

**Class-XII**  
**Session - 2022-23**  
**Subject - Science**  
**Sample Question Paper - 33**  
**With Solution**

**BLUE PRINT**

S. No.	Chapter Name	Section-A	Section-B	Section-C	Section-D	Section-E	Total Marks
		(MCQs & A/R) 1 Mark Q. No.	(VSAQs) 2 Marks Q. No.	(SAQs) 3 Marks Q. No.	(LAQs) 5 Marks Q. No.	(Case Study) 4 Marks Q. No.	
1	Chemical Reactions and Equations	3(Q2,7,17)			1(Q34)		8
2	Acids, Bases and Salts	1(Q4)	1(Q21)			1(Q37)	7
3	Metals and Non-metals	1(Q3)	1(Q21 OR)	1(Q27)			4
4	Carbon and its Compounds	3(Q1,5,6)		1(Q28)			6
5	Life Processes	1(Q9)	1(Q22)			1(Q39)	7
6	Control and Co-ordination	1(Q10)	1(Q23)	1(Q29)			6
7	How do Organism Reproduce	1(Q11)	1(Q26)		1(Q35)		8
8	Heredity and Evolution	2(Q12,19)	1(Q24)				4
9	Light- Reflection and Refraction	3(Q13,15,18)		2(Q31,32)			9
10	Human Eye and Colourful World	1(Q14)	1(Q25)				3
11	Electricity	1(Q16)				1(Q38)	5
12	Magnetic Effects of Electric Current			1(Q33)	1(Q36)		8
13	Our Environment	2(Q8,20)		1(Q30)			5
<b>* Total Questions (Total Marks)</b>		<b>20(20)</b>	<b>6(12)</b>	<b>7(21)</b>	<b>3(15)</b>	<b>3(12)</b>	<b>80</b>

\* The number given outside the bracket denotes number of questions asked in the sample paper, while the number given inside the bracket denotes marks.

### General Instructions

1. This question paper consists of 39 questions in 5 sections.
2. All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.
3. **Section A** consists of 20 objective type questions carrying 1 mark each.
4. **Section B** consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should be in the range of 30 to 50 words.
5. **Section C** consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should be in the range of 50 to 80 words.
6. **Section D** consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.
7. **Section E** consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

### SECTION-A

**Select and write one most appropriate option out of the four options given for each of the Questions 1 to 20**

1. The functional group represent alcohol is –
 

(a) –OH	(b) –CHO	(c) –COOH	(d) >C=O
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2. The following reaction is an example of a
 
$$4\text{NH}_3(\text{g}) + 5\text{O}_2(\text{g}) \longrightarrow 4\text{NO}(\text{g}) + 6\text{H}_2\text{O}(\text{g})$$

1. displacement reaction	2. combination reaction		
3. redox reaction	4. neutralisation reaction		
(a) 1 and 4	(b) 2 and 3	(c) 1 and 3	(d) 3 and 4
3. Which of the following are not ionic compounds?
 

(i) KCl	(ii) HCl	(iii) CCl <sub>4</sub>	(iv) NaCl
(a) (i) and (ii)	(b) (ii) and (iii)	(c) (iii) and (iv)	(d) (i) and (iii)
4. Which of the following acid does not react with metals?
 

(a) sulphuric acid	(b) phosphoric acid
(c) carbonic acid	(d) nitric acid
5. Methane, ethane and propane are said to form a homologous series because all are –
 

(a) hydrocarbons
(b) saturated compounds
(c) aliphatic compounds
(d) differ from each other by a CH <sub>2</sub> group
6. Which of the following options is false about a soap?
 

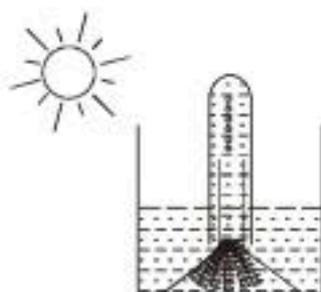
(a) The soap solution in water is neutral and can be used to wash all kinds of fabrics.
(b) Soap forms lather only in soft water.
(c) Soap is a metallic salt of higher fatty acids.
(d) Soap cannot be used in slightly acidic medium.
7. Which of the following are exothermic processes?
 

1. Reaction of water with quick lime	2. Dilution of an acid	3. Evaporation of water	4. Sublimation of camphor (crystals)
(a) 1 and 2	(b) 2 and 3	(c) 1 and 4	(d) 3 and 4
8. In the given food chain, suppose the amount of energy at fourth 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
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9. Photosynthesis in an aquatic plant was measured by counting the number of  $O_2$  bubbles coming out of the cut end of the plant. What will happen to  $O_2$  production if you use a pipe to blow air from your mouth into water in the beaker?



