Fourth Semester Examination, April – 2005

CHEMISTRY – II

Full Marks : 70

Time : 3 Hours

Answer Question No. 1 which is compulsory and any five from the rest.

Answer of all parts of a question must be written at one place only.

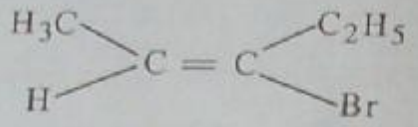
The figures in the right-hand margin indicate marks for the questions.

1. Answer the following questions in brief : 2×10

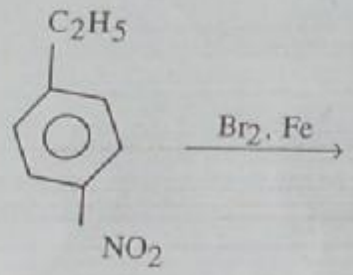
   (a) Draw the Newmann projection for the most stable conformation of n-butane.

P.T.O.

(b) Assign E or Z nomenclature for the following molecule :



(c) Predict the product of the following reaction :

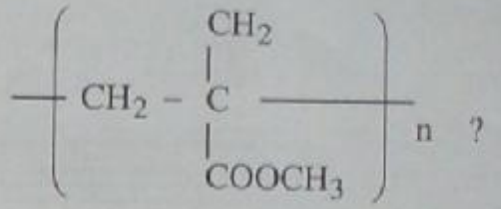


(d) Write equation for the reaction of isobutylene with HBr in presence of benzoyl peroxide.

(e) Write IUPAC name of the complex ion, $[CoCl(NO_2)(en)_2]^+$.

(f) If the oxidation potential of Ni to Ni^{2+} is +0.28V and that of Fe to Fe^{2+} is +0.44V, can Ni be used for cathodic protection of Fe ? Explain.

(g) What is structure and name of the monomer, which on polymerization gives the polymer



(h) What do you mean by a 75 – octane fuel ?

(i) During titration of hard water with EDTA, which type of buffer solution is added and why ?

(j) What do you understand by the term BOD ?

2. (a) Write the structures of all enantiomers and diastereomers of 2–Bromo–3–Chlorobutane.

(b) Draw the Newmann projection of boat conformation of cyclohexane.

(c) Which of the following compounds is not chiral and why ?

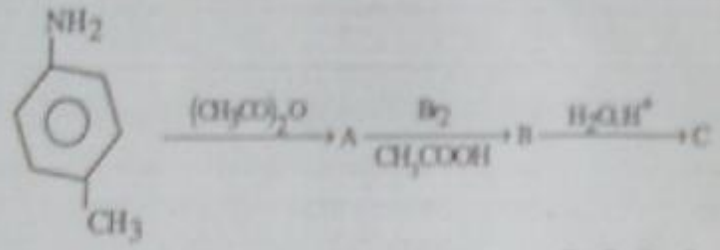
(i) $DCH_2CH_2CH_2Cl$

(ii) CH_3CH_2CHDCl

(iii) CH_3CHDCH_2Cl

(iv) $CH_3CHClCH_2D$

(d) Identify the products A, B, C in the following reaction :



3+2+2+3

3. (a) For the reaction of an alkyl halide with NaOH in a mixture of water and ethanol, compare S_N2 and S_N1 mechanisms with regard to the following :

(i) stereochemistry

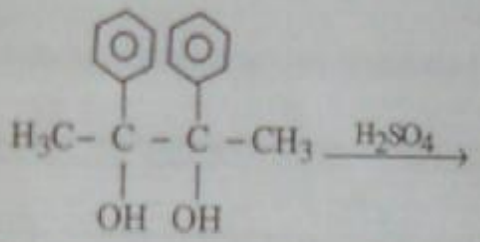
(ii) kinetic order

(iii) relative rates for CH_3X, C_2H_5X, $(CH_3)_2CHX$ and $(CH_3)_3CX$

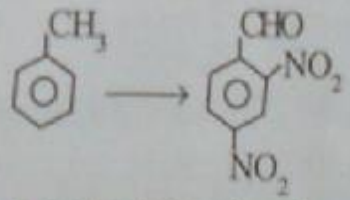
(iv) relative rates for CH_3Cl, CH_3Br, CH_3I

(b) Why the replacement of chlorine of chlorobenzene to give phenol requires drastic conditions, but the chlorine of 2, 4 – dinitrochlorobenzene is readily replaced ?

(c) Write the structure and name of the product of the following reaction and show the mechanism :



(d) Convert the following showing equations for all steps and reagents used :



(e) Account for the following observation :

When p–iodotoluene is treated with aqueous NaOH at 340°C, there is obtained a mixture of

p–cresol (51%) and m–cresol (49%). At 250°C, the reaction is, of course, slower and yields only p-cresol. 2×5

4. (a) Draw figure to show splitting of degenerate d–orbitals in an octahedral crystal field.

(b) On the basis of crystal field theory explain why the magnetic moments of $[Fe(H_2O)_6]^{3+}$ is 5.92 B.M. and that of $[Fe(CN)_6]^{3-}$ is 1.73 B.M.

(c) Draw the structures of all possible isomers of dichlorobis (ethylene diamine) chromium (III) ion.

(d) Show by equation formation of isotactic polypropylene from propylene by use of Ziegler-Natta catalyst. 2+3+3+2

5. (a) State Pilling-Bedworth rule.

(b) What is Galvanic corrosion ?

(c) How are underground pipelines protected from soil corrosion ?

(d) Why does iron corrode faster than alluminium, even though the oxidation potential of iron is lower than alluminium ?

(e) Predict the product of the following reaction and give the mechanism :

$$CH_3CH_2CONH_2 \xrightarrow[KOH]{Br_2}$$

2+2+2+2+2

6. (a) Write the mechanism of free-radical polymerization of styrene using benzoyl peroxide as initiator.

(b) What do you mean by thermoplastic and thermosetting resins ? Give examples.

(c) What are the main differences between LDPE and HDPE ?

(d) Write equation for the synthesis of terylene. 3+3+2+2

7. (a) Find the minimum amount of air required for the complete combustion of 10 kg of coal having the following composition by weight : C = 81%, H = 8%, O = 5%, N = 2% and remaining is ash.

Also calculate the higher calorific value and lower calorific value of the coal sample. Given, gross calorific value in Kcal/kg : C = 8,080 and H = 34,500.

(b) What is cracking ? Mention the catalysts used for catalytic cracking.

(c) Explain the term – Cetane number.

(d) What is the reason behind the toxicity of lead ? 4+2+2+2

8. (a) Calculate the quantity of lime of purity 70% and soda of purity 80% required for softening

$H_2 + \frac{1}{2}O_2 \rightarrow H_2O$