SET-1

Series JMS/2

Code No. 31/2

Roll No. | | | | | | | |

Candidates must write the Code on the title page of the answer-book

- Please check that this question paper contains **4** printed pages.
- Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains **27** questions.
- **Please write down the Serial Number of the questions before attempting it.**
- 15 minute time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer-book during this period.

SCIENCE

Time allowed : 3 hours **Maximum Marks : 80**

General Instructions :

(i) The question paper comprises **Five** Sections, A, B, C, D and E. You are to attempt All the sections.

(ii) All questions are **compulsory.**

(iii) Internal choice is given in section B, C, D and E

(iv) Question numbers **1** and **2** in **Section A** are **one**-mark questions. They are to be answered in **one** word or in **one** sentence.

(v) Question numbers **3** to **5** in **Section B** are **two**-marks questions. These are to be answered in about **30** words each.

(vi) Question numbers **6** to **15** in **Section C** are **three**-marks questions. These are to be answered in about **50** words each.

(vii) Question numbers **16** to **21** in **Section D** are **five**-marks questions. These are to be answered in about **70** words each..

(viii) Question numbers **22** to **27** in **Section E** are based on practical skills. Each question is a **two**-marks question. These are to be answered in brief.

SECTION - A

1. Name two industries based on forest produce.

Sol. The two industries based on forest produce are :-
i) Wood working ii) Paper manufacturing

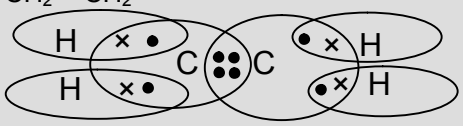
2. Why are the heating elements of electric toasters and electric irons made of an alloy rather than a pure metal ?

Sol. The heating elements of electric toasters and electric irons made of an alloy rather than a pure metal because they have high melting point and don't oxidize at high temperatures.

SECTION - B

3. Write the molecular formula of ethene and draw its electron dot structure.

Sol. Molecular formula of ethene is C_2H_4 electron dot structure of ethene
$CH_2 = CH_2$



4. Give reasons :
(a) Platinum, gold and silver are used to make jewellery.
(b) Metals like sodium and potassium are stored under oil.

OR

Silver articles becomes black when kept in open for some time, whereas copper vessels lose their shiny brown surfaces and gain a green coat when kept in open. Name the substance present in air with which these metals react and write the name of the products formed.

Sol. (a) Because Pt, Au, Ag are highly malleable, highly ductile, lustrous and less reactive.
(b) Sodium and potassium are highly reactive metal so stored under oil to protect from reaction with air.

5. The absolute refractive index of Ruby is 1.7. Find the speed of light in Ruby. The speed of light in vacuum is 3×10^8 m/s.

Sol. $R.I. = \frac{(\text{Speed of light})_{\text{Vaccum}}}{(\text{Speed of light})_{\text{Medium}}}$

$1.7 = \frac{3 \times 10^8 \text{m/s}}{V_R}$

$V_R = \frac{3 \times 10^8 \text{m/s}}{1.7}$ V_R = Velocity of light in Rubby.

$V_R = 1.764 \times 10^8$ m/s

SECTION - C

6. On heating blue coloured powder of copper (II) nitrate in a boiling tube, black copper oxide, O_2 and a brown gas X is formed.
(a) identify the type of reaction and the gas X.
(b) Write balanced chemical equation of aqueous solution of the gas X.
(c) Write the pH range of aqueous solution of the gas X.

Sol. (a) Thermal decomposition reaction, compound X is NO_2.

(b) $\underset{\text{Copper(II)Nitrate}}{2Cu(NO_3)_2(s)} \xrightarrow{\text{Heat}} \underset{\text{Black}}{2CuO(s)} + \underset{\text{Brown(x)}}{4NO_2(g)} + \underset{\text{Oxygen}}{O_2(g)}$

(c) pH range for aqueous solution of gas X is 0 to 7 (acidic).

