

SSC PUBLIC EXAMINATIONS - 2024

Physical Science (EM)



Special Edition

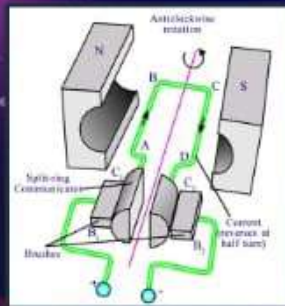
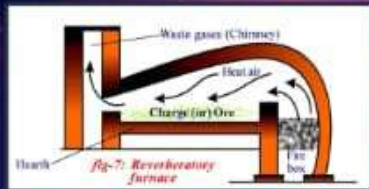


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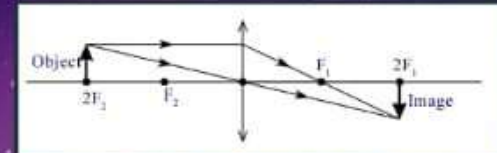
New Pattern

Academic Standards

Chapter Wise



	l-0	l-1	l-2	l-3
n=1	1s			
n=2	2s	2p		
n=3	3s	3p	3d	
n=4	4s	4p	4d	4f
n=5	5s	5p	5d	5f
n=6	6s	6p	6d	
n=7	7s	7p		
n=8	8s			



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1. HEAT

 1 Mark

1. Convert 30°C into Kelvin scale (AS₁)

Ans: 30°C = (30 + 273) = 303 K

2. Write the formula to find the specific heat of a substance (AS₁)

Ans: $s = \frac{Q}{m\Delta T}$

3. What is the S.I unit of specific heat? (AS₁)

Ans: J/kg-K

4. Define Heat? (AS₁)

Ans: Heat is the energy that flows from a hotter body to a colder body.

5. Which substance can gain/loss heat energy quickly? (AS₄)

Substance	Copper	Ice	Water	Mercury	Sea water
Specific heat(cal/g- °C)	0.09	0.5	1	0.033	0.95

Ans: Mercury

6. State the principle of method of mixtures. (AS₁)

Ans: Net heat lost = Net heat gain

7. Define Evaporation. (AS₁)

Ans: The process of escaping of molecules from the surface of a liquid at any temperature is called "Evaporation"

8. What happens to the water when wet clothes dry? (AS₂)

Ans: Water from the wet clothes evaporates when wet clothes dry and mixes with air in the surroundings.

9. What is Humidity? (AS₁)

Ans: The amount of water vapour present in air is called humidity.

10. During the winter season water droplets identified on the surface of leaves, grass, etc., what process is responsible for this? (AS₁)

Ans: Condensation

11. What is the value of latent heat of vaporization of water? (AS₁)

Ans: 540 cal/g

12. Raghava dropped ice cube in water. It floats on water. Assume why the ice Cube float on water? (AS₂)

Ans: The density of ice is less than of density of water

 2 Marks

1. Your friend is asked to differentiate between evaporation and boiling. What questions could you ask to make him to know the differences between evaporation and boiling? (AS₂)

Ans: a) What is meant by evaporation?

b) What is meant by boiling?

c) At what temperature evaporation takes place?

d) At what temperature boiling takes place?

e) Which one is the Cooling process?

f) Which one is the Warming process?

g) In which process, energy of the system increases?

h) In which process, energy of the system decreases?

(Write any two relevant questions)

2. What role does specific heat play in keeping a watermelon cool for a long time after removing it from a fridge on a hot day? (AS₆)

Ans: Water melon brought out from the refrigerator retains its coolness for a longer time than any other fruit because it contains a large percentage of water. Water has greater specific heat.

3. Write any two differences between heat and temperature? (AS₁)

Ans:

Heat	Temperature
1. Heat is the energy that flows from a hotter body to a colder body	1. The degree of hotness or coldness of the object is known as temperature
2. It is denoted by 'Q'	2. It is denoted by 'T'
3. S.I unit is Joule	3. S.I unit is Kelvin
4. $Q = ms\Delta T$	4. $K = C + 273$

4. If you are chilly outside the shower stall, why do you feel warm after the bath if you stay in the bathroom? (AS6)

Ans: You feel warm after you finish your bath under the shower on a hot day. In the bathroom, the number of vapour molecules per unit volume is greater than the number of vapour molecules per unit volume outside the bathroom. When you try to dry yourself with a towel, the vapour molecules surrounding you condense on your skin and this condensation makes you feel warm

5. What would be the final temperature of a mixture of 50g of water at 20°C temperature and 50g of water at 40°C temperature? (AS1)

Ans: Given $m_1 = 50\text{g}$ $T_1 = 20^\circ\text{C}$
 $m_2 = 50\text{g}$ $T_2 = 40^\circ\text{C}$

$$\text{Final temperature of mixture, } T = \frac{m_1T_1 + m_2T_2}{m_1 + m_2} = \frac{50 \times 20 + 50 \times 40}{50 + 50} = \frac{1000 + 2000}{100} = \frac{3000}{100} = 30^\circ\text{C}$$

6. Temperature of two cities at different times are given as follows (AS4)

Time/City	At 6 am	At 11.30 am	At 6 pm
A	-3°C	300K	5°C
B	271K	27°C	270K

- In which city the morning temperature at 6 am relatively high?
- At what time to both cities are having the equal temperature?

Ans: a) city B
b) At 11.30am

 **4 Marks**

1. Observe the table and answer the following questions (AS4)

Substance	Specific heat	
	In cal/g-°C	In J/kg-K
Lead	0.031	130
Mercury	0.033	139
Brass	0.092	380
Zinc	0.093	391
Copper	0.095	399
Iron	0.115	483
Glass(flint)	0.12	504
Aluminum	0.21	882
Kerosene oil	0.50	2100
Ice	0.50	2100
Water	1	4180
Sea water	0.95	3900

- What is the SI unit of Specific heat?
Ans: J/kg-K
- Which metal is best for cooking utensils? Why?
Ans: Copper. Because it has low specific heat value
- Which metal is slowly heated up among all given substances?
Ans: Aluminium
- How much heat energy is required to rise 1°C of water of 1 gram?
Ans: $Q = ms\Delta T = 1 \times 1 \times 1 = 1 \text{ cal}$
- Which metal is used to soldering the wires? Why?
Ans: Lead. It is very low specific heat value
- Why different substances have different specific heats?
Ans: Specific heat of a substance depends on its nature.
- Write the formula of specific heat of the substance?
Ans: $S = \frac{Q}{m\Delta T}$
- Convert 1 cal/g-°C into J/Kg-K
Ans: 1 cal/g-°C = $4.186 \times 10^3 \text{ J/kg-K}$
- Which liquid used as coolant? Why?
Ans: Water, because highest specific heat value.

2. How do you appreciate the role of the higher specific heat of water in stabilizing atmospheric temperature during winter and summer seasons? (AS6)

Ans: The sun delivers a large amount of energy to the Earth daily. The water sources on earth, particularly the oceans, absorb this energy for maintaining a relatively constant temperature. The oceans behave like heat “store houses” for the earth. They can absorb large amounts of heat at the equator without appreciable rise in temperature due to high specific heat of water.

3. Explain why dogs pant during hot summer days using the concept of evaporation? (AS1)

- Ans:** i) Dogs do not have sweat glands.
 ii) When dogs pant, the water molecules on the tongue are evaporated.
 iii) Evaporation is the cooling process and temperature falls down.
 iv) This evaporation gives a feeling of coolness to the dog.

4. What are the applications of specific heat? (AS6)

Ans: Applications of Specific heat capacity

- The sun delivers a large amount of energy to the Earth daily. The water sources on Earth, particularly the oceans, absorb this energy for maintaining a relatively constant temperature. The oceans behave like heat “store houses” for the earth. They can absorb large amounts of heat at the equator without appreciable rise in temperature due to high specific heat of water.
- Watermelon brought out from the refrigerator retains its coolness for a longer time than any other fruit because it contains a large percentage of water. Water has greater specific heat.
- A samosa appears to be cool outside but it is hot when we eat it because the curry inside the samosa contains ingredients with higher specific heats.

 **8 Marks**

1. Write the differences between evaporation and boiling? (AS1)

Ans:

Evaporation	Boiling
1. The process of escaping of molecules from the surface of a liquid at any temperature is called evaporation	1. Boiling is a process in which the liquid phase changes to gaseous phase at a constant temperature at a given pressure.
2. It is a surface phenomenon	2. It is a bulk phenomenon
3. It takes place at any temperature	3. It takes place at constant temperature
4. It is a cooling process	4. It is not a cooling process
5. It depends on surface area, temperature, wind speed and humidity	5. It depends on nature of the substance

(Write any 8 relevant differences)

2. Explain the procedure of finding specific heat of solid experimentally. (AS3)

Ans: Aim: To find the specific heat of given solid

Material required: calorimeter, thermometer, stirrer, water, steam water, wooden box and lead shots (or) iron bolt

Procedure:

Step-1:

Mass of the calorimeter (m_1) = ...
 Temperature of the calorimeter (T_1) = ..
 Let specific heat of calorimeter = S_c

Step-2:

Now fill 1/3rd of the volume of calorimeter with water.
 Mass of the calorimeter + water = m_2
 Mass of the water = $m_2 - m_1$
 Temperature of the water (T_1) =
 Let specific heat of water = S_w

Step-3:

Take a few lead shots and place them in hot water or steam water.
 Temperature of the lead shots (T_2) = ..
 Let specific heat of lead shots = S_l

Step-4:

Transfer the hot lead shots quickly into the calorimeter.
 Mass of the calorimeter + water + lead shots = m_3

Mass of lead shots = $m_3 - m_2$

After some time

Temperature of calorimeter + water + lead shots = T_3

According to Principle of method of mixtures

Heat lost by the solid (lead shots) = Heat gain by the calorimeter + Heat gain by the water

$$(m_3 - m_2) S_l (T_2 - T_3) = m_1 S_c (T_3 - T_1) + (m_2 - m_1) S_w (T_3 - T_1)$$

$$S_l = \frac{[m_1 S_c + (m_2 - m_1) S_w] (T_3 - T_1)}{(m_3 - m_2) (T_2 - T_3)}$$

3. Suggest an experiment to prove that the rate of evaporation of a liquid depends on its surface area and vapour already present in surrounding air. (AS3)

Ans: Aim: The rate of evaporation of liquid depends on its surface area and vapour already present in surrounding air

Apparatus: Two dishes of different surface area and water

Procedure (1): 1) Take two dishes of different surface area

2) Pour equal amounts of water in the both dishes

3) Keep aside for 2 to 3 hours

4) Observe them after sometime. Dish with more surface area has less quantity of water than the dish having less surface area

Conclusion: This shows evaporation increases with increasing of surface area

Procedure (2): 1) Take two dishes of equal surface area containing water

2) This experiment should be conducted on more humidity day and less humidity day

3) We may observe that evaporation is less on more humidity day due to more vapour in the air

Conclusion: Hence the rate of evaporation depends upon vapour already present in surrounding air.

2. ACIDS, BASES AND SALTS



1 Mark

1. The colour of phenolphthalein indicator in basic solution is

[]

A) yellow

B) green

C) pink

D) orange

Ans: C

2. Base : NaOH :: Acid : _____

A) Mg(OH)₂

B) NaHCO₃

C) HCl

D) NH₄Cl

Ans: C

3. Ammalu added a few drops of methyl orange indicator to sodium hydroxide solution. What colour may she observed?

Ans: Yellow

4. Which gas is released when metals reacts with acids.

Ans: Hydrogen

5. Madhuri mother stored pickles in a metal vessel. Madhuri told her not to store pickle in a metal vessel. Guess the reason?

Ans: Pickles contain acids which react with metal and form poisonous substances.

6. Which gas evolves, when metal carbonate or metal hydrogen carbonate react with acids

A) Hydrogen

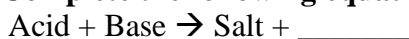
B) Oxygen

C) Nitrogen

D) Carbon dioxide

Ans: D

7. Complete the following equation



Ans: Water

8. Why pure acetic acid does not conduct electricity?

Ans: Pure acetic acid not containing the H⁺ ions. As there is no flow of ions, pure acetic acid do not conduct electricity.

9. What it is to be formed when an acid or base mixed with water?

Ans: When an acid or base mixed with water to formed as H₃O⁺ ions or OH⁻ ions

10. What is the pH value of freshly distilled water?

Ans: 7

11. What type of reaction takes place in stomach when an antacid tablet is consumed?

Ans: Neutralisation

12. A: Antacids participate in neutralise reaction**R: Antacids are bases in nature**

- A) Both A and R are true and R is correct explanation of A
 B) Both A and R are true and R is not correct explanation of A
 C) A is true but R is false D) A is false but R is correct

Ans: A**13. Match the following**

- i) Plaster of Paris () a) $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
 ii) Gypsum () b) NaHCO_3
 iii) Baking Soda () c) $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$

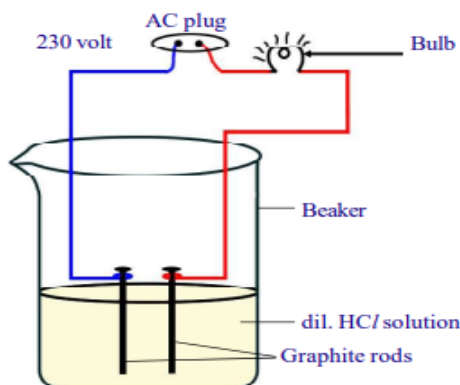
Ans: i-c, 2-a, 3-b**14. Which chemical substance is used by doctors as a plaster for supporting broken bones? Write its chemical formula.****Ans:** Plaster of Paris – $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$.**2 Marks****1. What is a neutralization reaction? Give two examples. (AS1)****Ans:** The reaction of an acid with a base to give a salt and water is known as a neutralization reaction.Examples: 1) $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$ 2) $\text{Mg}(\text{OH})_2 + \text{H}_2\text{SO}_4 \rightarrow \text{MgSO}_4 + 2\text{H}_2\text{O}$ **2. Why does not distilled water conduct electricity? (AS2)****Ans:** In Distilled water, the concentration of both H_3O^+ and OH^- is same. Distilled water is purest form of water. The extent of ionization is less for pure water. So, it is weak electrolyte hence it do not conduct of electricity.**3. How does the flow of acid rain into a river make the survival of aquatic life in a river difficult? (AS6)****Ans:** When pH of rain water is less than 5.6, it is called acid rain. When acid rain flows in to the rivers, it lowers the pH of the river water, the survival of aquatic life in such rivers becomes difficult.**4. Give two important uses of washing soda and baking soda. (AS6)****Ans:** Uses of washing soda

- i) It is used in glass, soap and paper industries.
 ii) It is used in the manufacture of sodium compounds such as borax.
 iii) It is used as a cleaning agent for domestic purposes.
 iv) It is used for removing permanent hardness of water.

(Write any two points)

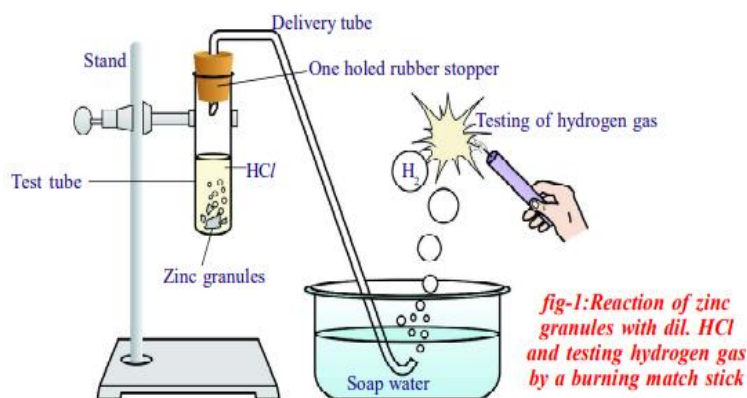
Uses of baking soda

- i) It is used to prepare baking powder ii) It is also an ingredient in antacids.
 iii) It is also used as soda-acid in fire extinguishers iv) It acts as mild antiseptic

5. What is baking powder? How does it make the cake soft and spongy? (AS6)**Ans:** Baking powder is a mixture of baking soda and tartaric acid. When baking powder is heated, carbon dioxide produced during the reaction causes bread or cake to rise making them soft and spongy.**6. Plaster of Paris should be stored in moisture – proof container. Explain why? (AS2)****Ans:** Plaster of paris is a white powder and on mixing with water or presence of moisture, it sets into hard solid mass due to the formation of gypsum. So Plaster of Paris should be stored in moisture – proof container**4 Marks****1. Draw a neat diagram showing acid solution in water conducts electricity. (AS5)****Ans:****fig-3: Acid solution in water conducts electricity**

2. Draw a diagram of arrangement of apparatus for the reaction of acids with metals (or) Draw the diagram that showing the reaction of zinc granules with dil.HCl and testing hydrogen gas by a burning matchstick (AS5)

Ans:



3. Why does tooth decay start when the pH of mouth is lower than 5.5?(AS1)

Ans: i) Tooth decay starts when the pH of the mouth is lower than 5.5.

ii) Tooth enamel, made of calcium phosphate is the hardest substance in the body.

iii) But is corroded when the pH in the mouth is below 5.5.

iv) Bacteria present in the mouth produce acids by degradation of sugar and food particles remaining in the mouth.

v) The best way to prevent this is to clean the mouth after eating food. Using tooth pastes, which are generally basic neutralize the excess acid and prevent tooth decay.

4. What are the applications of p^H in daily life (AS6)

Ans: 1. Plants and animals has sensitive p^H values

i) When pH of rain water is less than 5.6, it is called acid rain.

ii) When acid rain flows in to the rivers, it lowers the pH of the river water, the survival of aquatic life in such rivers becomes difficult.

2. Tooth decay

i) Tooth decay starts when the pH of the mouth is lower than 5.5.

ii) Tooth enamel, made of calcium phosphate is the hardest substance in the body.

iii) But is corroded when the pH in the mouth is below 5.5.

3. p^H in our digestive system

i) During indigestion the stomach produces too much acid and this causes pain and irritation.

ii) To get rid of this pain, people use bases called antacids.

4. p^H of the soul

i) Plants require a specific pH range for their healthy growth.

5. Observe the table and answer the following questions. (AS4)

Liquid/Solution	P	Q	R	S	T
pH	7	6	11	2	8

a) Which solution(s) turn into pink by adding phenolphthalein

Ans: T and R

b) Which solution(s) turn into red by adding methyl orange?

