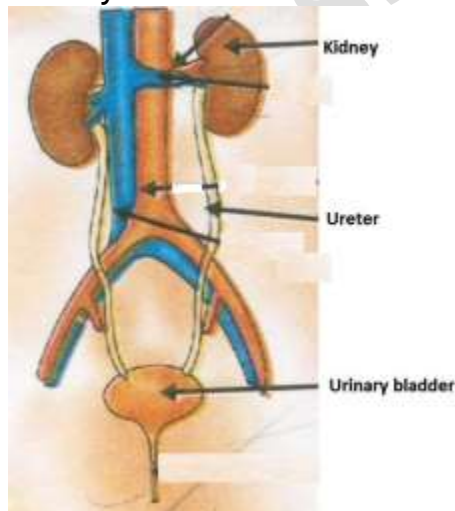
- ii. **is a long tube which collects urine from kidney.**
- iii. **store urine until it is passed out.**

**Ans.**

- a. Plasma, red blood cells, white blood cells, platelets (any two)
- b. Lungs →→ Left side of the heart →→ aorta →→ body organs  
Note : Give weightage even if same thing is explained in the form of paragraph.
- c. Prevent back flow of blood
- d. Artery has thick elastic wall and vein is thin walled/ valves are present in the veins and not in arteries

**OR**

- e. Process involved in removal of nitrogenous / harmful metabolic waste from the body.
- f. Nephron.
- g. Diagram of Human Excretory System:  
Labelling of the following parts
  - i. kidney
  - ii. ureter
  - iii. urinary bladder



h.

- a. **Write the function of following parts in human female reproductive system :**
  - i. **Ovary**

- ii. **Oviduct**
- iii. **Uterus**
- b. **Describe in brief the structure and function of placenta.**

**Ans.**

- a.
  - i. Ovary – releases egg/ female gamete/ ovum releases oestrogen/ female hormones (any one)
  - ii. Oviduct- Transportation of ovum/ egg from ovary to the uterus/ Site of fertilization
  - iii. Uterus – Development of embryo/ foetus
- b. Placenta- It is a disc embedded in uterine wall which contains villi on the embryo side of the tissue and blood space on mother side. Function of placenta: Provides nourishment to embryo from mother's blood / Removal of waste from embryo to mother's blood. (Any one)

20.

- a. **A student is unable to see clearly the words written on the black board placed at a distance of approximately 3 m from him. Name the defect of vision the boy is suffering from. State the possible causes of this defect and explain the method of correcting it.**
- b. **Why do stars twinkle ? Explain.**

**OR**

- a. **Write the function of each of the following parts of human eye :**
  - i. **Cornea**
  - ii. **Iris**
  - iii. **Crystalline lens**
  - iv. **Ciliary muscles**
- b. **Why does the sun appear reddish early in the morning ? Will this phenomenon be observed by an astronaut on the Moon ? Give reason to justify your answer.**

**Ans.**

- a. Defect of vision – Myopia or short sightedness or near sightedness

Causes of myopia:

- i. Excessive curvature of eye lens/eye lens becomes more converging
- ii. Elongation of eye ball

Methods of correction: By the use of concave lens of suitable power or focal length the defect is corrected. / suitable diagrammatic representation.

- b. Due to atmospheric refraction

The density of different layers of air keeps on changing due to which the apparent image of the stars keeps on changing. This changing position of stars appears as twinkling of stars.

**OR**

- a. Function of:

- Cornea: focuses light rays / permits the light to enter the eye..
- Iris: Controls amount of light entering the eye. / controls the size of pupil.
- Crystalline Lens: Converges light rays onto retina.
- Ciliary Muscles: Adjusts focal length of eye lens by contraction and relaxation so that sharp image can be obtained on the retina. / helps in accommodation

In early morning, sun light has to cover larger distance in the atmosphere. So, the shorter wavelengths scatter out. Only the longer wavelengths like red reach our eye.

On moon – No

Cause: Moon has no atmosphere

21.

- a. **State Fleming's left hand rule.**
- b. **Write the principle of working of an electric motor.**
- c. **Explain the function of the following parts of an electric motor.**
  - i. **Armature**
  - ii. **Brushes**

iii. **Split ring**

**Ans.**

- a. Fleming's left-hand rule: stretch the forefinger, middle finger and thumb of left hand in such a way that they are mutually perpendicular to each other. If the forefinger point in the direction of magnetic field, middle finger point in the direction of current then the thumb show the direction of force or motion on the current carrying conductor.
- b. Principle of working of electric motor: A coil carrying electric current placed in an external magnetic field experiences a force.
- c.
  - i. Function of armature: Enhances the power of the motor/ induces motion.
  - ii. Function of brushes: Helps easy transfer of charge between the coil and the external circuit.
  - iii. Function of split rings: Reverses the direction of current after each half rotation of the coil so that the coil can keep rotating continuously.