7. (a) While diluting an acid, why is it recommended that the acid should be added to water and not water to the acid?

(b) Dry hydrogen chloride gas does not change the colour of dry litmus paper. Why ?

OR

How is sodium hydroxide manufactured in industries? Name the process. In this process a gas X is formed as by-product. This gas reacts with lime water to give a compound Y, which is used as a bleaching agent in the chemical industry, Identify X and Y and write the chemical equation of the reactions involved.

Sol. (a) Acids and bases are mostly water soluble and can be diluted by adding the required amount of water. With the addition of water the amount of acid or base per unit volume decrease and dilution occurs. The process is generally exothermic in nature. When a concentrated acid like sulphuric acid or nitric acid is to be diluted with water, acid should be added dropwise to water taken in the container with constant stirring.

(b) Dry HCl does not contain free H^+ ions in absence of water so it will not change the colour of dry litmus paper.

OR

Electrolysis of aqueous solution of NaCl :

$$2NaCl(aq) \xrightarrow{\text{Electrolysis}} 2NaOH(aq) + Cl_2(g) + H_2(g)$$

Reaction takes place as follows -

- $NaCl \longrightarrow Na^+ + Cl^-$
- $2Cl^- \longrightarrow Cl_2(g) + 2e^-$ (anode reaction)

(X)

- $2H_2O + 2e^- \longrightarrow H_2 + 2OH^-$ (cathode reaction)
- $Na^+ + OH^- \longrightarrow NaOH$

$$\underset{\text{Slaked lime}}{Ca(OH)_2(aq)} + Cl_2(g) \xrightarrow{313\ K} \underset{\substack{\text{Bleaching}\\ \text{powder}}}{Ca(OCl)Cl(s)} + H_2O(g)$$

(Y)

8. What are amphoteric oxides? Give an example. Write balanced chemical equations to justify your answer.

Sol. Amphoteric oxides : Compounds which shows the properties of both acid as well as base.

Eg. ZnO, Al_2O_3

$ZnO + 2NaOH \rightarrow Na_2ZnO_2 + H_2O$

$ZnO + 2HCl \rightarrow ZnCl_2 + H_2O$

9. What is a homologous series of carbon compounds? Give an example and list its three characteristics.

Sol. Homologous series may be defined as a series of similarly constituted compounds in which the members possess similar chemical characteristics and the two consecutive members differ in their molecular formula by – CH_2.

Eg. Alkane series (CH_4, C_2H_6, C_3H_8, C_4H_{10})

Characteristics of Homologous Series :

(i) All the members of a series can be represented by the same general formula.
e.g. General formula for alkane series is C_nH_{2n+2} .

(ii) The members in any particular family have almost identical chemical properties. Their physical properties such as melting point, boiling point, density etc, show a regular gradation with the increase in the molecular mass.

(iii) The members of a particular series can be prepared almost by the identical methods.

10. List in tabular form three distinguishing features between autotrophic nutrition and heterotrophic nutrition.

Sol.

AUTOTROPHIC	HETEROTROPHIC
1.These can prepare their on food.	1. These cannot prepare their own food.
2.These contain photosynthetic pigment called chlorophyll	2. Chlorophyll is absent in them.
3.Example :- Plants	3. Example :- Animals and Human beings.

11. What is transpiration ? List its two functions.

OR

(a) What is translocation ? Why is it essential for plants ?
(b) Where do the substances in plants reach as a result of translocation ?

Sol. Transpiration : The evaporation of excess water from the stomata present in leaves of plants is called transpiration.
Two functions :
i) It is important for upward movement of water in plants.
ii) It helps in regulating temperature of plant.

OR

a) Translocation is defined as the process of transportation of organic food materials through phloem. Translocation helps in distribution of food throughout the plant.
b) As a result of translocation food is transported to root, stem and all other storage regions.

