



విజ్ఞానం

SSC PUBLIC EXAMINATIONS 2024

PHYSICAL SCIENCE

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1. Write the differences between evaporation and boiling?**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 surface phenomenon	2. It is 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's depends on surface area, temperature, wind speed and humidity	5. It's depends on nature of the substance

2. Explain the formation of mirages?

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.

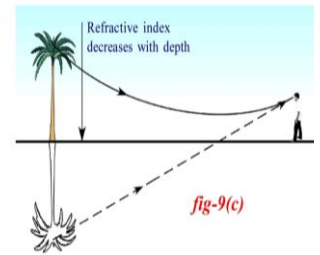
v) Thus the refractive index of air increases with height. So, the cooler air at the top has greater refractive index than hotter air just above the road.

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

**3. How do you correct the eye defect Myopia?**

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

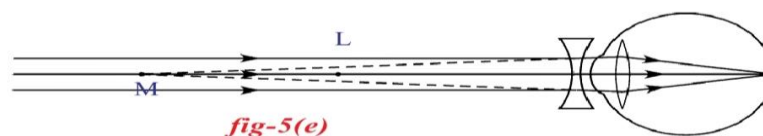


v) The point of maximum distance at which the eye lens can form an image on the retina is called "far point(M)"

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

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

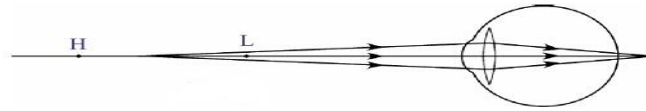
**4. Explain the correction of the eye defect Hypermetropia.**

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"

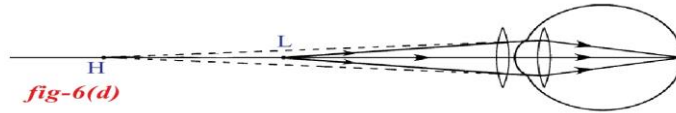
ii) It is also called "Far sightedness"

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 $f = 25d/(d-25)$



5. Explain the formation of rainbow.

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.

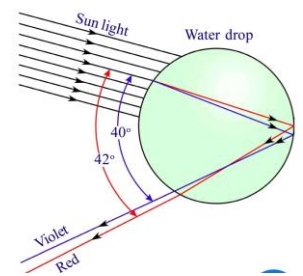
iii) The rays of sunlight enter the drop near its top surface. At this first refraction the white light is dispersed into its spectrum of colours, violet being deviated the most and red the least.

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° .



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

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

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 Ohms law

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

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

Also $V = IR_{eq}$

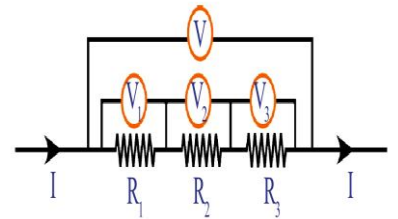
$$V = V_1 + V_2 + V_3$$

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

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

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

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



Section-IV

Q.No: 16 (Chemistry Part -AS₁)

8 Marks

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

Ans: 1. Principal Quantum Number (n)

- i) The principal quantum number gives the size and energy of the main shell and it is denoted by n.
- ii) ‘n’ has positive integer values of 1, 2, 3,...
- iii) As ‘n’ increases, size and energy of the shell increases.
- iv) 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)

- i) The angular momentum quantum gives the shape of sub-shells and it is denoted by l
- ii) ‘l’ has integer values from 0 to n-1 for each value of ‘n’.

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

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

- Based on the modern periodic law, this modern periodic table is proposed.
- The modern periodic table has 18 vertical columns known as Groups and 7 horizontal rows known as Periods.
- 18 groups represented by using Roman numeral I through VIII with letters A and B in traditional notation or 1 to 18 Arabic numerals.
- 7 periods represented by 1 to 7 Arabic numerals.
- 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.
- The elements are classified as s,p,d and f block elements.
- Inert or Noble or Rare gases elements are placed in 18th group.
- Each period starting with metal and ending with inert gas.
- Left side elements are metals and right side elements are non-metals.
- s and p block elements are known as Representative elements.
- d-block elements are called Transition elements.
- 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

3. 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.

