

**BACHELOR OF SCIENCE (CBCS-2018 COURSE)**  
**T. Y. B. Sc. Sem-V : WINTER- 2022**  
**SUBJECT : CHEMISTRY : PHYSICAL CHEMISTRY-I**

Day : Wednesday

Time : 02:00 PM-05:00 PM

Date : 7/12/2022

**W-18414-2022**

Max. Marks : 60

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**N.B.**

- 1) All questions are **COMPULSORY**.
  - 2) Figures to the **RIGHT** indicate **FULL** marks.
  - 3) Use of log table / scientific **CALCULATOR** is allowed.
  - 4) Draw neat diagrams **WHEREVER** necessary.
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**Q.1** Attempt **ANY TWO** of the following : (12)

- a) Define the term absorption. Distinguish between physical and chemical adsorptions.
- b) Give the definitions of transmittance, opacity and optical density.
- c) Obtain the expression for Nerust's equation for electrode potential.

**Q.2** Attempt **ANY TWO** of the following : (12)

- a) What is the principle of colorimetry? Give applications of Beer's law.
- b) What are the assumptions of Langmuir's theory?
- c) Write BET equation and state meanings of the terms involved in it.

**Q.3** Attempt **ANY TWO** of the following : (12)

- a) How the surface area of adsorbent is determined by using BET equation?
- b) Explain metal-metal ion electrode with suitable examples.
- c) What do you understand by reversible and irreversible cells?

**Q.4** Attempt **ANY THREE** of the following : (12)

- a) Calculate the potential of the cell at 298 K.  
 $\text{Zn}_{(s)} | \text{ZnCl}_2 (a=0.0072) | \text{AgCl}_{(s)} | \text{Ag}$   
Given :  $E^0_{\text{Zn}} = -0.761 \text{ V}$  and  $E^0_{\text{Ag-AgCl}} = 0.222 \text{ V}$ .
- b) A solution of  $\text{KMnO}_4$  shows 0.8 absorbance at wavelength 540 nm. Express the measurements in terms of transmittance unit.
- c) When a solution of concentration  $1 \times 10^{-2} \text{ M}$  is placed in a cell of path length 4 cm shows an absorbance of 0.5. What will be the absorbance of solution, if it is placed in a cell of path length of 1 cm. ?
- d) A cell consisting of hydrogen electrode at 1 bar pressure and normal calomel electrode connected by a normal KCl bridge has a potential of 0.602 V at 298 K. calculate the pH of the solution.  
Given : i) Std. Reduction potential of normal calomel electrode = 0.28 V.

ii)  $\frac{2.303RT}{F} = 0.0591$

**Q.5** Attempt **ANY FOUR** of the following : (12)

- a) What are the advantages of colorimetry?
- b) Define the terms adsorbent and adsorbate.
- c) What is photoelectric effect? What are its characteristics?
- d) Explain in brief theory of Colorimetry.
- e) What is Heisenberg's equation? What are the applications of uncertainty principle?
- f) How will you determine equilibrium constant from cell emf?

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