Ans: Q and S

c) Which is strong acid?

Ans: S

d) Which one indicates pure water?

Ans: P

e) If P^H=7, then find the [H]⁺

Ans: [H]⁺ = 10⁻⁷

f) Which solutions are acidic solutions?

Ans: Q and S

g) Which colour given by solution Q with universal indicator?

Ans: Green colour

h) Which colour gives by blue litmus paper when it is dipped in solution S? **Ans:** Red colour

6. A milkman adds a very amount of baking soda to fresh milk.

a) Why does shift the p^H of the fresh milk 6 to slightly alkaline?

b) Why does this milk take a long time to set as curd?

Ans: a) p^H value of fresh milk is 6 and p^H value of baking soda is 8.1. When milkman adds a little baking soda to fresh milk to make it slightly alkaline. The p^H value of fresh milk is slightly increase and the spoilage of milk can slow down.

b) The p^H of milk 6 it contains lactose and small quantity of lactic acid. When milk turns to curd the lactose present in milk turns lactic acid hence p^H of solution decreases.

👉 **8 Marks**

1. Compounds such as alcohols and glucose contain hydrogen but are not categorized as acids. Describe an activity to prove it.(AS3)

Ans: i) Prepare solutions of glucose, alcohol, hydrochloric acid and sulphuric acid etc.,

ii) Connect two different coloured electrical wires to graphite rods separately in a 100 ml beaker as shown in figure.

iii) Connect free ends of the wire to 230 volts AC plug and complete the circuit as shown in the fig by connecting a bulb to one of the wires.

iv) Now pour some dilute HCl in the beaker and switch on the current.

v) We observe that the bulb glows.

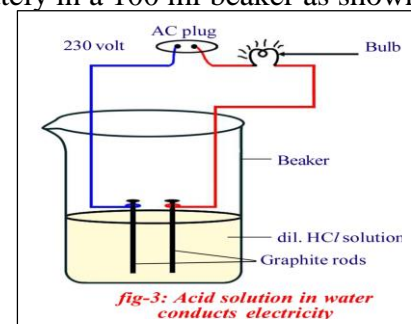
vi) Repeat activity with dilute sulphuric acid and glucose and alcohol solutions separately.

vii) You will notice that the bulb glows only in acid solutions but not in glucose and alcohol solutions.

viii) Glowing of bulb indicates that there is flow of electric current through the solution. Acid solutions have ions and the movement of these ions in solution helps for flow of electric current through the solution.

ix) The positive ion (cation) present in HCl solution is H⁺. This suggests that acids produce hydrogen ions H⁺ in solution, which are responsible for their acidic properties.

x) In glucose and alcohol solution the bulb did not glow indicating the absence of H⁺ ions in these solutions. The acidity of acids is attributed to the H⁺ ions produced by them in solutions.



2. Show that acids produce hydrogen gas when react with metals (AS3)

Ans: Aim: To show that acid produce hydrogen gas reacted with metals.

Materials required: test tube, delivery tube, glass trough, candle, soap water, dil. HCl, and zinc granules.

Procedure:

1) Set the apparatus as shown in figure.

2) Take about 10ml of dilute HCl in a test tube and add a few zinc granules to it.

3) We observe a gas is evolved from the zinc granules

4) Pass the gas being evolved through the soap water.

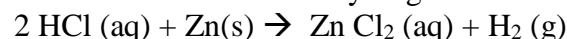
5) We observe some bubbles formed in the soap solution.

6) Bring a burning candle near the gas filled bubble.

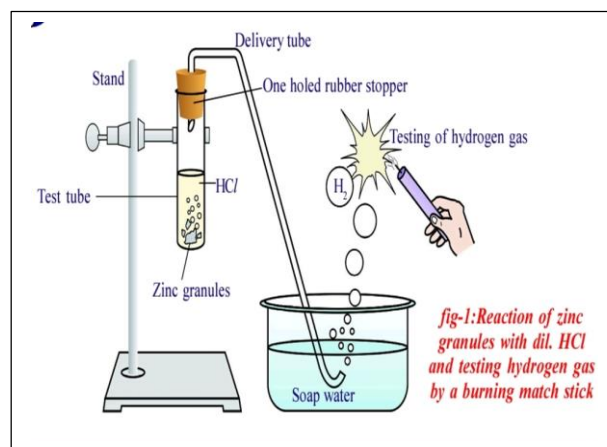
7) The candle turn off with a pop sound

8) The pop sound indicates that the gas evolved in H₂

Acid + Metal → Salt + Hydrogen



9) Repeat this experiment with remaining acids



Conclusion: We conclude that hydrogen gas is produced when acid reacts with metals.

3. What is meant by “water of crystallization” of a substance? Describe an activity to show the water of crystallisation. (AS3)

Ans: Water of crystallization is the fixed number of water molecules present in one formula unit of

a salt.

Activity:

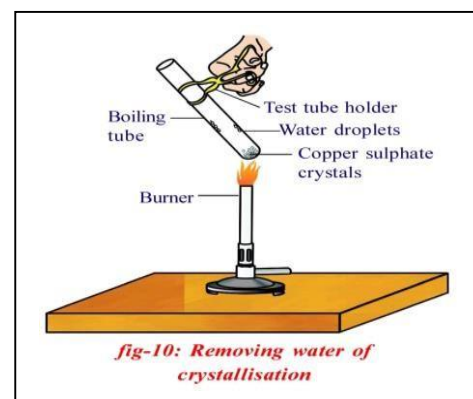
i) Take a few crystals of blue colour copper sulphate in a dry test tube and heat the test tube.

ii) We observed that blue colour salt turns white and water droplets on the walls of the test tube.

iii) Add 2-3 drops of water on the sample of copper sulphate obtained after heating.

iv) We observed that blue colour of salt is restored.

v) From this activity we conclude that some water molecules are fixed in the blue coloured copper sulphate crystals.



3. REFRACTION OF LIGHT AT PLANE SURFACES

 1 Mark

1. Define refraction?

Ans: The process of changing speed at an interface when light travels from one medium to another is called refraction

2. When a light ray travel from denser to rarer medium along with the normal

A) It bends towards the normal B) It moves away from the normal C) It is an undeviated

Ans: C

3. ASSERTION : It is difficult to shoot a fish swimming in water .

REASON : Due to refraction fish in water change its original position.

A) A –True,R-False B) A –False, R-True

C) A –False, R-False D) A –True, R-True

Ans: D

4. Define “Refractive index”

Ans: The ratio of speed of light in vacuum to the speed of light in that medium is defined as refractive index

5. On what factors does the refractive index of medium depend? (or) What are the factors that influence the refractive index

Ans: Nature of the material and wavelength of the used light

6. Refractive index of glass relative to water is 9/8. What is the refractive index of water relative to glass?

Ans: Given $n_{gw} = 9/8$
 $n_{wg} = 1/n_{gw} = 8/9$

7. Choose the suitable answers of section-B with section-A

Section-A

Section-B

1. Formula for refractive index

P) v/c

2. Possible values of refractive index

Q) c/v

R) >1

S) <1

Ans: 1-Q, 2-R

8. The refractive index of glass respect to air is 2. Then the critical angle of glass air interface is

A) 0° B) 45° C) 30° D) 60°

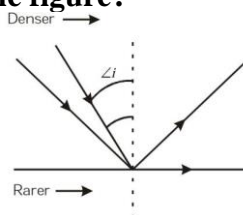
Ans: C

9. What phenomena of light takes place in optical fibres? (or) Name the phenomenon involved in the function of optical fibre (or) Optical Fibre Cable (OFC) are Oftenly used in tele-communications.

What is the working principle behind OFC (or) What is the basic principle of endoscope ?

Ans: Total internal reflection

10. Which phenomenon do you observe from the figure?



Ans: Total internal reflection

11. Why do stars appear twinkling? (or) What is the reason for twinkling of stars

Ans: Stars appear twinkling due to multiple refractions of light through different atmospheric layers with different refractive indices.

12. What is the formula of refractive index of glass slab,if its vertical shift is known?

Ans:: $\text{Refractive index of glass slab} = \frac{\text{Thickness of the slab}}{\text{thickness of slab} - \text{vertical shift}}$

13. Write the applications of total internal reflection (AS6)

Ans: Brilliance of diamond, optical fibres, formation of mirages etc

 2 Marks

1. Why is it difficult to shoot a fish swimming in water? (AS1)

Ans: Due to refraction, the actual position of the fish is change. Fish and Observer are in two different mediums. The light ray travel from denser medium to rarer medium

2. In what cases does a light ray not deviate at the interface of two media? (AS6)

Ans: In two cases, light ray will not deviate at the interface of two media.

- 1) When light ray is incident normally.
- 2) When two media having same refractive indices.

3. When we sit at a camp fire, objects beyond the fire are seen swaying. Give the reason for it.(AS6)

Ans: i) This happens due to refraction of light when it passes through hot to cold air.

- ii) So, we observe the objects behind the fire seen swaying.

4. Write the laws of refraction? (AS1)

Ans: 1) The incident ray, the refracted ray and the normal to interface of two transparent media at the point of incidence all lie in the same plane.

2) During refraction light follows Snell's law

$$n_1 \sin i = n_2 \sin r$$

5. Take a bright metal ball and make it black with soot in a candle flame. Immerse it in water.

How does it appear and why? (Make hypothesis and do the above experiment). (AS2)

Ans: Silvery or shiny, because total internal reflection takes place

Hypothesis: Speed of light changes when it travels from one medium to another medium.

6. What is the reason behind the shining of diamonds and how do you appreciate it? (AS6)

Ans: Total internal reflection is the main reason for brilliance of diamonds. The critical angle of a diamond is very low (24.4°). So if a light ray enters a diamond it is very likely to undergo total internal reflection which makes the diamond shine.

7. Frame some questions to know about the formation of mirage.

Ans: 1) What is mirage?

2) Can you take a photo of a mirage?

3) Why should you see a mirage as a flowing water?

4) Which phenomenon is involved in formation of mirages?

5) What is condition to form mirage? (Write any two relevant questions)



4 Marks

1. Observe the following table and answer the questions. (AS4)

Material medium	Refractive index	Material medium	Refractive index
Air	1.0003	Canada balsam	1.53
Ice	1.31	Rock salt	1.54
Water	1.33	Carbon Disulphide	1.63
Kerosene	1.44	Dense flint glass	1.65
Fused quartz	1.46	Ruby	1.71
Turpentine oil	1.47	Sapphire	1.77
Crown glass	1.52	Diamond	2.42
Benzene	1.50		

a) Write the SI unit of Refractive index

Ans: No unit

b) What happens to the speed of light when light is passing from Water to Rock salt

Ans: Decreases

c) Write the relation between speed of light(v) and refractive index of the material medium(n)

Ans: $n \propto 1/v$ (OR) There are inversely proportional each other

d) What is the speed of light in Benzene?

Ans: $n=1.5=3/2$, $C=3 \times 10^8$ m/s, $V=?$

$$V=C/n=3 \times 10^8 \times 2/3=2 \times 10^8 \text{ m/s}$$

e) What is reason, RI of kerosene is more than the RI of water?

Ans: Optical density of kerosene is more than the optical density of water

f) Among Ice, Fused quartz, Ruby and Diamond, Which is rarer medium? Why?

Ans: Ice. Because Ice has low refractive index comparatively remaining

g) In the table, In which material medium speed of light is less? Why?

Ans: Diamond, it has highest refractive index

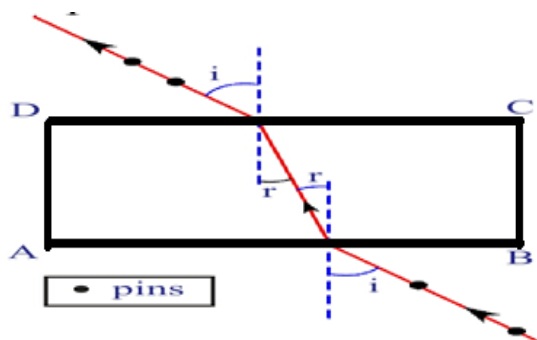
h) Whether the refracted ray bends towards normal or away from the normal when light ray travelled from Water to Kerosene

Ans: Bend towards normal

2. Draw the diagram to find out the lateral shift of the glass slab (OR)

Explain the refraction of light through a glass slab with a neat ray diagram (AS5)

Ans:



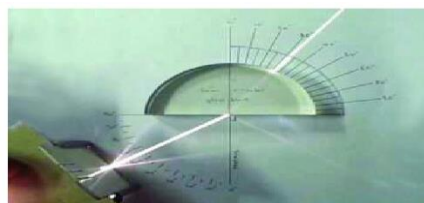
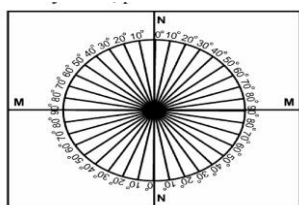
8 Marks

1. How do you verify experimentally that $\sin i / \sin r$ is a constant? (AS3)

Ans: Aim: Obtaining a relation between angle of incidence and angle of refraction (or) experimentally prove that the angle of incidence is more than angle of refraction when light rays travel from rarer medium to denser medium (or) prove that $\sin i / \sin r$ is constant

Materials required: Pro circle, scale, small black printed plank, a semi circular glass disc of Thickness nearly 2 cm, pencil and laser light

- Preparation of Pro Circle:
- 1) Take a wooden plank which is covered with white chart
 - 2) Draw two perpendicular lines, passing through the middle of the paper as shown in the figure
 - 3) Let the intersecting point be O.
 - 4) Mark one line as NN which is normal to the another line marked as MM
 - 5) Here MM represents the line drawn along the interface of two media and NN represents the normal drawn to this line at O
 - 6) Take a protractor and place it along NN in such a way that its centre coincides with as shown in fig.
 - 7) Then mark the angles from 0° to 90° on both sides of the line NN
 - 8) Repeat the same on the other side of the line NN
 - 9) The angles should be represented on circular line.



Procedure: 10) Now place a semi-circular glass disc so that its diameter coincides with the interface line (MM) and its center coincides with the point O

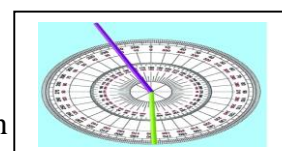
- 11) Take the laser light and send it along NN in such a way that the laser propagates from air to glass through the interface at point O and observe the way of laser light coming from other side of disc
- 12) There is no deviation
- 13) Send laser light along a line which makes 15 with NN and see that it must pass through point O
- 14) Measure its corresponding angle of refraction
- 15) Repeat this experiment with angles of $20^{\circ}, 30^{\circ}, 40^{\circ}, 50^{\circ}$ and 60° , note the corresponding angles of refraction

i	r	Sin i	Sin r	Sin i / Sin r

From the above table we observe that $\sin i / \sin r$ is constant
 From the above table, we observe that $i > r$

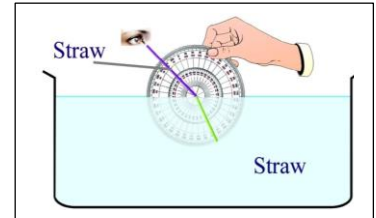
2. How do you verify experimentally that the angle of refraction is more than angle of incidence when light rays travel from denser to rarer medium. (AS3)

Ans: i) Take a Plastic Pro circle arrange two straws at the centre of the pro circle in such a way that they can be rotated freely about the centre of the pro circle as shown



in the fig.

- ii) Adjust one of the straws to make an angle 10°.
- iii) Immerse half of the pro circle vertically into the water, filled in a transparent vessel.
- vi) While dipping, verify that the straw at 10° is inside the water.
- v) From the top of the vessel try to view the straw which is inside the water as shown in fig.
- vi) Then adjust the other straw which is outside the water until both straws appear to be in a single straight line.
- vii) Then take the pro circle out of the water and observe the two straws on it. You will find that they are not in a single straight line.
- viii) Measure the angle between the normal and second straw. Note the value in the table.



i	r	sin i	Sin r	Sin i/sin r

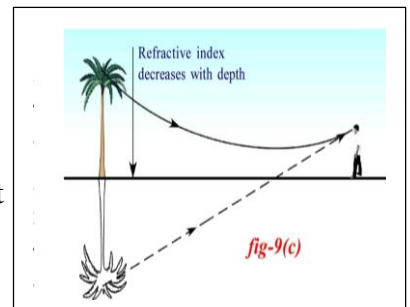
- ix) Do the same for various angles. Find the corresponding angles of refraction and note them in the table.
- x) You will observe that in the above activity, 'r' is greater than 'i' in all cases when light ray travels from denser medium to rarer medium.

3. Explain the formation of mirages? (OR)

What is the reason behind formation of mirage? Explain (AS1)

Ans: i) During a hot summer day, air just above the road surface is very hot and the air at higher altitudes is cool.

- ii) It means that the temperature decreases with height.
- iii) As a result density of air increases with height.
- iv) We know that refractive index of air increases with density.
- v) Thus the refractive index of air increases with height. So, the cooler air at the top has greater refractive index than hotter air just above the road. Light travels faster through the thinner hot air than through the denser cool air



- vi) When the light from a tall object such as tree or from the sky passes through a medium just above the road, whose refractive index decreases towards ground, it suffers, refraction and takes a curved path because of total internal reflection.
- vii) This refracted light reaches the observer in a direction shown in Figure.
- viii) Hence we feel the illusion of water being present on road which is the virtual image of the sky (mirage) and an inverted image of tree on the road

4. REFRACTION OF LIGHT AT CURVED SURFACES

1 Mark

1. What is a lens ?

Ans: A lens is formed when a transparent material is bounded by two surfaces of which one or both surfaces are spherical

2. Name the lens given in the figure?



Ans: Plano-Convex lens

3. What is principal axis?

Ans: The line which joins the two centre of curvatures is called principal axis.

4. Find the focal length of plano convex lens, when its radius of curvature of the surface is R and n is the refractive index of the lens?

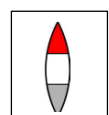
Ans: $f = \frac{R}{n-1}$

5. What is lens formula and explain the terms in it?

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

f= Focal length of the lens, u= Object distance v= Image distance

6. A convex lens is made up of 3 different materials. How many of images does it forms?



Ans: 3

7. Which lens always form virtual and diminished image?

Ans: Concave lens

8. In an experiment of finding focal length of lens the observation are as shown in the table.

U (in cm)	40	30	20
V (in cm)	24	30	38

Which lens is used in this experiment?

