Bachelor of Science (B.Sc.) (CBCS Pattern) Second Semester CBCS (New)

USCCHT04 - Chemistry Paper-II (Physical Chemistry)

P. Pages : 2 **GUG/W/18/11575**

Time : Three Hours * 3 6 5 0 * Max. Marks : 50

---

1. a) Find the minimum and maximum value of $x^3 - 12x + 10$. **5**

b) Define solubility and solubility product Give it's relationships. **5**

The solubility of $BaSO_4$ is $2 \cdot 33 \times 10^{-4}\ g/ml$ at 20ºC. Calculate the solubility product of $BaSO_4$ assuming that the salt is completely ionised.

OR

c) Calculate the pH of 0.020M $Ba(OH)_2$ solution. **2½**

d) Write a note on common-ion effect. **2½**

e) The density of vanadium is $5.96\,g\,cm^{-3}$ convert this unit into SI unit. **2½**

f) What do you mean by permutation and combinations. **2½**

2. a) Explain Carnot cycle. Derive the expression for efficiency of Carnot heat engine working between the temperatures T_1 and T_2. **5**

b) State and explain Hess's law of constant heat summation. **5**

Calculate the heat of formation of carbon monoxide from the following data:

i) $C_{(S)} + O_{2(g)} \rightarrow CO_{2(g)}\ \Delta H = -393.kJ \cdot mol^{-1}$

ii) $CO_{(g)} + \frac{1}{2}O_{2(g)} \rightarrow CO_{2(g)}\ \Delta H = -282\,kJmol^{-1}$.

OR

c) Derive Kirchhoff's equation. **2½**

d) State 1st law of themodynamics in various forms. Give its mathematical expression. **2½**

e) Define: **2½**

i) Isolated System ii) State function

iii) Isothermal Process iv) Isobaric Process

v) Work

f) Define intensive and extensive properties. Give one example of each. **2½**

3. a) Write kinetic gas equation. Derive Avogadro's law and Graham's law of diffusion from it. **5**

b) Derive Vander Walls equation of state. **5**

OR

c) Explain with graph the effect of temperature on the distribution of molecular velocities. **2½**

d) At what temperature will molecule of hydrogen have the same R.M.S. Velocity as the molecule of oxygen at 0ºC. **2½**

e) What are the causes of deviations from ideal behavior. **2½**

f) The critical temperature and critical pressure of O_2 are $-118 \cdot 8^{o}C$ and $49 \cdot 7\,atm$ respectively. Calculate Vander Wall's constants. **2½**

($R = 0.0821\ lit \cdot atm \cdot deg^{-1}\ mol^{-1}$).

4. a) Explain drop number method for determination of surface tension. **5**
In a drop number method, the number of drop of ethanol falling through stalagmometer are 714 while that of water are 300 at 25ºC Calculate surface tension of ethanol if that of water is $72 \cdot 75 \times 10^{-3}\ N/m$.

(Given- Density of water = $0 \cdot 9980 \times 10^{3} kg\, m^{-3}$ & Density of ethanol = $0 \cdot 7894 \times 10^{3} kg\ m^{-3}$).

b) What do you understand by crystallography. **5**
Explain:
i) Law of constancy of interfacial angles.
ii) Law of rationality of indices.

OR

c) Derive Bragg's equation. **2½**

d) What is coefficient of viscosity? Explain the effect of temperature on viscosity. **2½**

e) Why is the Bragg's method unable to show that kcl has F.C.C. crystal structure like Nacl. **2½**

d) A crystal plane cuts the x-axis & y-axis at unit distance and it is parallel to z-axis what are it's Miller Indices? **2½**

5. Attempt **any ten.** **10**

i) What is Buffer solution.

ii) Find the slope of line whose x and y intercepts are 3 and -9 respectively.

iii) State ostwald dilution law.

iv) Define Inversion Temperature.

v) What are standard state conditions.

vi) Define collision diameter and collision number.

vii) What is heat of reaction. Give the relation between heat of reaction at constant pressure and constant volume.

viii) State law of corresponding state.

ix) Define compressibility factor.

x) Give the relation between surface tension and Parachor.

xi) Draw unit cell of CsCl

xii) Identify the crystal system
Relative axis length - $a \neq b \neq c$
Interfacial angles - $\alpha \neq \beta \neq c \neq 90^{o}$.

****