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.

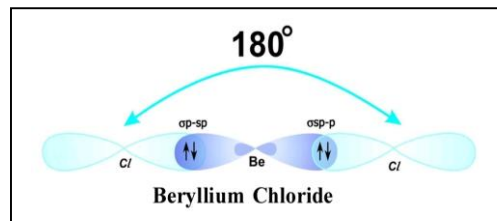
In a groups: Electro negativity decreases as we go down in a group.

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

4. Explain the formation of BeCl₂ molecule using hybridization.

Ans: Formation of BeCl₂:-

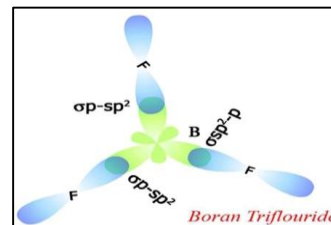
- Be(z=4) has electronic configuration $1s^2 2s^2$
- It has no unpaired electrons
- It is suggested that excited Be atom in which an electron from 2s shifts to 2p_x level.
- The excited electronic configuration of Be is $1s^2 2s^1 2p^1_x$
- Electronic configuration of Cl(z=17) is $1s^2 2s^2 2p^6 3s^2 3p^2_x 3p^2_y 3p^1_z$
- 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°



5. Explain the formation of BF₃ molecule using hybridization.

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.



Section-IV

Q.No: 17 (Physics and Chemistry Part –AS₃)

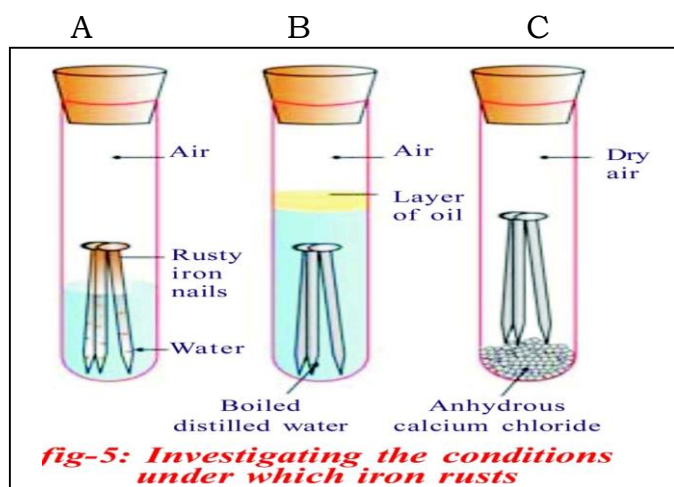
8 Marks

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

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:**
- Take 3 test tubes and place clean iron nails in each of them. Label the test tubes A, B and C
 - Pour some water in test tube A and cork it.
 - Pour boiled distilled water in test tube B, and about 1ml of oil and cork it.
 - Put some anhydrous calcium chloride in test tube C and cork it.
 - Leave these test tubes for a few days and then observe.
 - 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.



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

2. Compounds such as alcohols and glucose contain hydrogen but are not categorized as acids.

Describe an activity to prove it.

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.

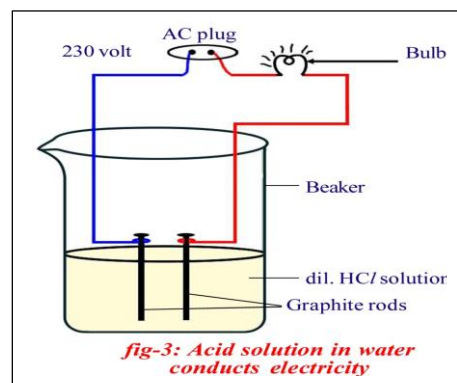


fig-3: Acid solution in water conducts electricity

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

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.

