http://www.makaut.com

*Name* : .....

*Roll No.* : .....

*Invigilator's Signature* : .....

**CS/B.TECH(NEW)/SEM-2/CH-201/2012**

**2012**

# CHEMISTRY - I

*Time Allotted* : 3 Hours Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

## GROUP – A

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

i) A living system is thermodynamically an example of

a) an open system b) an isolated system

c) a closed system d) none of these.

ii) The dimension of rate constant of a second order rate equation is

a) mole litres$^{-1}$ b) mole litre$^{-1}$ s$^{-1}$

c) mole$^{-1}$ litre$^{-1}$ s$^{-1}$ d) mole$^{-1}$ litre s$^{-1}$ .

iii) Which defect causes decrease of density of crystal ?

a) Interstitial Defect b) Schottky Defect

c) Frenkel Defect d) *F*-centre Defect.

iv) Anti-Markownikoff's addition of HBr is not observed in

a) pentene b) 2-butene

c) butene d) propene.

v) The half-life of a first order reaction is 20 minutes. The time required for 75% completion of the reaction is

a) 30 minutes b) 40 minutes

c) 50 minutes d) 60 minutes.

vi) Germanium is an example of

a) intrinsic semiconductor

b) *n*-type semiconductor

c) *p*-type semiconductor

d) an insulator.

vii) ZnO is white when cold and yellow when hot, because of

a) charge transfer b) *d-d* transfer

c) metal excess defect d) none of these.

viii) For a reaction to proceed spontaneously, we must have

a) $\Delta G < 0$ b) $\Delta G > 0$

c) $\Delta G = 0$ d) None of these.

ix) Proteins are biopolymers. The monomer unit present in them is

a) amino acid b) carbohydrate

c) fatty acid d) alkene.

x) Which of the following carboxylic acids will have the lagest $K_a$ value ?

a) $CH_3 - CH_2 - COOH$ b) $Cl - CH_2 - COOH$

c) $Ph - COOH$ d) $F_3 C - COOH$.

xi) Which of the following carbonium ions will be the most stable ?

a) $Ph_3 C^+$ b) $H_3 C - CH_2^+$

c) $H_2 C = CH - CH_2^+$ d) $(CH_3)_2 - CH^+$

xii) Fuel used in jet plane is

a) aviation gasoline b) 99·5% ethyl alcohol

c) alcohol with diesel d) alcohol with petrol.

## GROUP – B

### ( Short Answer Type Questions )

Answer any *three* of the following. $3 \times 5 = 15$

2. a) What is pseudo-unimolecular reaction ? Give one example.

   b) Deduce the expression for the rate constant of a first order reaction. Show that half-life period of a first order reaction is independent of the initial concentration.

   2 + 3

3. What is LPG ? Why is it used as a domestic fuel ? Define octane number of a fuel. How octane number can be improved ? 1 + 1 + 3

4. Prove that for an adiabatic reversible process $PV^{\gamma}$ = constant. How do you show that for an ideal gas $C_p - C_v = R$ ? $\gamma$ $2 \times 2\frac{1}{2}$

5. What is single electrode protential ? Derive the pH of an electrochemical cell with the help of Nernst equation. 2 + 3

6. Write notes on any *two* of the following : $2 \times 2\frac{1}{2}$

   a) Homogeneous catalysis

   b) Resonance

   c) Bio-diesel.

**GROUP – C**

**( Long Answer Type Questions )**

Answer any *three* of the following. 3 × 15 = 45

7. a) Explain Kohlrausch's law. Discuss two applications of it.

   b) Explain how ionic mobility varies with (i) size, (ii) temperature.

   c) Derive Kirchhoff's equations. ( 2 + 4 ) + 4 + 5

8. a) Define Joule-Thomson coefficient and inversion temperature explaining heating and cooling condition.

   b) Define free-energy (G) and entropy and write their physical significances.

   c) Write down Arrhenius equation for the activation energy of a reaction. Plot $lnk$ *vs* $1/T$ and write the significance of the slope.

   d) Explain the variation of equivalent conductance of strong and weak electrolytes with concentration.

   4 + 4 + 3 + 4

9. a) Explain why *p*-nitrophenol has much higher boiling point than *o*-nitrophenol although both have same molecular weight.

   b) What do you mean by hybridization ? How is it related to structure and acidity of ethane, ethylene and acetylene ?

c) Which one of the following is more acidic and why ?

i) $CCl_3$ COOH and (ii) $CH_3$ COOH.

d) Differentiate between the following :

Addition polymerisation and condensation polymerisation. 2 + ( 2 + 2 + 2 ) + 2 + 5

10. a) Differentiate between Schottky and Frenkel defects with the help of diagram.

b) What is proximate analysis of coal and what is its significance ?

c) Indicate the major fractionation products along with their boiling range and uses obtainable from atmospheric distillation of crude oil. 5 + 4 + 6

11. Write short notes on any *three* of the following : 3 × 5

a) Vulcanization

b) Hess law of constant heat summation

c) Gibbs-Helmholtz equation

d) E1 and E2 reaction

e) Hydrogen electrode

f) Conductometric titration.

12. a) Discuss the essential structural criteria for conductivity, environmental stability and process ability in conducting polymers with suitable examples.

b) What is spontaneous ignition temperature of a fuel ?

c) What is the importance of unleaded gasoline ? Which type of hydrocarbons is suitable as components of unleaded gasoline and why ?

d) Compare the acidic characters of formic acid, acetic acid and phenol. 6 + 2 + 5 + 2