

B.Sc. (Part-I) (C.B.C.S. Pattern) Sem-II  
**USCCHT04 - Chemistry Paper-II (Physical Chemistry)**

P. Pages : 2

GUG/W/19/11575

Time : Three Hours



Max. Marks : 50

- Notes : 1. All questions are compulsory and carry equal marks.  
2. Draw diagram whenever necessary.

1. a) Find maxima and minima point of the function  $f(x) = x^3 - 12x + 3$ . Also find maxima and minima values. 5
- b) What is hydrolysis? Define hydrolysis constant? Derive the relation between hydrolysis constant and degree of hydrolysis for the salt of strong acid and weak base. 5
- OR**
- c) Calculate the value of  $\left[ \frac{0.188 \times 172 \times 75}{0.064 \times 98} \right]^{1/2}$  by using log table. 2½
- d) Find the equation of line passing through the point (3,6) and (-5,9) and also Y intercept. 2½
- e) The solubility of  $\text{BaSO}_4$  is  $2.33 \times 10^{-4}$  gm/ml at  $20^\circ\text{C}$ . Calculate solubility product of  $\text{BaSO}_4$  assuming that the salt is completely ionised. 2½
- f) What are the different factors affecting the degree of dissociation. 2½
2. a) Derive an expression for efficiency of carnot cycle working between the temperature  $T_1$  &  $T_2$ . 5
- b) Explain Hess's Law of constant heat of summation. 5  
Calculate the heat reaction  
 $\text{C}_2\text{H}_4(\text{g}) + \text{H}_2(\text{g}) \rightarrow \text{C}_2\text{H}_6(\text{g})$  at  $25^\circ\text{C}$ . if the heat of combustion of ethylene, hydrogen and ethane are  $-338.0$ ,  $-70.4$  and  $380.0$  Kcal respectively at  $25^\circ\text{C}$ .
- OR**
- c) Explain intensive and extensive property with suitable example. 2½
- d) State and explain path function and state function with one example each. 2½
- e) Define molar heat capacity? Derive the relation between heat capacity at constant volume and constant pressure. 2½
- f) Derive Kirchhoff's equation showing effect of temperature on heat of reaction. 2½
3. a) Derive Kinetic gas equation  $PV = \frac{1}{3} m n \mu^2$  for an ideal gas where  $\mu$  is root mean square velocity. 5

- b) Describe the critical phenomenon with suitable example. Explain isotherms on the basis of Van der Waals equation. 5

**OR**

- c) Calculate average velocity and RMS velocity of ethane molecule of 27°C (R = 8.314 JK<sup>-1</sup>mol<sup>-1</sup>) 2½
- d) Explain the effect of temperature on molecular velocities. 2½
- e) What are the different causes of deviation from ideal behaviour. 2½
- f) Derive the relationship between critical constant and Van der Waals constant. 2½

4. a) Define surface tension. Describe drop number method for determination of surface tension. 5

- b) Derive Bragg's equation. 5  
When X-ray of a specific wavelength were used to study a crystal, the 1<sup>st</sup> order reflection obtained at 10° from 111 plane. Calculate the angle at which 2<sup>nd</sup> order reflection will be obtained from the same crystal using same wavelength from the same plane.

**OR**

- c) The flow time of water in an Ostwald viscometer is 60 sec at 25°C. If the same volume of another liquid having density 0.867 gcm<sup>-3</sup> takes 48 sec. Calculate absolute viscosity of that liquid. Given viscosity of water is 0.00895 poise density of water is 1.0 gmcm<sup>-3</sup> 2½
- d) What is Parachor value? Explain its application in structure determination. 2½
- e) Describe powder method for the determination of structure of crystal. 2½
- f) State and explain Law of symmetry. 2½

5. Attempt **any ten**. 10

- i) What is common ion effect?
- ii) Differentiate  $4x^3 + 7x^2 - 7x + 10$  w.r.to x.
- iii) Evaluate a)  ${}^{20}P_5$       b)  ${}^{30}C_6$
- iv) Define isolated system and Isothermal process.
- v) State any two statement of 1<sup>st</sup> law of thermodynamics.
- vi) Define bond dissociation energy.
- vii) State Avogadro's law.
- viii) Define Most probable velocity.
- ix) Define Critical temperature.
- x) Define Coefficient of viscosity and give its SI units.
- xi) State the law of constancy of interfacial angle.
- xii) Calculate Miller indices of crystal plane whose Weiss indices are  $\frac{2}{3}, 2, \frac{1}{3}$ .

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