SECTION : A [50 marks]
COMPULSORY: Attempt **ALL** questions

Question 1.

a. ***Direction: For each question, there are four alternatives A, B, C and D. Choose the correct alternative and circle it. Do not circle more than ONE alternative. If there are more than one circled, NO score will be awarded.*** **[25]**

i. "Equal volume of all gases under the same conditions of temperature and pressure contain the same number of molecules".
The above law refers to
A Avagadro's law.
B Gay Lussac's law.
C Charle's law.
D Boyle's law.

ii. The principle ore of Aluminium is
A zinc blende.
B haematite.
C calamine.
D bauxite.

iii. Which of the following is the most electronegative element?
A fluorine.
B chlorine.
C bromine.
D iodine.

iv. How many sub-orbitals are present in L-shell?
A 1
B 2
C 3
D 4

v. The factor which does NOT affect the equilibrium of the solution is
A concentration.
B temperature.
C pressure.
D catalyst.

vi. The general formula of alcohol is

A C_nH_{2n+1}— Cl
B C_nH_{2n+1}— Br
C C_nH_{2n+1} — I
D C_nH_{2n+1}— OH

vii.

The gas is used as a refrigerant and propellant. However it has negative impact to the environment when used excessively.

Which of the following gas is correctly described in the above statement?

A carbontetrachloride
B chlorofluorocarbon
C carbondioxide
D liquid nitrogen

viii. Thinley filled a balloon with 14L of hydrogen gas, then he reduced the pressure to 4 atmospheres and found out that the balloon expanded to occupy double the initial volume. What was the initial pressure exerted on the balloon?

A 8 atmospheres
B 6 atmospheres
C 4 atmospheres
D 2 atmospheres

ix. The following flasks are of same size and kept at the same temperature. Identify the flask with the minimum number of gas molecules.

Flask A **Flask B** **Flask C** **Flask D**

A Flask A
B Flask B
C Flask C
D Flask D

x. The relative molecular mass of glucose ($C_6H_{12}O_6$) is

A 120.
B 160.
C 180.
D 200.

xi. 1·5 moles of oxygen at STP occupies a volume of

A 11·2L.
B 22·4L.
C 33·6L.
D 44·8L.

xii. During the electrolysis of sodium chloride (NaCl) solution, the ion that gets discharged at the Cathode is

A Na^+.
B H^+.
C Cl^-.
D OH^-.

xiii. Atoms A and B have 7 valence electrons. The type of bond formed between them is example of

A a polar covalent bond.
B an electrovalent bond.
C a co-ordinate bond.
D a covalent bond.

xiv. Tshering added a substance 'X' from halogen group in a beaker of water. Then he observed that the solution has turned to pale green colour. Name the substance 'X'.

A Flourine
B Chlorine
C Bromine
D Iodine

xv. Which coefficient values will balance the reaction shown below.

A 1, 15, 16, 23
B 1, 16,15, 23
C 1, 15, 23, 16
D 1, 23, 15, 16

xvi. A Chemistry teacher asked one of the students to dissolve sodium hydroxide pallets in cold water. In due course of stirring the mixture, the student felt the production of heat. What can you conclude from the above experiment?

A It is due to heat of neutralization
B It is due to endothermic reaction
C It is due to exothermic reaction
D It is due to stirring of the mixture

xvii. Ammonium hydroxide is added to a solution. The solution formed a sky blue precipitate which turned deep blue in excess of ammonium hydroxide. Name the cation present in the solution.

A Fe^{2+}
B Zn^{2+}
C Cu^{2+}
D Pb^{2+}

xviii. What happens to an enzyme when it is heated above optimum temperature?

A It remains same
B It gets activated
C It gets inactivated
D It gets denatured

xix. Denatured alcohol is prepared by adding the following substances **EXCEPT**

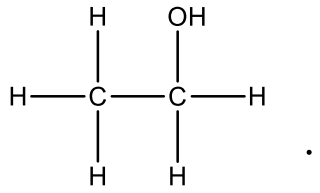
A pyridine.
B methanol.
C copper nitrate.
D copper sulphate.

xx. What does the positive value of enthalpy indicate in endothermic reaction?

