Printed Pages : 12 EAS-202

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 9612 Roll No. | | | | | | | | | |

B. Tech.

(Second Semester) Theory Examination, 2010-11

ENGINEERING CHEMISTRY

Time : 3 Hours] *[Total Marks : 100*

Note : Attempt *all* questions.

Section-A

1. Choose / Fill correct answers : 1×20=20

(i) The electrons delocalized over the whole sheet in graphite are :

(a) σ

(b) π

(c) n

(d) None of these.

(ii) The liquid crystal used in thermography :

(a) Smectic

(b) Nematic

(c) Cholesteric

(d) None of these.

(iii) Reaction rate can change with :

(a) Temperature

(b) Catalyst

(c) Reactant concentration

(d) All of these.

(iv) In phase diagram of water system incorrect system is :

(a) Line represents one degree of freedom

(b) Area represents bivarient degree of freedom

(c) Triple point represents trivarient degree of freedom

(d) Applicable phase rule is $F = 3 - P$.

(v) Which of the following carbocation is most stable ?

(a) $CH_2 = CH\overset{+}{C}H_2$

(b) $(CH_3)_2\overset{+}{C}H$

(c) $CH_3\overset{+}{C}H_2$

(d) $\overset{+}{C}H_3$.

(vi) Aldol condensation reaction is not given by :

(a) $C_6H_5CH_2CHO$

(b) C_6H_5CHO

(c) CH_3CHO

(d) CH_3COCH_3.

(vii) Caprolactum is a monomer of :

(a) Bakelite

(b) Nylon 6, 6

(c) Nylon-6

(d) Teflon.

(viii) Ferrocene is :

(a) $(C_3H_7)_2Fe$

(b) $C_6H_5FeC_5H_5$

(c) $(C_6H_5)_2Fe$

(d) $(C_5H_5)_2Fe$.

(ix) Which statement about the NMR reference compound TMS is not correct ?

(a) TMS stands for tetra methy l silane

(b) All the hydrogens in TMS have the same chemical shift

(c) TMS has a high boiling point, so it is not easily lost when holding the NMR sample

(d) TMS is relatively unreactive with most functional groups.

(x) The determination of moisture, volatile matter, fixed carbon and ash in coal is done through :

(a) Proximate analysis

(b) Ultimate analysis

(c) Bomb Calorimeter

(d) Boys Calorimeter.

(xi) CO^+ molecular ion is ..... stable than CO molecule.

(xii) The hydrogen bond is ..... than a van der Waals interaction, but ..... than covalent bonds.

(xiii) In a one component system, the maximum degree of freedom will be .....

(xiv) During electrochemical corrosion, the corrosion occurs at the ..... part.

(xv) Atropisomerism in o-disubstituted diphenyls is due to ..... rotation around carbon-carbon single bond.

(xvi) N-Bromoamide intermediate is formed in ..... reaction.

(xvii) $(Ph_3P)_3RhCl$ is known as .....

(xviii) In the vulcanization process raw rubber is mixed with small amount of .....

(xix) IR active molecules are those which undergo a net change in .....

(xx) Hardness of water is determined by ..... titrations.

Section- B

2. Attempt any *three* of the following : 10×3=30

(i) (a) What is molecular orbital theory ? With the help of MO diagram, calculate the bond order of the following :

CO, NO and HF.

(b) The rate of a reaction quadruples when the temperature chahges from 293 K to 313 K. Calculate the energy of activation of the reaction assuming that it does not change with temperature.

(ii) State and explain phase rule. Discuss the salient features of phase diagram of water system.

(iii) Deduce an expression for the rate constant of a first order reaction and show that half life time of the reaction does not depend upon initial concentration of the reactant. Show that in case of first order reaction, the time required to complete 99% is twice for its 90% completion.

(iv) (a) What are necessary conditions for optical activity ? The following compounds are optically active or not ? Explain :

Meso-tartaric acid, 6,6-Dinitro diphenic acid.

(b) What is conformational isomerism ? Discuss the conformations of n-butane with the help of its potential energy diagram.

(v) What is hardness of water ? Describe zeolite process for making soft water from hard water. A sample of hard water has a hardness 450 ppm. Express the hardness in °French and °Clark.

Section-C

3. Attempt any *one* part of the following : 1×10=10

(a) (i) What is metallic bond ? Explain it on the basis of band theory.

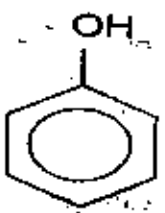
(ii) Calculate the angle at which (1) first order reflection and (2) second order reflection will occur in an X-ray spectrometer when X-rays of wavelength 1.54A° are diffracted by the atoms of a crystal, given that the interplaner distance is 4.04A°.

(b) What are liquid crystals ? Briefly describe the different types of liquid crystals. Give their applications in detail.

4. Attempt any *one* part of the following : 1×10=10

(a) Describe the construction of galvanic cell. Write down the electrode reactions and formula of its e.m.f. What is the role of salt bridge in a cell ?

(b) (i) Arrange the following compounds in increasing order of acidity with giving reasons.

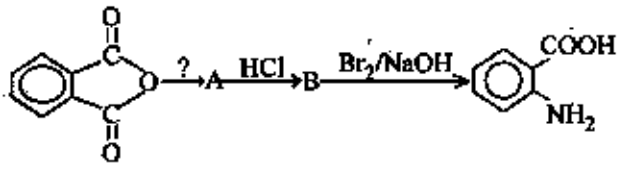


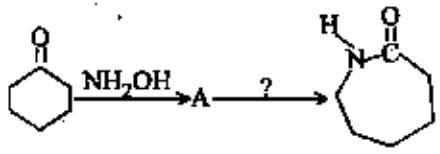
CH_3CH_2OH CH_3COOH

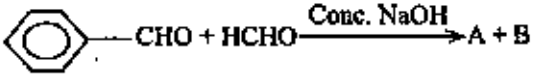
(ii) Explain hyperconjugation taking propene and isopropyl carbocation as an example. What do you mean by isovalent and sacrificial hyperconjugation ?

5. Attempt any *one* part of the following : 1×10=10

(a) Complete the following reactions and write their mechanism :

(i) 

(ii) 

(iii) 

(b) What do you mean by E-Z system of nomenclature ? Draw the structures of all the geometrical isomers and assign name using the E-Z system of the following compounds :

(i) 1-Bromo-1-chloro propene

(ii) 2-Bromo-3-chloro-2-pentene.

6. Attempt any *one* part of the following : 1×10=10

(a) (i) Describe in brief about conducting polymers with their applications.

(ii) Write the preparation and uses of PVC, Polystyrene, PTFE and Nylon-6,6.

(b) What is calorific value of a fuel ? Define high and low calorific value. A 0.72 gm of a hydrocarbon fuel containing 85% carbon when burnt in a bomb calorimeter increased the temperature of water from 27.3°C to 29.1°C. If the calorimeter contains 250 gm of water and its water equivalent is 150gm, calculate the HCV and LCV of the fuel.

7. Attempt any *one* part of the following : 1×10=10

(a) Discuss the possible electronic transitions in the UV region. When UV light is passed through a solution, the radiant power is reduced to 50%. Calculate the absorbance.

(b) Explain the NMR spectrum of CH_3CH_2OH molecule. What is spin-spin coupling ? Explain with help of splitted signals of the above molecule. A compound having the molecular formula $C_6H_{12}O_2$ gave the following ^1H NMR data :

δ 1.1 (6H, Singlet), δ 2.1(3H, Singlet), δ 2.6 (2H, Singlet), δ3.9 (1H, Singlet)

Identify the compound.