12. What is carpel ? Write the function of its various parts

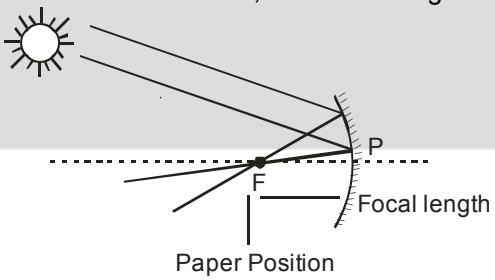
Sol. Carpel is female reproductive part of the plant . It has three parts :
(i) Stigma : It is sticky in nature so that pollen grain can attach on it.
(ii) Style : It provides height to stigma.
(iii) Ovary : It is basal part which contain ovule.On maturity, ovule becomes seed and ovary becomes fruit.

13. A student holding a mirror in his hand, directed the reflecting surface of the mirror towards the Sun.He then directed the reflected light on to a sheet of paper held close to the mirror.
(a) What should he do to burn the paper ?
(b) Which type of mirror does he have ?
(c) Will he be able to determine the approximate value of focal length of this mirror from this activity ? Give reason and draw ray diagram to justify your answer in this case.

OR

A 10 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 12 cm. The distance of the object from the lens is 18 cm. Find the nature , position and size of the image formed.

Sol. (a) To burn the paper student should move the mirror in such a way that paper is positioned at the focus of the mirror.
(b) Student have converging type of mirror that is concave mirror.
(c) Yes, he can measure the approximate value of focal length from this activity as paper will burn when it will be kept at focus of the mirror, as shown is figure.



OR

Given :

h_o = 10 cm = 0.1 m

f = 12 cm = 0.12 m

u = – 18 cm = – 0.18 m

We know that,

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

$$\frac{1}{V}+\frac{1}{18}=\frac{1}{12} \quad \Rightarrow \frac{1}{V}=\frac{1}{12}-\frac{1}{18}=\frac{3-2}{36}$$

v = 36 cm

$$m=\frac{v}{u}=\frac{h_i}{h_o}$$

$$\Rightarrow \frac{36}{-18}=\frac{h_i}{10}$$

h_i = – 20 cm

Magnified and real inverted image.

14. What are solar cells. Explain the structure of solar panel. List two principal advantages associated with solar cells.

Sol. Solar Cell – A solar cell is a device which converts the incident solar light energy directly into electrical energy in DC form.

Solar Panel – In a solar cell panel a large number of solar cells are joined together in a definite pattern to provide greater power at higher voltage.

Advantages of solar cell –

- They directly utilize solar energy.
- They can work satisfactorily even in diffused radiations.
- They need no maintenance.
- They do not cause pollution.

15. Write the essential function performed by ozone at the higher levels of the Earth's atmosphere ? How is it produced ? Name the synthetic chemicals mainly responsible for the drop of amount of ozone in the atmosphere. How can the use of these chemicals be reduced ?

Sol. Ozone layer helps in preventing the entry of harmful UV radiations on earth. Ozone is produced by reaction of O_2 molecules with O free radicle in the presence of solar radiation. Chloro fluoro carbons (CFC's) are synthetic chemicals responsible for depletion of ozone.

Methods to reduce CFC emission.

i) By reducing the use of AC, fridge , perfumes, etc.

SECTION - D

16. (a) List any three observations which posed a challenge to mendeleev's Periodic Law.

(b) How does the metallic character of elements vary on moving from

(i) Left to right in a period,

(ii) from top to bottom in a group of the Modern Periodic Table ?

Give reason for your answer.

OR

The electrons in the atoms of four elements A,B,C and D are distributed in three shells having 1,3,5 and 7 electrons respectively in their outermost shells. Write the group numbers in which these elements are placed in the Modern Periodic Table. Write the electronic configuration of the atoms of B and D and the molecular formula of the compound formed when B and D combine.