Ans: Convex lens

9. In which situation, the value of focal length of a convex lens is equal to the value of image distance

Ans: Object at infinite distance

10. P: Light ray passing along the principal axis is un deviated.

Q: Light ray passing through the focus is un deviated.

A)P,Q both are correct B)P is correct, Q is incorrect

C)P in correct, Q is correct D)P,Q both are incorrect

Ans: B

11. Assertion (A): A person standing on the land appears taller than his actual height to a fish inside a pond

Reason (R): Light bends away from the normal as it enters air from water

Which of the following is correct?

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

Ans: A

12. Suppose you are inside the water in a swimming pool near the edge. A friend is standing on the edge. Do you find your friend taller or shorter than his usual height? Why?

Ans: My friend appears to be taller. Because the light ray bend towards normal, when light ray travels from rarer medium to denser medium.

13. What happens to the focal length of the convex lens when it is kept in water?

Ans: Increases**2 Marks**1. A double convex lens has two surfaces of equal radii 'R' and refractive index $n = 1.5$. Find the focal length 'f'. (AS1)**Ans:** Given $n=1.5$ Focal length of symmetrical convergent lens $\frac{1}{f} = (n - 1) \frac{2}{R}$

$$\frac{1}{f} = (1.5 - 1) \frac{2}{R} = \frac{1}{2} \times \frac{2}{R} = \frac{1}{R}$$

$$f = R$$

2. Harsha tells Siddhu that the double convex lens behaves like a convergent lens. But Siddhu knows that Harsha's assertion is wrong and corrected Harsha by asking some questions. What are the questions asked by Siddhu? (AS2)

Ans: a) In which situation, double convex lens behaves as divergent lens?

b) What happens to the rays when the object kept in between optic centre and focal point?

c) What type of images is formed by double convex lens?

d) How does air bubbles in water behaves?

(Write any two relevant questions)

3. Write lens maker's formula and explain the terms in it.

$$\mathbf{Ans:} \frac{1}{f} = (n - 1) \left[\frac{1}{R_1} - \frac{1}{R_2} \right]$$

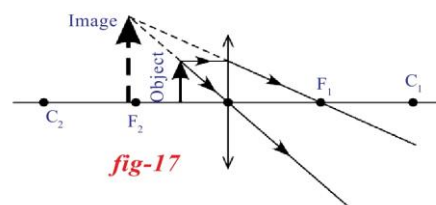
f= Focal length of the lens n=Refractive index of the lens

 R_1, R_2 = Radii of curvatures of two surfaces of the lens

4. The Information given from the above figure, answer the following questions.

1. Write the nature of the image?

2. What is the lens shown in the figure?

**Ans:** 1. Virtual, Erected and Enlarged(Magnified) image

2. Convex lens

5. Your friend is not able to distinguish between concave and convex lenses. Ask two suitable questions to understand the differences between the lenses?

- Ans:** a) Which lens behaves as converging lens?
 b) Which lens behaves as diverging lens?
 c) What type of images is formed by convex lens?
 d) What type of images is formed by concave lens? (Write any two relevant questions)

6. Define the following terms a) Centre of curvature b) Optic centre (AS1)

- Ans:** a) The centre of the sphere which contains the part of the curved surface is called centre of curvature
 b) The midpoint of a thin lens is called optic centre of lens

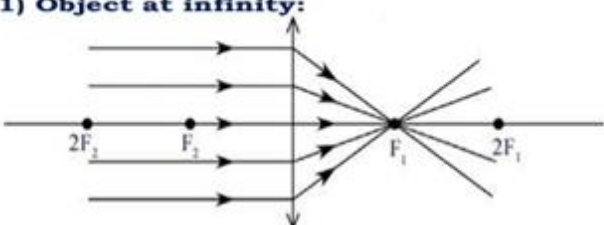
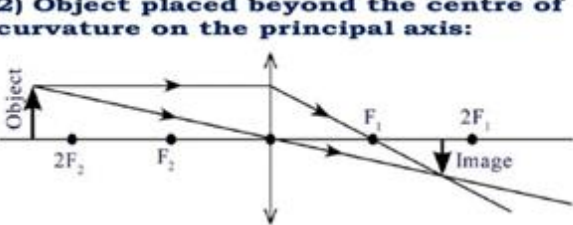
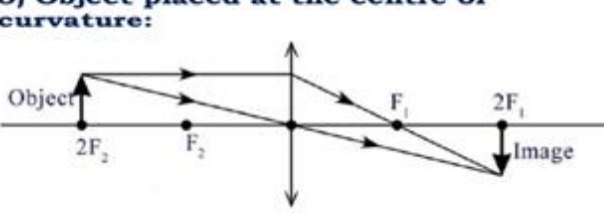
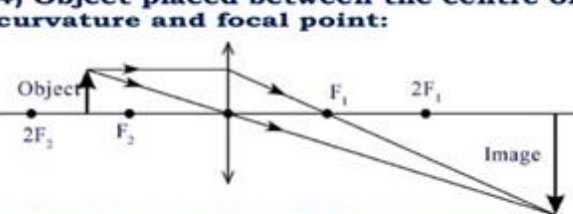
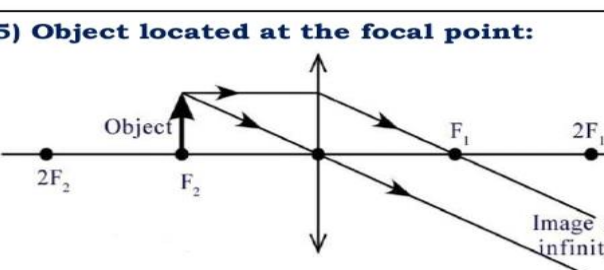
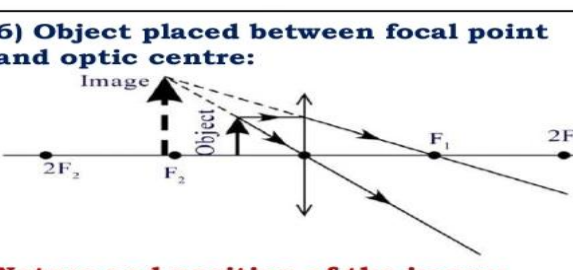
7. Write the applications of lens in day to day life? (AS6)

- Ans:** i) Lenses are used in telescopes and microscopes
 ii) Lenses are used in binoculars, cinema projectors and cameras
 iii) Lenses are used in correction of eye defects. (Write any two applications)

 **4 Marks**

1. Draw ray diagrams for the Convex lens following positions and explain the nature and position of image. (AS5)

- 1) Object at infinity 2) Object is placed at beyond $2F_2$ 3) Object is placed at $2F_2$
 4) Object is placed between F_2 and $2F_2$ 5) Object is placed at F_2
 6) Object is placed between F_2 and optic centre

<p>1) Object at infinity:</p>  <p>Nature and Position of the image: a) Real, Inverted and Diminished image b) At F_1</p>	<p>2) Object placed beyond the centre of curvature on the principal axis:</p>  <p>Nature and position of the image: a) Real, Inverted and Diminished image b) Between F_1 and $2F_1$</p>
<p>3) Object placed at the centre of curvature:</p>  <p>Nature and position of the image: a) Real, Inverted and same size of the object b) At $2F_1$</p>	<p>4) Object placed between the centre of curvature and focal point:</p>  <p>Nature and position of the image: a) Real, Inverted and Enlarged (Magnified) image b) Beyond $2F_1$</p>
<p>5) Object located at the focal point:</p>  <p>Nature and position of the image: a) Real, Inverted and Enlarged (Magnified) image At infinite distance</p>	<p>6) Object placed between focal point and optic centre:</p>  <p>Nature and position of the image: a) Virtual, Erected and Enlarged (Magnified) image b) Behind the object (same side of the object)</p>

2. The focal length of a converging lens is 20cm. An object is 60cm from the lens. Where will the image be formed and what kind of image is it? (AS1)

Ans: $f = 20\text{cm}$ $u = -60\text{cm}$ $v = ?$

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

$$\frac{1}{20} = \frac{1}{v} + \frac{1}{60}$$

$$\frac{1}{v} = \frac{1}{20} - \frac{1}{60} = \frac{3}{60} - \frac{1}{60} = \frac{2}{60} = \frac{1}{30}$$

$$v = 30 \text{ cm}$$

Real, diminished and inverted image
Image forms between F₁ and 2F₁

v < u ---> Diminished image
F=20 cm and C (2F₂)=40 cm---> Between F₁ and 2F₁
m = v/u = 30/-60 = -1/2 - sign means Real image

3. Fill the table following, which is related to convex lens. (AS4)

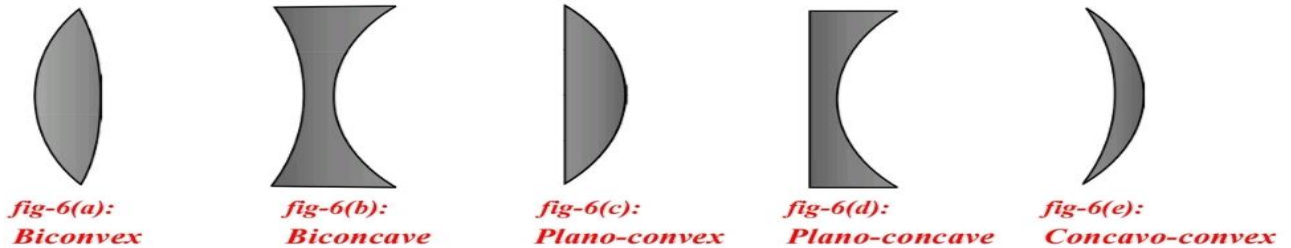
Position of the Object	Position of the Image	Real/Virtual image	Inverted/Erected image	Enlarged/Diminished image
Beyond 2F ₂			Inverted	Diminished
	At 2F ₁	Real		Enlarged
Between 2F ₂ and F ₂	Beyond 2F ₁	Real		
	Same side of the Object		Erected	Enlarged

Ans:

Position of the Object	Position of the Image	Real/Virtual image	Inverted/Erected image	Enlarged/Diminished image
Beyond 2F ₂	Between F ₁ and 2F ₂	Real	Inverted	Diminished
At 2F ₂	At 2F ₁	Real	Inverted	Enlarged
Between 2F ₂ and F ₂	Beyond 2F ₁	Real	Inverted	Enlarged
Between O and F ₂	Same side of the Object	Virtual	Erected	Enlarged

4. Draw various types of lenses. (AS5)

Ans:



8 Marks

1. How do you find the focal length of a lens experimentally? (OR)

You have a lens. Suggest an experiment to find out the focal length of the lens. (AS3)

Ans: Aim: Determination of focal length of bi-convex lens using UV method.

Material Required: V Stand, convex lens, light source, screen, meter scale.

- Procedure:
- i) Take a v-stand and place it on a long table at the middle.
 - ii) Place a convex lens on the v-stand. Imagine the principal axis of the lens.
 - iii) Light a candle and ask your friend to take the candle far away from the lens along the principal axis.
 - iv) Adjust a screen (a sheet of white paper placed perpendicular to the axis) which is on other side of the lens until you get an image on it.
 - v) Measure the distance of the image from the v-stand of lens and also measure the distance between the candle and stand of lens.
 - vi) Record the values in a table.

Object distance(u)	Image distance(v)	Focal length(f)

- vii) Now place the candle at a distance of 60 cm from the lens, such that the flame of the candle lies on the principal axis of the lens.
- viii) Try to get an image of the candle flame on the other side on a screen. Adjust the screen till you get a clear image. Measure the image distance (v) from lens and record the values of 'u' and 'v' in table.
- ix) Repeat this for various object distances like 50 cm, 40 cm, 30 cm, etc. Measure image distances in all the cases and note them in table

x) Find 'f' values in all cases by using the formula of $1/f = 1/v - 1/u$

xi) We observe that f value is equal in all cases and this is focal length of a given lens

2. How do you verify experimentally that the focal length of a convex lens is increased when it is kept in water?
(AS3)

Ans: i) Take a convex lens whose focal length is known.

ii) Take a cylindrical vessel such as glass tumbler. Its height must be four times of the focal length of lens.

iii) Keep a black stone inside the vessel at its bottom.

iv) Now pour water into the vessel up to a height such that the height of the water level from the top of the stone is greater than focal length of lens.

v) Now dip the lens horizontally using a circular lens holder as shown in the figure above the stone.

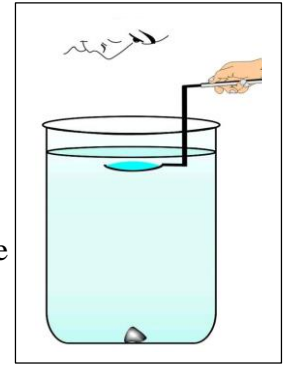
vi) Set the distance between stone and lens that is equal to or less than focal length of lens. Now look at the stone through the lens.

vii) You can see the image of the stone if the distance between lens and stone is less than the focal length of the lens.

viii) Now increase the distance between lens and stone until you cannot see the image of the stone.

ix) You have dipped the lens to a certain height which is greater than the focal length of lens in air. But you can see the image.

x) This shows that the focal length of lens has increased in water.



5. HUMAN EYE AND COLOURFUL WORLD

1 Mark

1. Which lens is concave?

Lens	Focal length (cm)
A	+20
B	-15

Ans: B

2. Assertion(A): Blue colour of sky appears due to scattering of light

Reason(B): Blue colour has shortest wavelength among all colours of white light.

Which is correct A or B

Ans: A

3. Give the values of maximum and minimum focal length of eye lens ? (or) What are the limits to change the focal length of eye lens?

Ans: 2.5 cm and 2.27 cm

4. Predict the reason behind the formation of a Rainbow ?

Ans: Dispersion

5. Which lens is used to correct the eye defect presbyopia ? (or) How do you correct the defect Presbyopia ?

Ans: Bi-focal lens

6. Which part of eye helps to change the focal length of eye lens?

Ans: Ciliary muscles

7. If focal length of lens is 50cm, then find the power of the lens?

Ans: $P = \frac{100}{f} = \frac{100}{50} = 2 D$

8. What is the value of least distance of distinct vision for healthy human being?

Ans: 25 cm

9. What is the value of angle of vision for healthy human being?

Ans: 60°

10. Write the formula of Refractive index of the prism. Explain terms in it?

Ans: : Refractive index of the prism, $n = \frac{\sin\left(\frac{A+D}{2}\right)}{\sin\frac{A}{2}}$

n= Refractive index of the prism, A= Angle of prism, D= Angle of minimum deviation

11. Define accommodation of lens

Ans: The ability of eye lens to change its focal length is called "accommodation of lens" (or) The process of adjusting focal length is called "accommodation of lens"

12. Define Dispersion of light?

Ans: The splitting of white light into different colours (VIBGYOR) is called Dispersion

13. Define Power of lens? Write SI unit of power of lens.

Ans: The reciprocal of focal length is called Power of lens. SI unit is Dioptre

14. What is the role of rods and cones in human eye?

Ans: Cones-Identify the colour, Rods- Identify the intensity of light

**2 Marks****1. Why does the sky sometimes appear white? (AS6)**

Ans: On a hot day, due to rise in the temperature water vapour enters into atmosphere which leads to abundant presence of water molecules in the atmosphere. These water molecules scatter the colours of other frequencies (Other than blue). All such colours of other frequencies reach your eye and sky appears white.

2. "A doctor advised to Ravi to use -2D lens for his defect". Based on this Information answer the questions given below.

- a) Identify the eye defect of Ravi b) Find the focal length of lens.

(OR)

A boy who is suffering from eye defect has been given a prescription as -2D. Based on the information given, answer the following questions

- a) Identify the eye defect he is suffering b) Write the nature and focal length of the lens

Ans: a) Myopia

$$b) f = \frac{100}{P} = \frac{100}{-2} = -50 \text{ cm} \quad (\text{Bi-concave lens})$$

3. When Raju, a ten years old boy, saw rainbow and so many doubts are raised in his mind. Guess those doubts and ask some questions.

- Ans:** a) How many colours in the rainbow?
 b) What colours are there in rainbow?
 c) What is actual shape of rainbow?
 d) Which phenomenon is involved in formation of rainbow? (Write any two relevant questions)

4. If a white sheet of paper is stained with oil, the paper turns transparent .Why? (AS6)

Ans: If a white sheet of paper is stained with oil, the oil occupies the gaps in the paper. If the refractive indices of both paper and oil are similar, then it becomes transparent.

5. A light ray falls on one of the faces of a prism at an angle 40° so that it suffers angle of minimum deviation of 30° . Find the angle of prism and angle of refraction at the given surface.

Ans: Given $i_1=40^\circ$ and $D=30^\circ$

$$\text{We know that } A + D = 2i$$

$$A = 2 \times 40^\circ - 30^\circ$$

$$\text{Angle of prism } A = 50^\circ$$

$$\text{Angle of refraction } r = A/2 = 50^\circ/2 = 25^\circ$$

**4 Marks****1. How do you appreciate the role of molecules in the atmosphere for the blue colour of the sky? (AS6)**

- Ans:** i) The sky appear blue due to atmospheric refraction and scattering of light through molecules.
 ii) The reason for blue sky is due to the molecules N_2 and O_2 , which are presented more in the atmosphere.
 iii) The sizes of these molecules are comparable to the wavelength of blue colour.
 iv) Those molecules act as scattering centres for scattering of blue light.
 v) We should appreciate the molecules which are scattering centres.

2. How do you appreciate the working of Ciliary muscles in the eye? (AS6)

- Ans:** i) The ciliary muscle to which eye lens is attached helps the eye lens to change its focal length by changing the radii of curvature of the eye lens.
 ii) When the eye is focussed on a distant object, the ciliary muscles are relaxed so that the focal length of eye lens has its maximum value
 iii) When the eye is focussed on a closer object, the ciliary muscles are strained and focal length of eye-lens decreases.
 iv) Accommodation process helps, we are able to see the distant and near objects.
 v) So, I appreciate the working of ciliary muscles in the eye.

3. Sridhar has a difficulty in reading the black board. While sitting in the last row. What could be the defect the child is suffering from? Draw a neat diagram which shows the correction of the

above defect. (OR) Bhanu can see near objects clearly but cannot see objects at distant. What type of eye defect is he suffering? Draw the diagrams showing the defected eye and its correction.