- (a) Air from mouth contains  $O_2$  which is being added to the plant. Hence increase in  $O_2$  production.  
 (b) Air from mouth contains  $CO_2$  which is utilized in photosynthesis. Hence, increase in  $O_2$  production.  
 (c) Bacteria from mouth will infect plant. Hence reduction in  $O_2$  production.  
 (d) Water is already in contact with air. Hence air from mouth will have no effect.
10. Electrical impulse travels in a neuron from  
 (a) Dendrite → axon → axonal end → cell body  
 (b) Cell body → dendrite → axon → axonal end  
 (c) Dendrite → cell body → axon → axonal end  
 (d) Axonal end → axon → cell body → dendrite
11. The development of offspring from any part of body is called  
 (a) Asexual reproduction  
 (b) Sexual reproduction  
 (c) Vegetative reproduction  
 (d) All the above
12. Which of the following is a dominant character according to Mendel?  
 (a) Dwarf plant and yellow fruit  
 (b) Terminal fruit and wrinkled seed  
 (c) White testa and yellow pericarp  
 (d) Green coloured pod and rounded seed
13. An object is placed 20.0 cm in front of a concave mirror whose focal length is 25.0 cm. What is the magnification of the object?  
 (a) +5.0  
 (b) -5.0  
 (c) +0.20  
 (d) -0.20
14. The reason for using red light in traffic signals to stop vehicles.  
 (a) Red light has shorter wavelength  
 (b) Red light has longer wavelength  
 (c) Red light is very bright and attractive  
 (d) Red light has highest angle of refraction
15. Where should an object be placed in front of a convex lens to get a real image of the size of the object?  
 (a) At the principal focus of the lens  
 (b) At twice the focal length  
 (c) At infinity  
 (d) Between the optical centre of the lens and its principal focus.
16. A cylindrical conductor of length  $l$  and uniform area of cross-section  $A$  has resistance  $R$ . Another conductor of length  $2l$  and resistance  $R$  of the same material has area of cross-section.  
 (a)  $A/2$   
 (b)  $3A/2$   
 (c)  $2A$   
 (d)  $3A$

**Directions: Q.No. 17–20 are Assertion - Reasoning based questions:** These consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

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

17. **Assertion :** Decomposition of vegetable matter into compost is an endothermic reaction.

**Reason :** Heat is required in an endothermic reaction.

18. **Assertion:** A point object is placed at a distance of 26 cm from a convex mirror of focal length 26 cm. The image will not form at infinity.

**Reason:** For above given system, the equation  $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$  gives  $v = \infty$ .

19. **Assertion:** The principal of segregation given by Mendel is the principle of purity of gametes.

**Reason:** Gametes are pure for a character and do not mix up.

20. **Assertion:** Lichens are bio-indicators of air pollution.

**Reason:** They do not grow in Delhi.

### SECTION-B

**Q. no. 21 to 26 are Very Short Answer Questions.**

21. pH of a solution changes from 4 to 3 what changes in hydrogen ion concentration do you expect?

**OR**

Metals replace hydrogen from acid, whereas non-metals do not. Why?

22. The inner lining of the small intestine has numerous finger like projections. What are they called? List their functions.

23. Name the hormone which regulates carbohydrates, protein and fat metabolism in our body. Which gland secretes this hormone? Why is it important for us to have iodised salt in our diet?

24. Give Mendel's First Law of Heredity.

25. A person suffering from long sightedness cannot see objects before 1.5 m distinctly. Suggest a lens with proper focal length and power for his remedy. Assume the near point of the normal eye to be 25 cm.

**OR**

Make a diagram to show how hypermetropia is corrected

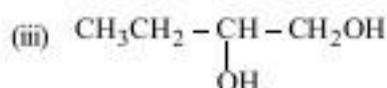
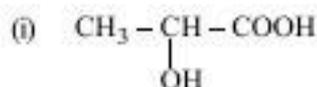
26. Mention the two functions of human testes.

### SECTION-C

**Q.no. 27 to 33 are Short Answer Questions.**

27. A non-metal A is an important constituent of our food and forms two oxides B and C. Oxide B is toxic whereas C causes global warming. Identify A, B and C.

28. Write the IUPAC names of the following:



29. Give one example of following plants:

(a) Which is (i) positively phototropic and (ii) negatively geotropic.

(b) Which is positively hydrotropic as well as positively geotropic?

(c) Which synthesises auxin?

30. You have been selected to talk on "ozone layer and its protection" in the school assembly on 'Environment Day'.

(i) Why should ozone layer be protected to save the environment?

(ii) List any two ways that you would stress in your talk to bring in awareness amongst your fellow friends that would also help in protection of ozone layer as well as the environment.