A release of heat energy
B absorption of heat energy
C zero absorption of heat energy
D zero release of heat energy

xxi. The correct structural formula of butanol is

A



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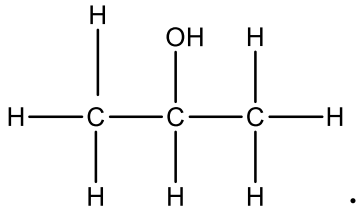

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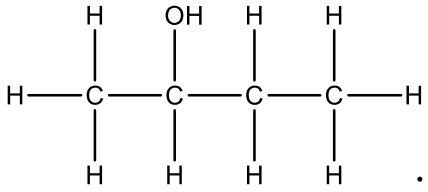

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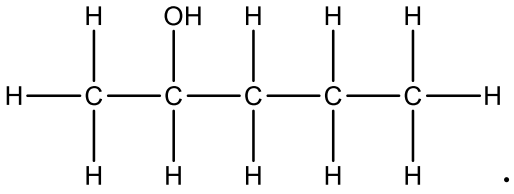


xxii. Which of the following statements best describes the characteristics of ionization energy?

I Ionisation energy decreases across the period.
II Ionisation energy increases across the period.
III Ionisation energy decreases down the group.
IV Ionisation energy increases down the group.

A I and II
B II and III
C III and IV
D IV and I

xxiii. Which direction will the equilibrium shift in endothermic reaction, if the temperature is decreased?

A Equilibrium will shift to left.
B Equilibrium will shift to right.
C Equilibrium will remain same.
D Equilibrium will first shift to left and then to right.

xxiv. Given below is the balanced equation representing a reaction:

$Fe(s) + 2HCl(aq) \longrightarrow FeCl_2(aq) + H_2(g)$

This reaction occurs more quickly when a substance 'X' is used. Which statements best describes substance 'X'?

I It increases the rate of chemical reaction.
II It takes part in the chemical reaction.
III It does not take part in chemical reaction.
IV It initiates the chemical reaction.

A I and IV
B II and III
C II and IV
D I and III

xxv. What relationship can you draw from Charle's law?

A	increase	decrease	constant
B	increase	increase	constant
C	increase	constant	decrease
D	increase	constant	increase

b) **Match each item under column A with the most appropriate item in column B. Rewrite the correct matching pairs in the space provided**. **[5]**

Column A	Column B
i. The combination of Boyle's law, Charle's law and Avogadro's law	a. Pepsin
ii. Heating of ore in absence of air.	b. Esterification
iii. Nitrogen and hydrogen reacts to form ammonia	c. Pancreatic amylase
iv. Enzyme that breaks down starch and polysaccharides into disaccharides.	d. Oxidation
v. Alcohol reacts with carboxylic acid in presence of H_2SO_4	e. Haber's Process
	f. Ideal Gas Law
	g. Calcination
	h. Graham's law
	i. Eyde Process

c) **Fill in the blanks by writing suitable word(s).** **[5]**

i. The process of purification of bauxite ore using caustic soda at the temperature of 150º C is _____ process.

ii. The law which is used to determine the total pressure of the mixture of gases is _____

iii. In an electrolytic process, the reaction that take place at cathode is _____

iv. In a reaction, when a stress is first applied to a system, _____ equilibrium is disturbed.

v. In the Aufbau's principle, if d-orbital has the capacity to hold 10 electrons, then the capacity of f-orbital is _____

d) **Correct the following statements by changing only the underlined words. Rewrite the correct statements.** **[5]**

i. The vapour density of a gas is <u>thrice</u> its relative molecular mass.

_____

ii. <u>Complex ion</u> is a species which can use its lone pair of electrons to form dative bond.

_____

iii. When the plunger of the syringe filled with air is pushed in, the pressure inside the syringe increases and volume decreases. This statement explains <u>Charle's</u> law.

_____

iv. The reaction taking place in the car battery gives <u>chemical</u> energy which is used in running the engine.

_____

v. The bond formed between hydrogen and some electronegative atom within the same molecule is called <u>intermolecular</u> hydrogen bonding.