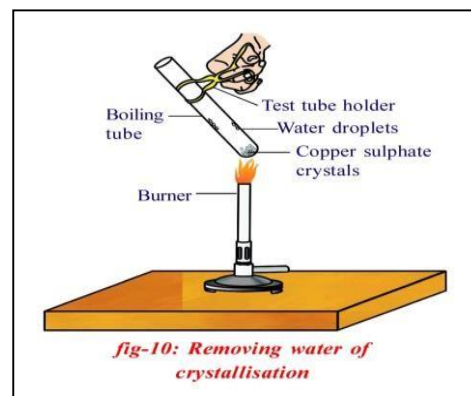


fig-10: Removing water of crystallisation

4. Show that acids produce hydrogen gas when react with metals.

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 H_2
 $\text{Acid} + \text{Metal} \rightarrow \text{Salt} + \text{Hydrogen}$
 $2\text{HCl}(\text{aq}) + \text{Zn}(\text{s}) \rightarrow \text{ZnCl}_2(\text{aq}) + \text{H}_2(\text{g})$
- 9) Repeat this experiment with remaining acids

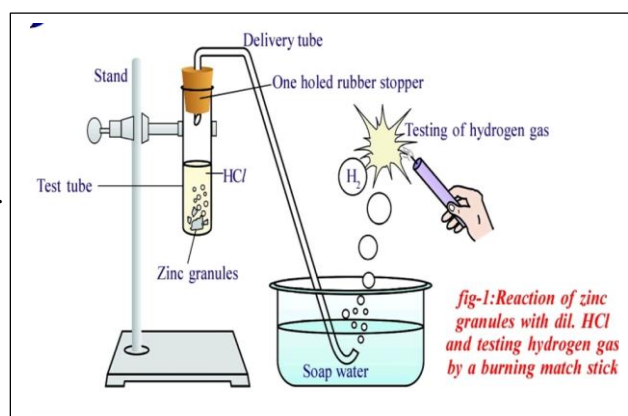


fig-1: Reaction of zinc granules with dil. HCl and testing hydrogen gas by a burning match stick

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

Section-III

Q.No: 12 (Physics and Chemistry – AS₅)

4 Marks

1. Draw various types of lenses.

Ans:



fig-6(a):
Biconvex



fig-6(b):
Biconcave



fig-6(c):
Plano-convex



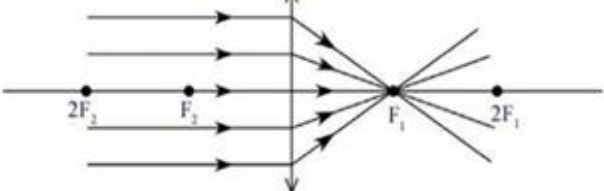
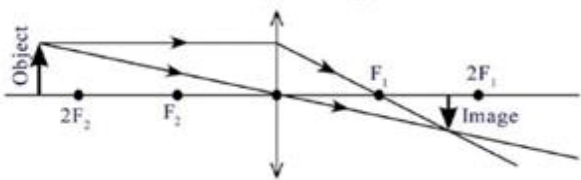
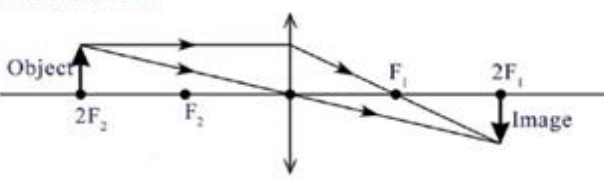
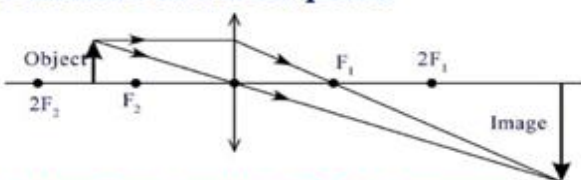
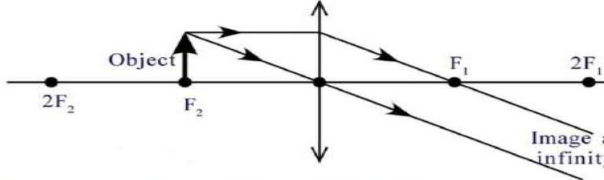
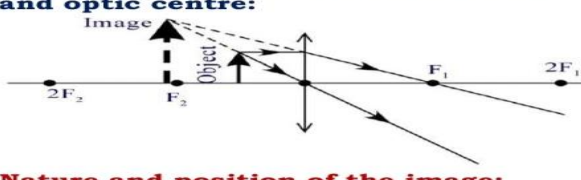
fig-6(d):
Plano-concave



fig-6(e):
Concavo-convex

2. Draw ray diagrams for the Convex lens following positions and explain the nature and position of image.

- 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 b) 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>

