

**BACHELOR OF SCIENCE (CBCS - 2016 COURSE)**  
**T. Y. B Sc. Sem-V : WINTER :- 2021**  
**SUBJECT: CHEMISTRY : PHYSICAL CHEMISTRY-I**

Day : Wednesday  
Date 19-01-2022

W-14939-2021

Time : 02:00 PM-05:00 PM  
Max. Marks: 60

**N.B.:**

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Neat diagram must be drawn **WHEREVER** necessary.
- 4) Use of **log table- scientific calculator** is allowed.

**Q.1** Attempt any **TWO** of the following: **(12)**

- a) Explain electrochemical cell with a suitable example.
- b) What is an adsorption isotherm? Obtain the equation for Langmuir adsorption isotherm.
- c) State and explain the Beer's law.

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

- a) What is adsorption? Distinguish between physical adsorption and chemical adsorption.
- b) Discuss in detail metal –insoluble salt electrode.
- c) Give the assumptions of Langmuir theory.

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

- a) Derive Nernst's equation for emf of the cell.
- b) Describe determination of surface area of adsorbents by using BET equation.
- c) Distinguish between colour comparator and photoelectric colorimeter.

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

- a) The absorption spectrum for titanium peroxide complex ion in perchloric acid showed a maximum of 4000 Å. Express the measurement in millimicro, nanomicro, centimeter and wave number units.
- b) Calculate emf of the following cell at 298 K  
 $Pt | Cl_2(g, 0.5 atm) | HCl(aq) | Cl_2(g, 3 atm) | Pt$
- c) Calculate the potential of the following electrode at 298 K.  
 $Zn_{(s)} | ZnCl_2(a=0.0072) | AgCl_{(s)} | Ag$   
Given :  $E_{Zn}^0 = -0.761 V$  and  $E_{Ag-AgCl}^0 = 0.222 V$
- d) When a solution of concentration  $1 \times 10^{-2} M$  is placed in a cell of path length 4 cm shows an absorbance of 0.5. What will be the absorbance of the solution, if it is placed in a cell of path length of 1 cm.

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

- a) Write the conventions used to represent a cell.
- b) Give a brief account of determination of pH of the solution from emf measurement.
- c) What is Heisenberg's equation? What are the applications of uncertainty principle?
- d) Elaborate on the black body radiation.
- e) What are the characteristics of the photoelectric effect?
- f) Give applications of the quantum theory.

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