BLUE PRINT

S. No.	Chapter Name	Section-A (MCQs & A/R) 1 Mark	Section-B (VSAQs) 2 Marks	Section-C (SAQs) 3 Marks	Section-D (LAQs) 5 Marks	Section-E (Case Study) 4 Marks	Total Marks
		Q. No.	Q. No.	Q. No.	Q. No.	Q. No.	
1	Chemical Reactions and Equations	2(Q3,7)	1(Q OR 21)	1(Q27)			5
2	Acids, Bases and Salts	3(Q2,6,17)		1(Q28)			6
3	Metals and Non-metals	1(Q1)	1(Q21)		1(Q34)		8
4	Carbon and its Compounds	2(Q4,5)				1(Q37)	6
5	Life Processes	2(Q8,19)	1(Q26)	1(Q33)			7
6	Control and Co-ordination	2(Q9,12)	1(Q22)			1(Q38)	8
7	How do Organism Reproduce	2(Q10,20)	1(Q23)				4
8	Heredity and Evolution	1(Q11)			1(Q36)		6
9	Light- Reflection and Refraction	2(Q13,14)	1(Q25)		1(Q35)		9
10	Human Eye and Colourful World			1(Q30)			3
11	Electricity	2(Q16,18)		1(Q31)		1(Q39)	9
12	Magnetic Effects of Electric Current	1(Q15)		1(Q29)			4
13	Our Environment		1(Q24)	1(Q32)			5
	* Total Questions (Total Marks)	20(20)	6(12)	7(21)	3(15)	3(12)	80

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

Time Allowed : 3 Hours **Max. Marks : 80**

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 Answer type questions carrying 02 marks each. Answers to these questions should 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 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. Aluminium does not oxidise readily in air because –
(a) it is high in the electrochemical series.
(b) it is low in the electrochemical series.
(c) the metal does not combine with oxygen.
(d) the metal is covered with a layer of oxide which does not rub off.

2. Which of the following acid does not react with metals?
(a) sulphuric acid (b) phosphoric acid (c) carbonic acid (d) nitric acid

3. In which of the following the identity of initial substance remains unchanged?
(a) Curdling of milk (b) Formation of crystals by process of crystallisation
(c) Fermentation of grapes (d) Digestion of food

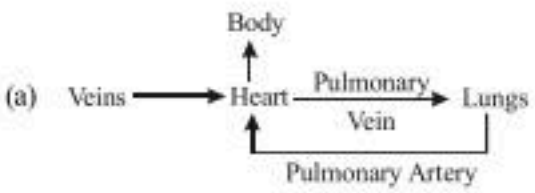
4. Which compound represents the vinegar?
(a) HCOOH (b) CH_3CHO (c) HCHO (d) CH_3COOH

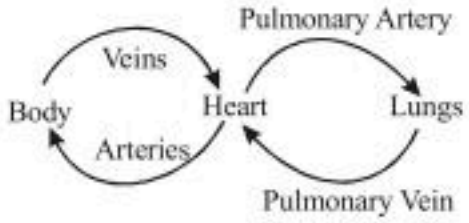
5. Which one of the following statement is incorrect about graphite and diamond ?
(a) Graphite is smooth and slippery.
(b) Diamond is good conductor of heat.
(c) Graphite is a good conductor of electricity.
(d) Physical and chemical properties of graphite and diamond are same.

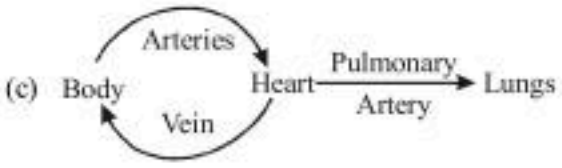
6. If a sample of water containing detergents is provided to you, which of the following methods will you adopt to neutralize it?
(a) Treating the water with baking soda (b) Treating the water with vinegar
(c) Treating the water with caustic soda (d) Treating the water with washing soda