3. Draw a neat diagram showing acid solution in water conducts electricity.

Ans:

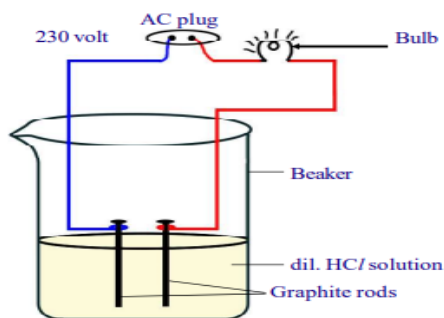
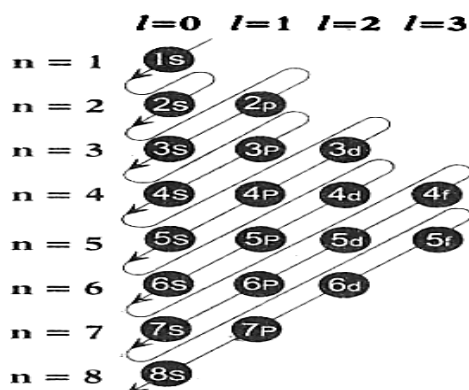


fig-3: Acid solution in water conducts electricity

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

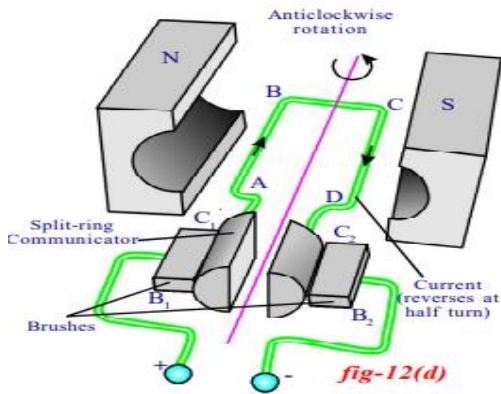
Draw moeller chart of filling order of atomic orbitals

Ans:



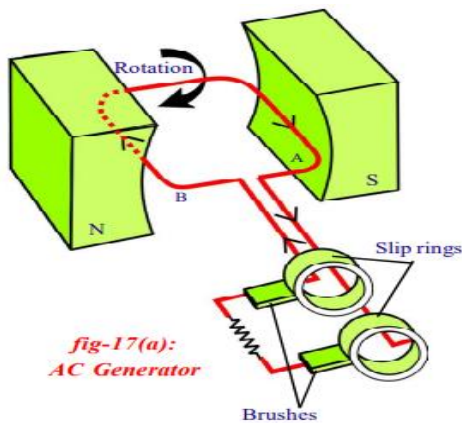
5. Draw a neat diagram of electric motor. Name the parts.

Ans:

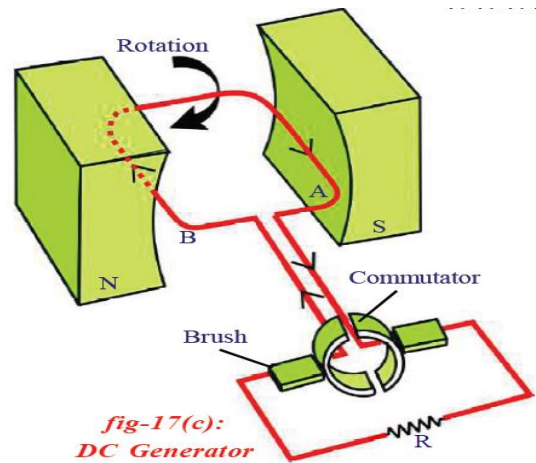


6. Draw a neat diagram of an AC generator.

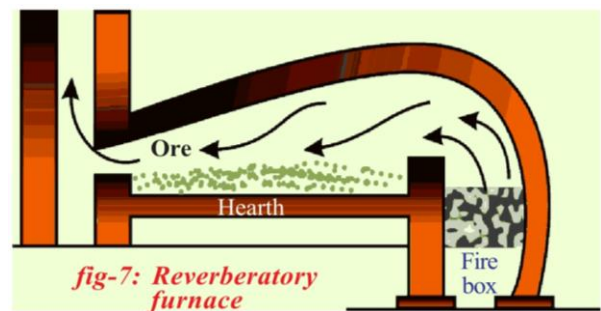
Ans:



7. Draw a neat diagram of an DC generator.



8. 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.