Sol. (a) Limitations of Mendeleev's periodic table : Inspite of many advantages, the Mendeleev's periodic table has certain defects also. Some of these are given below -

(i) **Position of hydrogen :** Position of hydrogen in the periodic table is uncertain. It has been placed in 1A group with alkali metals, but certain properties of hydrogen resemble those of halogens. So, it may be placed in the group of halogens as well.

(ii) **Position of isotopes :** Isotopes are the atoms of the same element having different atomic masses. Therefore, according to Mendeleev's classification these should be placed at different places depending upon their atomic masses. For example, hydrogen isotopes with atomic masses 1, 2 and 3 should be placed at three places. However, isotopes have not been given separate places in the periodic table because of their similar properties.

(iii) Anomalous pairs of elements : In certain pairs of elements, the increasing order of atomic masses was not obeyed. In these, Mendeleev placed elements according to similarities in their properties and not in increasing order of their atomic masses.

◆ For example :

• The atomic mass of argon is 39.9 and that of potassium 39.1. But argon is placed before potassium in the periodic table.

(b) (i) Metallic character decreases on moving from left to right in a period. Because tendency to gain electron increases due to increase in nuclear charge.

(ii) Metallic character increases on moving from top to bottom in a group. Due to increase in number of shells tendency to lose electron increases.

OR

Element	No. of Valence	Electronic configuration	Group No.
A	1	2, 8, 1	1
B	3	2, 8, 3	13
C	5	2, 8, 5	15
D	7	2, 8, 7	17

Molecular formula of compound formed by B and D will be BD_3

17. (a) Why is the use of iodised salt advisable? Name the disease caused due to deficiency of iodine in our diet and state its one symptom

(b) How do nerve impulses travel in the body ? Explain.

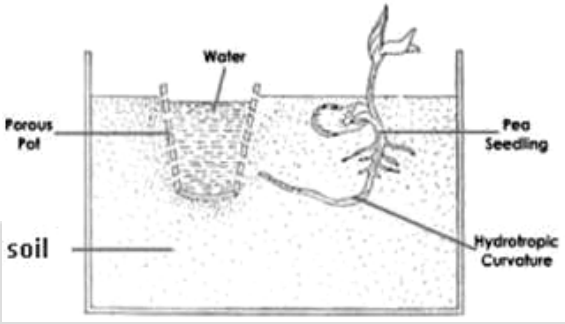
OR

What is hydrotropism ? Design an experiment to demonstrate this phenomenon

Sol. (a) Iodised salt is advisable because it is an essential element for the synthesis of thyroxine hormone. If there is deficiency of iodine in the diet then thyroxine hormone will not be synthesized and a disease called goitre will occur.

(b) All information from our environment is detected by the specialised tips of some nerve cells. This information, acquired at the end of the dendritic tip of a nerve cell sets off a chemical reaction that creates an electrical impulse. This impulse travels from the dendrite to the cell body,and then along the axon to its end. At the end of the axon, the electrical impulse sets off the release of some chemicals. These chemicals cross the gap, or synapse, and start a similar electrical impulse in a dendrite of the next neuron. This is a general scheme of how nervous impulses travel in the body. A similar synapse finally allows delivery of such impulses from neurons to other cells, such as muscles cells or gland

OR

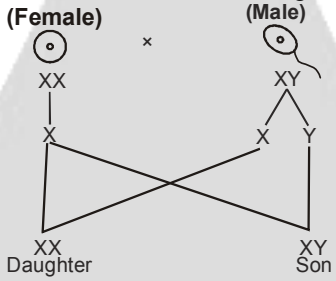


Hydrotropism is the growth movement of plant towards water.Experiment to show hydrotropism in plants :
1. Plant a seedling in a vessel containing soil
2. Adjacent to the seedling put a porous pot containing water.
3. Leave the set up for few days.
4. On examining the roots of seedlings it is observed that the roots bend towards the source of water and do not grow straight.

Result : It confirms that plant shows hydrotropism as the roots bend towards the porous pot of water.

