[This question paper contains 4 printed pages.]

4408 *Your Roll No.* .....

Subsidiary for B.Sc. Honours/II **AS**

Paper IV – CHEMISTRY

Organic and Physical Chemistry

Time : 3 Hours *Maximum Marks : 50*

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt Section **A** *and Section* **B** *on separate answer sheets.*

SECTION A

(Organic Chemistry)

(Marks : 33)

Attempt any **Four** *questions.*
Question No. **1** *carries* **nine** *marks.*

SECTION B

(Physical Chemistry)

(Marks : 17)

Answr any **Two** *questions.*

P.T.O.

SECTION A

Answer any **four** *questions.*

1. An aromatic compound A(C_6H_6O) on distillation with zinc dust gives compound B. B on being heated with conc. HNO_3 and conc. H_2SO_4 at 60°C gives compound C($C_6H_5O_2N$). C reacts with Br_2 to give D($C_6H_4O_2NBr$). D is reduced with H_2/Pt to E(C_6H_6NBr) which reacts with $NaNO_2$/HCl below 5°C to give a product which on treatment with acid gives compound F(C_6H_5OBr). Identify A to F. (9)

2. (a) A freshly prepared aqueous solution of glucose has a specific rotation of +112.5°. On standing at room temperature the rotation gradually changes to +52.5° and no further, explain.

   (b) Write a reaction which established the presence of five hydroxyl groups in the open chain structure of glucose.

   (c) How are carbohydrates classified ? (4,2,2)

3. How will you convert :

   (a) Aniline into chlorobenzene

   (b) Aniline into p-bromoaniline

   (c) Benzoic acid into Aniline

   (d) m-Dinitrobenzene into m-nitroaniline (2×4)

4. Explain the following reactions with suitable examples :
   (a) Perkin Reaction
   (b) Carbylamine Reaction
   (c) Haloform Reaction
   (d) Hoesch Reaction (2×4)

5. (a) How was the structure of naphthalene determined ?
   (b) Why was Baeyer's Strain Theory inadequate ? How was it modified by Sachse-Mohr ? (4×2)

6. Write short notes on any **two** of the following :
   (a) Aromatic nature of Pyridine
   (b) Ring structure of glucose
   (c) Coupling reaction of Diazonium salts (4×2)

SECTION B

Attempt any **two** *questions.*

1. (a) Show that
   $\Delta H = \Delta U + \Delta n_g RT$ (2)
   (b) The heat of the reaction
   $$C(\text{graphite}) + \frac{1}{2}O_2(g) \rightarrow CO(g)$$
   at 25°C and 1 atn pressure is –110.5 kJ. What is the value of heat of reaction at constant volume ? ($R = 8.314\ J\ mol^{-1}\ K^{-1}$). (4)

P.T.O.

(c) Write a short note on photoelectric cell. (2½)

2. (a) What is a galvanic cell ? How does it differ from an electrolytic cell ? (2½)

(b) Describe a glass electrode. How can it be used for determining the pH of a solution ? (3)

(c) A certain photochemical reaction requires an activation energy of 126 kJ mol^{-1}. To what value does this correspond to in the following units :

(i) Wavelength, (ii) wave number, and

(iii) Frequency of light ?

($h = 6.626 \times 10^{-34}$ Js) (3)

3. (a) Explain giving reasons any **three** of the following :

(i) Enthalpy of neutralization of a strong monobasic acid by a strong base is always equal to –57.32 kJ mol^{-1}.

(ii) All the spontaneous processes lead to a state of minimum energy and maximum entropy.

(iii) A gas shows cooling effect in adiabatic expansion.

(iv) Entropy of a substance is maximum in gaseous state. (6)

(b) Write a short note on Hess's law of constant heat summation. (2½)