Total Pages—8

B.Tech
BSCC 2201

3rd Semester B.Tech Examination, Nov. 2004

CHEMISTRY-II

*Full Marks* : 70

*Time* : 3 hours

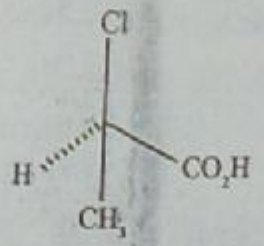
Question paper contains eight questions (Number 1 to 8). Question number 1 is compulsory. Answer any five questions from question number 2 to 8

*The figures in the right-hand margin indicate marks*

1. Answer the following questions : 2 × 10

(*a*) Draw Newman projection of chair conformation of cyclohexane.

(*b*) Assign an R and S absolute configuration to the following molecule :




(Turn Over)

(*c*) Predict the reagent for the following conversion :

$$CH_3CH_2OH \longrightarrow CH_3CH_2Br$$

(*d*) What are the monomers required for the production of Nylon-6 ?

(*e*) Which of the organo-silicon compounds, $MeSiCl_3$, $Me_2SiCl_2$, $Me_3SiCl$, will give three-dimensional silicone on hydrolysis ?

(*f*) Calculate the crystal field stabilization energy (CFSE) for the configuration: $t_{2g}^3\, e_g^2$.

(*g*) Draw the shape of the $d_{xy}$ and $d_{x^2-y^2}$ orbitals.

(*h*) What is octane number ?

(*i*) Copper reacts with ammonia as well as ethylenediamine (en) to produce $[Cu(NH_3)_4]^{2+}$ and $[Cu(en)_2]^{2+}$, respectively. Which of these two is more stable ?

(*j*) What are the products of reaction of $O_3$ with NO in the atmosphere ?

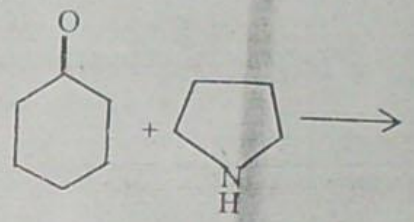




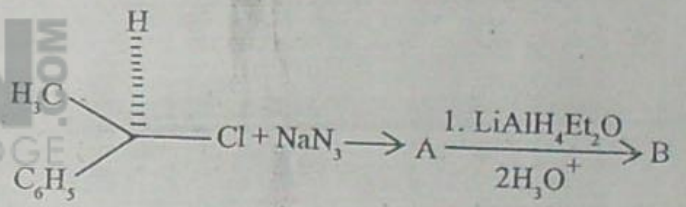
2. Predict the major product of the following reactions :

*a*

(*i*)

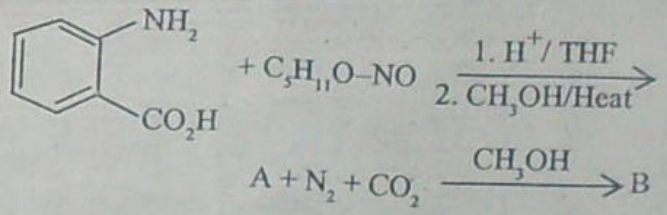


(*ii*)



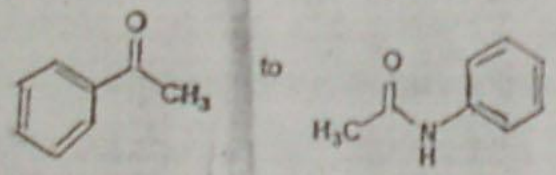

Show the stereochemistry of the products A and B and account for the stereochemistry.

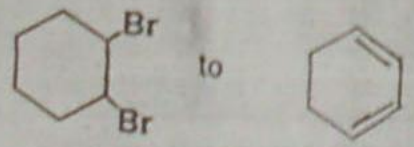
(*iii*)

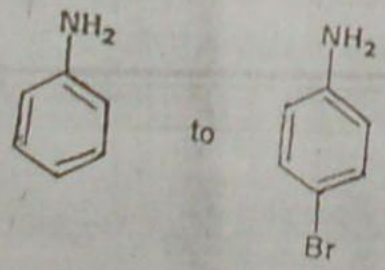


Draw the structure of the intermediate A and the final product B. 2+4+4

3. Suggest suitable methods for the following conversion: 3+2+2+3

(a) 

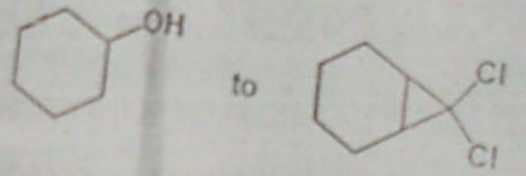
(b) 

(c) 



( Continued )



(d) 

4. (a) Predict the magnetic moment of $K_3[FeF_6]$ and $K_3[Fe(CN)_6]$ and explain the difference, if any, in their magnetic moments.

(b) Compare the crystal field splitting parameter of the pair $[FeF_6]^{3-}$ and $[RuF_6]^{3-}$ and explain your answer.

(c) Draw the catalytic cycle of hydrogenation of alkene using Wilkinson's catalyst.

(d) Write down the mechanism of degradation of Ozone layer by which, chlorofluorcarbon, $CF_3Cl$(CFC).

3+2+3+2

5. (a) Dissolved oxygen in boiler water helps corrosion especially if some $CO_2$ is present in water. Explain the mechanism of the corrosion.



( Turn Over )

(*b*) Determine the temporary hardness of a sample of water, 500 ml of which require 8·4 ml of N/10 $H_2SO_4$ for determination (8·4 ml is the final volume of acid necessary, obtained after deducting the volume of acid necessary in the blank titration.)

(*c*) What is greenhouse effect? Amongst the gases, $CO_2$, $N_2$, $CH_4$, $O_2$, which are the gases responsible for greenhouse effect?

(*d*) In Thermofor Process of catalytic cracking, what is the catalyst used? In the production of aviation gasoline, alkylation of olefin by isobutane is important. What is the catalyst used for this reaction? 3+3+2+2

6. (*a*) $BF_3$ is an initiator for cationic polymerization of isobutene. Explain the mechanism of (*i*) initiation, (*ii*) propagation and (*iii*) termination.

(*b*) Anion exchange resin is a co-polymer of styrene and divenylbenzene containing a $CH_2N^+ (CH_3)_2Cl^-$ group attached to phenyl group. Suggest a method of introduction of $CH_2N^+ (CH_3)_2Cl^-$ group in the parent polymer.





(*c*) Benzoquinone is a typical inhibitor of radical polymerization. How does it act as an inhibitor? 4+3+3

7. (*a*) What is chelate effect? What is the driving force behind this effect? Explain with an example.

(*b*) Draw the d-orbital splitting diagram for a tetrahedral metal complex of the type $[ML_4]$.

(*c*) What is the most commonly used catalyst for heterogeneous, Ziegler-Natta polymerization?

(*d*) Stainless steel is highly resistant to corrosion. What is the reason behind this? 3+2+2+3

8. (*a*) 'CO stabilizes low formal oxidation states of metal.' Explain.

(*b*) For the compound, $[Co(en)_2Cl_2]$, two geometrical isomers are possible, cis and trans. Which of the two isomers will be optically active? Explain with proper diagrams.

(c) What is the reason behind the toxicity of mercury ? 3+4+3