Time: 3 Hrs. M.M: 70

General Instructions:

(i) Question 1 to 5 one mark.

(ii) Question 6 to 10 each two mark.

(iii) Question 11 to 22 each three mark.

(iv) Question 23 is value based question and carry four marks.

(v) Questions 24 to 26 each five mark.

Q1 What do you understand by "Limiting reagent".

Q.2 State Hiesenberg Uncertainty Principle.

Q.3 The value of Vander was constants a and b are as given for two gases:

Gases	$a(atm\,L^2\,mol^{-1})$	$b(mol^{-1})$
C02	3.6	0.043
S02	6.7	0.056

Out of these = two gases which gas molecules will possess largest magnitude to intermolecular forces of attraction?

Q.4: In Lasssaigne's test for detection of nitrogen in an organic compound the blue colour appears due to the formation.

Q.5: For a reaction both enthalpy change and entropy change are positive. Under what conditions the reaction will be spontaneous?

Q.6 (i) How many subshells are associated with n=4?

(ii) How many electron will be present in the subshells having m_s value of -1/2 for n=4?

Q.7 (i) Define electron gain enthalpy.

(ii) Why is the electron gain enthalpy of chlorine more negative than fluorine?

Q.8 (i). In what group of the periodic table the element will found having electronic configuration :

$$[Xe]4f^{14}\ 5d^4\ 6s^2$$ [Xe] 4f 14 5d4 6s2
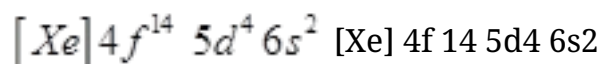
(ii) Why first ionization enthalpy of nitrogen is more than oxygen?

Q.9: Which out of NH_3 and NF_3 has higher dipole moment and why?

<div align="center">**OR**</div>

Draw the molecular orbital diagram of dioxygen and calculate bond order.

Q.10 (i) Draw the structure of diborane.

(ii) $PbCl_4$ is less stable than $SnCl_4$ but $PbCl_2$ is more stable than $SnCl_2$. Why?

Q.11 (i) CO_2 is a gas while Si02 is solid at room temperature. Why?

(ii) $SiCl_4$ can be easily hydrolysed but CCl_4 does not hydrolysed.. Why?

(iii) Silicon shows a higher covalency than carbon. Why?

Q.12 An electron beam is accelerated by a potential difference of 10000 *volts.* What is the wavelength of the wave associated with the electron beam?

(mass of electron = $9.1 \times 10^{-31} kg$,Charge of electrons = $1.6 \times 10^{-19} C$

<div align="center">**OR**</div>

Calculate the uncertainty in the velocity of a cricket ball of mass 150 g, if the uncertainty in its position is of the order of $1 A^0$.

$$(h = 6.6 \times 10^{-34}\ Kg\,m^2\ s^{-1})$$

Q.13 (i) Draw the orbital structure of ethane..

(ii) Out of H_2O and H_2S which have high boiling point and why?

(iii) He_2 molecule does not exists. Why?

_**Q.14:(i)** Define" Charles law ".

(ii) Calculate the temperature of 4 mol of gas occupying 5 dm^3 at 3.32 bar pressure.

(R = 0.083 bar dm^3 /mol/k)

Q.15 Define the following terms:

(i) Hess's law

(ii) Standard enthalpy of atomization

(iii) Entropy

Q.16: For the reaction:

$$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$$

$\Delta H = $ 95.4 kj; $\Delta S = $ -198.3

Calculate the temperature at which Gibb's free energy change is equal to zero. Predict the nature of the reaction at this temp. and above it

Q17:(i) Given the standard electrode potentials

$K^*/K = $ -2.93V $Ag^+/Ag = $ +0.80 V, Cr^{+3} /Cr = -0.74 V

Out of these electrode which will be the strongest reducing agent?

(ii) Represent the Galvanic cell in which the reaction takes place:

$$Zn + 2Ag^+(aq) \rightarrow Zn^{+2} + 2Ag\,(s)$$
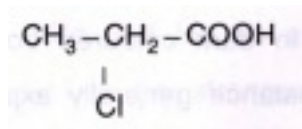
(a) Which of the electrode is negatively charged?

