

Bachelor of Science (B.Sc.) Semester—II
(C.B.S.) Examination
CHEMISTRY
(Physical Chemistry)
Compulsory Paper—II (CH-202)

Time—Three Hours]

[Maximum Marks—50

N.B. :— (1) All **FIVE** questions are compulsory and carry equal marks.

(2) Draw diagrams and give chemical equations whenever necessary.

1. (A) Derive an expression for the work of expansion,

$$W_{\max} = -2.303 \, nRT \log \frac{P_1}{P_2}.$$

Calculate the work performed when 10.5×10^{-3} kg of oxygen expands isothermally and reversibly from $10 \, \text{dm}^3$ to $21 \, \text{dm}^3$ at 27°C .

5

(B) Define Heat of reaction. Derive the relationship between heat of reaction at constant volume and at constant pressure.

5

OR

1. (C) Explain intensive and extensive properties.

2½

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1

(Contd.)

(D) Define :

(i) Adiabatic process and

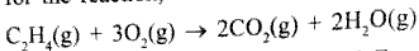
2½

(ii) Irreversible process.

(E) State and explain Hess's law of constant heat of summation.

2½

(F) Define bond dissociation energy. Calculate ΔH for the reaction,



(Given : B.E. of C-H = 414 kJ, B.E. of O=O = 499 kJ, B.E. of C=O = 724 kJ, B.E. of O-H = 460 kJ and B.E. of C-C = 619 kJ)

2½

2. (A) State phase rule and explain the terms involved in it.

5

(B) State and explain Raoult's law of ideal solutions. What are the partial pressures in a solution of benzene and toluene, if vapour pressures in pure state of benzene and toluene are 51.3×10^3 P.a. and 18.5×10^3 P.a. respectively at 60°C . Mole fraction of benzene in a solution is 0.3.

5

OR

2. (C) Discuss Pattinson's process of desilverization of lead.

2½

(D) Draw well labelled diagram of sulphur system.

2½

(E) Discuss Nicotine-Water system.

2½

(F) State and explain Nernst distribution law.

2½

3. (A) Define equivalent conductance. How can it be determined experimentally? What is the effect of dilution on specific and equivalent conductance? 5
- (B) Define transport number. Explain Hittorf's method for determination of transport number. 5

OR

3. (C) State and explain Kohlrausch's law. 2½
- (D) Write a note on 'Electrophoretic effect'. 2½
- (E) Discuss conductometric titration of weak acid with strong base. 2½
- (F) A cell consisting of electrodes 2.2×10^{-2} m apart having an area of cross section 3.8×10^{-4} m offered a resistance of 45 ohms when filled with 0.5 N solution of an electrolyte. Calculate cell constant, specific conductance and equivalent conductance. 2½
4. (A) Derive the equation of rate constant for first order reactions. A first order reaction is 20% completed in 10 minutes. Calculate the rate constant of the reaction. 5
- (B) Describe Lindemann's theory of unimolecular reactions. 5

OR

4. (C) Define rate of reaction. Write various factors affecting on the rate of reaction. 2½

(D) Describe the Ostwald's isolation method for the determination of order of reaction. $2\frac{1}{2}$

(E) Calculate the activation energy for the decomposition of N_2O_5 whose rate constants at 300 K and 340 K are $2.2 \times 10^{-5} \text{ s}^{-1}$ and $5.5 \times 10^{-3} \text{ s}^{-1}$ respectively. $2\frac{1}{2}$

(F) Explain Pseudounimolecular reactions with suitable examples. $2\frac{1}{2}$

5. Attempt any TEN questions out of the following :—

(i) Define Isolated system.

(ii) State Joule-Thomson effect.

(iii) Define State functions.

(iv) What are azeotropes ?

(v) State Henry's law.

(vi) Write reduced phase rule equation.

(vii) Give any two limitations of Arrhenius theory.

(viii) Write Debye-Huckel-Onsagar equation.

(ix) Write an equation for solubility product of AB_2 type electrolyte.

(x) Write rate equation for second order reactions in which initial concentrations of the two reactants are different.

(xi) Define zero order reaction.

(xii) Mention two limitations of Collision theory.

$1 \times 10 = 10$