31. A student wants to project the image of a candle flame on a screen 48 cm in front of a mirror by keeping the flame at a distance of 12 cm from its pole.

(i) Suggest the type of mirror he should use.

(ii) Find the linear magnification of the image produced.

(iii) How far is the image from its object?

(iv) Draw ray diagram to show the image formation in this case.

32. 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.

33. Derive the relation for equivalent resistance when three resistances are connected in parallel.

OR

- (i) Explain three applications of heating effect of electricity.  
(ii) A shop is fitted with five 40W fans and four 100W bulbs. Find the cost of using the fans for 10 hrs a day and the bulbs for 6 hrs each day for 25 days at 30p per unit of electrical energy.

### SECTION-D

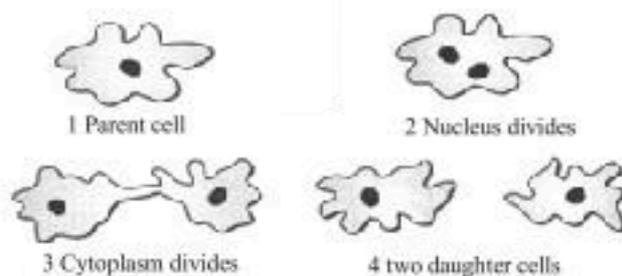
Q.no. 34 to 36 are Long Answer Questions.

34. What happens when a solution of  $\text{Na}_2\text{CO}_3$  is mixed with a solution of  $\text{CaCl}_2$ ? Support your answer with the help of total ionic and net ionic equation.

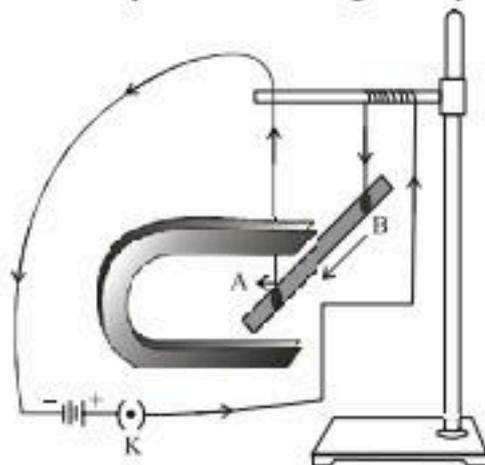
OR

Balance the following equations.

- (a)  $\text{CaCO}_3 \xrightarrow{\Delta} \text{CaO} + \text{CO}_2$   
(b)  $\text{Na} + \text{O}_2 \longrightarrow \text{Na}_2\text{O}$   
(c)  $\text{H}_2\text{O}_2 \longrightarrow \text{H}_2\text{O} + \text{O}_2$   
(d)  $\text{Al} + \text{H}_3\text{PO}_4 \longrightarrow \text{AlPO}_4 + \text{H}_2$   
(e)  $\text{Ca}(\text{OH})_2 + \text{HCl} \longrightarrow \text{CaCl}_2 + \text{H}_2\text{O}$   
(f)  $\text{Mg} + \text{N}_2 \longrightarrow \text{Mg}_3\text{N}_2$   
(g)  $\text{C}_2\text{H}_6 + \text{O}_2 \longrightarrow \text{CO}_2 + \text{H}_2\text{O}$   
(h)  $\text{Mg}_3\text{N}_2 + \text{H}_2\text{O} \longrightarrow \text{Mg}(\text{OH})_2 + \text{NH}_3$   
(i)  $\text{H}_2\text{S} + \text{O}_2 \longrightarrow \text{S} + \text{H}_2\text{O}$   
(j)  $\text{BF}_3 + \text{NaH} \longrightarrow \text{B}_2\text{H}_6 + \text{NaF}$
35. (i) Identify the process depicted in the picture given below:



- (a) Name the organism that divide by the above process.  
(b) Compare the above process with multiple fission.  
(c) State the type of reproduction in the above process and define it.  
(ii) Differentiate between fission in *Amoeba* and *Leishmania*.
36. A student was asked to perform an experiment to study the force on a current carrying conductor in a magnetic field. He took a small aluminum rod AB, a strong horse shoe magnet, some connecting wires, a battery and a switch and connected them as shown. He observed that on passing current, the rod gets displaced. On reversing the direction of current, the direction of displacement also gets reversed. On the basis of your understanding of this phenomenon, answer the following questions :



- (a) Why does the rod get displaced on passing current through it ?
- (b) State the rule that determines the direction of the force on the conductor AB.
- (c) (i) In the above experimented set up, when current is passed through the rod, it gets displaced towards the left. What will happen to the displacement if the polarity of the magnet and the direction of current both are reversed ?
- (ii) Name any two devices that use current carrying conductors and magnetic field.