_____

e) **Answer the following questions:** **[5]**

i. Write the relationship between empirical formula and molecular formula.

ii. "Energy can neither be created nor destroyed". Justify.

iii. What is the empirical formula of hydrogen peroxide (H_2O_2)?

iv. 1 mole of CO_2 contains 22·4L at STP and 6·023 × 10^{23} molecules. Explain.

v. How are some enzymes similar to a catalyst?

f) **Write down the difference between the following pairs**. **[5]**

i. Boyle's law and Charle's law (Definition)

Boyle's Law	Charle's Law

ii. Invar and Brass (Composition)

Invar	Brass

iii. Iron and Calcium (electronic configuration)

Iron	Calcium

iv. Define Mole and Stoichiometry

Mole	Stoichiometry

v. Explain Threshold energy and Activation energy

Threshold energy	Activation Energy

SECTION: B [50 Marks]

*Attempt **ANY FIVE** questions*

Question 2.

a) i. Define amphotheric compounds. **[1]**

ii. Write **TWO** similarities between copper and zinc. **[2]**

b) A compound of carbon, hydrogen and oxygen is found to contain 40% of carbon, 6·7% of hydrogen and 53·3% of oxygen. If its Vapour Density is 30, find:

i. Empirical formula. **[2]**

ii. Molecular formula. **[2]**

c) Write the structural formula for the following compounds.

i. 2-methyl-3-pentanol. **[1]**

ii. Propene. **[1]**

d) State Le Chatelier's principle. **[1]**

Question 3.

a) Dema was playing with a balloon having a volume of 6L of air at 25ºC. She wanted to hide it from her sister by keeping it inside the refrigerator kept at a temperature of 4ºC. Calculate the volume of the air inside the balloon at the time of taking it out from the refrigerator. **[2]**

b) In the electrolytic reduction of alumina, a chemist added cryolite and fluorspar to an electrolyte in order to make the reduction process easier.
What is the function of:
i. Cryolite. **[1]**

ii. Fluospar. **[1]**

b) Aum Pem from Kurtoe wanted to decolorize the threads to weave a gho for her son. However, she was confused in choosing the substance that can decolorize the threads. If you were in her place which of the following chemical substance would you choose to decolorize threads? **[1]**

1. Fluorine.
2. Chlorine.
3. Sulphurdioxide.
4. Ammonia.

d) Fanning the flame to a slow burning fire helps to burn faster. Explain the above statement based on one of the factors affecting the rate of reaction. **[2]**

e) Name the following.

i. S.I. unit of pressure. **[1]**

……..

ii. The type of chemical bond present in the common salt. **[1]**

…….

iii. Ions formed by losing one or more electrons by an atom. **[1]**

…….

Question 4.

a) Complete the following table with regards to the periodic table trends in physical properties. **[2]**

Properties	Across the period	Down the group
I. Atomic radius	1.	2.
II. Ionisation energy	3.	4.

b) Calcium nitrate decomposes on heating according to the following equation.
$2Ca(NO_3)_2 \rightarrow 2CaO + 4NO_2 + O_2$
The relative molecular mass of calcium nitrate is 164. Calculate:

i. the volume of NO_2 obtained at STP. **[2]**

ii. The weight of CaO obtained when 16·4g of $Ca(NO_3)_2$ is heated. **[2]**

c) i. What is a biochemical reaction? **[1]**

ii. Explain how biochemical reaction is important to living things with **ONE** example. **[2]**

d) How is ethanol used as a biofuel? **[1]**

Question 5.

a) Iron extraction is carried out in the Blast Furnace. Write down the balanced chemical reactions that take place in the upper region of the Blast Furnace. **[3]**

b) The Table given below shows the behavior of a gas at constant temperature. Study it carefully and answer the following questions.