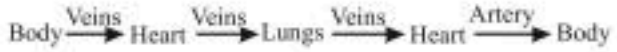
7. In a balance equation $H_2SO_4 + xHI \rightarrow H_2S + yI_2 + zH_2O$, the values of x, y, z are–
(a) $x=3, y=5, z=2$ (b) $x=4, y=8, z=5$ (c) $x=8, y=4, z=4$ (d) $x=5, y=3, z=4$

8. Select the correct schematic representation of blood circulation in human from the followings :

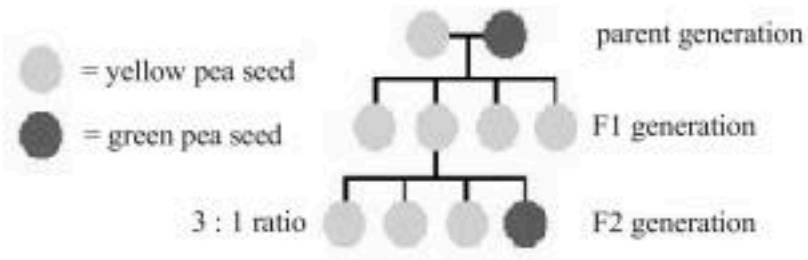
(a)


(b)


(c)


(d)


9. A high concentration of synthetic auxins is generally used for
   (a) weed control.
   (b) enhancing root initiation.
   (c) controlling of cell enlargement.
   (d) preventing the growth of the lateral buds.
10. The correct route that sperm follows when it releases from the testis of a mammal:
   (a) Vas deferens → Epididymis → Urethra
   (b) Urethra → Epididymis → Vas deferens
   (c) Epididymis → Urethra → Vas deferens
   (d) Epididymis → Vas deferens → Urethra
11. Assuring that both parent plants in the diagram below are homozygous, why would all of the F1 generation have yellow phenotype?



   (a) because the F1 genotypes are homozygous
   (b) because yellow is dominant over green
   (c) because both parents passed on yellow alleles.
   (d) None of the above
12. Which of the following is an example of reflex action?
   (a) To shoot the bird after aiming
   (b) Watering of the mouth of seeing the good edibles
   (c) To obey the order
   (d) To read story
13. An object is placed 40 cm from a concave mirror of focal length 20 cm. The image formed is
   (a) real, inverted and same in size
   (b) real, inverted and smaller
   (c) virtual, erect and larger
   (d) virtual, erect and smaller
14. What is the power of a concave lens whose focal length is – 75.0 cm?
   (a) 1.33 D
   (b) – 13.3 D
   (c) 13.3 D
   (d) – 1.33 D
15. Which of the following property of a proton canot change while it moves freely in a magnetic field?
   (a) mass
   (b) speed
   (c) velocity
   (d) momentum
16. The heating element of an electric heater should be made with a material, which should have
   (a) high specific resistance and high melting point
   (b) high specific resistance and low melting point
   (c) low specific resistance and low melting point
   (d) low specific resistance and high melting point

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

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17. **Assertion :** All alkalis are bases but all bases are not alkali.
Reason : Water soluble bases are alkali.

18. **Assertion:** Electric fuse wire is made of an alloy of law melting point.
Reason: Resistivity of an alloy is less than the resistivity of a pure metal.

19. **Assertion:** Hydrochloric acid helps in the digestion of food in the stomach.
Reason: Hydrochloric acid creates an acidic medium to activate protein digesting enzymes.

20. **Assertion:** Petals help during the process of pollination.
Reason: They attract insects.

SECTION-B

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

21. $3MnO_2 + 4Al \longrightarrow 3Mn + 2Al_2O_3$.

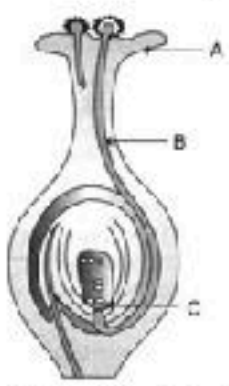
State which is more reactive, Mn or Al, and why?

OR

What are the differences between corrosion and combustion?

22. How is the movement of leaves of the sensitive plant different from the movement of a shoot towards light?

23. Name the part A, B and C shown in the diagram and write function [any one].



24. In the following food chain, 100 J of energy is available to the lion. How much energy was available to the producer?