**OR**

Draw the pattern of magnetic field lines produced around a current carrying straight conductor held vertically on a horizontal cardboard. Indicate the direction of the field lines as well as the direction of current flowing through the conductor.

### SECTION-E

**Q.no. 37 to 39 are case -based/data -based questions with 2 to 3 short sub - parts. Internal choice is provided in one of these sub-parts.**

37. Read the following case/passage and answer the questions.

The strength of a base depends on the concentration of the hydroxyl ions present in a solution. Greater the number of hydroxyl ion present, greater is the strength of base. However, some bases do not dissociate to any appreciable extent in water, e.g.  $\text{NH}_4\text{OH}$ . Some bases dissolve in water to form alkali. Examples of such bases are sodium hydroxide and potassium hydroxide. The acidity of bases is the number of hydroxyl ions that the basic molecule can produce in the aqueous solution.

- (a) What are the characteristic features of bases? Mention at least two
- (b) Explain the strength of basicity

**OR**

Give examples of two diacidic bases. What is the conjugate acid of  $\text{NH}_2^-$  ?

38. Read the following case/passage and answer the questions.

We define the electric current, or simply the current, to be the net amount of charges or electrons passing per unit time across any section through a conductor. If the charges are positive, the current is assumed to flow in the direction of charges and if the charges are negative, the current is in a direction opposite to the charges.

If  $\Delta Q$  is the amount of charge that passes through a particular area in a time interval  $\Delta t$ , the average current,  $I_{av}$ , is equal to the ratio of the charge to the time interval.

$$\text{i.e., } I_{av} = \frac{\Delta Q}{\Delta t}$$

- (a) What does an electric circuit means?
- (b) Define the unit of current.
- (c) Calculate the number of electrons constituting one coulomb of charge.

**OR**

- (c) What is meant by saying that the potential difference between two points is 1 V?

39. Read the following case/passage and answer the questions.

Heterotrophic nutrition is a type of nutrition in which organisms obtain that food from other sources. Such type of the organisms that depend upon outside sources for their food are called as heterotrophs.

Heterotrophic nutrition is classified as saprophytic, holozoic and parasitic nutrition.

- (i) Give an example of parasite.
- (ii) Define heterotrophic mode of nutrition.
- (iii) Mention any organism which exhibit saprotrophic mode of nutrition.
- (iv) Which type of organisms are capable of converting carbon dioxide into sugar?

# Solution

## SAMPLE PAPER-5

- (a)  $-\text{OH} \Rightarrow$  alcohol;  $-\text{CHO} \Rightarrow$  aldehyde  
 $-\text{COOH} \Rightarrow$  Carboxylic acid;  $\text{>C}=\text{O} \Rightarrow$  Ketone
- (c) In this reaction,  $\text{NH}_3$  is changing into  $\text{NO}$ . Removal of hydrogen from a substance is called oxidation. So,  $\text{NH}_3$  is undergoing oxidation.  $\text{O}_2$  is changing into  $\text{H}_2\text{O}$ . The addition of hydrogen to a substance is called reduction. So,  $\text{O}_2$  is undergoing reduction.  
Also, it is a displacement reaction as H in  $\text{NH}_3$  is getting displaced by oxygen.
- (b)  $\text{HCl}$  and  $\text{CCl}_4$  both are formed by sharing of electrons.  $\text{HCl}$  is a polar covalent compound while  $\text{CCl}_4$  is a non-polar covalent compound.
- (c) Carbonic acid is a weak and so it does not react with metal.
- (d) Methane ( $\text{CH}_4$ ), ethane ( $\text{C}_2\text{H}_6$ ) and propane ( $\text{CH}_3\text{CH}_2\text{CH}_3$ ) differ from each other by  $\text{CH}_2$  group. Hence these are said to form a homologous series.
- (a) The soap solution in water is not neutral and cannot be used to wash all kinds of fabrics.
- (a) When quick lime react with water, a large amount of heat is released along with the formation of calcium hydroxide means this is an exothermic reaction. Similarly, the process of dissolving an acid or base in water is a highly exothermic reaction. While, evaporation of water and sublimation of camphor are endothermic reactions.
- (d) Only 10% of the energy entering a particular trophic level of organisms is available for transfer to the next higher trophic level according to 10% law. In this food chain, at the 4th trophic level, only 5 kJ energy is available to the snake. Thus, the energy available at the producer level will be 5000 kJ. (1 mark)
- (b) Photosynthesis is a process by which green plants make their food from  $\text{CO}_2$  and  $\text{H}_2\text{O}$  in the presence of sunlight. If we blow air into water in a beaker then air from mouth that contains  $\text{CO}_2$  utilized in photosynthesis. Hence,  $\text{O}_2$  production increases. (1 mark)
- (c) Messages in the form of electrical signals carried by neurons are called electrical impulses or nerve impulses. The dendrites pick up the impulses from receptor and pass on to the cell body and finally to the axonal end.  
At the axonal end, electrical impulse releases some chemicals which crosses the gap or synapse and start an impulse in dendrite of the next neuron. (1 mark)
- (a) In asexual reproduction the offsprings are formed by the body parts of organism like in planaria, Hydra, etc.
- (d) Mendel used round seed and green coloured pod which is dominant over wrinkled seed and yellow pod respectively.
- (a)
- (b) The primary reason why the colour red is used for traffic signals is that red light is scattered the least by air molecules. So, the red light is able to travel the longest distance.
- (b)
- (c) We know that,  $R = \rho \frac{l}{A}$   
where,  $\rho$  = resistivity,  $l$  = length,  $A$  = area.  
For first and second conductor,  
$$R_1 = \frac{\rho_1 l_1}{A_1}, R_2 = \frac{\rho_2 l_2}{A_2}$$
  