18. (a) What are homologous structures ? Give an example.
(b) "The sex of a newborn child is a matter of chance and none of the parents may be considered responsible for it." Justify this statement with the help of a flow chart showing sex-determination in human beings.

Sol. a) Homologous structures are those structures which are similar in origin but different in functions. e.g.The arm of a human, the wing of a bird.
b) Flow chart showing sex determination in human beings :



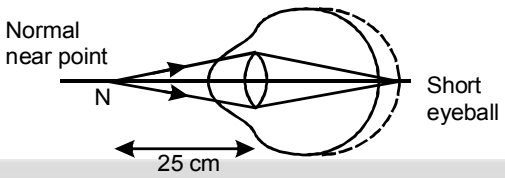
Woman have two 'X' chromosomes, while men have one 'X' and one 'Y' chromosome. So the sex of the child is determined by the type of chromosome inherited from father. A child who inherit an 'X' chromosome from father will be a girl and one who inherits 'Y' chromosome from father will be a boy.

19. When do we consider a person to be myopic or hypermetropic ? List two causes of hypermetropia. Explain using ray diagrams how the defect associated with hypermetropic eye can be corrected.

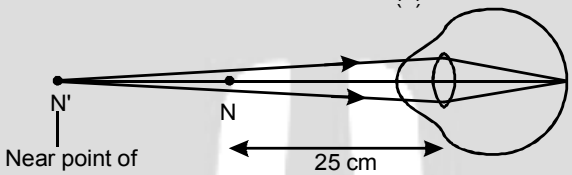
Sol. When person is unable to see far away objects clearly or when the far point of eye of person has been shifted from ∞ to a nearer point then we say person is suffering from myopia, and when person is unable to see near by objects clearly or when the near point of eye of person has been shifted from 25 cm to a point away then we say person is suffering from hypermetropia.
Causes of hypermetropia –

(1) Increase in focal length of eye lens.
(2) The eye ball has become to small.

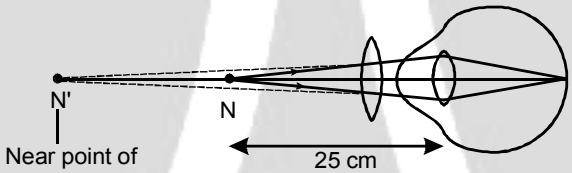
Ray diagram for correction of hypermetropia –



(a)



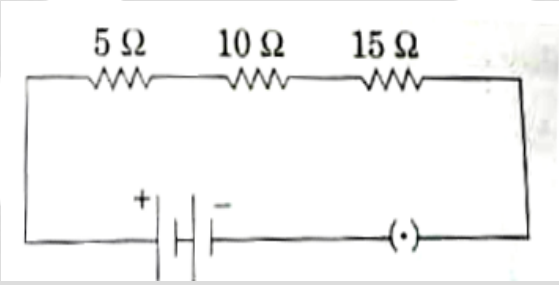
(b)



(c)

20. (a) How will you infer with the help of an experiment that same current flows through every part of a circuit containing three resistors in series connected to a battery?

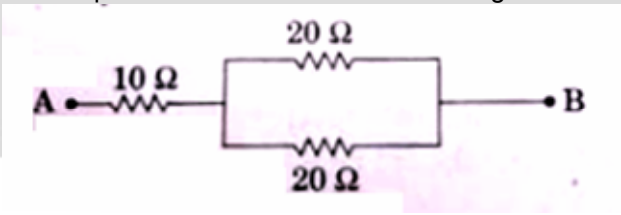
(b) Consider the given circuit and find the current flowing in the circuit and potential difference across the 15 Ω resistor when the circuit is closed.



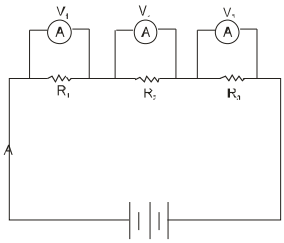
OR

(a) Three resistors R_1. R_2 and R_3 are connected in parallel and the combination is connected to a battery, ammeter, voltmeter and key. Draw suitable circuit diagram and obtain an expression for the equivalent resistance of the combination of the resistors.