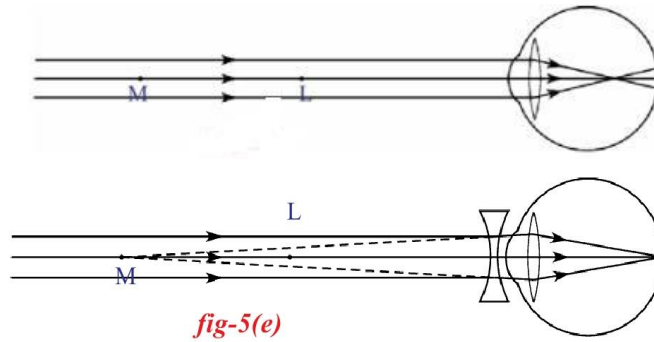


fig-5(e)

8 Marks

1. How do you correct the eye defect Myopia? (AS1)

Ans: i) Some people cannot see objects at long distances but can see nearby objects clearly.

This type of defect in vision is called “Myopia”

ii) It is also called “Near sightedness”

iii) If person with myopia, his maximum focal length is less than 2.5 cm

iv) If person with myopia, form an image before the retina.

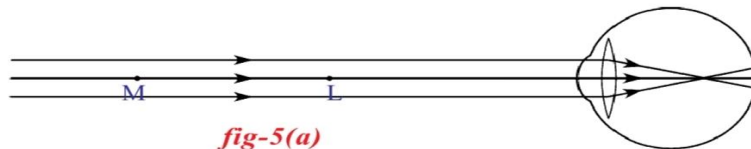


fig-5(a)

v) The point of maximum distance at which the eye lens can form an image on the retina is called “far point(M)”

vi) A person with myopia can see objects clearly up to far point. After far point cannot see the objects clearly

vii) To correct this myopia by using bi-concave lens

viii) Focal length of bi-concave lens is $f = -D$

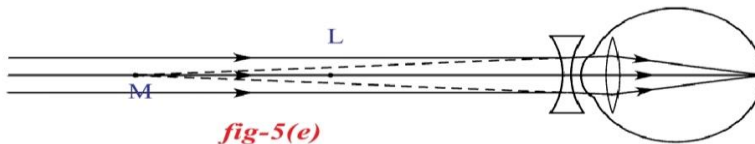


fig-5(e)

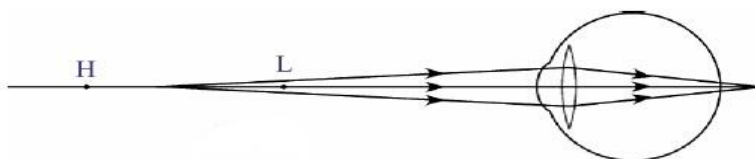
2. Explain the correction of the eye defect Hypermetropia. (AS1)

Ans: i) Some people cannot see objects at near distances but can see distant objects clearly. This type of defect in vision is called “Hypermetropia”

ii) It is also called “Far sightedness”

iii) If person suffering from hypermetropia, his maximum focal length is more than 2.27cm

iv) If person suffering from hypermetropia, form an image beyond the retina

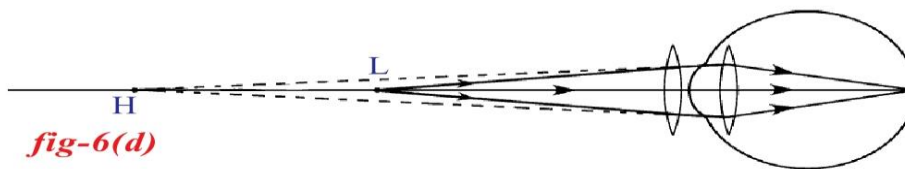


v) The point of minimum distance at which the eye lens can form an image on the retina is called “near point(H)”

vi) A person with hypermetropia can see objects clearly after near point. Cannot see the objects clearly between Least distance of distinct vision(L) and near point(H)

vii) To correct this hypermetropia by using bi-convex lens

viii) Focal length of bi-concave lens is $f = 25d/(d-25)$



3. Explain the formation of rainbow. (AS1)

Ans: i) The rainbow are due to dispersion of the sunlight by millions of tiny water droplets.

ii) Let us consider the case of an individual water drop.

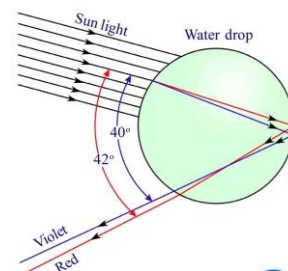
iii) The rays of sunlight enter the drop near its top surface. At this first refraction, the white light is dispersed into its spectrum of colours, violet being deviated the most and red the least.

iv) Reaching the opposite side of the drop, each colour is reflected back into the drop because of total internal reflection.

v) At the second refraction the angle between red and violet rays further increases when compared to the angle between those at first refraction.

vi) The angle between the incoming and outgoing rays can be anything between 0° and about 42°.

vii) We observe bright rainbow when the angle between incoming and outgoing rays is near the maximum angle of 42°.



4. How do you find experimentally the refractive index of material of a prism. (AS3)

Ans: Aim: Finding the refractive index of a prism.

Material required: Prism, piece of white chart, pencil, pins, scale and protractor.

Procedure: i) Take a prism and place it on the white chart, draw the boundary lines by using a pencil.

ii) Remove the prism and name the vertices as P, Q and R

iii) Calculate the angle of the prism and note in the book

iv) Draw a normal to PQ at M and draw a line with 30° to the normal

v) This is incident ray AB. Fix two ball pins on this ray at A and B.

vi) Place the prism in its exact position and fix another two pins at C and D such that all four pins appear to lie along the same line by seeing the images of pins through the prism from the other side PR

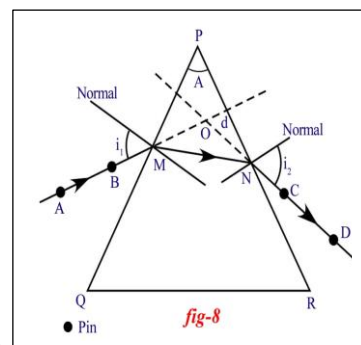
vii) Draw line joining C and D, extend it to meet PR at N this is emergent ray.

viii) Draw normal at PR at N and measure the angle between normal at N and emergent ray.

ix) If we extend the incident ray AB and emergent ray CD, they meet at O.

x) Measure angle between these two rays and note as angle of deviation(d).

xi) The same experiment repeated for different angles of incidence and measure corresponding angle of deviation, noted drawn in the following table.



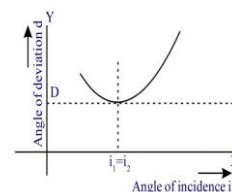
Angle of incidence(i ₁)	Angle of emergence(i ₂)	Angle of deviation(d)

xii) We draw a graph by taking i₁ values on X-axis and d values on Y-axis.

xiii) The graph is a curved line and find angle of minimum deviation(D).

xiv) We can calculate the refractive index of the prism by using the formula

$$n = \frac{\sin\left(\frac{A+D}{2}\right)}{\sin\frac{A}{2}}$$



6. STRUCTURE OF ATOM

1 Mark

1. The maximum no. of electrons that can be accommodated in the L-shell of an atom is?

Ans: Eight(8) electrons.

2. What is the shape of s-orbital?

Ans: Spherical.

3. Write the Planck's constant value?

Ans: 6.626×10^{-34} JS.

4. Observe the following table.

n	l	m _l	m _s
4	3	0	+1/2

This table indicated the orbital _____

A) 4f orbital. B) 3p orbital C) 3s orbital D) 4d orbital

Ans: A) 4f orbital.

5. Principle quantum number: Orbit: : Magnetic quantum number: _____

A) Spin B) Orbitals C) Elliptical orbits D) Angular momentum

Ans: B

6. In the given data which shell has least energy

K	L	M
(n=1)	(n=2)	(n=3)

Ans: K

7. Which principle gives the information that maximum number of electrons filled in an orbital is 2?

Ans: Pauli's exclusion principle

8. What is absorption spectrum?

Ans: The spectrum obtained when the substance absorbs energy is called absorption spectrum. Its contains dark lines on bright background.

9. Write the four quantum numbers for the differentiating electron of sodium (Na) atom?

Ans:

n	l	m _l	m _s
3	0	0	+ 1/2

10. The wave length of a radio wave is 1.0m. Find its frequency.

Ans: Given $\lambda=1$ m $c=3 \times 10^8$ m/s $v=?$

We know that $c = v \lambda$

$$v = c/\lambda = 3 \times 10^8 / 1 = 3 \times 10^8 \text{ Hz}$$

11. Out of 3d and 4s, which has more (n+l) value ? Explain

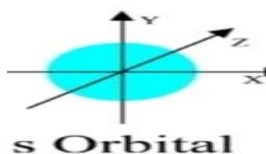
Ans: (n+l) value of 3d= 3+2=5

(n+l) value of 4s= 4+0=4

3d has more (n+l) value than 4s.

12. Draw the shape of s-orbital

Ans:



13. Which rule is violated in the following electronic configuration?

↑↓	↑↓	↑↓↑	
<small>1s²</small>	<small>2s²</small>	<small>2p³</small>	

Ans: Hund's rule

14. An element is an atom has the following set of four quantum numbers

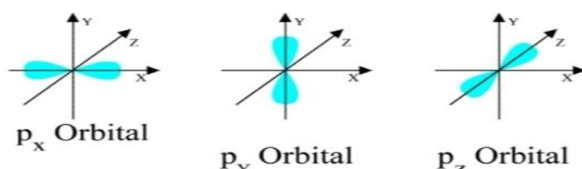
n	l	m _l	m _s
2	0	0	+1/2

i) Name of the element ii) Which orbital it belong to

Ans: i) Lithium ii) 2s

15. Draw the shape of any one of p-orbital

Ans:



**2 Marks****1. Rainbow is an example for continuous spectrum – explain. (AS1)****Ans:** i) Rainbow is a natural spectrum.

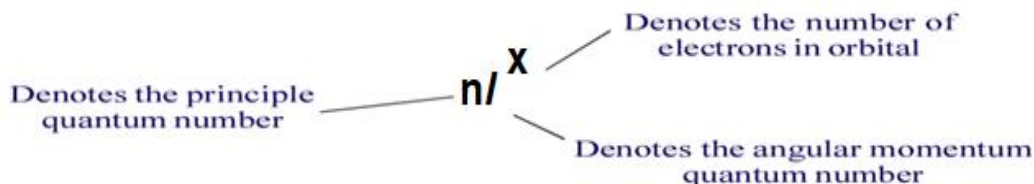
ii) It consists of different colours with different wavelengths

iii) This spectrum has no sharp boundaries in between colours

iv) That's way rainbow is continuous spectrum

2. What is n/l^x method? How it is useful? (AS1)**Ans:** The shorthand notation of electronic configuration is n/l^x .

This gives the information as follows

**Useful of n/l^x method:**

i) To write the electronic configuration of an atom.

ii) To find the position of electrons around the nucleus in an atom.

3. Complete the table. (AS4)

n Value	1		3	
Shell		L		N

Ans:

n Value	1	2	3	4
Shell	K	L	M	N

4. The differentiate electron in an atom has following set of quantum numbers are given, then answer the given questions

n	l	m_l	m_s
3	0	0	+1/2

a) Which orbital this electron belongs

b) Write the name of the element

Ans: i) 3s

ii) Sodium

5. The electron enters into 4s orbital after filling 3p orbital but not into 3d. Explain the reason.**Ans:**

Orbital	4s	3d
(n+l) value	(4+0)=4	(3+2)=5

According Aufbau principle electron enters least (n+l) value orbital. So electron enter into 4s instead of 3d after 3p

6. Your friend is unable to understand n/l^x . What questions will you ask him to understand n/l^x method.(AS2)**Ans:** 1) What is n/l^x method?2) What are uses of n/l^x method?

3) What are the symbols of n, l and x ?

(write any two relevant questions)

7. State and explain Pauli's exclusion principle? (AS1)**Ans:** According to Pauli Exclusion Principle no two electrons of the same atom can have all four quantum number the same.Ex: The electronic configuration of Helium(Z=2) is $1s^2$ 

Electron	n	l	m_l	m_s
1 st	1	0	0	+1/2
2 nd	1	0	0	-1/2

We observe that three quantum numbers are equal but fourth one is different

 **4 Marks**

1. Explain Aufbau principle with an example. (AS1)

Ans: The lowest-energy orbitals are filled first.

Two general rules help us to predict electronic configurations.

1. Electrons are assigned to orbitals in order of increasing value of (n+l).
 2. For sub-shells with the same value of (n+l), electrons are assigned first to the sub-shell with lower 'n'.
- Ex: In Scandium(Z=21), first twenty electrons can be accommodated in 1s,2s,2p,3s,3p and 4s orbitals.

The last electron can enter into either 3d or 4p orbital

Orbital	(n+l) value
3d	3+2=5
4p	4+1=5

Both orbitals have (n+l) value. But 3d orbital is least "n" value. So last electron enter into 3d orbital.

2. Explain Hund's rule with an example. (AS1)

Ans: Hund's rule: Electron pairing in orbitals starts only when all available empty orbitals of the same energy are singly occupied(OR) Electron pairing takes place only after all the available degenerate orbitals are occupied by one electron each.

Explanation: The E.C of carbon atom(Z=6) is $1s^2 2s^2 2p^2$
 The first four electrons go into 1s and 2s orbitals
 The next two electrons go into $2p_x$ and $2p_y$ orbitals
 But, they do not pair in $2p_x$ orbital



3. Electronic configuration of element is $1s^2 2s^2 2p^6 3s^2 3p^5$ (OR) An element has atomic number is 15.

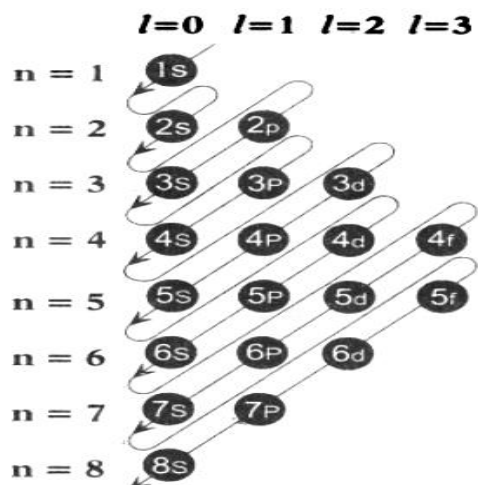
Answer the following questions (AS4)

- | | |
|---|---------------------------------------|
| a) What is the name of element? | Ans: Phosphorus |
| b) How many electrons are present in L-shell? | Ans: 8 |
| c) What is the (n+l) value of $3p$ orbital? | Ans: $3+1=4$ |
| d) In which orbital the next electron enters? | Ans: $3p$ |
| e) Which period and which group the element belongs? | Ans: 3 period and VA(15) group |
| f) What are the number of valence electrons in the element? | Ans: 7 |
| g) Which block it belongs? | Ans: p-block |
| h) Is it metal or non-metal? | Ans: Non-metal |
| i) What is the valency of the element? | Ans: 5 |
| j) What is the name of the group which the element exists? | Ans: Nitrogen family |
| k) It is electropositive or electronegative? | Ans: Electronegative |

4. Draw a diagram showing the increasing value of (n+l) of orbitals (OR)

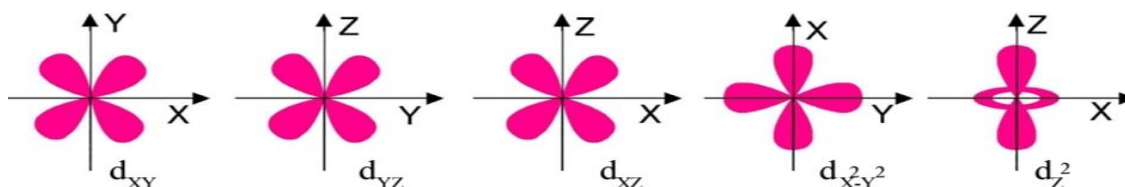
Draw moeller chart of filling order of atomic orbitals (AS5)

Ans:



5. Draw the shapes of d-orbitals (AS5)

Ans:



**8 Marks**

1. Explain the significance of three Quantum numbers in predicting the positions of an electron in an atom. (AS1)

Ans: 1. Principal Quantum Number (n)

- The principal quantum number gives the size and energy of the main shell and it is denoted by n.
- 'n' has positive integer values of 1, 2, 3,...
- As 'n' increases, size and energy of the shell increases.
- The shells are denoted by the letters K,L,M,N,...

Shell	K	L	M	N
n	1	2	3	4

2. The angular - momentum quantum number (l)

- The angular momentum quantum gives the shape of sub-shells and it is denoted by l
- 'l' has integer values from 0 to n-1 for each value of 'n'.
- The sub-shell are designated by the letters s,p,d,f...

l	0	1	2	3
Name of the sub-shell	s	p	d	f

3. The magnetic quantum number (m_l)

- It gives the information about the orientation of orbitals in the presence of magnetic field.
- The magnetic quantum number (m_l) has integer values between -l and l, including zero.
- For given l value, m_l has (2l+1) values
- s-orbital is spherical in shape, p-orbital is dumbbell-shaped and d-orbital are double dumbbell-shaped

Sub shells	Number of orbitals (2l+1)	Maximum number of electrons
s (l=0)	1	2
p (l=1)	3	6
d (l=2)	5	10
f (l=3)	7	14

2. Write postulates and limitations of Bohr's model of hydrogen atom. (AS1)

Ans: Main Postulates:

- Niels Bohr proposed that electrons in an atom occupy 'stationary orbitals(states) of fixed energy at different distances from the nucleus.
- When an electron jumps from a lower energy(ground state) to higher energy states(excited state) it absorbs energy or emits energy when such a jump occurs from a higher energy state to a lower energy state.
- The energies of an electron in an atom can have only certain values E₁, E₂, E₃; that is, the energy is quantized. The states corresponding to these energies are called stationary states and the possible values of the energy are called energy levels.

Limitations:

- Bohr's model failed to account for splitting of line spectra of hydrogen atom into finer lines.
- Bohr's model could not explain the Zeeman and stark effects.

7. CLASIFICATION OF ELEMENTS – THE PERIODIC TABLE

**1 Mark**

1. Statement-I : 4f elements are called lanthanides

Statement-II : s, p block elements except noble gases are called representative elements.

Which of the following statement/statements is/are correct?