$$\frac{R_1}{R_2} = \frac{\rho_1 l_1}{\rho_2 l_2} \times \frac{A_2}{A_1} \Rightarrow \frac{R}{R} = \frac{\rho}{\rho} \times \frac{l}{2l} \times \frac{A_2}{A} \Rightarrow A_2 = 2A$$
  
[as given  $R_1 = R_2 = R, l_1 = l, l_2 = 2l,$   
 $\rho_1 = \rho_2 = \rho$  (same material)]
- (d) Decomposition of vegetable matter into compost is an exothermic reaction.
- (c) Distance of image from the optical centre is determined by  $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$
- (a) Both Assertion and Reason are correct and the Reason is a correct explanation of Assertion.  
According to principle of segregation (first law of Mendel), the two factors of a character which remain together in an individual do not get mixed up but keep their identity distinct and separate at the time of gametogenesis. Gametes carry a single factor or allele for a trait. The two Mendelian factors present in the  $F_1$  plants segregate during gamete formation. The principle of segregation is called the principle of purity of gametes because segregation of the two Mendelian factors of a trait results in gametes receiving only one factor out of a pair. As a result gametes are always pure for a character.

20. (b) Both Assertion and Reason are correct but Reason is not a correct explanation of Assertion.  
Lichens are sensitive to  $\text{SO}_2$  level in air. Increased released of  $\text{SO}_2$  from auto-mobiles and other sources causes their depletion. Delhi has more air pollution due to increased vehicles, this lichens do not grow here.

21. Hydrogen ion concentration will increase. (2 marks)

OR

Non-metals cannot supply electrons to convert  $\text{H}^+$  to  $\text{H}_2(\text{g})$  whereas metals can give electrons to form  $\text{H}_2$



22. The finger like projections in small intestine are villi.

Function of villi are: (1 marks)

- (i) Villi are richly supplied with blood vessels which take the absorbed food to each and every cell of the body.  
(ii) They absorb water and they increase the surface area for the absorption of food. (1 mark)

23. The hormone which regulates carbohydrates, protein and fat metabolism in our body is thyroxine. (½ mark)

It is secreted by the thyroid gland. (½ mark)

Iodised salt in diet is important because it contains iodine, which is essential for the synthesis of thyroxine hormone by the thyroid gland. In case, iodine is deficient in our diet, there is a chance of suffering from goitre. (1 mark)

24. The principle of segregation is called as first law of heredity. This principle states that a pair of contrasting factor or gene remains together and separate at the time of gamete formation. (2 marks)

25. Person is suffering from long-sightedness or hypermetropia hence, lens to be used is a convex lens of suitable focal length.

Here,  $u = -25 \text{ cm}$ ,  $v = -1.5 \text{ m} = -150 \text{ cm}$ ,  $f = ?$ ,  $P = ?$

By lens formula,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} = \frac{1}{-150} + \frac{1}{25} = \frac{-1+6}{150} = \frac{5}{150} = \frac{1}{30}$$

