

Ex/SC/CHEM/UG/CORE/TH/13/2025

B.Sc. CHEMISTRY EXAMINATION, 2025

(5th Semester)

CHEMISTRY (CORE)

PAPER : CORE 13

Time : Two Hours

Full Marks : 40

(20 marks for each Unit)

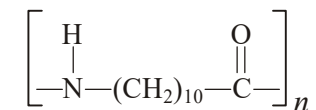
Use a separate Answer Script for each Unit.

The figures in the margin indicate full marks.

UNIT—5131-P

1. Answer *all* questions :

(a) Nylon 11 has the following structure :



If the number-average degree of polymerization for nylon is 100 and weight-average degree of polymerization is 120,000; what is its polydispersity? 2

(b) Briefly describe about a cross-linked polymer with an example and application. 2

(c) What is diene polymerization? State this with example. 2

CHEM-953

[Turn Over]

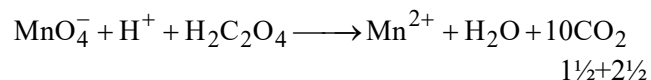
(2)

- (d) Nanoparticles have unique chemical and physical properties as compared to their solid bulk materials — justify. 2
- (e) Discuss about the process of synthesis of Au@Ag nanoparticles. 2
- (f) Instead of employing the term ‘colloidal substances’ it is the practice to refer to the ‘colloidal system’ — justify the statement. 2
- (g) What happens during endosmosis? What is the streaming potential of a colloid? 2
- (h) Write down Gibbs adsorption isotherm for surface excess. 2
- (i) Does adsorption increase with temperature? 2
- (j) Write down Langmuir adsorption isotherm mentioning each term. 2

UNIT—5132-P

2. Answer *all* questions :

- (a) Determine the electrochemical conditions for the thermodynamic equilibrium between the metal and solution phases. What will be the expression of the Nernst potential for the following electrochemical processes under electrochemical and chemical equilibria?



(3)

- (b) Explain why addition of an excess quantity of saturated KCl solution significantly reduces the electrode potential for $\text{Ag}^+(\text{aq}, 0.1 \text{ M})/\text{Ag}$ electrode. Do you expect larger potential variation if one replaces KCl by KI solution? 2+1
- (c) Construct the following half-cell electrodes :
- (i) Reversible with Ca^{2+} ions
- (ii) For experimental determination of dissociation constant of a weak acid
- Write the cell reaction and *emf* expression for the electrochemical cell shown below :
- $\text{Ag}/\text{AgCl}/\text{HCl}(\text{aq}, a_1)/\text{HCl}(\text{aq}, a_2)/\text{AgCl}/\text{Ag}$
(1½+1)+2½
- (d) Define an electrolyte’s decomposition potential. Why the decomposition potential of dilute HNO_3 solution is lower than that of dilute HCl? Discuss briefly why hydrogen overvoltage is important for electrolytic separation of metal. Explain the basic principle for extracting sodium from aqueous solution of NaCl using the Castner cell. 1+1+1½+2
- (e) The standard cell potential of $\text{Pt}/\text{H}_2(\text{g})/\text{HCl}(\text{aq})/\text{Hg}_2\text{Cl}_2(\text{s})/\text{Hg}(\text{l})/\text{Pt}$ was found to be +0.2699 at 293 K and +0.2669 at 303 K. Evaluate standard reaction Gibbs function, enthalpy and entropy at 298 K. 2½