**Section – B**

22. **A student added few pieces of aluminium metal to two test tubes A and B containing aqueous solutions of iron sulphate and copper sulphate. In the second part of her experiment, she added iron metal to another test tubes C and D containing aqueous solutions of aluminium sulphate and copper sulphate.**

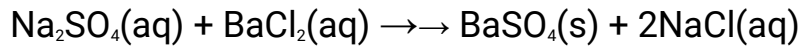
**In which test tube or test tubes will she observe colour change ? On the basis of this experiment, state which one is the most reactive metal and why.**

**Ans.** In the test tube A, B, D she will observe colour change (No splitting of marks)

Aluminum is the most reactive metal, because it displaces Iron, Zinc and Copper from their aqueous salt solutions.

23. **What is observed when a solution of sodium sulphate is added to a solution of barium chloride taken in a test tube ? Write equation for the chemical reaction involved and name the type of reaction in this case.**

**Ans.** White precipitate is observed



Double displacement reaction

24. **List the steps of preparation of temporary mount of a leaf peel to observe stomata.**

**Ans.** The steps are:

- i. Removal of peel from leaf
- ii. Stain with safranin
- iii. Put the stained peel on a clean slide
- iv. Mount it with glycerine and cover slip

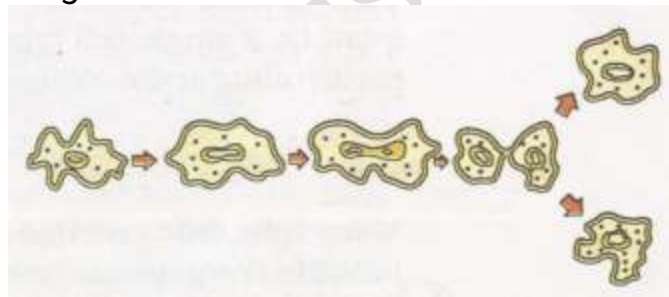
25. **Name the process by which an amoeba reproduces. Draw the various stages of its reproduction in a proper sequence.**

OR

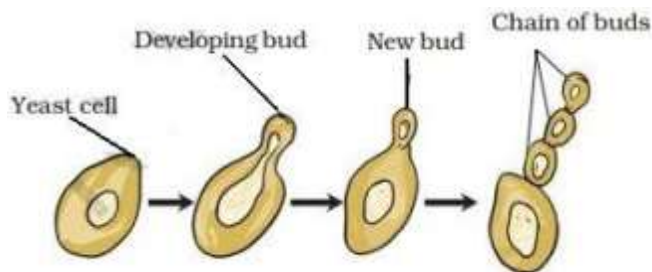
**A student is viewing under a microscope a permanent slide showing various stages of asexual reproduction by budding in yeast. Draw diagrams of what he observes. (in proper sequence)**

**Ans.**

- Binary fission
- Diagram

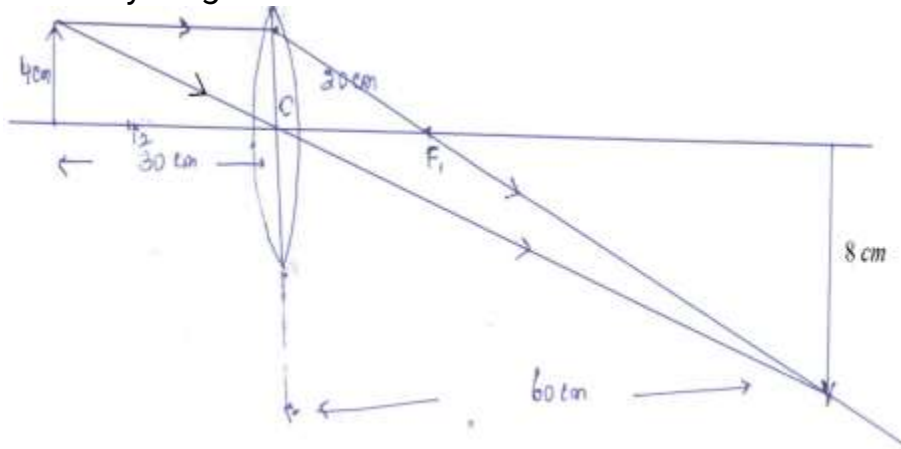


OR



26. 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.

Ans. Ray diagram



Position of O and F

Ratio =  $h_i/h_o$  approximately 2:1

27. The values of current (I) flowing through a given resistor of resistance (R), for the corresponding values of potential difference (V) across the resistor are as given below :

V (volts)	0.5	1.0	1.5	2.0	2.5	3.0	4.0	5.0
I (amperes)	0.1	0.2	0.3	0.4	0.5	0.6	0.8	1.0

28. Plot a graph between current (I) and potential difference (V) and determine the resistance (R) of the resistor.

Ans.