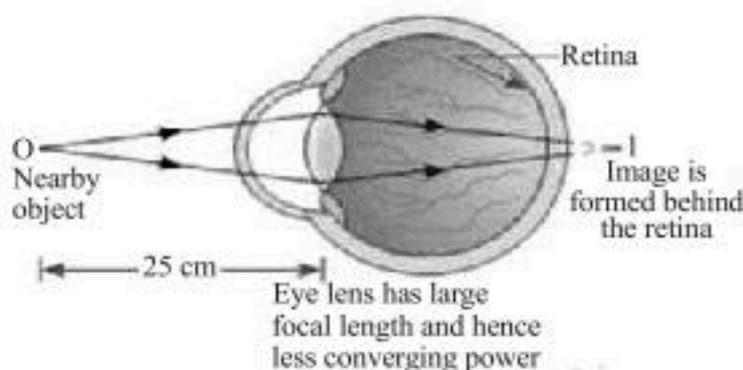
$$\therefore f = +30 \text{ cm} = 0.3 \text{ m} \quad (1 \text{ mark})$$

$$\text{Power } (P) = \frac{1}{f \text{ (in m)}} = \frac{1}{0.3} = \frac{10}{3} = +3.33 \text{ D.} \quad (1 \text{ mark})$$

OR

Hypermetropia is a defect of the eye in which parallel rays are focused behind the retina and a person unable to see nearby objects distinctly. This defect can be corrected by using a convex lens of appropriate power.

### Hypermetropic eye and its correction



(2 marks)

26. Two functions of testes are:

- (i) Testes produce sperms.  
(ii) Testes produce male sex hormone called testosterone. (2 marks)

27. A is carbon, B is carbon monoxide and C is carbon dioxide. (1 × 3 = 3 marks)

28. (i) 2-hydroxy-propan-1-oic acid (1 mark)  
(ii) Ethyl ethanoate (1 mark)  
(iii) But-1, 2-diol (1 mark)

29. (a) (i) Positively phototropic – Shoot (1 mark)  
(ii) Negatively geotropic – Shoot (1 mark)  
(b) Root (1 mark)  
(c) Shoot tip (1 mark)

30. (i) Ozone layer helps in shielding the Earth from the lethal UV radiation coming from sun. If ozone layer gets depleted, UV radiation will directly reach the earth's surface and seriously affect the life on earth. (1½ marks)

(ii) Ozone layer can be protected by:

- (a) Restriction in release of chlorofluorocarbons  
(b) Eliminating the pollutant nitrogen monoxide and carbon monoxide  
(c) Less usage of air conditioners (1½ marks)

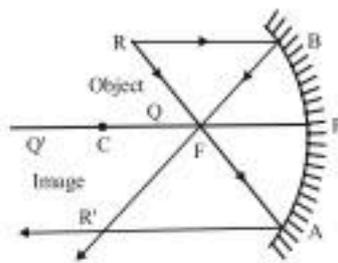
31. (i) He should use a concave mirror, because it forms a real image on the same side of the mirror. (1 mark)

(ii) Given,  $u = -12 \text{ cm}$ ,  $v = -48 \text{ cm}$   
Magnification,  $m = -v/u = -(-48)/(-12) = -4$

The minus sign of magnification shows that the image formed is real and inverted. (½ mark)

- (iii) The image is formed at a distance of 36 cm from the object. (½ mark)

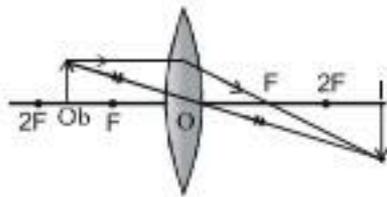
(iv)



(1 mark)

In this case, the image is formed beyond the centre of curvature. This image is real, inverted and enlarged.

32. Ray diagram to find the position and size of the image formed.



(1 mark)

Here, focal length,  $f = 20$  cm,  $u = -30$  cm,  $h_0 = 4$  cm

Using, lens formula,  $\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \Rightarrow \frac{1}{20} = \frac{1}{v} - \frac{1}{-30}$

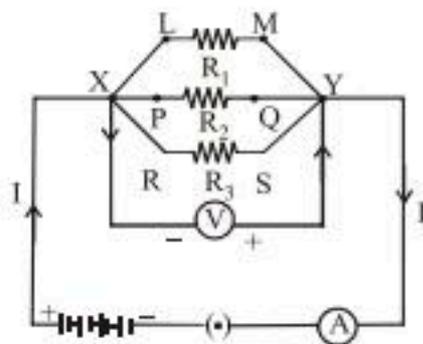
$\therefore$  Image distance,  $v = 60$  cm (1 mark)

The image formed is real and inverted.

The ratio of size of the image to the size of the object

$$\frac{h_1}{h_0} = \frac{v}{u} = \frac{60}{30} = 2 \quad (1 \text{ mark})$$

33.



(1 mark)

It is observed that the total current  $I$ , is equal to the sum of the separate currents through each branch of the combination.

$$I = I_1 + I_2 + I_3 \quad \dots\dots(i)$$

Let  $R_p$  be the equivalent resistance of the parallel combination of resistors.