Plant → Deer → Lion

25. 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 ligt 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.

26. Where does aerobic respiration occur in a cell? Draw the flow chart showing breaking down of glucose by various pathways.

SECTION-C

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

27. How many of the following is/are example of both oxidation and reduction reactions and why?

(i) $CaCO_3(s) \xrightarrow{\Delta} CaO(s) + CO_2(g)$

(ii) $Na_2SO_4(aq) + BaCl_2(aq) \xrightarrow{\Delta} BaSO_4(s) + 2NaCl(aq)$

(iii) $CuO(s) + H_2(g) \longrightarrow Cu(s) + H_2O(l)$

(iv) $4Na(s) + O_2(g) \longrightarrow 2Na_2O(s)$

28. Why do HCl, HNO_3 etc. show acidic character in aqueous solutions while solutions of compounds like alcohol and glucose do not show acidic character?

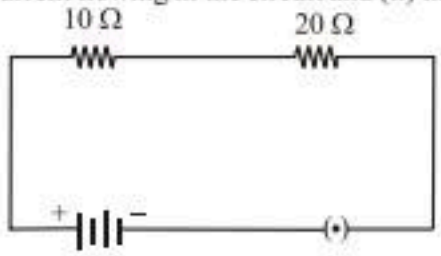
29. What is overloading and short circuiting? what is the function of earth wire?

30. (a) With the help of labelled ray diagram show the path followed by a narrow beam of monochromatic light when it passes through a glass prism.
    (b) What would happen if this beam is replaced by a narrow beam of white light?

31. Draw symbol of:
    (i) Rheostat, (ii) Voltmeter, (iii) Electric bulb

OR

Study the following electric circuit (i) the current flowing in the circuit and (ii) the potential difference across 10Ω resistor



32. 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.

33. (a) How does the transport of material in xylem and phloem occur?
    (b) What is translocation?

SECTION-D

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

34. What are the advantages and disadvantages of using carbon as a reducing agent in the metallurgy?

OR

In what forms are metal found in nature ? With the help of examples explain how metals react with oxygen and dilute acids. Also write chemical equations for the reaction.

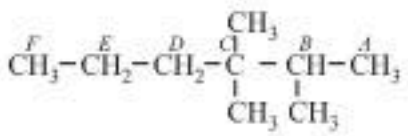
35. The image of candle flame placed at a distance of 40 cm from a spherical lens is formed on a screen placed on the other side of the lens at a distance of 40 cm from the lens. Identify the types of lens and write its focal length. What will be the nature of the image formed if the canle flame is shifted 25 cm towards the lens? Draw ray diagram to justify.

36. How do Mendel's experiments show that.
    (i) traits may be dominant or recessive
    (ii) inheritance of two traits is independent of each other

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.
A carbon atom attached to one, two, three and four other carbon atoms is called primary, secondary, tertiary and quaternary carbon respectively. Now consider following compound and answer the following questions.



(a) What is the IUPAC name of the compound.
(b) What is valency of carbon atom? Draw the electron dot structure of methane.
(c) How many carbon stoms are primary, secondary, tertiary and quarternary carbon.

OR

(i) What is the formula and electron dot structure of butane?
(ii) What do you understand by functional group?

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

While conducting experiments to study the effect of various stimuli on the plants, it was observed that the roots of a plant X grow and bend towards two stimuli A and B but bend away from a third stimulus C. The stem of the plant X, however, bends away and from stimuli A and B but bends towards the stimulus C. The stimulus B is known to act on the roots due to too much weight of the earth. Keeping these points in mind, answer the following questions.

(i) What could stimulus A be?

(ii) Name the stimulus B.

(iii) What could stimulus C be?

(iv) The branches of a fallen tree in a forest grow straight up in response to two stimuli. What could be these two stimuli out of A, B and C? Also name these two stimuli.

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

When the electric current is passed through a conductor then conductor gets heated, this effect is known as the heating effect of current. As current flows through a conductor, the free electrons lose energy which is converted into heat.