Ans: both Statements I and II are correct

2. The most and least electronegative element pairs among the following is

- a) Oxygen, Fluorine b) Fluorine, Oxygen c) Fluorine, Cesium d) Carbon, Fluorine

Ans: c

3. Who proposed law of octaves?**Ans:** John Newland**4. The atomic number of an element X is 9. Which of the following statement/s about the molecule of X is incorrect?**

- A)X is fluorine b)electronic configuration of X is 2,7 c) valency of X is 7

Ans: c**5. How many number of elements present in the 2nd period of a periodic table?****Ans:** 8 elements.**6. Which of the following is the most active metal?**

- A) lithium B) sodium C) potassium D) rubidium

Ans: D) rubidium**7. On moving from top to bottom in a group the ionization energy is?****Ans:** Decreases.**8. Assertion (A):** In a group from top to bottom the atomic size is increasing.**Reason(R):** In the group from top to bottom the atomic number increases hence shell number also increases.

- A) Both A and R are true and R is correct explanation of A
 B) Both A and R are true and R is not correct explanation of A
 C) A is true but R is false D) A is false but R is correct

Ans: B) Assertion, reason correct. The reason is the correct explanation of A.**9. Using the periodic table, predict the formula of compound formed between an element X of group 13 and another element Y of group 16.****Ans:** X₂Y₃**10. Define Moseley's periodic law****Ans:** The physical and chemical properties of the elements are the periodic functions of their atomic numbers"**11. State Mendeleeff's periodic law****Ans:** "The physical and chemical properties of the elements are the periodic functions of their atomic weights"**12. How does atomic size changes in groups and periods****Ans:** In group, the atomic radius increases
 In period, the atomic radius decrease**13. Define 'Ionization energy'****Ans:** The energy required to remove an electron from the outer most orbit or shell of a neutral gaseous atom is called ionization energy.**14. An element has atomic number 19. Where would you expect this element in the periodic table and why?****Ans:** The element with atomic number 19 is in 4th period and 1st group of the periodic table
 The differentiating electron enter into 4th shell and valence is one.**2 Marks****1. Define "Dobereiner's law of triads" and give one example (AS1)****Ans:** A group of three elements in which atomic weights, the atomic weight of the middle element is the average of the atomic weights of the first and third elements. This statement is called the Dobereiner's law of triads.

Ex: Li,Na,K

2. An element X belongs to 3rd period and group 2 of the period table. State

- a) The number of valence electrons b) The valency c) Whether it is metal or a nonmetal (AS2)

Ans: Element is Mg. Electronic configuration of Mg (Z=12)- 1s² 2s² 2p⁶ 3s²

- a) 2 b) 2 c) Metal

3. Comment on the position of hydrogen in periodic table. (AS7)**Ans:** i) Hydrogen can losses one electron and behave electropositive ion like alkali metals.
 ii) Hydrogen can gain one electron and behave like electronegative ion like halogens.
 iii) Its properties resemble with both alkali metals and halogens
 iv) Its placed at the top of both alkali metals and halogens
 v) But based on electronic configuration, hydrogen is placed in 1A group.

4. The electronic configuration of the elements X, Y and Z are given below?

- a) X = 2 b) Y = 2, 6 c) Z = 2, 8, 2

i) Which element belongs to second period? ii) Which element belongs to second group?

iii) Which element belongs to 18th group? (AS2)

Ans: i) Y ii) Z iii) X

5. Write the limitation of Mendeleev's classification? (or)

What are the limitations of Mendeleeff's periodic table? (AS1)

Ans: i) **Anomalous pair of electrons:** Certain elements of highest atomic weights precede those with lower atomic weights.

ii) **Dissimilar elements placed together:** elements with dissimilar properties were placed in same group as sub-group A and sub-group B.

6. How does Metallic nature properties changes in groups and periods (AS1)

Ans: a) In groups, metallic nature increases from top to bottom.

In periods, metallic nature decreases from left to right.

7. Name two elements that you would expect to have chemical properties similar to Mg. What is the basis for your choice? (AS2)

Ans: Calcium (Ca) and strontium (Sr) are expected to shows chemical reaction similar to magnesium (Mg). Because they are in same group.

 **4 Marks**

1. Observe the table and answer the questions (AS3)

Element	Electronic configuration
A	$1s^2 2s^2$
B	$1s^2 2s^2 2p^6 3s^2$
C	$1s^2 2s^2 2p^2 3s^2 3p^3$
D	$1s^2 2s^2 2p^6$

a) Which are the elements coming within the same period? **Ans:** A,D and B,C

b) Which are the elements coming within the same group? **Ans:** A,B

c) Which are the noble gas element? **Ans:** D

d) To which group and period does the element 'C' belong? **Ans:** 3 period and VA(15) group

e) Name the element 'D' **Ans:** Neon

2. Write down the characteristics of element having atomic number 17. (AS4)

1) Electronic configuration _____

2) Period number _____

3) Group number _____

4) Element family _____

5) No.of valence electrons _____

6) Valency _____

7) Metal or non metal _____

Ans: 1) $1s^2 2s^2 2p^6 3s^2 3p^5$ 2) 3 3) VIIA or 17

4) Halogen 5) 7 6) 1 7) Non-metal

 **8 Marks**

1. Define the modern periodic Law. Discuss the construction of the long form of the periodic table.(AS1)

Ans: "The physical and chemical properties of elements are the periodic functions of the electronic configurations of their atoms."

1. Based on the modern periodic law, this modern periodic table is proposed.

2. The modern periodic table has 18 vertical columns known as Groups and 7 horizontal rows known as Periods.

3. 18 groups represented by using Roman numeral I through VIII with letters A and B in traditional notation or 1 to 18 Arabic numerals.

4. 7 periods represented by 1 to 7 Arabic numerals.

5. 1st period contains 2 elements, 2nd and 3rd periods contains 8 elements each, 4th and 5th periods contains 18 elements each, 6th period contains 32 elements and 7th periods is incomplete.

6. The elements are classified as s,p,d and f block elements.

7. Inert or Noble or Rare gases elements are placed in 18th group.

8. Each period starting with metal and ending with inert gas.

9. Left side elements are metals and right side elements are non-metals.
10. s and p block elements are known as Representative elements.
11. d-block elements are called Transition elements.
12. f-block elements are called Inner transition elements. They are placed separately at the bottom of the table.

Advantage: 1. To study the properties of the elements easily

2. Explain how the elements are classified into s, p, d and f- block elements in the periodic table and give the advantage of this kind of classification. (AS1)

Ans: Based upon the electronic configuration the modern periodic table is divided into s, p, d and f- block elements.

S- Block elements:

1. The valence electrons enter into s-orbital is called s- block elements.
2. The elements of group IA and IIA belongs to s-block
3. Except hydrogen, all are metals

P- Block elements:

1. The valence electron enter into p-orbital is called p-block elements.
2. The elements of group IIIA and VIIIA belongs to p-block
3. Metals, non-metals and metalloids

d- Block elements:

1. The valence electron enter into d- orbital is called d-block elements.
2. The elements of group IB and VIIIB belongs to d-block
3. All are metals

f- Block elements:

1. The elements in which the last electron enters the f-orbital of their outer most energy level is called f-block elements.
2. Lanthanoids and Actinoids are f-block elements

3. What is a periodic property? How do the following properties change in a group and period?

Explain. (AS1)

(a) Atomic radius (b) Ionization energy (c) Electron affinity (d) Electronegativity. (AS1)

Ans: Periodic property: The property of an element which is related and repeated according to electronic configuration of the atoms of elements is known as periodic property.

a) Atomic radius: The distance between the center of the nucleus to the outermost shell of an atom is called atomic radius.

In a groups: Atomic radius increases from top to bottom in a group.

In a periods: Atomic radius decreases from left to right in a period.

b) Ionization energy: The energy required to remove an electron from the outer most orbit of a neutral gaseous atom is called ionization energy.

In a groups: Ionization energy decreases as we go, down in a group.

In a periods: Ionization energy generally increases from left to right in period.

c) Electron affinity: The electron affinity of an element is defined as the energy liberated when an electron is added to its neutral gaseous atom.

In a groups: Electron affinity decreases as we go down in a group.

In a periods: Electron affinity increases along a period from left to right.

d) Electro negativity: The electro negativity of an element is defined as the relative tendency of its atom to attract electrons towards it when it is bounded to the atoms of another element.

In a groups: Electro negativity decreases as we go down in a group.

In a periods: Electro negativity increases along a period from left to right.

8. CHEMICAL BONDING

 1 Mark

1. Match the following.

Group A (molecules)

1) BeCl₂

2) BF₃

3) CH₄

Group B (Bond angle)

(p) 109° 48'

(q) 104° 31'

(r) 180°

(s) 120°

Ans: 1- r, 2-s, 3-p

2. Which of the following is not a covalent compound?

- a) $BeCl_2$ b) BF_3 c) $CaCl_2$ d) CH_4

Ans: $CaCl_2$

3. Match the molecules in Set-A with their shapes in Set-B

Set-A

- A) Ammonia
B) Methane
C) Water

Set-B

- P) Tetrahedral
Q) V-shape
R) Pyramidal

Ans: A-R, B-P, C-Q

4. What is the structure of $NaCl$ lattice

Ans: Face centred cubic lattice crystal

5. What is the general electronic configuration of Inert gases?

Ans: $ns^2 np^6$

6. Who proposed the electronic theory of valence?

Ans: Lewis and Kossel.

7. An element 'A' forms a chloride ACl_4 . The number of electrons in the valence shell of 'A'?

- A) 1 B) 2 C) 3 D) 4

Ans: D) 4

8. Covalent compounds are generally soluble in?

- A) Polar solvents B) Non-Polar solvents C) Concentrated acids. D) All solvents

Ans: B) Non-Polar solvents

9. Define octet rule

Ans: The tendency of atoms to achieve eight electrons in their outermost shell is known as Octet rule

10. Define chemical bond

Ans: The force between any two atoms or a group of atoms that results in the formation of a stable entity is called chemical bond

11. Draw electron dot structure for Ne

Ans: $:\ddot{Ne}:$

12. Define covalent bond

Ans: A chemical bond that formed by sharing of valence-shell electrons between the atoms so that both of them can attain octet or duplet in their valence shell is called covalent bond.

13. Represent Calcium atom using Lewis notation.

Ans: $\overset{\cdot\cdot}{\underset{\cdot\cdot}{Ca}}$ (or) $\overset{\times\times}{\underset{\times\times}{Ca}}$

14. Expand VSEPR

Ans: Valence shell electron pair repulsion theory

 2 Marks

1. Explain the difference between the valence electrons and the covalence of an element.(AS1)

Ans:

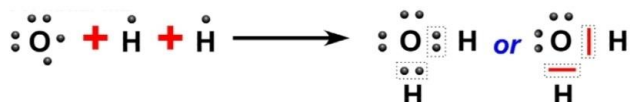
Valence electrons	Covalence of an element
1.No.of electrons present in the valence shell is known as valence electrons	1. No.of electrons gain or loose or share of element is known as covalence
2.Its indicate group number	2. Its indicate no.of electrons are participating in the bonding
3. Ex: Valence of Chlorine is 7	3. Ex: Covalence of Chlorine is 1

2. Predict the reasons for low melting point for covalent compounds when compared with ionic compound. (AS2)

Ans: In ionic compounds the ions are bounded by strong electrostatic force of attractions. But covalent compounds the atoms are bounded by weak forces. So covalent compounds have low melting points.

3. Represent the molecule H_2O using Lewis notation. (AS5)

Ans:



4. Write electronic configurations of a) Na⁺ b) Cl⁻ (AS1)

Ans: a) Na⁺ - 1s² 2s² 2p⁶
 b) Cl⁻ - 1s² 2s² 2p⁶ 3s² 3p⁶

 **4 Marks**

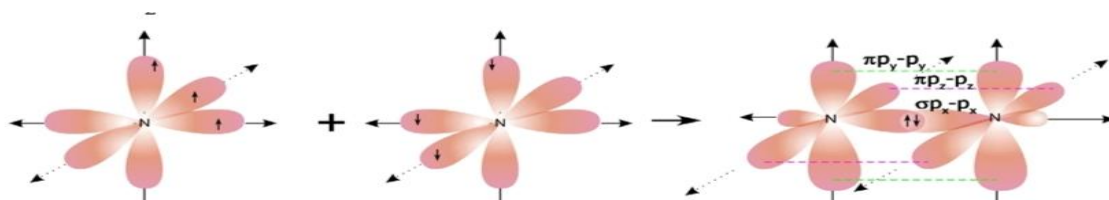
1. Observe the figure and answer the questions (AS4)



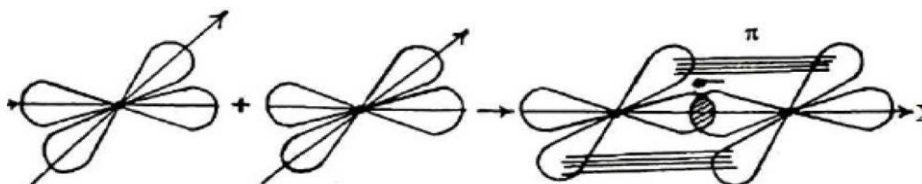
- How many valance electrons are present in Y
- How many valance electrons are present in X
- How many covalent bonds are formed by X ?
- How many covalent bonds are formed by Y ?
- What is the valancy of X and Y
- Suggest the names for elements X and Y
- Which method used in the molecular representation
- Suggest the shape of the molecule?

Ans: 6**Ans:** 1**Ans:** 1**Ans:** 2**Ans:** X valancy-1, Y valancy-2**Ans:** X-Hydrogen , Y-Oxygen**Ans:** Lewis electron dot structure**Ans:** 'V'shape2. Explain the formation of N₂ molecule (AS1)

- Ans:** i). ⁷N has electronic configuration 1s² 2s² 2p^x¹ 2p^y¹ 2p^z¹.
 ii) The p_x orbital of one 'N' atom overlaps the 'p_x' orbital of the other 'N' atom giving σ p_x - p_x bond along the inter-nuclear axis.
 iii) The p_y and p_z orbitals of one 'N' atom overlap the p_y and p_z orbital of other 'N' atom laterally, respectively perpendicular to inter-nuclear axis giving π p_y-p_y and π p_z-p_z bonds.
 iv) Therefore, N₂ molecule has a triple bond between two nitrogen atoms.

3. Explain the formation of O₂ molecule (AS1)

- Ans:** i) ⁸O has electronic configuration 1s² 2s² 2p^x² 2p^y¹ 2p^z¹.
 ii) The 'p_y' orbital of one 'O' atom overlaps the 'p_y' orbital of other 'O' atom along the inter nuclear axis, a sigma p_y- p_y bond (σ p_y- p_y) is formed.
 iii) p_z orbital of one 'O' atom overlaps the p_z orbital of other 'O' atom laterally, perpendicular to the inter-nuclear axis giving a π p_z- p_z bond.
 iv) O₂ molecule has a double bond between two oxygen atoms.



4. What is octet rule? How do you appreciate role of the 'octet rule' in explaining the chemical properties of elements? (AS6)

Ans: The tendency of atoms to achieve 8 electrons in their valence shell is known as Octet rule.

- All noble gas elements have octet configuration except Helium.
- They are stable, so do not participate any chemical reactions.
- If any group of elements try to get octet configuration by transferring of sharing of electrons then they attains stability.

 **8 Marks**

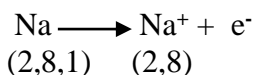
1. What is ionic bond? How does ionic bond is form? Explain with one example. (AS1)

Ans: The electrostatic attractive force that keeps cation and anion (which are formed from metal atoms and non-metal atoms due to transfer of electrons) together to form a new electrically neutral compounds is called 'ionic bond'.

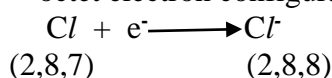
Formation of sodium chloride (NaCl):

NaCl is formed from the elements Na and Cl

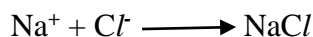
Cation formation: When Sodium atom loses one electron to get octet electron configuration



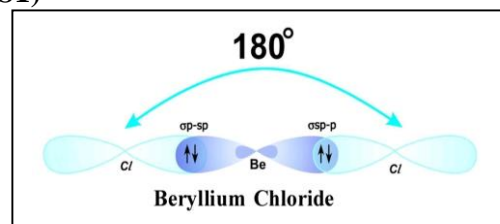
Anion formation: Chlorine atom to gain one electron from the sodium atom and get the octet electron configuration.



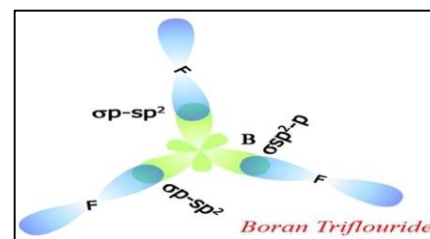
Formation of NaCl: These oppositely charged ions get attracted towards each other due to electrostatic forces and form the NaCl compound.

**2. Explain the formation of BeCl₂ molecule using hybridization.(AS1)****Ans: Formation of BeCl₂:-**

- Be(z=4) has electronic configuration $1s^2 2s^2$
- It has no unpaired electrons
- It is suggested that excited Be atom in which an electron from 2s shifts to 2p_x level.
- The excited electronic configuration of Be is $1s^2 2s^1 2p^1_x$
- Electronic configuration of Cl(z=17) is $1s^2 2s^2 2p^6 3s^2 3p^2_x 3p^2_y 3p^1_z$
- If Be forms two covalent bonds with two Chlorine atoms, one bond should be $\sigma 2s-3p$ due to the overlap of 2s orbital of Be, the 3p_z orbital of one Chlorine atom.
- The other bond should be $\sigma 2s-3p$ due to the overlap of 2p_x orbital of Be atom the 3p orbital of the other Chlorine atom and bond angle is 180°

**3. Explain the formation of BF₃ molecule using hybridization. (AS1)****Ans: Formation of BF₃:-**

- B(z=5) has electronic configuration $1s^2 2s^2 2p^1_x$
- The excited electronic configuration of B is $1s^2 2s^1 2p^1_x 2p^1_y$
- As it forms three identical B-F bonds in BF₃
- It is suggested that excited B atom undergoes hybridization.
- There is an intermixing of 2s, 2p_x, 2p_y orbitals and their redistribution into three identical orbitals called sp² hybrid orbitals
- For three sp² orbitals to get separated to have minimum repulsion the angle between any two orbitals is 120° at the central atom.
- Now three fluorine atoms overlap their 2p_z orbitals containing unpaired electrons. [F (z=9) $1s^2 2s^2 2p^2_x 2p^2_y 2p^1_z$] the three sp² orbitals of B that contain unpaired electrons to form three σsp^2-p bonds.