By applying Ohm's law to the parallel combination of resistors, we have

$$I = \frac{V}{R_p} \quad \dots\dots(ii)$$

On applying Ohm's law to each resistor, we have

$$I_1 = \frac{V}{R_1}, I_2 = \frac{V}{R_2}, \text{ or } I_3 = \frac{V}{R_3} \quad \dots\dots(ii) \quad (1 \text{ mark})$$

From eqns (i), we have

$$\frac{V}{R_p} = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}$$

$$\text{or } \frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \quad (1 \text{ mark})$$

Thus, we may conclude that the reciprocal of the equivalent resistance of a group of resistances joined in parallel is equal to the sum of the reciprocals of the individual resistances.

OR

(i) **Applications of heating effect of electricity:**

- This effect of electricity is used in electrical heating appliances like geyser, heater, iron, etc. - all these appliances contain nichrome wire which has very high resistance.
- Heating effect of electricity is also used in bulbs. The bulb contains tungsten filament which has very high resistance due to which large amount of heat is produced which causes emission of light.
- Heating effect is also used for making fuse wire because when heat is produced, fuse wire melts which disconnects the household circuit with the main electricity board. The fuse wire is a thin wire of high resistance. When high voltage or electricity (due to short circuit) enters into the main electricity board, large amount of heat is produced due to which the fuse wire melts and the whole household circuit gets disconnected from the main electricity board.

(1½ marks)

$$(ii) \text{ Energy of fans} = n \times P \times t = 5 \times \frac{40}{1000} \times 10 = 2 \text{ kWh.}$$

$$\text{Energy of bulbs} = n \times P \times t = 4 \times \frac{100}{1000} \times 6 = 2.4 \text{ kWh.}$$

$$\text{Total energy consumed in 25 days} \\ = 25 \times (2 + 2.4) = 25 \times 4.4 = 110 \text{ kWh.}$$

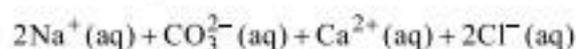
$$\text{Total cost of bill} = 0.30 \times 110 = ₹ 33 \quad (1\frac{1}{2} \text{ marks})$$

34. The four ions involved are  $\text{Na}^+$ ,  $\text{CO}_3^{2-}$ ,  $\text{Ca}^{2+}$  and  $\text{Cl}^-$  when a solution of  $\text{Na}_2\text{CO}_3$  is mixed with a solution of  $\text{CaCl}_2$ . The combinations of the  $\text{Na}^+$  and  $\text{Cl}^-$  and the  $\text{Ca}^{2+}$  and  $\text{CO}_3^{2-}$  produce the compounds  $\text{NaCl}$  and  $\text{CaCO}_3$ . If both of these compounds are soluble, no reaction occurs. In this case, however,  $\text{CaCO}_3$  is insoluble. Thus, a reaction occurs that we can illustrate with a balanced reaction written in molecular form. (2 marks)

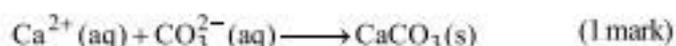


(1 mark)

The above equation can be written in total ionic form:



The net ionic equation will be:



OR

- (a)  $\text{CaCO}_3 \longrightarrow \text{CaO} + \text{CO}_2$   
 (b)  $4\text{Na} + \text{O}_2 \longrightarrow 2\text{Na}_2\text{O}$   
 (c)  $2\text{H}_2\text{O}_2 \longrightarrow 2\text{H}_2\text{O} + \text{O}_2$   
 (d)  $2\text{Al} + 2\text{H}_3\text{PO}_4 \longrightarrow 2\text{AlPO}_4 + 3\text{H}_2$   
 (e)  $\text{Ca}(\text{OH})_2 + 2\text{HCl} \longrightarrow \text{CaCl}_2 + 2\text{H}_2\text{O}$   
 (f)  $3\text{Mg} + \text{N}_2 \longrightarrow \text{Mg}_3\text{N}_2$   
 (g)  $2\text{C}_2\text{H}_6 + 7\text{O}_2 \longrightarrow 4\text{CO}_2 + 6\text{H}_2\text{O}$   
 (h)  $\text{Mg}_3\text{N}_2 + 6\text{H}_2\text{O} \longrightarrow 3\text{Mg}(\text{OH})_2 + 2\text{NH}_3$   
 (i)  $2\text{H}_2\text{S} + \text{O}_2 \longrightarrow 2\text{S} + 2\text{H}_2\text{O}$   
 (j)  $2\text{BF}_3 + 6\text{NaH} \longrightarrow \text{B}_2\text{H}_6 + 6\text{NaF}$  ( $\frac{1}{2} \times 10 = 5$  marks)