Section-III

Q.No: 13 (Physics or Chemistry – AS₄)

4 Marks

1. 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

a) What is the SI unit of Specific heat?

Ans: J/kg-K

b) Which metal is best for cooking utensils? Why?

Ans: Copper. Because it has low specific heat value

c) Which metal is slowly heated up among all given substance?

Ans: Aluminium

d) How much heat energy is required to rise 1° C of water of 1 gram?

Ans: $Q = ms\Delta T = 1 \times 1 \times 1 = 1 \text{ cal}$

e) Which metal is used to soldering the wires? Why?

Ans: Lead. It is very low specific heat value

f) Why different substances have different specific heats?

Ans: Specific heat of a substance depends on its nature.

g) Write the formula of specific heat of the substance?

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

h) Convert 1 cal/g- °C into J/Kg-J

Ans: 1 cal/g- °C = $4.186 \times 10^3 \text{ J/kg-K}$

i) Which liquid used as coolant? Why?

Ans: Water, because highest specific heat value.

2. Observe the table and answer the following questions.

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

- a) Which solution is strong acid? **Ans:** S
 b) Which solution is strong base? **Ans:** R
 c) Which solution is weak acid? **Ans:** Q
 d) Which solution is neutral? **Ans:** P
 e) Which solution is weak base? **Ans:** T
 f) Which solution(s) turn into pink by adding phenolphthalein **Ans:** T and R
 g) Which solution(s) turn into red by adding methyl orange? **Ans:** Q and S

3. Observe the following table and answer the questions.

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) They are inversely proportional to each other
 d) What is the speed of light in Benzene?
Ans: $n = 1.5 = 3/2$, $C = 3 \times 10^8$ m/s, $V = ?$
 $V = C/n = 3 \times 10^8 \times 2/3 = 2 \times 10^8$ 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) In the table, In which material medium speed of light is less? Why?
Ans: Diamond, it has highest refractive index
 g) 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.
 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

4. 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? **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

5. 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

- 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

6. Observe the table and answer the questions.

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: $R=pl/A$
 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

7. Observe the table and answer the questions.

ORE	Formula	metal	ORE	Formula	metal
Bauxite	$(Al_2O_3 \cdot 2H_2O)$	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	$(MgSO_4 \cdot 7H_2O)$	Mg	Galena	(PbS)	Pb
Horn Silver	$(AgCl)$	Ag	Gypsum	$(CaSO_4 \cdot 2H_2O)$	Ca
Pyrolusite	(MnO_2)	Mn	Lime stone	$(CaCO_3)$	Ca
Haematite	(Fe_2O_3)	Fe	Carnallite	$(KCl \cdot MgCl_2 \cdot 6H_2O)$	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 Carnalite?

Ans: Potassium and Magnesium

Section-III

Q.No: 14 (Physics or Chemistry – AS₆)

4 Marks

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

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.

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

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.

3. Give two important uses of washing soda and baking soda.

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.

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

4. What is baking powder? How does it make the cake soft and spongy?

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.

5. What is the reason behind the shining of diamonds and how do you appreciate it?

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.

6. How do you appreciate the role of molecules in the atmosphere for the blue colour of the sky?

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.

7. How do you appreciate the working of Ciliary muscles in the eye?

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 focused 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 focused 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.

8. Why does the sky sometimes appear white?

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.

9. Comment on the position of hydrogen in periodic table.

Ans: i) Hydrogen can lose one electron and behave as 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) It is placed at the top of both alkali metals and halogens
v) But based on electronic configuration, hydrogen is placed in 1A group.

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

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 in any chemical reactions
- If any group of elements try to get octet configuration by transferring or sharing of electrons then they attain stability.

11. 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 is 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.