**9. ELECTRIC CURRENT**

1 Mark

1. Statement P: Conductors like metals contain a large number of free electrons.

Statement Q: In Conductors positive ions are fixed in their locations.

- a) P and Q are true b) P true and Q false c) P and Q are false d) P false and Q true

Ans: a

2. What is the unit of electric power consumption?

Ans: Kilo Watt Hour (KWH)

3. What type of electric connections observed in the household electrical appliances?

Ans: Parallel connection

4. What is the Unit for Conductivity ?

Ans: $(\Omega\text{-m})^{-1}$ (OR) (ohm-meter)⁻¹

5. Joule/ Coulomb is same as

- (a) 1-watt (b) 1-volt (c) 1-amp (d) 1-ohm

Ans: b

6. Give examples for Ohmic conductors and non Ohmic materials.

Ans: Example of Ohmic materials- Metals

Example of Non Ohmic materials- LEDs

7. Match the following

(X) 1 Ohm

(P) 1 Colounb / 1 sec

(Y) 1 Ampere

(Q) 1 Watt / 1 sec

(R) 1 Volt / 1 Ampere

(A) X-Q, Y-P,

(B) X-R, Y-P

(C) X-Q, Y-R

(D) X-R, Y-Q

Ans: B

8. Express 1 KWH in Joules?

Ans: 1KWH= 3.6X10⁶J

9. What is the resultant resistance of series of combination of 4Ω, 6Ω.

Ans: 10Ω

10. What is the S.I unit of Resistivity

Ans: Ω-m (OR) ohm-meter

11. Define Resistivity of a conductor?

Ans: The resistance per unit length of a unit cross section of the material is called resistivity.

12. What are factors which affect the resistance of a material?

Ans: Temperature, Nature of material, Length and Cross section area of the conductor

13. Why do we consider tungsten as a suitable material for making the filament of a bulb?

Ans: Tungsten has higher resistivity value and high melting point

14. Why a bird does not get the shock when it stands on a high voltage wire?

Ans: When the bird stands on a high voltage wire, there is no potential difference between the legs of the bird because it stands on a single wire. So, no current passes through the bird.**2 Marks**

1. What are the limitations of Ohm's (AS1)

Ans: 1. Ohm's law is valid for metal conductors. 2. Ohm's law is not applicable to gaseous conductors. 3. Ohm's law is not applicable to semi conductors.

3. Two bulbs have ratings 100 W, 220V and 60 W, 220V . Which one has the greatest resistance?

Ans: .

$$P_1 = 100W$$

$$V_1 = 220V$$

2nd bulb

$$P_2 = 60W$$

$$V_2 = 220V$$

$$\text{Resistance of 1st bulb (R}_1\text{)} = V^2/P_1 = \frac{220 \times 220}{100} = 484\Omega$$

$$\text{Resistance of 2nd bulb (R}_2\text{)} = V^2/P_2 = \frac{220 \times 220}{60} = 806.6\Omega \quad \text{So, 2nd bulb has the greater resistance}$$

4. What do you meant by electric shock? Explain how it takes place

Ans: Electric shock is a combined effect of potential difference, electric current and resistance of the human body. When current flows through human body, resistance of a body gradually changes. As long as current flow continues inside the body, resistance too decreases. This is called "electric shock"

5. Explain overloading of household circuits

Ans: 1. Generally we observe the values noted on the digital meters fixed at homes as follows

Potential difference: 240V Current: 5-20A

2. This means the line wires that are entering the meter have a potential difference of 240V.

3. The minimum and maximum limit of current that can be drawn from the mains is 5-20A.

4. Thus, the maximum current that we can draw from the mains is 20A.

5. When the current drawn from the mains is more than 20A. Overheating occurs and may causes a fire.

This is called over loading

6. Are the head lights of a car connected in series or parallel? Why?

Ans: Parallel. When they are connected in parallel, same voltage will be maintained in the two lights. If one of the head light damage/not working/fail, the other head light keeps working.**4 Marks**

1. How can you appreciate the role of a small fuse in house wiring circuit in preventing damage to various electrical appliances connected in the circuit?(or) Why do we use fuses in household circuits?

Ans: i) A fuse wire is a thin wire made up of a high resistance material and has a low melting point.

ii) The fuse wire should be connected in series with an electrical device.

iii) So, the entire current from mains must pass through the fuse.

iv) When the current in the fuse overloaded, the wire gets heated and melted.

v) Then the circuit becomes open and prevents the flow of current.

vi) Hence, all the electrical appliances are saved from damage that could be caused by overload.

vii) So, I appreciate the role of small fuse in the house wiring circuit in preventing damage to various electrical appliances.

2. Observe the table and answer the questions. (AS4)

Material	$\rho(\Omega\text{-m})$ at 20 °C
Silver	1.59×10^{-8}
Copper	1.68×10^{-8}
Gold	2.44×10^{-8}
Aluminium	2.82×10^{-8}
Calcium	3.36×10^{-8}
Tungsten	5.60×10^{-8}
Zinc	5.90×10^{-8}
Nickel	6.99×10^{-8}
Iron	1.00×10^{-7}
Lead	2.20×10^{-7}
Nichrome	1.10×10^{-6}
Carbon (Graphite)	2.50×10^{-6}
Germanium	4.60×10^{-1}
Drinking water	2.00×10^{-1}
Silicon	6.40×10^2
Wet wood	1.00×10^3
Glass	10.0×10^{10}
Rubber	1.00×10^{13}
Air	1.30×10^{16}

- a) On what factors does the resistivity of material depends?
Ans: Temperature and nature of the material
- b) Write the SI unit of resistivity
Ans: $\Omega\text{-m}$
- c) Name the material which act as best conductor?
Ans: Silver
- d) Name the material which is used to make of filament in the electric lamp?
Ans: Tungsten
- e) Name the material which is used to make the heating elements of irons, toasters?
Ans: Nichrome and Manganin
- f) Name the materials which are used to make diodes, transistors and integrated circuits?
Ans: Silicon and Germanium
- g) Name the two factors on which the resistivity of a substance does not depend?
Ans: Length and Cross section area of the substance
- h) Write the equation to show the relation between resistance and resistivity of the material?
Ans: $R = \rho l/A$
- i) Which of the material do not oxidise easily either Nickel or Nichrome
Ans: Nichrome
- j) Name the metals present in Nichrome?
Ans: Nickel, Chromium and Iron

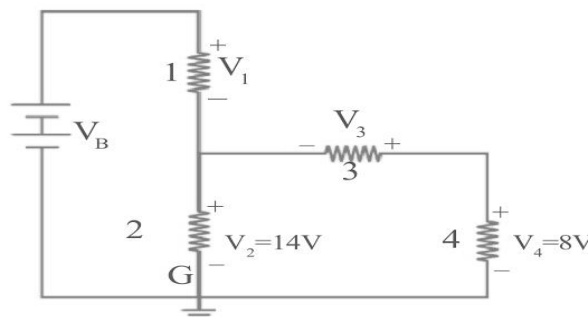
3. Write the differences between potential difference and emf (AS1)

Ans:

Potential difference	Electro motive force (emf)
1. Work done by the electric force to move unit positive charge from one point to another point is called potential difference	1. Work done by the chemical force to move unit positive charge from negative terminal to positive terminal of the battery
2. Its symbol is 'V'	2. Its symbol is 'ε'
3. S.I unit is volt(V)	3. S.I unit is volt(V)
4. $V = W/q$	4. $\epsilon = W/q$
5. This can be measured by using voltmeter	5. This can be measured by using voltmeter

(Write any four differences)

4. Observe the circuit and answer the questions given below. (AS4)



- a) Are resistors 3 and 4 in series?
Ans: Yes
- b) Are resistors 1 and 2 in series?
Ans: No
- c) Is the battery in series with any resistor?
Ans: The battery is in series with 1

d) What is the potential drop across the resistor 3?

Ans: $V_2 = V_3 + V_4$
 $14 = V_3 + 8$
 $V_3 = 14 - 8 = 6V$

e) What is the total emf in the circuit if the potential drop across resistor 1 is 6V?

Ans: $V_1 = 6V, V_2 = 14V$
 The total emf in the circuit = $V_1 + V_2 = 6 + 14 = 20V$

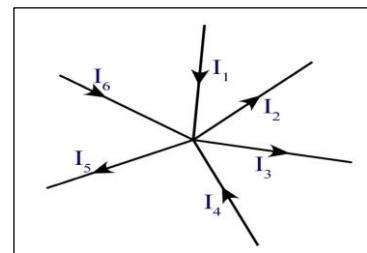
5. Why should we connect electric appliances in parallel in a household circuit? What happens if they are connected in series? (AS2)

Ans: The appliances are connected in parallel, which gives same potential difference. In parallel combination of one appliance is damage, the remaining continue to work.

If appliances are connected in series, then same amount of current passes through them. If any one of the appliance is damage, the remaining are not working.

6. Explain Kirchhoff's laws with examples (AS1)

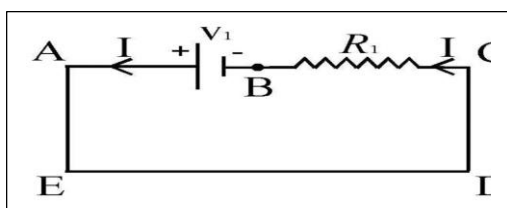
Ans: Junction Law: At any junction point in a circuit where the current can divide, the sum of the currents into the junction must equal the sum of the currents leaving the junction



$I_1 + I_4 + I_6 = I_5 + I_2 + I_3$
 $\sum I = 0$

This law is based on the conservation of charge.

Loop law: The algebraic sum of the increases and decreases in potential difference across various components of a closed circuit loop must be zero.



$-V_1 + I_1 R_1 = 0$
 $\sum V = 0$

8 Marks

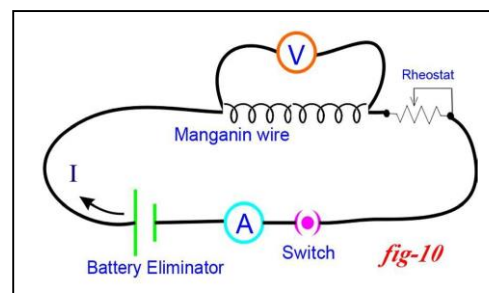
1. State Ohm's law. Suggest an experiment to verify it and explain the procedure. (AS3)

Ans: Ohm's law: The potential difference between the ends of a conductor is directly proportional to the electric current passing through it at constant temperature

Aim: To show that the ratio V/I is a constant for a conductor.

Materials required: 6V battery eliminator, 0 to 1A ammeter, 0-6V volt meter, copper wires, 50cm manganin coil, Rheostat, switch

Procedure: 1. Complete the circuit as shown in the figure.



- By using Rheostat adjust the potential difference V between two ends of manganin wire.
- Now observe the electric current through ammeter in the circuit.
- Using Rheostat change the potential difference with different values upto 4.5V and note down atleast five values of V and I in the table.

S.No	Potential	Current	V/I

We can conclude that the ratio of V/I is constant.

We can conclude that the ratio of V/I is constant for a conductor

2. Deduce the expression for the equivalent resistance of three resistors connected in series. (OR)

Derive $R_{eq} = R_1 + R_2 + R_3$ (AS1)

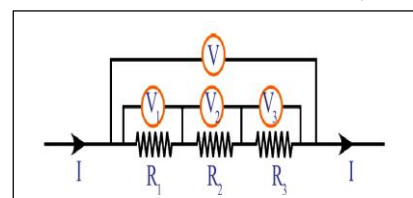
Ans: In series connection of resistors there is only one path for the flow of current in the circuit. Hence, the current in the circuit is equal to I

According to Ohm's law

$V_1 = IR_1 ; V_2 = IR_2 ; V_3 = IR_3$

Let R be the equivalent resistance of the combination of resistors in series.

Also $V = IR_{eq}$



$$V = V_1 + V_2 + V_3$$

$$IR_{eq} = IR_1 + IR_2 + IR_3$$

$$IR_{eq} = I(R_1 + R_2 + R_3)$$

$$R_{eq} = R_1 + R_2 + R_3$$

The sum of individual resistances is equal to their equivalent resistance when the resistors are connected in series

3. Deduce the expression for the equivalent resistance of three resistors connected in parallel. (OR) Derive $1/R = 1/R_1 + 1/R_2 + 1/R_3$ (AS1)

Ans: In parallel connection of resistors there is same potential difference at the ends of the resistors. Hence, the potential difference is equal to V.

According to Ohms law

$$I_1 = V/R_1 ; I_2 = V/R_2 ; I_3 = V/R_3$$

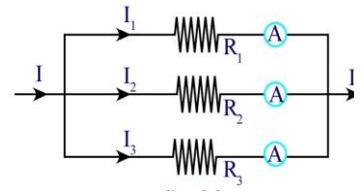
Let R be the equivalent resistance of the combination of resistors in series.

Also $I = V/R_{eq}$

$$I = I_1 + I_2 + I_3$$

$$V/R_{eq} = V(1/R_1 + 1/R_2 + 1/R_3)$$

$$1/R_{eq} = 1/R_1 + 1/R_2 + 1/R_3$$

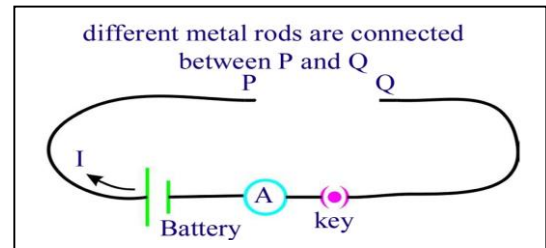


The equivalent resistance of a parallel combinations is less than the resistance of each of the resistors.

4. How do you verify that resistance of a conductor is proportional to the length of the conductor for constant cross section area and temperature. (AS3)

Ans:

1. Collect manganin wires of different lengths with the same cross sectional areas.
2. Make a circuit as shown in figure.
3. Connect one of the manganin wires, say 10cm length, between P and Q.
4. Measure the value of the current using the ammeter connected to the circuit.
5. Repeat this for other lengths of the wires.
6. Note corresponding values of currents.
7. We can conclude that the resistance (R) of a conductor is directly proportional to its length (l) for a constant potential difference.



10. ELECTROMAGNETISM

1 Mark

1. **A:** A magnetic field exists in the region surrounding a bar magnet.

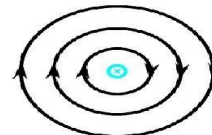
R: A magnetic field is characterized by strength and direction.

- A) Both A, R are correct, R is correct explanation.
 B) Both A, R are correct, R is not correct explanation.
 C) A is correct, R is incorrect.
 D) A is incorrect, R is correct.

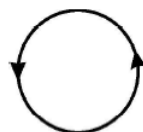
Ans: A

2. See the figure, magnetic lines are shown. In what direction does the current through wire flow?

Ans: Into page



3. What type of magnetic pole is formed at the face that has flow of current as shown in figure?



Ans: North pole

4. Which converts mechanical energy into electrical energy?

- A) Motor B) Battery C) Generator D) Switch

Ans: C

5. Faraday's law of induction is the consequence of _____

Ans: Law of Conservation of energy

6. Match the following

- | | |
|------------------------------|------------|
| i) Magnetic flux | x) Tesla |
| ii) Magnetic field induction | y) weber |
| iii) Magnetic field strength | z) oersted |

Ans: i - y. ii - x, iii - z**7. The main difference between AC generator and DC generator is _____**

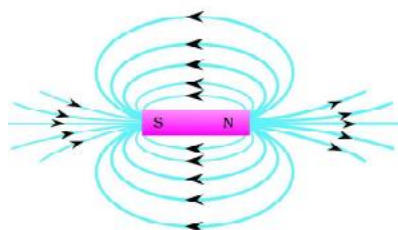
- A) Carbon brushes B) Magnets C) Coil D) Commutator

Ans: D**8. The magnetic force on a current carrying wire placed in an uniform magnetic field if the wire is oriented perpendicular to magnetic field is _____**

- A) 0 B) ILB C) 2ILB D) ILB/2

Ans: B) ILB**9. Write the mathematical expression of Faraday's law of electromagnetic induction?****Ans:** $\mathcal{E} = \frac{\Delta\phi}{\Delta t}$ **10. Define magnetic flux density (or) magnetic field induction (AS1)****Ans:** The magnetic flux through unit area, which is perpendicular to the magnetic field is known as magnetic flux density or magnetic field induction.**11. State Faraday's law of electromagnetic induction (AS1)****Ans:** Whenever there is a continuous change of magnetic flux linked with a closed coil, a current is generated in the coil.**12. Define Lenz law (AS1)****Ans:** The induced current will appear in such a direction that it opposes the changes in the flux in the coil. When you curl your right hand fingers in the direction of current, thumb gives the direction of magnetic field.**13. The value of magnetic field induction which is uniform is 2T. What is the flux passing through a surface of area 1.5m² perpendicular to the field? (AS1)****Ans:** Given B = 2T, A = 1.5 m², $\phi = ?$ Magnetic flux (ϕ) = BA = 2X1.5 = 3 weber**14. What is Solenoid? Write use of Solenoid. (AS6)****Ans:** A solenoid is a long wire wound in a close packed helix. It is use as bar magnet.**15. Define Magnetic flux. (AS1)****Ans:** Number of magnetic lines passing through the plane of area perpendicular to the field is called magnetic flux.**2 Marks****1. Are the magnetic lines closed? Explain. (AS1)****Ans:** Yes, magnetic lines are always closed loops and any two field lines never intersect each other. Inside the magnet the direction of magnetic lines of force is from South pole to North pole. Outside the magnet the direction of magnetic lines of force is from North pole to South pole. Thus, the magnetic lines of force are closed loops.**2. Rajkumar said to you that the magnetic field lines are open and they start at north pole of bar magnet and end at south pole. What questions do you ask Rajkumar to correct him by saying "field lines are closed"?(AS2)**

- Ans:** i) What is the direction of field lines inside the bar magnet?
 ii) What is the direction of field lines outside the bar magnet?
 iii) Are these field lines are closed or open?
 iv) What is the nature of field line? (write any two relevant questions)

3. Draw the magnetic field lines to form around the bar magnet.**Ans:****4. Why does the picture appear distorted when a bar magnet is brought close to the screen of a television? Explain (AS1)**

Ans: T.V has a picture tube which produces a motion of electrons on the screen. These electrons are affected by magnetic field of bar magnet. Magnetic field exerts a force on the moving electrons. So, picture distorts.

