Ex/1CH/IIS/4/2017

FIRST B. SC. EXAMINATION, 2017

(1st Semester)

CHEMISTRY (SUBSIDIARY)

PAPER - IIS

Time : Two hours Full Marks : 50

Use a separate answerscript for each group.

GROUP - A

1. a) Briefly discuss about the 'capillary action'. Give its practical example. 3

   b) Why does oil spread over the surface of water ? 2

   c) A drop of water, 0·4 cm in radius, is split up into 125 tiny drops. Find the increase in surface energy.

   [$\gamma_{water} = 72$ dynes/cm] 2

2. a) A liquid of high density and low viscosity flowing through a tube of wide bore helps motion to be turbulent - explain. 2

   b) What is the SI unit of coefficient of viscosity of a liquid ? 1

   c) In a certain experiment on the flow of liquid through a capillary tube, the following data were obtained :

   Volume of liquid collected per minute = 7·06 c.c. ; Height of the water column = 34·1 cm. ; Length of the tube =

56·45 cm. ; Radius of the tube = 0·0514 cm. ; g = 980 cm/s^2.

Calculate the coefficient of viscosity. 3

3. a) Define Unit Cell of a crystal. 1

b) What is the law of rational intercepts ? Explain. 2

c) For a simple cubic crystal, draw a plane for which Weiss and Miller indices are the same. 1

GROUP - B

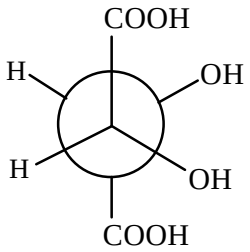
4. a) Draw the conformational energy profile diagram of n-butane arising from the rotation of $C_2 - C_3$ σ -bond and label the conformers. 2

b) Draw the stable conformation of

(i) 1, 2- Dibromo ethane (ii) Ethylene glycol. 1+1

5. a) Designate the chiral center (s) of the following compounds with *R*/*S* notations ***(any two)*** : 1×2

i)



c) State Slater rules when nd and/or nf orbitals are concerned. 3

d) Calculate the effective nuclear charge Z_{eff} of Mg^{2+}. 2

OR

Explain the periodic trend of atomic radii of the atoms in the Periodic Table. 2

e) Why Cation is smaller in radius than the neutral atom from which it has been derived ? 2

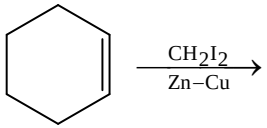
f) Define ionization energy. 2

6. Predict the product(s) of the following reactions with plausible reaction mechanism. ***(any three)*** $1\frac{1}{2}\times3$

a) $(CH_3)_2C=CHCH_3 \xrightarrow[2.\ Na\ BH_4]{1.\ Hg(OCOCH_3)_2+H_2O}$

b) $2-$Butyl acetate $\xrightarrow[150^oC]{\Delta}$

c) $CH_3-CH=CH_2 \xrightarrow{NOCl}$

d)  $\xrightarrow[Zn-Cu]{CH_2I_2}$

e) $3CH_3-C\equiv CH \xrightarrow[ii)\ H_2O_2/\bar{O}H]{i)\ B_2H_6}$

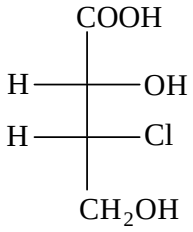
7. a) What is Zeigler-Natta Catalyst ? Mention its application. $1+\frac{1}{2}$

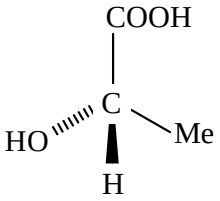
b) What is biodegradable polymer ? Give an example. $\frac{1}{2}+\frac{1}{2}$

GROUP - C

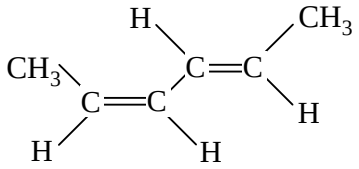
8. a) What are the differences between Electron Affinity and Electronegativity. How does electronegativity difference govern the ionicity of bonds ? 3+2

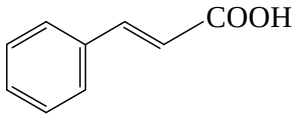
b) The covalent radius of C is 77 pm and the C - N bond distance is 147 pm in CH_3-NH_2. Calculate the atomic radius of nitrogen. 2

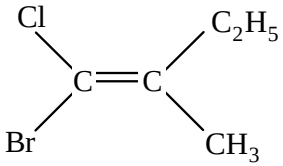
ii) 

iii) 

b) Determine *E*/*Z* configuration of the following compounds. ***(any two)*** 1×2

i) 

ii) 

iii) 

c) What is axial chirality ? Give an example. 1+1