12. What is thermite process? Mention its applications in daily life?

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

13. What is activity series? How it helps in extraction of metals?

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 bottom of the activity series (moderately reactive) can be extracted by reduction of metal oxide with C or CO.

14. How do you appreciate the role of esters in daily life?

Ans: i) Esters are used for making artificial flavours and essences
ii) Esters are used for making perfumes
iii) Esters are used as plasticizers
iv) Esters are used as solvents for oil, fats, gums etc.

Section-II

Q.No's: 9 - 11 (Physics and Chemistry – AS₁, AS₂, AS₄)

2 Marks

1. Explain why dogs pant during hot summer days using the concept of evaporation?

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.

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

Ans: a) What is meant by evaporation?
b) What is meant by boiling?
c) At what temperature does evaporation take place?
d) At what temperature does boiling take 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)

3. What is a neutralization reaction? Give two examples.

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) $\text{Mg}(\text{OH})_2 + \text{H}_2\text{SO}_4 \rightarrow \text{MgSO}_4 + 2\text{H}_2\text{O}$

4. Plaster of Paris should be stored in moisture – proof container. Explain why?

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.

5. Why does tooth decay start when the pH of mouth is lower than 5.5?

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.

6. Why does not distilled water conduct electricity?

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.

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)

8. Why is it difficult to shoot a fish swimming in water?

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

9. 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).

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

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

10. 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?

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?

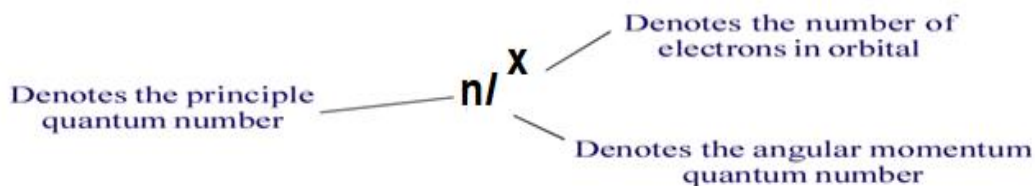
c) What type of images is formed by double convex lens?

d) How does air bubbles in water behaves? (Write any two relevant questions)

11. What is n/l^x method? How it is useful?

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.

12. 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

13. State and explain Pauli's exclusion principle?

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 1s²



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

14. 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

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

a) 2 b) 2 c) Metal

15. 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?

Ans: i) Y ii) Z iii) X

16. Predict the reasons for low melting point for covalent compounds when compared with ionic compound.

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.

17. 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"

18. 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

19. 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.

20. Are the magnetic lines closed? Explain.

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.

21. 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"?

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)

22. Which method do you suggest for extraction of high reactivity metals? Why?

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.

23. What is the difference between roasting and calcinations? Give one example for each?

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: $2ZnS + 3O_2 \rightarrow 2ZnO + 2SO_2$	3. Ex: $CaCO_3 \rightarrow CaO + CO_2$
4. It is suitable to sulphide ores.	4. It is suitable to carbonate ores.

24. Complete the following table.

Ore	Formula	Metal
Bauxite	$Al_2O_3 \cdot 2H_2O$	
Galena	PbS	
Cinnabar	HgS	
Gypsum	$CaSO_4 \cdot 2H_2O$	

A

Ore	Formula	Metal
Bauxite	$Al_2O_3 \cdot 2H_2O$	Al
Galena	PbS	Pb
Cinnabar	HgS	Hg
Gypsum	$CaSO_4 \cdot 2H_2O$	Ca

25. Give the names of functional groups (i) -CHO (ii) -C=O (ii) -COOR (iv) -OH (AS1)

Ans: i) Aldehyde ii) Ketone iii) Ester iv) Alcohol

26. What are the general molecular formulae of alkanes, alkenes and alkynes.

Ans: Alkanes - C_nH_{2n+2} Alkenes - C_nH_{2n} Alkynes - C_nH_{2n-2}

27. Give the names of functional groups (i) -CHO (ii) -C=O (ii) -COOR (iv) -OH

Ans: i) Aldehyde ii) Ketone iii) Ester iv) Alcohol

28. Complete the following table.

Hydrocarbon		Ethane		Butane
Formula	CH ₄		C ₃ H ₈	

Ans:

Hydrocarbon	Methane	Ethane	Propane	Butane
Formula	CH ₄	C ₂ H ₆	C ₃ H ₈	C ₄ H ₁₀

Section-I Q.No's: 1 - 8 (Physics and Chemistry –AS₁,AS₂, AS₄,AS₅,AS₆) 1 Mark

1. Convert 30°C into Kelvin scale

Ans: 303K

2. State the principle of method of mixtures.

Ans: Net heat lost = Net heat gain

3. What is Humidity? (AS₁)

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

4. 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.

