

M.Sc. 3rd Semester Practical Examination, 2021

CHEMISTRY

Course Title: Physical Chemistry Practical

Course Code: CHEM 306C(PR)

Course ID: 31466

Time: 2 Hours

Full Marks: 40

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Answer *any four* of the following questions: 10×4 = 40
- a) What are acid-base indicators? What is the mechanism behind color change of an indicator? Define indicator constant. 'For strong acid-weak base titration methyl orange is suitable; whereas for weak acid-strong base phenolphthalein is suitable'. – Explain. 2+2+3+2 = 10
- b) Establish the relation between degree of dissociation and dissociation constant of a weak acid. Elaborate Ostwald's dilution law from this expression. How can you determine the degree of dissociation of a weak electrolyte experimentally? How does the degree of dissociation vary with temperature? 3+2+3+2 = 10
- c) Write down the advantages of calomel electrode. Why are KCl and NH₄NO₃ used in salt bridge? What do you mean by standard and formal potentials? For the cell H₂ | HCl | AgCl, Ag; E° = 0.222 V. If the measured emf is 0.385 V, what is the pH of HCl solution? [P(H₂) = 1 atm] 2+2+2+4 = 10

d) Distinguish between order and molecularity. What is pseudo-first order reaction? Why is rate constant of hydrolysis of ester dependent on catalyst concentration? How does rate constant vary with temperature? 2+2+2+4 = 10

e) Define quantum efficiency and one Einstein of light. An aqueous solution of a compound A of concentration 10^{-3} mol./L absorbs 50% of incident radiation in a cell of length 1 cm and another compound B of concentration 2×10^{-3} mol./L absorbs 60% of the incident radiation at a particular wavelength. Calculate the percentage absorbed by a solution containing 10^{-3} mol./L of A and B each in the same cell at the same wavelength. 2+2+6 = 10

f) Define specific and equivalent conductance. How do they change with dilution? Predict the shape of titration curves during conductometric titration of (i) NH_4Cl vs. NaOH (ii) CH_3COONa vs. HCl (iii) BaCl_2 vs. H_2SO_4 1+1+2+6 = 10