(b) Calculate the equivalent resistance of the following network :



Sol **(a)**

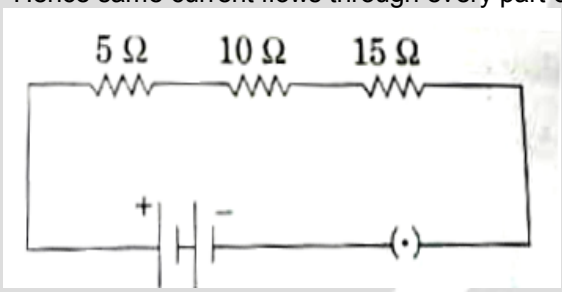


Connect an ammeter in the circuit and three voltmeter across each resistance as shown in figure.
Note the reading of ammeter let us say it is (i). Note the reading of voltmeters let us say they are V_1, V_2 and V_3 respectively across R_1, R_2 and R_3.
Now by ohm's law

$$i_1 = \frac{V_1}{R_1}, \qquad i_2 = \frac{V_2}{R_2}, \qquad i_3 = \frac{V_3}{R_3}$$

We will find that $i_1 = i_2 = i_3 = i$.
Hence same current flows through every part of the circuit.

(b)



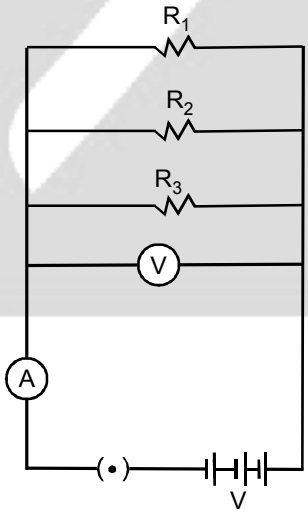
Req = 5 + 10 + 15
= 30 Ω

V = IR
30 = i (30) $\Rightarrow$ i = 1 ampere
Now as all resistiors are in series so current in all will be same.
So,
V_{15} = (1 × 15) = 15 V

Across 15 Ω potential difference is 15 Volt.

OR

(a)



$$i_1 = \frac{V}{R_1}$$

$$i_2 = \frac{V}{R_2}$$

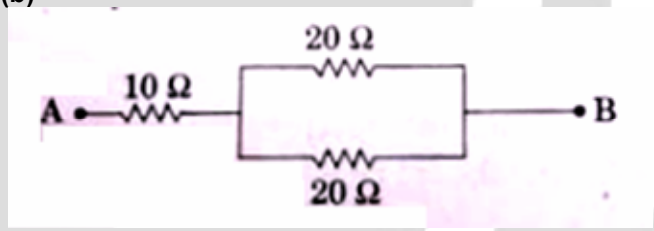
$$i_3 = \frac{V}{R_3}$$

$$i_1 + i_2 + i_3 = i$$

$$\frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3} = \frac{V}{R_{eq}}$$

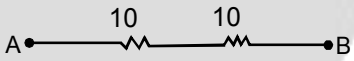
$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{V}{R_2} + \frac{1}{R_3}$$

(b)

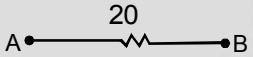


For resistor is parallel $\frac{1}{Req_1} = \frac{1}{20} + \frac{1}{20}$

Req_1 **= 10** Ω

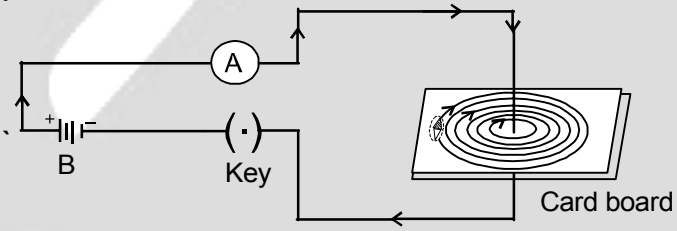


$Req = 10 + 10 = 20\Omega$



21. Draw the pattern of magnetic field lines produced around a current carrying straight conductor passing perpendicularly through a horizontal cardboard. State and apply right hand thumb rule to mark the direction of the field lines. How will the strength of the magnetic field change when the point where magnetic field is to be determined is moved away from the straight conductor? Give reason to justify your answer.