When an electric charge Q moves against a potential difference V, the amount of work done (W) is given by $W = Q \times V$

According to Ohm's law, $R = \frac{V}{I}$

or potential difference, $V = I \times R$

Now, substituting the values

$W = I \times t \times I \times R$

$H = I^2 \times R \times t$

(a) A heater coil is cut into two equal parts and only one part is used in the heater. Find the heat generated.

(b) What happens to the heat produced when current is doubled?

(c) Name two devices which work on heating effect of electric current.

OR

(c) An electric iron of resistance 20 Ω takes a current of 5A. Calculate the heat developed in 30 sec.

Solution

SAMPLE PAPER-4

1. **(d)**

2. **(c)** Carbonic acid is a weak and so it does not react with metal.

3. **(b)** Formation of crystals by process of crystallization.

4. **(d)**

5. **(d)** Graphite and diamond show different physical and chemical properties. Diamond is colourless transparent substance. It does not conduct electricity. Graphite is greyish black. It is good conductor of electricity.

6. **(b)**

7. **(c)** The value of x, y, z are 8, 4, 4 respectively hence the reaction is

$$H_2SO_4 + 8HI \rightarrow H_2S + 4I_2 + 4H_2O$$

8. **(b)** **Arteries** are blood vessels which carry blood coming from heart to various organs of the body. Blood flows inside the arteries with jerk due to pumping activity of the heart.

Veins are blood vessels which carry blood from various parts of the body towards the heart. Blood flows smoothly and slowly inside veins.

Pulmonary arteries carry deoxygenated blood from the heart to the lungs and **pulmonary veins** receive oxygenated blood from the lungs to the left atrium of the heart.

9. **(a)**

10. **(d)** The sperm releases from the testis, enters into epididymis which leads to vas deferens. Then sperms are transferred into the urethra.

11. **(b)** The yellow color is dominant aver green color. (1 mark)

12. **(b)**

13. **(a)** Real, inverted and same in size because object is at the centre of curvature of the mirror.

14. **(d)** $P = \frac{100}{-75} = -\frac{4}{3}D$

15. **(a)**

16. **(a)** A heating wire should be such that it produces more heat when current is passed through it and also does not melt. It will be so if it has high specific resistance and high melting point.

17. **(a)** Bases generate hydroxide ions in water hence water soluble bases are called alkalis.

18. **(c)** Alloys have higher resistivity than constituents metals.

19. **(a)** The digestion in stomach is taken care of by the gastric glands present in the wall of the stomach. These release hydrochloric acid, a protein digesting enzyme called pepsin, and mucus. The hydrochloric acid creates an acidic medium which facilitates the action of the enzyme pepsin.

20. **(a)** Both Assertion and Reason are correct and the Reason is a correct explanation of Assertion.

The agents which help in pollination are wind, water etc. Petals of flowers are colourful and attract insects and birds which on the other hand, results in pollination.

21. Al is more reactive because it displaces Mn in this reaction. (2 marks)

OR

Corrosion is slow while combustion is fast process. (2 marks)

22. In sensitive plants like *Mimosa pudica* (touch me not), there is an electrical-chemical means to convey the information of touch from cell to cell. Plant cells change shape by changing the amount of water in them, resulting in swelling or shrinking.

This type of movements in sensitive plant is totally different from the movement of a shoot towards light.

A sensitive plant

The movement of the plant (shoot and root) due to the influence of sunlight is called phototropism. In this movement, the cells of that part which are in direct contact of light shrink due to the transfer of water from these cells to the cells of opposite side. Thus, the plant part bends towards sunlight. It is called positively phototropic. It does not have the effect of sensation by electrical-chemical means. (2 marks)

23. Part A is stigma.

Function : It is the terminal part of carpel, which may be sticky and helps in receiving the pollen grains from the anther of stamen during pollination part B is pollen tube.

Function : The pollen tube grows out of the pollen grain through the style to reach the ovary.

Part C is female germ cell. (1 + 1 = 2 marks)

Function : It is female gametes which fuses with male gamete to form a diploid cell called zygote.

24. 10000 J. According to 10% law of energy in the form heat is lost and only 10% energy is available to the lower trophic level so, if lion has 100 J of energy, deer will have $100 \times 10 \rightarrow 1000$ J and plant will have $1000 \times 10 \rightarrow 10{,}000$ J of energy. (2 marks)

25. **Laws of refraction of light:**

(i) The incident ray, the refracted ray at the point of incidence and the normal all lies in the same plane for the two given mediums.

(ii) The ratio of sine of angle of incidence (*i.e.*, sin *i*) to the sine of angle of refraction (*i.e.*, sin *r*) is always constant for the light of given colour and for the given pair of media.

Mathematically, $\frac{\sin i}{\sin r} = \text{constant} = n$ (½ × 2 = 1 mark)

The constant '*n*' is called refractive index of the second medium with respect to the first medium.

Absolute refractive index of the medium is given by

$$n = \frac{\text{Speed of light in vacuum (c)}}{\text{Speed of light in medium (v)}}$$ (1 mark)

OR

The power of a lens is defined as the reciprocal of its focal length (f) expressed in metres. SI unit of power is dioptre. One dioptre is defined as the power of a lens whose focal length is 1 metre. (1 mark)

Focal length of lens is positive 40 cm hence lens is convex and the lens of focal length negative (–20cm) is concave lens.

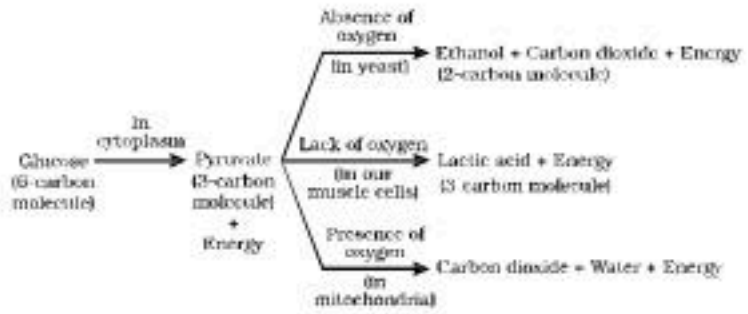
Power of lens of focal length (f = – 20cm)

$$= \frac{1}{\frac{-20}{100}} = -5 \text{ dioptre}$$ (½ mark)

Power of lens of focal length (f = 40 cm)

$$= \frac{1}{\frac{40}{100}} = 2.5 \text{ dioptre}$$ (½ mark)

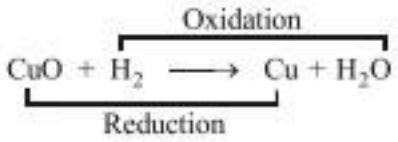
26. Aerobic respiration occcurs in mitochondria of the cell.



Break-down of glucose by various pathway

(1 mark)

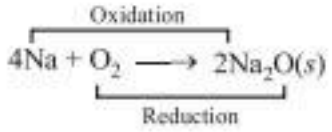
27. Reaction (iii) Shows oxidation and reduction both as in this reaction CuO is reduced to copper and H_2 is oxidised to H_2O. (1 mark)



(½ mark)

Reaction (iv) shows both oxidation and reduction in which Na is oxidised and oxygen is reduced to form Na_2O.

(1 mark)



(½ mark)

28. The acids (HCl, HNO_3 etc.) have replaceable hydrogen atoms in their molecule and they release hydrogens ion (H^+) in aqueous solution. Since they release H^+ ion so they show acidic character. (1½ marks)

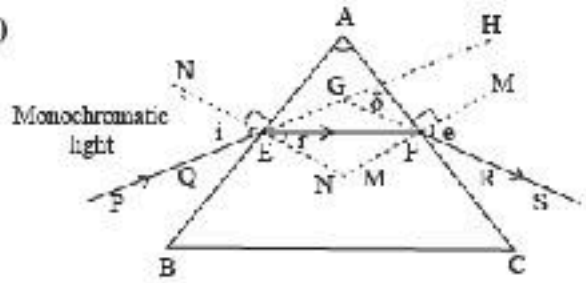
In their aqueous solution both the compounds alcohol (C_2H_5OH) and glucose ($C_6H_{12}O_6$) fail to release H^+ ions because of absence of replaceable hydrogen atom in their molecule. So, they do not show acidic properties in solution. (1½ marks)

