Note: Calculator allowed.

SECTION-A

I. Answer all the questions by selecting the most suitable alternative. **(30 × 1 = 30M)**

1) The molarity of a solution containing 5g of NaOH(molar mass =40g/mole) in 450 ml solution is
   A) 0.277mole/L B) 0.277mole/ml C) 277 mole/dm^3 D) 2.77 mole/L
2) Solubility of a solute '**X**' is 1.325g in 100 ml solution at 298K, if the process of solubility is exothermic ,the solubility of solute in 100 ml of solution at 310K would be
   A) increases B) decreases
   C) remains the same D) increases or decreases
3) The composition of the gas mixture in the tank used by scuba divers is
   A) 13.3% He ,56%N_2 ,30.7% O_2
   B) 30.7% He ,56%N_2 ,14.4% O_2
   C) 11.7% He ,24.3%N_2 64% O_2
   D) 11.7% He ,56.2%N_2 ,32.1% O_2
4) What mass of solution of 0.50 molal glucose($C_6H_{12}0_6$) solution is required to obtain 0.15mol glucose
   A) 732g B) 273g C) 327g D) 372g
5) Two solutions prepared by same solute and solvent have the osmatic pressure 1bar and 4 bar respectively at a given temperature. If these two solutions are separated by a semi permeable membrane then
   A) Solution of osmatic pressure **4** bar flows into solution of osmatic pressure **1** bar
   B) Solution of osmatic pressure **1** bar flows into solution of osmatic pressure **4** bar
   C) Solvent of osmatic pressure **1** bar flows into solvent of osmatic pressure **4** bar
   D) Solvent of osmatic pressure **4** bar flows into solvent of osmatic pressure **1** bar
6) Elevation of boiling point of an aqueous solution is 0.52K .K_b of water is 0.52 K. kg /mole. Mole fraction of solute in that solution is
   A) 0.0166 C) 0.025
   B) 0.052 D) 0.0176
7) Cryoscopic constant of water =1.86K.kg/mole. 34.2g of sucrose($C_{12}H_{22}0_{11}$) dissolved in 1 kg of water. The solution will freez at
   A) -0.52^0c B) -0.192^0c C) -0.186^0c D) -0.362^0c
8) The concentration of pollutant in ppm, that has been measured at 450mg per 150kg of sample is
   A) 3 B) 0.3 C) 30 D) 300

9) The slope of the straight line obtained from the graph of vapor pressure versus mole fraction of a gas is 1.0. The mole fraction of the gas in solution at 0.1bar pressure is

A) 10 B) 0.1 c) 0.01 D) 100

10) The colligative properties of a dilute solutions depends on

A) nature of solute B) no.of solute particles

C) no. of solvent particles D) all the above

11) The shape of carbocation is

A) tetrahedral B) pyramidal C) Trigonal planar D) linear

12) Which of the following free radical is more stable

A) Methyl B) Ethyl C) Isopropyl D) Tert-butyl

13) Which of the following molecule is not a cyclic compound

A) Napthalene B) Tetrahydro furan C) Neopentane D) both B&C.

14) Which of the following is not a nucleophile

A) BF_3 B) OH^- C) H_2O D) None of the above

15) The functional isomer of acetone is

A) propanal B) ethanal C) acetic acid D) all the above

16) The compound having one isopropyl group is

A) 2,2,3,3-Tetramethylpentane

B) 2,3-Dimethylpentane

C) 2,2,3-Trimethylpentane

D) 2-Methylpentane

17) The structure of 4-Methylpent-2-en-1-ol is

A) CH_3-CH_2-CH=CH-CH_2-OH

B) $(CH_3)_2$CH-CH=CH-CH_2-OH

C) $(CH_3)_2$C=CH-CH_2-CH_2-OH

D) CH_3-CH(OH)-CH=C$(CH_3)_2$

18) The displacement of electrons in a multiple bond in the presence of an attacking reagent is called