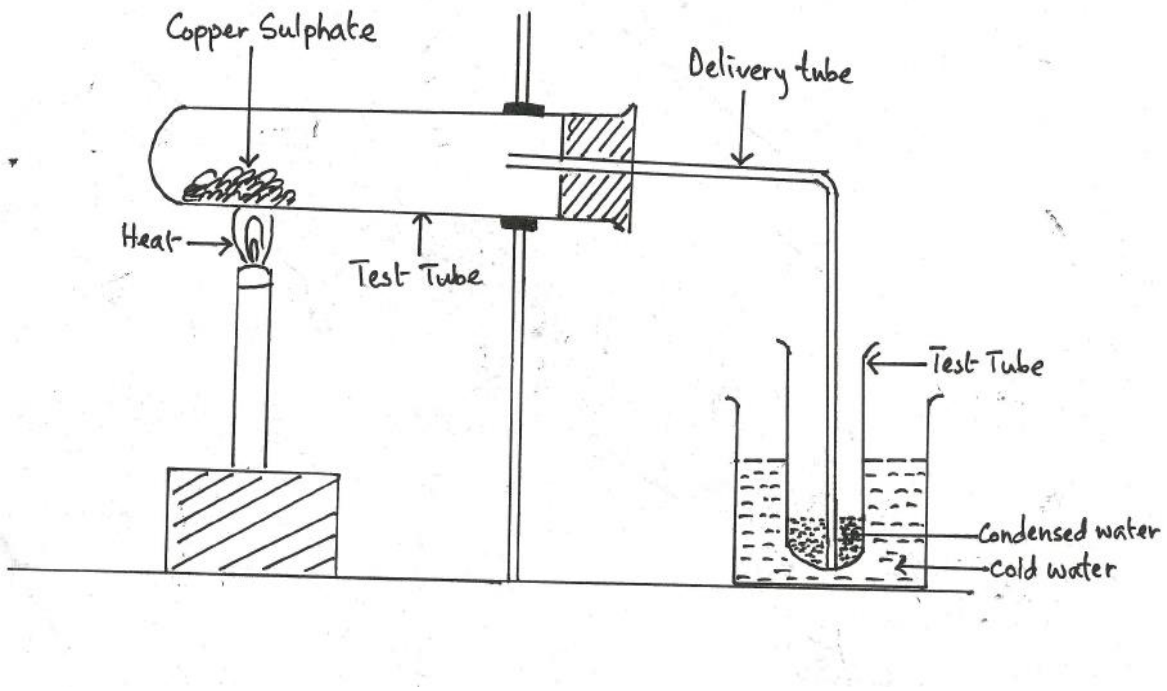
Volume (L)	Pressure (atm)
2	4
4	3
6	2
8	1

i. What happens to the volume of the gas as the pressure increases? **[1]**

ii. Write down the relationship between pressure and volume of a gas at constant temperature. **[1]**

c) A chemical reaction has equal number of reactants and products of gas molecules. If the volume of the container is changed, what will be the direction of change? **[1]**

d) A student drew a diagram showing 'an action of heat on copper sulphate' as given below.



i. Identify the error in the diagram. **[1]**

ii. What will happen if the student carries out the experiment with the same set up? **[1]**

e) i. How does surface area affect the rate of chemical reaction? **[1]**

ii. **Rate of reaction** = $\frac{\text{Change in concerntration of reactant}}{\text{Change in time}} = \frac{\text{Change in concerntration of product}}{\text{Change in time}}$

Explain the above relationship. **[1]**

Question 6.

a) Urea is a chemical fertilizer which is used by the farmers to enhance the nitrogen content in the soil. If the farmer uses 1 mole of urea ($COCNH_2$)$_2$, calculate the percentage of nitrogen that the farmer is able to increase? **[2]**

b) i. Define homologous series. **[1]**

ii. Classify the following examples according to their homologous series. **[2]**

C_3H_4, C_3H_6, C_3H_8, C_3H_7OH

Homologous Series	**Examples**
Alkane	1.
Alkene	2.
Alkyne	3.
Alcohol	4.

c) Differentiate between enthalpy and internal energy. **[2]**

Enthalphy	**Internal Energy**

d) Define aqua-regia. Write **one** use of aqua-regia. **[2]**

e) From the chemical reactions,

I_2**(g) + 2**e^- **$\rightarrow$2**I^- **(aq)**

$2I^-$ **(aq)** $\rightarrow I_2$ **(aq) +** $2e^-$**,**

Write the reaction that undergoes

i. Oxidation **[½]**

ii. Reduction. **[½]**

Question 7.

a) i. How can degree Celsius be converted into Kelvin temperature? **[1]**

ii. At what temperature will 0·01 mol. of a gas occupy 1200 ml at a pressure of 1·5 atm? **[2]**

b) If you are given one strong and one weak electrolytes, what simple experiment would you conduct to distinguish between them? **[2]**

c) Describe Birkland and Eyde process. **[2]**

d) i. Give **two** uses of hydrogen peroxide. **[1]**

ii. Why enzymes are highly specific in nature? **[1]**

e) Balance the chemical equation given below: **[1]**

CH_4 (g) + O_2 (g) → CO_2 (g) + H_2O (l).

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