29. If two many electrical appliances of high power rating are switched on at the same time, they draw large current from the circuit. This is called overloading. (1 mark)

If the live wire and neutral wire brought in contact to each other either directly or via conducting wire, the situation is called short circuiting. (1 mark)

To avoid risk of an elctrical shock, the metal body of the appliances is earthed. Earthing means to connect the metal case of the appliance to earth by a means of metal wire called earth wire. (1 mark)

30. **(a)**



PE – Incident ray ∠i – Angle of incidence

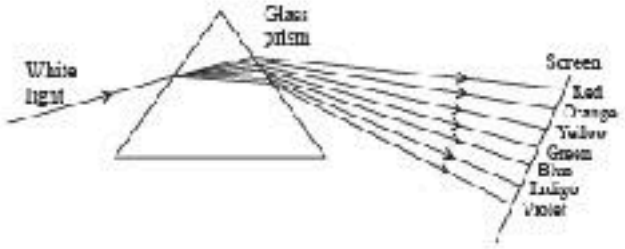
EF – Refracted ray ∠r – Angle of refraction

FS – Emergent ray ∠e – Angle of emergence

∠A – Angle of the prism ∠δ – Angle of deviation

(2 marks)

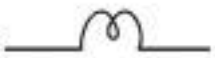
(b) When a narrow beam of white light passes through a prism, it emerges as a spectrum of all components of white light. (see the fig.)



(1 mark)

31. (i) Rheostat 

(ii) Voltmeter 

(iii) Electric bulb  (1 × 3 = 3 marks)

OR

$R = R_1 + R_2 = 10 + 20 = 30\ \Omega$ (1 mark)

(i) From Ohm's law V = IR

$$3 = I \times 30 \Rightarrow I = \frac{3}{30} = \frac{1}{10} \text{ Ampere or } 0.1\ \text{A}$$

(1 mark)

(ii) Potential difference across 10Ω resistor

V = IR

$$= \frac{1 \times 10}{10} = 1 \text{ volt.}$$ (1 mark)

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

(iii) 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

33. (a) **Xylem:**

(i) Transport of water and mineral.

(ii) Upward movement. (Unidirectional)

Phloem:

(i) Transport of food and hormones. (2 marks)

(ii) Upward and downward movements (bidirectional).

(b) Transport of soluble food by phloem is define as translocation. (1 mark)

34. **Advantages**

(a) It is very cheap.

(b) It is readily available and is widely used in metallurgy.

Disadvantages

(a) It cannot be used for the reduction of metals which are very high in the activity series of metals like Na, K, Ca, Mg, Al, because these metals have more affinity for oxygen than carbon therefore carbon is unable to remove oxygen from these metal oxides and hence cannot convert them into free metals.

(b) Some traces of carbon left in the metals act as an impurity when we use carbon as a reducing agent.

(2½ × 2 = 5 marks)

OR

Metals are found in nature in the form of ores or minerals. (1 mark)

Reaction with oxygen : When a metal combines with oxygen, it loses its valence electrons and forms positively charged metal ions (oxidation of metal).The atoms of oxygen accept the electrons lost by the metal and form negative oxide ions.

$$Mg \longrightarrow Mg^{2+} + 2e^-$$

$$O + 2e^- \longrightarrow O^{2-}$$

$$Mg^{2+} + O^{2-} \longrightarrow MgO$$ (2 marks)

Reaction with dil. acids: The metal replaces the hydrogen atom in the acid to form a salt.

$$2Al(s) + 6HCl(aq) \longrightarrow 2AlCl_3(aq) + 3H_2(g)$$ (2 marks)

35. Given,

$u = -40$ cm, $v = 40$ cm

From lens formula,

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

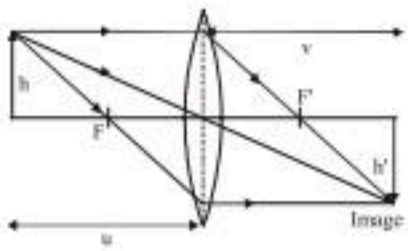
$$= \frac{1}{40} - \frac{-1}{(-40)}$$

Focal length, $f = +20$ cm

The positive sign of focal length shows that it is a convex lens.