Sol.



Right hand thumb rule : If we hold the current carrying conductor in the right hand such that the thumb points in the direction of current, then the fingers encircle the wire in the direction of magnetic lines of force.

The strength of the magnetic field will reduce when the point where magnetic field is to be determined is moved away from the straight conductor as $B \propto \frac{I}{r}$

SECTION - E

22. A teacher provided acetic acid, water, lemon juice, aqueous solution of sodium hydrogen carbonate and sodium hydroxide to students in the school laboratory to determine the pH values of these substances using pH papers. One of the students reported the pH values of the given substances as 3, 12, 4, 8 and 14 respectively. Which one of these values is not correct ? Write its correct value stating the reason.

OR

What would a student report nearly after 30 minutes of placing duly cleaned strips of aluminium, copper, iron and zinc in freshly prepared iron sulphate solution taken in four beakers ?

Sol.

Given substance	Given pH	
Acetic acid	3	Correct
Water	12	Incorrect
Lemon juice	4	Correct
$NaHCO_3$(aq)	8	Correct
NaOH(aq)	14	Correct

Correct pH for water will be 7, because it is neutral in nature.

OR

Case-1 :

$3FeSO_4$ (aq) + $2Al \rightarrow Al_2(SO_4)_3$ (aq) + 3Fe(s)

In this case light green solution of ferrous sulphate turns into colourless due to the displacement of Fe by Al.

Case-2 : $FeSO_4 + Cu \rightarrow$ No reaction

Because copper is less reactive than iron.

Case-3 : $FeSO_4 + Fe \rightarrow$ No reaction

Case-4 : $FeSO_4$(aq) + $Zn \rightarrow ZnSO_4$(aq) + Fe

Zinc is more reactive than iron so light green colour of solution turns into colourless.

23. What is observed when a pinch of sodium hydrogen carbonate is added to 2 mL of acetic acid taken in a test tube ? Write chemical equation for the reaction involved in thise case.

Sol. $NaHCO_3$ (aq) + CH_3COOH(aq) $\rightarrow$ CH_3COONa (aq) + H_2O + CO_2(g)$\uparrow$

In this process colourless and odourless gas CO_2 evolves with brisk effervescence.

24. List in proper sequence four steps of obtaining germinating dicot seeds.

OR

After examining a prepared slide under the high power of a compound microscope, a student concludes that the given slide shows the various stage of binary fission in a unicellular organism. Write two observations on the basis of which such a conclusion may be drawn.

Sol. Four steps of obtaining germinating dicot seeds are :-

(i) Imbibition (ii) Respiration (iii) Effect of light (iv) Mobilization of reserve food

OR

Two observations should be :-

(i) Karyokinesis in which division of nucleus occurs.

(ii) Karyokinesis is followed by cytokinesis in which division of cytoplasm occurs.

25. List four precautions which a students should observe while preparing a temporary mount of a leaf peel to show stomata in his school laboratory.

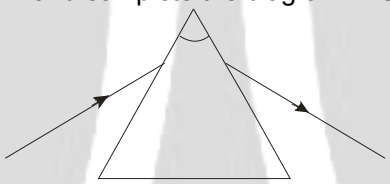
Sol. **Precautions :**

i) Cut the peel to a proper size and avoid folding it.
ii) Always place the peel at the centre of the slide and hold the slide at the edges.
iii) Do not overstrain or under strain the peel.
iv) Remove excess stain and glycerin with a blotting paper.