5. Give a few applications of Faraday’s law of induction in daily life. (AS6)

Ans: a) Use of ATM cards b) Induction stove c) Tape recorder d) Metal detectors in Security checking

6. A force of 8N acts on a rectangular conductor 20cm long placed perpendicular to a magnetic field.

Determine the magnetic field induction if the current in the conductor is 40A. (AS1)

Ans: $\mathcal{E} = 8V$, $B = 0.8 T$, $v = 10 m/s$

We know that $\mathcal{E} = Blv$

$$8 = 0.8 \times l \times 10$$

$$l = 1 m$$

7. What is the difference between AC generator and DC generator?

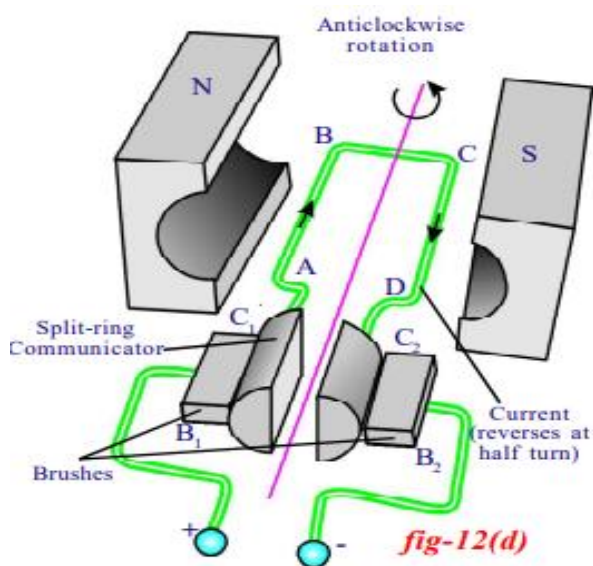
Ans: i) In an AC generator, the ends of coil are connected to two slip rings.

ii) In a DC generator, the ends of coil are connected to two half-slip rings.

 **4 Marks**

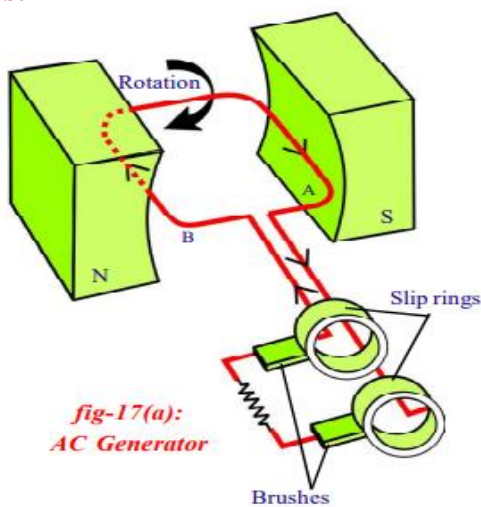
1. Draw a neat diagram of electric motor. Name the parts. (AS5)

Ans:

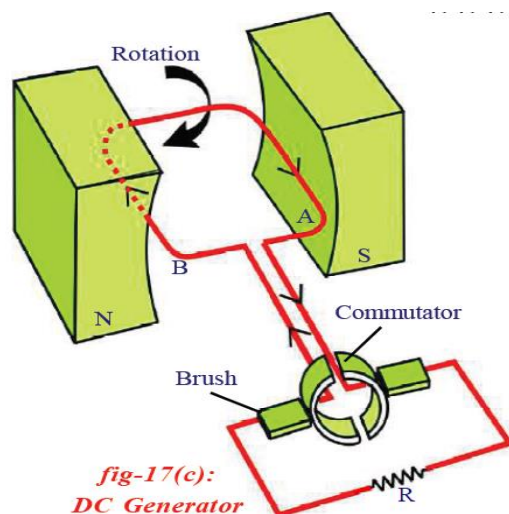


2. Draw a neat diagram of an AC generator. (AS5)

Ans:



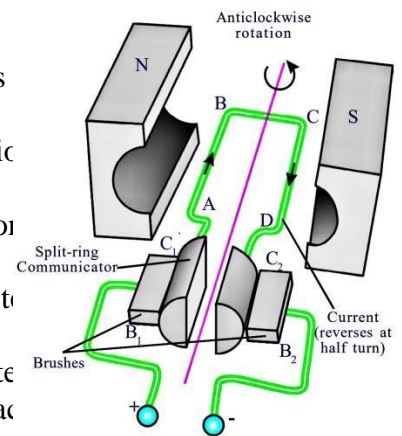
3. Draw a neat diagram of a DC generator. (AS5)



 **8 Marks**
1. Explain the working of electric motor with a neat diagram. (AS1)

Ans: 1. An electric motor consists of a rectangular coil ABCD kept in a uniform magnetic field as shown in figure.

2. Switch on the circuit so that the current flows through the rectangular coil. The direction of current in the coil is shown in figure.
3. At BC, magnetic force pulls the coil up and at DA magnetic force pulls it down.
4. As a result, this coil comes to halt and rotates in anti clock wise direction this will go on if the direction of current remains unchanged.
5. If the direction of current through the coil is reversed every half rotation the coil will rotate continuously in one and the same direction.
6. To achieve this, brushes B_1 and B_2 are used. These brushes are connected to the battery.
7. The ends of the coil are connected to split rings C_1 and C_2 , which rotate along with the coil. Initially C_1 is in contact with B_1 and C_2 is in contact with B_2 .
8. After half rotation, the brushes come into contact with the other slip rings in such a way that the direction of current through the coil is reversed. This happens every half rotation.
9. Thus the direction of rotation of the coil remains the same. This is the principle used in “electric motor”
10. In electric motors, electrical energy is converted into mechanical energy.

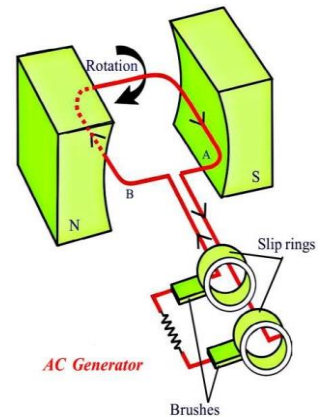
**2. Explain the working of AC electric generator with a neat diagram. (AS1)**

Ans: AC electric generator:

1. Consider a rectangular coil. Let it be held between the poles of Curve- shaped permanent magnet as shown in figure.
2. As the coil rotates, the magnetic flux passing through the coil changes.
3. According to the law of electromagnetic induction an induced current is generated in the coil.

Working:

1. When the coil is at rest in vertical position, with side (A) of coil at top position and side (B) at bottom position, no current will be induced in it.
2. When the coil is rotated in clockwise direction, current will be induced in it and it flows from A to B.
3. If we continue the rotation of coil, current decreases during the second quarter of the rotation and once again becomes zero when coil comes to vertical position with side B at top (A) at bottom position.
4. During the second part of the rotation, current generated follows the same pattern as that in the first half except that the direction of current is reversed.
5. The ends of the coil are connected to two slit rings. Two carbon brushes arranged in such a way that they press the slit rings to obtain current from the coil.
6. This current is called alternating current (AC) in which, the direction of charge flow reverses periodically.

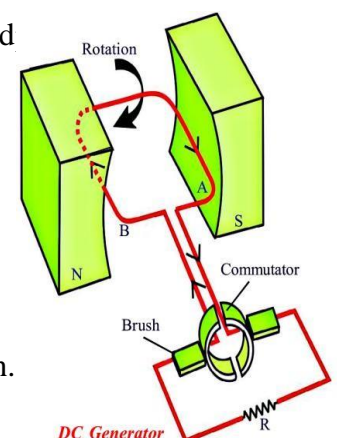
**3. Explain the working of DC generator with a neat diagram. (AS1)**

Ans: DC electric generator:

1. Consider a rectangular coil. Let it be held between the poles of Curve- shaped permanent magnet as shown in figure.
2. As the coil rotates, the magnetic flux passing through the coil changes.
3. According to the law of electro magnetic induction an induced current is generated in the coil.
4. If two half split rings are connected to ends of the coil as shown in figure, the AC generator works as DC generator to produce DC current.

Working:

1. When the coil is in the vertical position the induced current generated during the first half rotation, rises from zero to maximum and then falls to zero again.
2. As the coil moves further from this position, the ends of the coil go to other



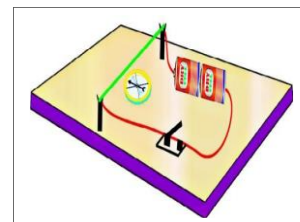
slit rings.

- Hence during the second half rotation, the current is reversed in the coil itself.
- The current generated in the second half rotation of the coil is identical with that during the first half of direct current (DC) as shown figure, for one revolution.
- This current is known as direct current (DC).

4. How can you verify that a current carrying wire produces a magnetic field with the help of an experiment? (OR) Describe oersted's experiment. (AS3)

Ans: Aim: To verify that current carrying wire produces magnetic field.

Required Apparatus: Thermocol sheet, battery, key, wooden sticks, compass needle, bar magnet etc.

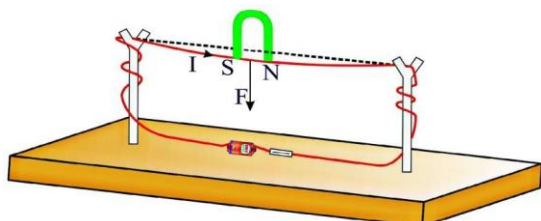


Procedure: 1. Take a thermocol sheet and fix two thin wooden sticks of height 1cm which have small slit at the top of their ends.

- Arrange a copper wire of 24 gauge so that it passes through these slits and make a circuit.
- The circuit consists of a 9 volt battery, key and copper wire which are connected in series as shown in figure.
- Now, keep a magnetic compass below the wire.
- Bring a bar magnet close to the compass. The needle get deflected by the bar magnet.
- Take the bar magnet far away from the circuit and switch on the circuit.
- The needle get deflected by the bar magnet in opposite direction.
- This deflection is due to the magnetic field produced by the current carrying wire.
- Hence we experimentally proved that current carrying wire produces a magnetic field

5. How do you verify experimentally that the current carrying conductor experiences a force when it is kept in magnetic field? (AS3)

Ans:



- Take a wooden plank. Fix two long wooden sticks on it. These wooden sticks are split at their top ends.
- A copper wire is passed through these splits and the ends of the wire are connected to battery of 3 volt, through a switch.
- Close the switch to make the circuit. Current passes through the wire.
- Now bring a horseshoe magnet near the copper wire as shown in figure.
- A deflection is observed in current carrying copper wire.
- Change polarities of the horse shoe magnet. Again observe the deflection.
- Repeat this by changing the direction of current in the circuit.
- Right hand rule helps to find direction of magnetic force exerted by the magnetic field on current carrying wire.

11. PRINCIPLES OF METALLURGY

1 Mark

1. The impurity present in the ore is called as _____

- A) Gangue B) flux C) Slag D) Mineral

Ans: A) Gangue

2. Froth floatation is method used for the purification of _____ ore.

Ans: Sulphide.

3. Galena is an ore of _____

- A) Zn B) Pb C) Hg D) Al

Ans: B) Pb

4. The metal that occurs in the native form is _____

- A) Pb B) Au C) Fe D) Hg

Ans: B) Au

5. The most abundant metal in the earth's crust is _____

- A) Silver B) Aluminium C) zinc D) iron

Ans: B) Aluminium(Al)

6. **X: Metallurgy is the process of extraction of metals from their ores.**

Y: The minerals from which the metals are extracted without an economical loss are called ores.

- A) Both X and Y are true. B) X is true and Y is wrong. C) Both X and Y are Wrong.

Ans: A) Both X and Y are true.

7. **X: To prevent corrosion of metals by covering the surface with paint or by some chemicals like bisphenol.**

Y: Alloying is a method of improving the properties of a metal.

- A) Both X and Y are true. B) X is true and Y is wrong. C) Both X and Y are Wrong.

Ans: A) Both X and Y are true.

8. Which furnace is used for Calculations and Roasting?

Ans: Reverberatory furnace.

9. Which furnace is used for smelting?

Ans: Blast furnace.

10. **X: A pyrochemical process in which the ore is heated in presence of air is called roasting**

Y: A pyrochemical process in which the ore is heated in the absence of air is called calcination

- A) X is correct, Y is wrong B) X is wrong, Y is correct
C) Both X and Y are correct D) Both X and Y are wrong

Ans: C

11. Write the names of any two ores of iron. (AS1)

Ans: Haematite (Fe_2O_3) and Magnetite (Fe_3O_4)

12. Mention two methods which produce very pure metals? (AS2)

Ans: Electrolytic and Distillation processes

13. What are the preventive methods do you take for rusting iron materials?

Ans: Painting or electroplating

14. List three metals that are found in nature in uncombined form?

Ans: Gold, Silver, Platinum

15. Define flux

Ans: The substance added to the ore to remove gangue from it is called flux.

 **2 Marks**

1. What is thermite process? Mention its applications in daily life? (AS6)

Ans: Thermite process is the reaction of metal oxides with Aluminium produces molten metal

Applications in daily life: i) To join cracked machine parts ii) To join railings of railway track

2. Which method do you suggest for extraction of high reactivity metals? Why? (AS2)

Ans: High reactivity metals can be extracted by electrolysis.

It is not feasible for method of reduction. The temperature required for the reduction is too high and more expensive.

3. Define a) Mineral b) Ore (AS1)

Ans: a) A metallic compound occurring in the earth crust along with impurities is called mineral. (or) The elements or compounds of the metals which occur in nature in the earth crust are called minerals.

b) A mineral from which a metal can be extracted economically and conveniently is called ore.

4. Complete the table (AS4)

Ore	Formula	Metal	Form
Magnesite			
	MnO_2		
		Silver	

Ans:

Ore	Formula	Metal	Form
Magnesite	MgCO_3	Magnesium	Carbonate
Pyrolusite	MnO_2	Manganese	Oxide
Horn Silver	AgCl	Silver	Chloride

5. Magnesium is an active metal if it occurs as a chloride in nature, which method of reduction is suitable for its extraction?

Ans: Electrolysis method is suitable for its extraction.

6. What is the difference between roasting and calcinations? Give one example for each? (AS1)

Ans:

Roasting	Calcination
1. Roasting is a pyrochemical process in which the ore is heated in the presence of air.	1. Calcination is a pyrochemical process in which the ore is heated in the absence of air.
2. Oxidation reaction.	2. Decomposition reaction.
3. Ex: $2\text{ZnS} + 3\text{O}_2 \rightarrow 2\text{ZnO} + 2\text{SO}_2$	3. Ex: $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
4. It is suitable to sulphide ores.	4. It is suitable to carbonate ores.

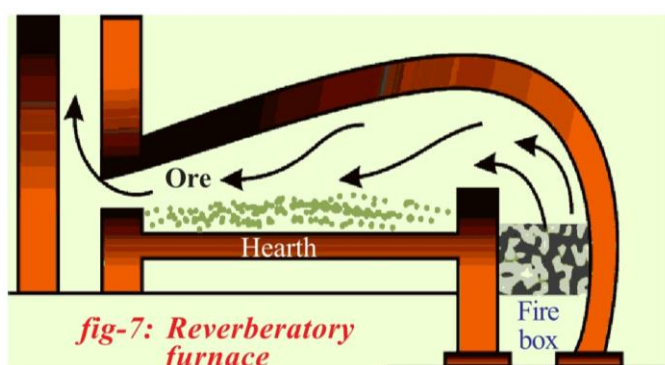
 **4 Marks**

1. Observe the table and answer the questions (AS4)

ORE	Formula	metal	ORE	Formula	metal
Bauxite	($\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$)	Al	Zincite	(ZnO)	Zn
Copper Iron Pyrites	(CuFeS_2)	Cu	Rock salt	(NaCl)	Na
Zinc Blende	(ZnS)	Zn	Cinnabar	(HgS)	Hg
Magnesite	(MgCO_3)	Mg	Magnetite	(Fe_3O_4)	Fe
Epsom salt	($\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$)	Mg	Galena	(PbS)	Pb
Horn Silver	(AgCl)	Ag	Gypsum	($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$)	Ca
Pyrolusite	(MnO_2)	Mn	Lime stone	(CaCO_3)	Ca
Haematite	(Fe_2O_3)	Fe	Carnallite	($\text{KCl} \cdot \text{MgCl}_2 \cdot 6\text{H}_2\text{O}$)	Mg

- a) Give two examples for sulphide ores? **Ans:** Copper iron pyrites, Zinc Blende, Cinnabar, Galena
- b) Which method is used for concentration of Galena? **Ans:** Froth Floatation
- c) What is method used to convert Zinc blend to an oxide ore? **Ans:** Roasting
- d) What is the method used to convert Magnesite into an oxide ore? **Ans:** Calcination
- e) What is the metal present in Rock salt? **Ans:** Sodium
- f) Which furnace is useful in extraction of Iron from Haematite? **Ans:** Blast furnace
- g) What is the ore of Aluminum? **Ans:** Bauxite
- h) Which metal can be extracted from Cinnabar? **Ans:** Mercury
- i) What are metals present in Carnallite? **Ans:** Potassium and Magnesium

2. What is a Furnace? Draw Reverberatory furnace and label its parts (OR) Which furnace is generally used for roasting? Draw a neat diagram and label the parts of this furnace. (AS5)



3. Write a note on dressing of ore in metallurgy? (AS1)

Ans: Ore dressing in metallurgy: Ore has large amount of impurities such as soil and sand etc.

- Dressing or concentration means, simply getting rid of unwanted rocky materials as possible before ore is converted into the metal.
- The impurities are known as “gangue”.
- The various physical methods to separate the ore and gangue are,
 - Hand picking.
 - Washing.
 - Froth floatation and.
 - Magnetic separation.

4. What is activity series? How it helps in extraction of metals? (AS6)

Ans: Arrangement of the metals in decreasing order of their reactivity is known as activity series.

- The metals at the top of the activity series (highly reactive) can be extracted by electrolysis.
- The metals at the top of the activity series (moderately reactive) can be extracted by reduction of metal oxide with C or CO.
- The metals at the top of the activity series (low reactive) can be extracted by heating alone, because they are often in free state.