Now, Magnification, $m = \frac{v}{u} = \frac{40}{(-40)} = -1$ (1 mark)

Thus, the image is real, inverted and same size as object.



(1 mark)

If candle flame is shifted 25 cm toward the lens, then

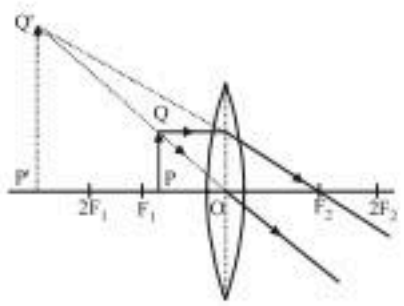
$u = -(40-25) = -15$ cm

then, $\frac{1}{20} = \frac{1}{u} - \frac{1}{(-15)} = \frac{1}{v} + \frac{1}{15}$

or $v = -60$ cm

$m = \frac{v}{u} = \frac{-60}{-15} = 4$

Thus the image will be virtual, erect and enlarged. For this you can refer to the following diagram,



(1 mark)

36. (i) Mendel experimented on garden pea plant with selection of seven visible contrasting characters forming laws of inheritance. He selected and crossed homozygous tall pea plant with genotype TT and a homozygous dwarf pea plant with the genotype tt. F_1 generation consists only of tall plants having genotype Tt.

The expressed allele 'T' for tallness is dominant over the unexpressed allele t for dwarfness. Therefore, the trait of tallness is dominant while dwarfness is the recessive trait. Thus, Mendel's experiment showed that traits may be dominant or recessive.

(2½ marks)

(ii) In Mendel's experiment, different traits were tall and dwarf plant, round and wrinkled seeds. In F_2 (second) generation, some plants were tall with round seeds and others were dwarf with wrinkled seeds. Other combination was dwarf plants having round/wrinkled seed traits, that were independently inherited.

(2½ marks)

37. (a) 2, 3, 3 - Trimethylhexane (1 mark)

(i) The volency of 'e' atom = 4 (½ mark)

Structure of methane:  H(½ mark)

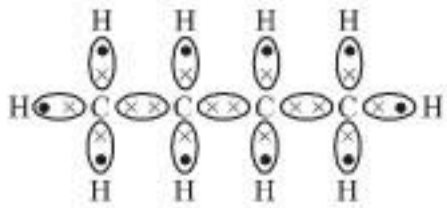
(ii) Primary-5, secondary-2, tertiary-1, quaternary-1

(½ / 4 = 2 marks)

OR

(i) Chemical formula of butane: $CH_3CH_2CH_2CH_3$

(1 mark)



(1 mark)

(ii) In a hydrocarbon chain, the H-atom is sometimes replaced by other atoms or groups, which confer specific properties to the compound regardless of the length and nature of chain. This heteroatom or group of atoms is known as functional group. e.g. CH_3CH_2OH-Ethanol; CH_3-O-CH_3-Ether-Functional group: I-OH and -O-, respectively (1 mark)

38. (i) Water

(ii) Gravity

(iii) Light

(iv) B and C; Gravity and Light (Sunlight)

39. (a) Resistance of the heater be R.

New resistance of heater is R/2

Initial power $= \frac{V^2}{R}$ Final power $= \frac{V^2}{R/2} = 2\frac{V^2}{R}$

$\therefore$ Heat generated is doubled. (1 mark)

(b) It becomes four times. (1 mark)

(c) (i) Electric toaster

(ii) Electric heater. (2 marks)

OR

(c) $H = I^2 Rt = 5^2 \times 20 \times 30 = 15000$ J, H= 15 kJ

(2 marks)