UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 3rd Semester Examination, 2021

GE2-P1-CHEMISTRY

Time Allotted: 2 Hours   Full Marks: 40

The figures in the margin indicate full marks.
All symbols are of usual significance.

Use separate answer scripts for SECTION-A (Physical) and SECTION-B (Organic)

SECTION-A

PHYSICAL CHEMISTRY

GROUP-A

1. Answer any ***two*** questions from the following: $1 \times 2 = 2$

    (a) The molar conductance of an electrolyte increases when

       (i) dilution increases   (ii) temperature decreases

       (iii) dilution decreases   (iv) both temperature and dilution decreases

    (b) $CaCO_3$ (s) $\rightleftharpoons$ CaO (s) + CO_2 (g). Number of phases of the system is

       (i) 1   (ii) 3   (iii) 2   (iv) 0

    (c) Example of a minimum boiling azeotrope is

       (i) Ethanol-Chloroform   (ii) HCl and Water

       (iii) Acetone-Chloroform   (iv) None of these

GROUP-B

2. Answer any ***two*** questions from the following: $5 \times 2 = 10$

    (a) (i) The colour of $AgNO_3$ solution turns blue when a copper wire is dissolved into   2+2+1
             it. — Why?

        (ii) Determine the standard Gibbs free energy of the given Galvanic cell

             $Mg \mid Mg^{2+}(aq) \parallel Ag^+(aq) \mid Ag$

        (iii) Represent the Daniel cell symbolically.

    (b) (i) At what temperature water boils at a place having atmospheric pressure   4+1
             740 mm of Hg. [latent heat of vaporization of water = 537 cal/g]

        (ii) What is the critical temperature of CO_2?

(c) (i) Explain maximum boiling azeotrope with example. 2+3

(ii) State Raoult's law for the solution containing volatile components. Write two differences between an ideal solution and non-ideal solution.

GROUP-C

3. Answer any *one* question from the following: 10×1 =10

(a) (i) Specific conductance does not depend on cell-constant. — Why? 3+3+2+2

(ii) The specific conductivity of a weak acid of 0.02 (N) is 3.13×10^{-4} mho.cm^{-1}. What is the equivalent conductivity at infinite dilution of that solution if its degree of dissociation is 0.045?

(iii) Among CH_3COOH and NaOH, which one will have greater Λ° value and why?

(iv) State Kohlrausch's Law.

(b) (i) Write down the differences between electrochemical cell and electrolytic cell. 2+4+2+2

(ii) Write a short note on Calomel electrode.

(iii) Write down the uses of salt bridge.

(iv) Calculate the EMF of the cell at 25°C

$$\text{Cu , } CuSO_4 \ (C_1 = 0.01\text{N}) \ // \ CuSO_4 \ (C_2 = 0.10\text{N}), \ \text{Cu}$$

SECTION-B
ORGANIC
GROUP-A

1. Answer any *three* questions from the following: 1×3 = 3

(a) Draw the cyclic structure (Haworth) of D-Glucose.

(b) What is pKa value?

(c) Draw the structure of Phenylthiohydantoin derivative of Phenylalanine.

(d) What reagents are used in Hinsberg's method for separation of amines?

GROUP-B

2. Answer any *one* question from the following: 5×1 = 5

(a) (i) Between 4-nitrobenzoic acid and 4-aminobenzoic acid which one is stronger and why? 2+3

(ii) Write a note on HVZ reaction.

(b) (i) Between Sucrose and Maltose which one reduces Tollen's Reagent and why? What is the composition of Tollen's reagent? (2+1)+ (1+1)

(ii) Name a test by which you can detect amino acids. Give structure of the reagent involved.
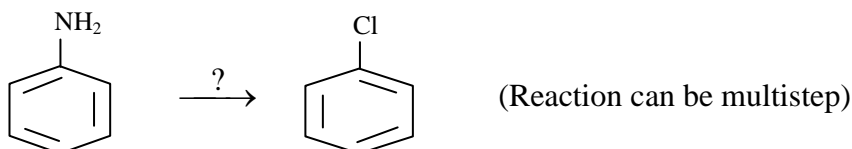
GROUP-C

3. Answer any *one* question from the following: $10\times1 =10$

  (a) (i) How many pKa values do you expect for Maleic acid and Fumaric acid? In which manner these pKa values differ? Justify the variation. $(1+1+2)+$ $2+2+2$

    (ii) Identify A and B:
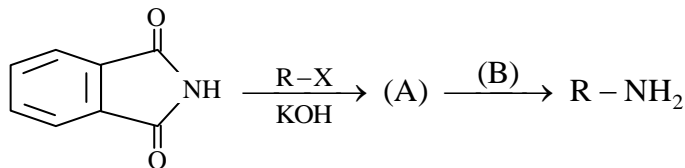
    (iii) How do you perform following conversion?

(Reaction can be multistep)

    (iv) What happens when an aqueous solution of Glycine is heated with copper oxide? Write the requisite equation of the above reaction.

  (b) (i) What is N-terminal of protein? Discuss any method for determining the N-terminal of protein / peptide. $(1+1+2)+$ $1+3+2$

    (ii) Why tertiary amine are not synthesized by the Gabriel Phthalimide method?

    (iii) Discuss with an example for each Hofmann and Saytzeff elimination.

    (iv) Dipole moment of alamine is usually higher in comparison to 2-amino propane. — Explain.

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