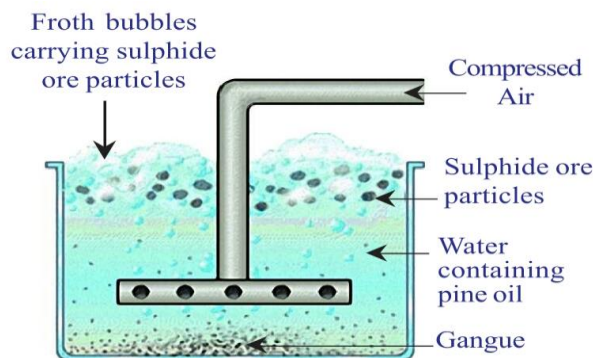
5. Which method is suitable to enrich sulphide ores? Draw a neat diagram and label the parts (OR) Draw the diagram showing Froth floatation method and label its parts (AS5)

fig-1: Froth floatation process for the concentration of sulphide ores

8 Marks

1. Suggest an experiment to prove that the presence of air and water is essential for corrosion. Explain the procedure (AS3)

Ans: Aim: To prove that the presence of air and water are essential occurrences of corrosion.

Apparatus: Three test tubes, three corks, Distilled water, anhydrous calcium chloride, clean iron nails and oil etc.

Procedure: 1. Take 3 test tubes and place clean iron nails in each of them. Label the test tubes A, B and C

2. Pour some water in test tube A and cork it.

3. Pour boiled distilled water in test tube B, and about 1ml of oil and cork it.

4. Put some anhydrous calcium chloride in test tube C and cork it.

5. Leave these test tubes for a few days and then observe.

6. After a few days, we will observe that iron nails rust in test tube A, but they do not rust in test tubes B and C.

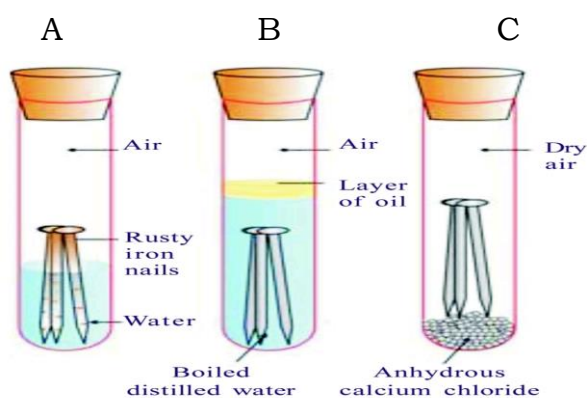


fig-5: Investigating the conditions under which iron rusts

Conclusion: From the above experiment, we can prove that air and water are essential for corrosion.

2. Write short notes on froth floatation process? (AS1)

Ans: i) Froth Flotation method is used for dressing the sulphide ore.

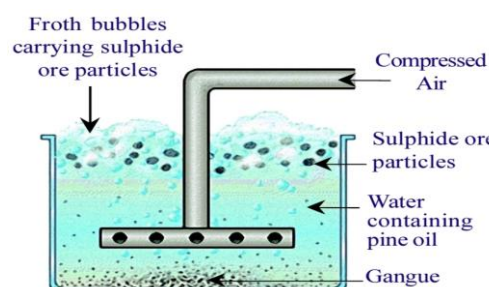
ii) The ore with impurities is finely powdered and kept in water, containing pine oil taken in a flotation cell.

iii) Air under pressure is blown to produce froth in water.

iv) Froth so produced, takes the ore particles to the surface.

v) The impurities settle at the bottom.

vi) Froth is separated and washed to get ore particles.



12. CARBON AND ITS COMPOUNDS

 1 Mark

1. Name the Simplest hydrocarbon.

Ans: Methane (CH₄)

2. What do we call the self linking property of carbon?

Ans: Catenation

3. The name of CH₃-CH₂-CH₂-COOH is _____

- A) Propanoic acid B) Propanaldehyde C) Butanoic acid D) Butanaldehyde

Ans: C

4. Which one of the following is unsaturated hydrocarbon?

- A) C₂H₆ B) C₃H₈ C) C₃H₆ D) CH₄

Ans: C

5. Which one of the following hydrocarbon can show isomerism?

- A) C₂H₄ B) C₂H₆ C) C₃H₈ D) C₄H₁₀

Ans: D

6. The Carboxylic acid which is used as a preservative in preparation of pickles is _____

Ans: Ethanoic acid

7.
$$\begin{array}{c} \text{CH}_3 - \text{CH} - \text{CH}_2 - \text{CH}_3 \\ | \\ \text{CH}_3 \end{array}$$
 IUPAC name of the compound is _____

Ans: 2-Methyl butane

8. When Acetic acid reacts with Ethyl alcohol, we add con. H₂SO₄. This process is called _____

Ans: Esterification

9. Which of the following solution of acetic acid in water can be used as preservative?

- A) 5-10% B) 10-15% C) 15-20% D) 100%

Ans: A

10. Name the simplest ketone and write its molecular formula. (AS1)

Ans: Propanone (or) Di-Methyl ketone



11. What happens when a small piece of sodium is dropped into ethanol? (AS2)

Ans: When a small piece of sodium is dropped into ethanol, it shows brisk effervescence and liberates hydrogen gas and forms sodium ethoxide.

12. What is micelle?

Ans: A spherical aggregate of soap molecules in water is called micelle.

13. Name the product other than water formed on burning of ethanol in air.

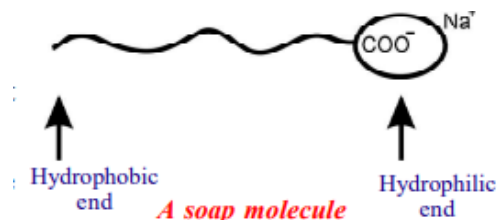
Ans: Carbon dioxide

14. Name the acid present in vinegar

Ans: The acid present in vinegar is Ethanoic acid or acetic acid.

15. Draw the simple figure of a soap molecule.

Ans:


 2 Marks

1. Define homologous series of carbon compounds; Mention any two characteristics of homologous series. (AS1)

Ans: The series of carbon compounds in which two successive compounds differ by -CH₂ unit is called homologous series.

Characteristics of homologous series:

- i) They have one general formula.
- ii) Successive compounds in the series possess a difference of (-CH₂) unit.

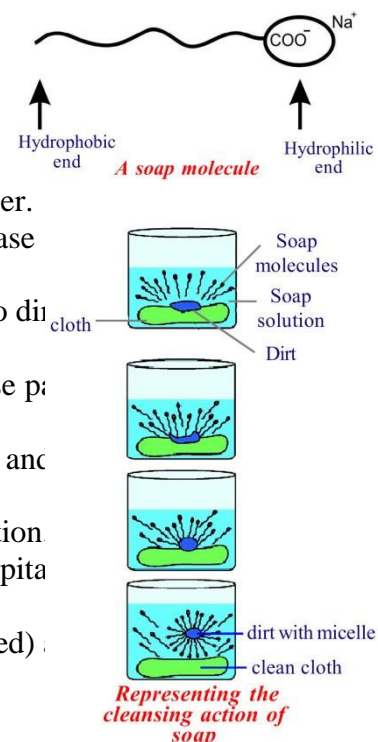
- e) In which direction the numbering should be given? **Ans:** Right to left
 f) Is it an unsaturated compound. If Yes, why? **Ans:** Yes, it has two double bonds

 **8 Marks**

1. Explain the cleansing action of soap. (AS1)

Ans: Cleansing action of soap:

- Soaps and detergents make oil and dirt present on the cloth come out into water, thereby making the cloth clean.
- Soap has one polar end (the end with carboxy) and one non-polar end (the end with hydrocarbon chain) as shown in the figure.
- The polar end is hydrophilic in nature and this end is attracted towards water.
- The non-polar end is hydrophobic, in nature and it is attracted towards grease or oil on the cloth, but not attracted towards water.
- When soap is dissolved in water, its hydrophobic ends attach themselves to dirt cloth, as shown sequentially in the figure that follows.
- The hydrophobic end of the soap molecules move towards the dirt or grease particle.
- The hydrophobic ends attached to the dirt particle and try to pull out.
- The molecules of soap surround the dirt particle at the centre of the cluster and structure called micelle.
- These micelles remain suspended in water like particles in a colloidal solution.
- The various micelles present in water do not come together to form a precipitate the other because of the ion-ion repulsion.
- Thus, the dust particles remain trapped in micelles (which remain suspended) away with water.
- Hence, soap micelles remove dirt by dissolving it in water.



2. Distinguish between esterification and saponification reactions of organic compounds. (AS1)

Ans:

Esterification	Saponification
1. Carboxylic acid combines with an alcohol in the presence of little con. H_2SO_4 to form an ester	1. The hydrolysis of an oil under basic conditions leading to formation of sodium salt of carboxylic acid and glycerol
2. Reversible reaction	2. Irreversible reaction
3. Ex: dehydration reaction	3. Ex: hydrolysis
4. Used in preparation of different types of esters	4. Used in preparation of soaps or glycerol
5. Acid is catalyst	5. Base is catalyst
6. Requires heat energy	6. Do not requires heat energy

MODEL PAPERS – SSC PUBLIC EXAMINATIONS 2024

MODEL PAPER - 1

GENERAL SCIENCE, Paper – I (Physical Science)

Time: 2 hrs

Maximum Marks: 50

Instructions:

- Question paper consists of 4 sections and 17 questions.
- Internal choice is available only for Q.no. 12 in section III and for all the questions in section IV.
- In the duration of 2 hours, 15 minutes of time is allotted to read the question paper
- All answer shall be written in the answer booklet only.
- Answers shall be written neatly and legibly.

- Notes:** 1. Answer **all** the questions.
2. Each question carries **1** mark.

1. Convert 20°C into Kelvin scale.
2. Write lens formula
3. In an experiment of finding focal length of lens the observation are as shown in the table.

U (in cm)	40	30	20
V (in cm)	24	30	38

- a) Which lens is used in this experiment? b) What is the focal length of the given lens?
4. **Assertion (A):** In a group from top to bottom the atomic size is increasing.
Reason(R): In the group from top to bottom the atomic number increases hence shell number also increases.
- Choose the correct option and write it in your answer booklet.
- D) Both A and R are true and R is correct explanation of A
E) Both A and R are true and R is not correct explanation of A
F) A is true but R is false
G) A is false but R is correct
5. Write three metals that are found in nature as oxide ores.
6. What happens when a small piece of sodium is dropped into ethanol?
7. Draw the simple figure of a soap molecule.
8. Name the simplest hydrocarbon

SECTION II

3 x 2 = 6

- Notes:** 1. Answer **all** the questions.
2. Each question carries **2** marks.

9. Frame any two questions to understand differentiate between evaporation and boiling?
10. Observe the table and answer the following questions.

Ore	Bauxite	Zinc Blende	Horn Silver	Zincite	Cinnabar	Galena	Lime stone
Formula	Al ₂ O ₃ ·2H ₂ O	ZnS	AgCl	ZnO	HgS	PbS	CaCO ₃

- a) What are the ores of Zinc? B) What is the ore of Aluminium?
11. An element has atomic number 19. Where would you expect this element in the periodic table and why?

SECTION III

3 x 4 = 12

- Notes:** 1. Answer **all** the questions.
2. Each question carries **4** marks.

12. Draw any of the following diagrams:
A) Draw the diagram of AC generator and label the parts
B) Draw a neat diagram of Reverboratory furnace and label it neatly?
13. Observe the table and answer the questions

Element	Electronic configuration
A	1s ² 2s ²
B	1s ² 2s ² 2p ⁶ 3s ²
C	1s ² 2s ² 2p ² 3s ² 3p ³
D	1s ² 2s ² 2p ⁶

- a) Which are the elements coming within the same period?
b) Which are the elements coming within the same group?
c) Which are the noble gas element?
d) To which group and period does the element 'C' belong?
14. What is thermite process? Mention its applications in daily life?

SECTION IV

3 x 8 = 24

- Notes:** 1. Answer **all** the questions.
2. Each question carries **8** marks.
3. Each question has internal choice.

15. What is the reason behind formation of mirage? Explain
(OR)

Explain the correction of the eye defect Hypermetropia with suitable diagrams.

16. What is hybridisation? Explain the formation of BF_3 molecules using hybridisation.

(OR)

Explain the significance of three Quantum numbers in predicting the positions of an electron in an atom.

17. State Ohm's law. Suggest an experiment to verify it and explain the procedure.

(OR)

Compounds such as alcohols and glucose contain hydrogen but are not categorized as acids. Describe an activity to prove it.

MODEL PAPER - 2

GENERAL SCIENCE, Paper – I (Physical Science)

Time: 2 Hrs

Maximum Marks: 50

Instructions:

- Question paper consists of 4 sections and 17 questions.
- Internal choice is available only for Q.no. 12 in section III and for all the questions in section IV.
- In the duration of 2 hours, 15 minutes of time is allotted to read the question paper
- All answer shall be written in the answer booklet only.
- Answers shall be written neatly and legibly.

SECTION I

8 x 1 = 8

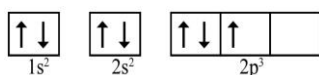
Notes: 1. Answer **all** the questions.

2. Each question carries **1** mark.

- What happen when an acid or base is mixed with water?
- Write snell's law?
- Which lens is concave?

Lens	Focal length (cm)
A	+20
B	-15

- What is principal axis?
- Draw the any one of p-orbital.
- An element 'A' forms a chloride ACl_4 . The number of electrons in the valence shell of 'A'?
A) 1 B) 2 C) 3 D) 4
- Which rule is violated in the following electronic configuration?



- Give a few applications of Faraday's law of induction in daily life.

SECTION II

3 x 2 = 6

Notes: 1. Answer **all** the questions.

2. Each question carries **2** marks.

- Rajkumar said to you that the magnetic field lines are open and they start at north pole of bar magnet and end at south pole. What questions do you ask Rajkumar to correct him by saying "field lines are closed"?
- The differentiate electron in an atom has following set of quantum numbers are given, then answer the given question

n	l	m_l	m_s
3	0	0	+1/2

- Which orbital this electron belongs
 - Write the name of the element
- What is a neutralization reaction? Give two examples

SECTION III

3 x 4 = 12

Notes: 1. Answer **all** the questions.

2. Each question carries **4** marks.

- Draw any of the following diagrams:
 - Draw ray diagrams for the Convex lens following positions and explain the nature and position of image.
 - Object is placed at beyond $2F_2$
 - Object is placed at $2F_2$
 - Draw a neat diagram showing acid solution in water conducts electricity.

13. What is octet rule? How do you appreciate role of the 'octet rule' in explaining the chemical properties of elements?

14. Observe the table and answer the following questions.

Liquid/Solution	P	Q	R	S	T
pH	7	6	13	2	8

- Which solution is strong acid?
- Which solution is strong base?
- Which solution is weak acid?
- Which solution is neutral?

SECTION IV

3 x 8 = 24

- Notes:** 1. Answer **all** the questions.
2. Each question carries **8** marks.
3. Each question has internal choice.

15. Explain the formation of rainbow.

(OR)

Deduce the expression for the equivalent resistance of three resistors connected in series.

16. Define the modern periodic Law. Discuss the construction of the long form of the periodic table.

(OR)

Explain the cleansing action of soap.

17. Explain the procedure of finding specific heat of solid experimentally?

(OR)

Suggest an experiment to prove that the presence of air and water is essential for corrosion.
Explain the procedure.

MODEL PAPER -3

GENERAL SCIENCE, Paper – I (Physical Science)

Time: 2 hrs

Maximum Marks: 50

Instructions:

- Question paper consists of 4 sections and 17 questions.
- Internal choice is available only for Q.no. 12 in section III and for all the questions in section IV.
- In the duration of 2 hours, 15 minutes of time is allotted to read the question paper
- All answer shall be written in the answer booklet only.
- Answers shall be written neatly and legibly.

SECTION I

8 x 1 = 8

- Notes:** 1. Answer **all** the questions.
2. Each question carries **1** mark.

- State the principle of method of mixtures.
- Why pure acetic acid does not conduct electricity?
- Why do stars appear twinkling?
- Define Dispersion of light?
- Complete the table.

Orbital	No.of orbitals	Maximum no.of electrons
S		2
	3	6

- Mention two methods which produce very pure metals?
- Draw the simple figure of a soap molecule.
- Which of the following solution of acetic acid in water can be used as preservative?
A) 5-10% B) 10-15% C) 15-20% D) 100%

- Notes:** 1. Answer **all** the questions.
2. Each question carries **2** marks.

9. Give the names of functional groups (i) -CHO (ii) -C=O (iii) -COOR (iv) -OH
10. Your friend is unable to understand $n l^x$. What questions will you ask him to understand $n l^x$ method.
11. Frame some questions to know about the formation of mirage.

SECTION III

3 x 4 = 12

- Notes:** 1. Answer **all** the questions.
2. Each question carries **4** marks.

12. Draw any one of the following diagram:
A) Draw a neat diagram of electric motor. Name the parts.
B) Draw a diagram showing the increasing value of $(n+l)$ of orbitals
13. Observe the table and answer the following questions

Substance	Specific heat	
	In cal/g-°C	In J/kg-K
Lead	0.031	130
Mercury	0.033	139
Brass	0.092	380
Zinc	0.093	391
Copper	0.095	399
Iron	0.115	483
Glass(flint)	0.12	504
Aluminum	0.21	882
Kerosene oil	0.50	2100
Ice	0.50	2100
Water	1	4180
Sea water	0.95	3900

- h) What is the SI unit of Specific heat?
i) Which metal is best for cooking utensils? Why?
j) Which metal is slowly heated up among all given substance?
k) How much heat energy is required to rise 1^o C of water of 1 gram?
14. How do you appreciate the role of molecules in the atmosphere for the blue colour of the sky?

SECTION IV

3 x 8 = 24

- Notes:** 1. Answer **all** the questions.
2. Each question carries **8** marks.
3. Each question has internal choice.

15. Explain the working of electric motor with a neat diagram

(OR)

Deduce the expression for the equivalent resistance of three resistors connected in parallel.

16. What is a periodic property? How do the following properties change in a group and period? Explain
a) Atomic radius b) Ionization energy c) Electron affinity d) Electronegativity

(OR)

What is hybridisation? Explain the formation of $BeCl_2$ molecule using hybridisation.

17. How do you find the focal length of a lens experimentally?

(OR)

What is meant by “water of crystallization” of a substance? Describe an activity to show the water of crystallization.

