B.Sc.- I (CBCS Pattern) Sem-II

USCCHT04 - Chemistry (Paper-II) : Physical Chemistry

P. Pages : 2 **GUG/W/22/11575**

Time : Three Hours * 0 5 2 7 * Max. Marks : 50

Notes : 1. All questions carry equal marks.
2. Calculator are allowed.

1. a) Find maxima and minima values of $x^3 - 12x + 10$. **5**

b) Solve the equation $3^{(2x+7)} = 7^{(3x+2)} \cdot 2^{(x+1)}$. **5**

OR

c) Define degree of ionization. Explain the factor affecting. **2½**

d) Derive the expression for hydrolysis constant for the salt of strong acid and weak base. **2½**

e) What is buffer solution? Explains mechanism of acidic buffer action. **2½**

f) Calculate the pH of $0.020\text{M}\,Ba(OH)_2$ solution. **2½**

2. a) Explain Carnot cycle and derive the expression for efficiency of Carnot heat engine. **5**

b) State and explain Hess's Law. **5**
The heat of combustion of gaseous methan at constant volume is -885.4KJ mol^{-1} at 298K. Calculate the enthalpy change.

OR

c) Show that Joule Thomson expansion is an isenthalpic process. **2½**

d) State and explain intensive and extensive properties. Give an examples of each. **2½**

e) The maximum work done by 1 mole of gas at 27º is 5.27 KJ. Calculate initial volume of gas if final volume of gas is 10 lit. $\left(R = 8.314\text{JK mol}^{-1}\right)$ **2½**

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

3. a) What are the postulates of kinetic theory of gases? Deduce Avogadro's law from kinetic gas equation. **5**

b) State Maxwell distribution law of molecular velocities. Explain the effect of temperature on molecular velocities. **5**
Calculate root mean square velocity of SO_2 gas molecule at 427ºC $\left(R = 8.314\text{JK}^{-1}\text{ mol}^{-1}\right)$

OR

c) What are the causes of deviation from ideal behaviour? **2½**

d) Show that the excluded volume of gas is four times the actual volume of the gas. **2½**

e) The critical temperature and critical pressure of chlorine are 146ºC and 93.5 atm respectively. Calculate the values of the Van-der Waal's constant 'a' and 'b'. **2½**

f) State the law of corresponding states and deduce the equation. **2½**

4. a) Explain : **5**
i) Law of constancy of interfacial angle.
ii) Law of rationality of indices.

b) Derive Bragg's equation. Describe the powder method for the determination of structure of solid crystals. **5**

OR

c) Describe the drop number method for the determination of surface tension. **2½**

d) The flow time of water in an Ostwald Viscometer is 59.2 sec at 25ºC. If same volume of another liquid having density $0.867\,gm\,cm^{-3}$ take 46.2 sec. Calculate the absolute viscosity of that liquid. Given that the viscosity of water is 0.00895 poise and density of water $1.0\,gm\,cm^{-3}$. **2½**

e) Define : **2½**
i) Intrinsic viscosity
ii) Parachor value
Explain the effect of temperature on viscosity.

f) Define : **2½**
i) Plane of symmetry
ii) Axis of symmetry
State total number of symmetries of cubic lattice can have.

5. Solve **any ten.** **10**
i) Calculate the slope of line passing through the point (1,2) and (3, -4)
ii) Find the derivative of $\sin(4x+5)$ w.r.t. x .
iii) What is common ion effect?
iv) Define –
  a) Isothermal process
  b) Adiabatic process
v) State any two statement of 1st law of thermodynamic.
vi) Define bond dissociation energy.
vii) Define :
  i) Mean free path
  ii) Collision diameter
viii) What is compressibility factor.
ix) Write Van der Waal's equation for 'n' mole gas.
x) Define coefficient of viscosity and give its C.G.S. unit.
xi) Define :
  a) Unit cell
  b) Space lattice
xii) A face make intercepts 2a and 3b on the x-axes and y-axes respectively and does not cut z-axis at all. Calculate Miller indices of this face.

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