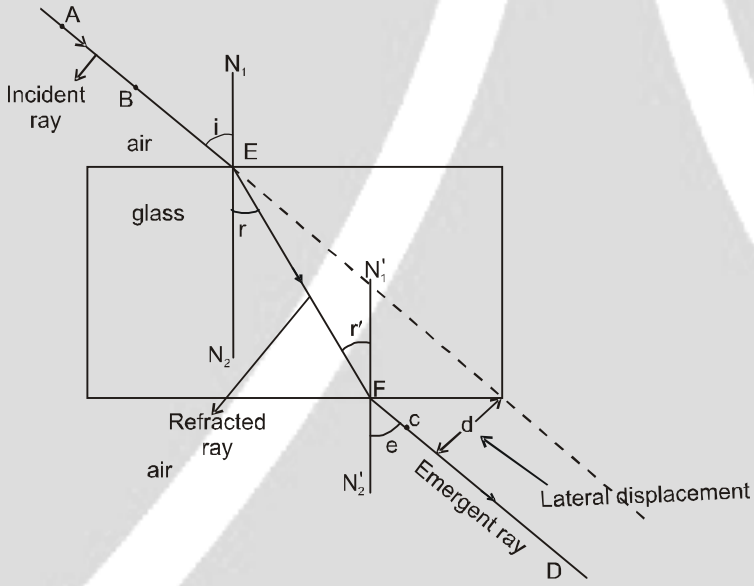
26. Draw the path of a ray of light when it enters one of the faces of a glass slab at a angle of nearly 45º. Label on it (i) angle of refraction. (ii) angle of emergence and (iii) lateral displacement.

OR

A Student traces the path of a ray of light through a glass prism as shown in the diagram, but leaves it incomplete and unlabelled. Redraw and complete the diagram. Also label on it ∠i, ∠e, ∠r and ∠D

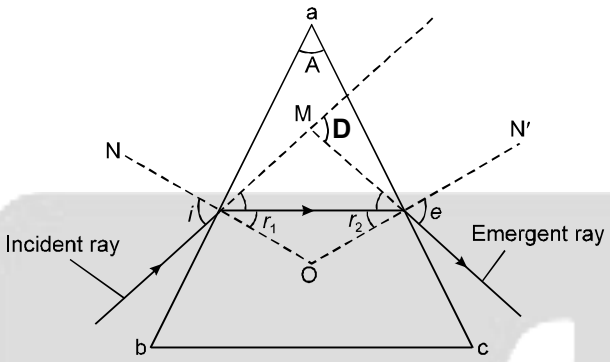


Sol.



∠i = incident angle
∠r = refractive angle
∠e = emergent angle

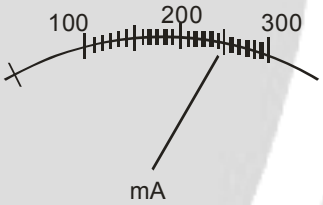
OR

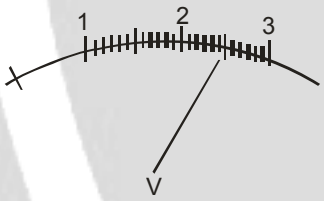


27. The current flowing through a resistor connected in a circuit and the potential difference develop across its ends are as shown in the diagram by milliammeter and voltmeter reading respectively

(a) What are the least counts of these meters ?

(b) What is the resistance of the resistor ?





Sol. (a) $(L.C)_A = \frac{100}{10}$

$= 10$ mA

$(L.C)_V = \frac{1}{10}$

$= 0.1V$

(b) Reading of ammeter = 200 + 5 × 10 = 250 mA.

Reading of voltmeter = 2 + 4 × 0.1 = 2.4 V.

$R = \frac{V}{I}$

$= \frac{2.4}{250 \times 10 - 3} = 9.6\ \Omega.$