35. (i) **Binary fission** : (a) *Amoeba*  
 (b) **Binary fission** : Two daughter cells. (1 mark)  
**Multiple fission** : Many daughter cells are formed  
 (c) Asexual reproduction is a type of reproduction in which offsprings are produced from a single parent. (1 mark)  
 (ii) In *Amoeba*, splitting of two cells during division can take place in any plane. (1 mark)  
 In *Leishmania*, binary fission occurs in definite orientation in accordance to the whip like structure. (1 mark)
36. (a) The rod get displaced on passing current through it because a force is exerted on the rod when it is placed in a magnetic field. (1 mark)  
 (b) Fleming's left hand rule determines the direction of the force on the conductor AB. (1 mark)

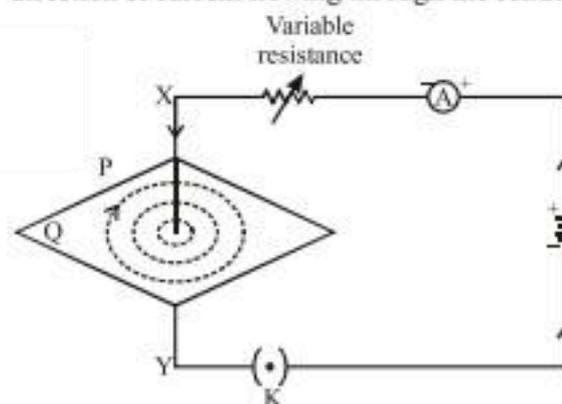
According to this rule, stretch the thumb, forefinger and middle finger of your left hand such that they are mutually perpendicular. If the first finger points in the direction of magnetic field and the second finger in the direction of current, then the thumb will point in the direction of motion or the force acting on the conductor. (1 mark)

- (c) (i) If the polarity of the magnet and the direction of current both are reversed, the rod gets displaced towards the right.  
 (ii) Two devices that use current carrying conductors and magnetic field are electric motor and electric generator. ( $1 \times 2 = 2$  marks)

OR

Pattern of magnetic field lines produced around a current carrying straight conductor held vertically is shown in the figure below.

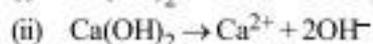
Also indicated the direction of field lines as well as the direction of current flowing through the conductor.



(5 marks)

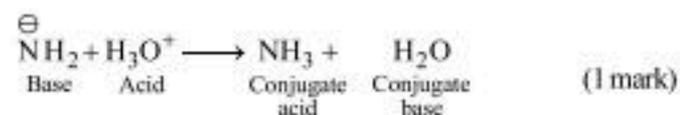
37. (a) A few bases dissolved in water are known as alkali  
 (i) Action on indicators: An alkaline solution turns red litmus into blue and pink phenolphthalein into colourless solution (1 mark)  
 (ii) Bases produce hydroxyl ( $-\text{OH}^-$ ) ion in aqueous medium and reacts with acid (1 mark)  
 (b) A strong base dissociates completely in aqueous medium and a weak base dissociates partially. Therefore, if the concentration of strong base increases the production of  $\text{OH}^-$  increases and the solution becomes strongly basic. Whereas the dissociation of a weak base in solution depends on the concentration of the base. As the concentration decreases the degree of dissociation and eventually, production of  $\text{OH}^-$  increases. Therefore, the concentration and degree of dissociation both these parameters required to define the strength of basicity. (2 marks)

OR



Both of the compound have two replacable hydroxyl ions.

(1 mark)



38. (a) A combination of electrical devices connected by conducting wires is called an electric circuit. (1 mark)

(b) Its S.I unit is ampere. If one coulomb of charge flows through a conductor in one second, then the amount of current flowing is said to be 1 ampere. (2 marks)

(c) Charge on one electron =  $1.6 \times 10^{-19}\text{C}$

$\therefore 1.6 \times 10^{-19}\text{C}$  charge carried by 1 electron

$\therefore 1\text{C}$  charge carried by

$$= \frac{1}{1.6 \times 10^{-19}} = 6.25 \times 10^{18} \text{ electrons} \quad (1 \text{ mark})$$

OR

(c) It means that 1 joule of work is done in carrying one coulomb charge between the two given points.

(1 mark)

39. (i) Taenia (tapeworm) is an example of parasite. (1 mark)

(ii) Heterotrophic nutrition is the mode of nutrition where the organism is unable to prepare its food and hence, depends upon plants or other organisms for nutrition.

(1 mark)

(iii) Mushroom is an example of the organism that exhibits saprotrophic mode of nutrition. (1 mark)

(iv) Autotrophs are capable of converting carbon dioxide into sugar via photosynthesis. (1 mark)