(b) What are the carriers of the current in the cell?

Q.18 Chlorophyll, the green colouring material of plants contains 2.68% of magnesium by mass. Calculate the number of moles of magnesium and atoms in 5.00 g of this complex. (Atomic mass of Mg = 24)

Q.19 (i) Write IUPAC names of the following compound:

$$CH_3 - CH_2 - COOH$$
$$| $$
$$Cl$$

(ii) Draw the structure of phenol

(iii) A substance has boiling point 350 K, but it starts decomposing near this temperature. Which type of distillation process is suitable for its purification?

Q.20: 0.25 g of organic compound produced 50 cm3 of N2 collected at

300 K and 715 mm of Hg pressure in Duma's method. Calculate the %age of nitrogen in the compound (aqueous tension of water at 300 K = 15 mm

Q.21 Draw cis and trans isomers of the following compound

ClHC = CHCl
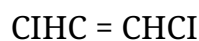
(ii) Define "markownikov's rule".

(iii) Why terminal alkynes are acidic in nature?

Q.22: **(i)** What do you understand by Biochemical Oxygen Demand.

(ii) Write two harmful effects of photochemical smog.

Q.23: In the school laboratory, the chemistry teacher instructed the lab attendant to store a thick syrup liquid made up of hydrogen and oxygen elements in brown bottles in dark room. He also told to add some another chemical to it and keep it free from dust so that it does not decomposed but the concentration of the liquid is a big problem because it readily decomposes when heated under normal conditions of temperature and pressure. The compound can act as oxidizing and reducing agent both in acidic and alkaline media.

(i) Write the name and formula of the liquid substance.

(ii) Why this compound is stored in dark coloured bottles?

(iii) How is the strength of the substance generally expressed?

(iv) What values are associated with the chemistry teacher?

Q.24 (i) State Le-chateliers principle.

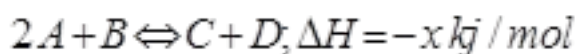**(ii)** Write conjugate base for the acids

HCO_3, H_2SO_4

(iii) What is the difference between solubility product and ionic product?

(iv) Calculate the PH of a solution having [H_3O^+] of 10^{-3} .

OR

(i) State " Common ion effect".

(ii) For a hypothetical reaction:

$2A + B \Leftrightarrow C + D; \Delta H = -x\, kj/mol$

What will be the effect on the equilibrium with

(a) Decrease of temperature

(b) addition of Helium

(iii) At 700K, the equilibrium constant Kp, for the reaction
$2SO_2(g) <=> 2SO_3(g) + O_2(g)$ is 1.8×10^{-3} kPa . What is the numerical value in moles per litre of Kc for this reaction at this temperature?

Q.25:(a) Account for the followings

(i) Be and Mg do not give flame colouration

(ii) Li is the strongest reducing agent.

(iii) Potassium carbonate cannot be prepared by Solvay process

(b) In what ways Li shows similarities to Mg in its chemical behavior. (any two)
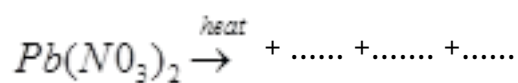
OR

(a) Write three properties of Lithium which differ from the rest of the members of group.

(b) Arrange the following in order of the property mentioned:

$Mg(OH)_2$, $Sr(OH)_2$, $Ba(OH)_2$ v, $Ca(OH)_2$ increasing basic character

(c) Complete the reaction:

$Pb(NO_3)_2 \xrightarrow{heat}$ + ... + ... + ...

Q.26 (a) Explain the following reactions:
(i) Wurtz reaction
(ii) Friedel crafts alkylation

(b) Convert:
(i) 1-bromopropane to propene
(ii) Sodium acetate to methane

(c) Melting point of cis-2-butene is lower than that of trans-2-butene. Why?

OR

(a) Propanal and pentan-3-one are the products of reductive ozonolysis. What is the structure of the alkene.

(b) Explain Huckel's Rule.

(c) Convert:
(i) Benzene to nitrobenzene
(ii) Ethyne to ethanal

(d) Why the boiling points of n-alkanes are higher than their branched chain isomers?