A) inductive effect B) hyper conjugation

C) electromeric effect D) resonance effect

19) Among the following ,the one having longest parent chain is

A) Neopentane B) Isopentane

C) 2-Methylpentane D) 2, 2-Dimethylbutane

20) The flame color of 'Rb' metal is

A) Crimson red B) yellow C) violet D) Red violet

21) Among the alkali metals ,least powerful reducing agent is

A) Li B) Na C) K D) Rb

22) $2Mg(NO_3)_2 \rightarrow O2 + X + Y$. Where 'X' & 'Y' are

A) X= MgO,Y=NO B) X= MgO, Y=NO_2

C) X= MgO, Y=N_2O D) X= Mg_3N_2, Y=NO

23) Lead compounds in **'+4'** oxidation state acts as

A) strong oxidizing agent B) strong reducing agent

C) both A&B D) none of the above

24) $2Al_{(s)} + 2\,NaOH_{(aq)} + 6\,H_2O_{(l)} \rightarrow X + Y$ where '**X**' **&** '**Y**' are

A) $X=Na[Al(OH)_4]$ $Y=H_2$ B) $X=Na[Al(OH)_3]$, $Y=H_2$

C) $X=Al_2H_6$, $Y=Na_2O$ D) $X=Al_2O_3$, $Y=NaH$

25) As we go down the group, the solubility of alkaline earth metal carbonates in water

A) decrease

B) increases

C) decreases upto 'Mg' after that increases

D) increases upto 'Mg' after that decreases.

26) Which of the following species is amphoteric in nature

A) H_3O^+ B) Cl^- C) HSO_4^- D) CO_3^{-2}

27) The solubility of A_2B_3 is '**X**' mole/L .The solubility product is

A) $108\,X^5$ B) $72\,X^5$ C) $8\,X^5$ D) $9\,X^5$

28) In which of the following reaction $K_p \neq K_c$

A) $3A_{(g)}+2B_{(s)} \rightleftharpoons 3C_{(g)}$

B) $A_{(g)}+2B_{(g)} \rightleftharpoons 2C_{(s)}$

C) $2A_{(g)}+2B_{(g)} \rightleftharpoons 4C_{(g)}$

D) $A_{(g)}+B_{(g)} \rightleftharpoons 2C_{(g)}$

29) Given the reaction $A_{(g)}+B_{(g)} \rightleftharpoons C_{(g)} + D_{(g)}$. Find the equilibrium constant for this reaction if the equilibrium concentrations of **A, B, C & D** are 0.5,0.5,0.05 & 0.05 mole/lit respectively.

A) 1 B) 0.1 C) 0.01 D) 0.001

30) For a reaction If $Q_C < K_C$,The reaction will proceed in the direction of

A) products B) reactants C) at equilibrium D) not possible to predict

SECTION –B

Answer any THREE of the following questions **(3×10=30M)**

Note: Answer all parts of a question together at one place

1) **a)** If N_2 gas is bubbled through water at 293K , how many mill moles of N_2 gas would dissolve in 1 liter of water.? Assume that N_2 exerts a partial pressure of 0.987bar.Given that Henry's law constant for N_2 at 293K is 76.48kbar. 5M

b) A solution containing 30 g of non-volatile solute exactly in 90 g of water has a vapor pressure of 2.8 kPa at 298 K. Further, 18 g of water is added to the solution and the new vapor pressure becomes 2.9 kPa at 298K. Calculate:

(i) Molar mass of the solute. (ii) vapor pressure of water at 298 K. 5M

2) **a)** Consider the reaction

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g) : \Delta H = -92.1\ kJ/mole$$

Indicate the direction in which the equilibrium will shift when

i) Temperature is increased

ii) Concentration 'H_2' increased

iii) Helium gas is added at constant pressure

iv) Adding the catalyst

v) Concentration 'NH_3' decreased 5M

b) 2 moles of PCl_5 were introduced into a 2L flask and heated at 600K to attain the equilibrium .PCl5 was found to be 40% dissociated into PCl_3 and Cl_2. Calculate the value of K_c.

$$PCl_{5\,(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$$ 5M

3) **a)** Write a short note on the synthetic resin method for the removal of hardness of water. 5M

b) Discuss the position of hydrogen in the periodic table. 5M

4) **a)** Write a short note on flame coloration of alkaline earth metals and their salts. 5M

b) Write a short note on the differences between lithium and other alkali metals. 5M

5) **a)** Explain the differences in properties of diamond and graphite on the basis of their structure. 5M

b) Write a short note on the oxidation state of Group-13 Elements. 5M

6) **a)** Explain different types of organic reactions with suitable examples. 5M

b) What is resonance effect? Explain positive and negative resonance effect with suitable examples. 5M