5. 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

6. Which chemical substance is used by doctors as a plaster for supporting broken bones? Write its chemical formula.

Ans: Plaster of Paris – $CaSO_4 \cdot \frac{1}{2} H_2O$.

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

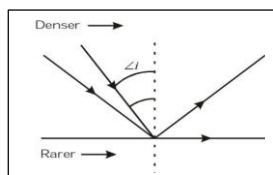
Ans: Stars appear twinkling due to multiple refractions of light through different atmospheric layers with different refractive indices.

8. Write Snell's law?

Ans: $n_1 \sin i = n_2 \sin r$ (or) $\sin i / \sin r = \text{constant}$

9. Which phenomenon do you observe from the figure?

Ans: Total internal reflection



10. Write the applications of total internal reflection

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

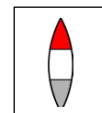
11. What is lens formula and explain the terms in it?

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

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

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

Ans: 3



13. In an experiment of finding focal length of lens the observation is as shown in the table.

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

What is the radius of curvature of this lens?

Ans: 30 cm

14. Write the applications of lenses in day to day life?

- 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.

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

Ans: 25 cm

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

Ans: 60°

17. Define Dispersion of light?

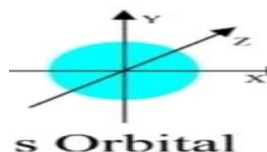
Ans: The splitting of white light into different colours (VIBGYOR) is called Dispersion

18. Which rule is violated in the electronic configuration $1s^0 2s^2 2p^4$?

Ans: Aufbau principle

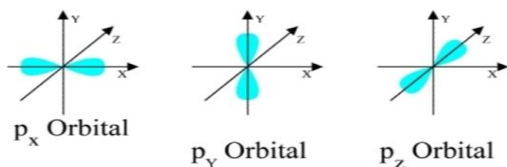
19. Draw the shape of s-orbital

Ans:

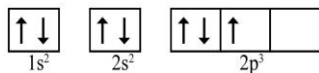


20. Draw the shape of any p-orbital

Ans:



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



Ans: Hund's rule

22. 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 enters into 4th shell and valence is one.

23. 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: X_2Y_3

24. State Mendeleev's periodic law

Ans: "The physical and chemical properties of the elements are the periodic functions of their atomic weights"

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

Ans: Calcium (Ca) and strontium (Sr) are expected to show chemical reactions similar to magnesium (Mg).

Because they are in same group.

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

Ans: $ns^2 np^6$

27. Represent Calcium atom using Lewis notation.

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

28. Express 1 KWH in Joules?

Ans: $1\text{KWH} = 3.6 \times 10^6 \text{J}$

29. Why do tungsten is used in filament?

Ans: Tungsten has higher resistivity value and high melting point

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

Ans: 10Ω

31. What is Solenoid? Write use of Solenoid.

Ans: A solenoid is a long wire wound in a close packed helix. It is use as bar magnet.

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

Ans: Into page



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



Ans: North pole

34. Write the names of any two ores of iron.

Ans: Haematite (Fe_2O_3) and Magnetite (Fe_3O_4)

35. Mention two methods which produce very pure metals.

Ans: Electrolytic and Distillation processes

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

Ans: Gold, Silver, Platinum

37. Name the simplest hydrocarbon

Ans: Methane (or) CH_4

38. Name the simplest ketone and write its molecular formula.

Ans: Propanone (or) Di-Methyl ketone



39. What happens when a small piece of sodium is dropped into ethanol?

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

40. Name the acid present in vinegar

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

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

Ans: Catenation

42. Draw the simple figure of a soap molecule.

Ans:

