



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/B.Tech (NEW)/SEM-1/CH-101/2010-11**

**2010-11**

**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 × 1 = 10

i) The quantity  $T \Delta S$  may be expressed in units of

a) J

b) K

c) JK

d)  $\text{JK}^{-1}$ .

ii) A reaction is at equilibrium in a closed rigid vessel at  
constant temperature when

a)  $\Delta S = 0$

b)  $\Delta H = 0$

c)  $\Delta U = 0$

d)  $\Delta A = 0$ .



iii) Change of internal energy is equal to heat change in case of

- a) isochoric process
- b) isothermal process
- c) isobaric process.

iv) At inversion temperature Joule-Thomson Coefficient is

- a) zero
- b) positive
- c) negative
- d) all of these.

v) The half-life period of a reaction is found to be directly proportional to the initial concentration. The order of the reaction is

- a) zero
- b) one
- c) two
- d) three.

vi) If the rate of a reaction becomes twice for every  $10^{\circ}\text{C}$  rise in temperature, by what factor does the rate of the reaction increase when temperature is raised from  $30^{\circ}\text{C}$  to  $80^{\circ}\text{C}$  ?

- a) 16
- b) 32
- c) 64
- d) 128.



vii) ZnO is white when cold and yellow when hot. This is due to

- a) charge transfer                      b) *d-d* transition
- c) metal excess defect                d) Schottky defect.

viii) When ice melts into water, entropy

- a) becomes zero                      b) remains same
- c) increases                              d) decreases.

ix) The human body is an example of a

- a) closed system                      b) open system
- c) isolated system                      d) none of these.

x) An example of step-growth polymer is

- a) PVC                                      b) Teflon
- c) Bakelite                                d) Poly-butadiene.

xi) Which of the following is used as fuel in jet engine ?

- a) Petrol                                    b) Diesel
- c) Kerosene                                d) Power alcohol.

xii) Which one of the following is not a primary fuel ?

- a) Wood                                      b) Natural gas
- c) Coke                                      d) Crude oil.



**GROUP – B**

**( Short Answer Type Questions )**

Answer any *three* of the following.

3 × 5 = 15

2. Define ionic mobility and equivalent conductance with their units. How does equivalent conductance vary with concentration for both strong and weak electrolytes ? 2 + 3
3. What is catalysis ? Derive the kinetic expression of 'homogeneous catalysis' with example. 1 + 4
4. Give the outline of preparation, structure and uses of SBR.  
How is HDPE manufactured ? What are its uses ? 3 + 2
5. a) Explain that alcohols are weaker acids than phenols but are stronger nucleophiles.  
  
b) The degree of polymerization of polyethylene is 1000.  
Find the molecular weight of polyethylene. 3 + 2
6. a) What is CNG and what is its composition ?  
  
b) What are the advantages of CNG over other fuels ? 2 + 3

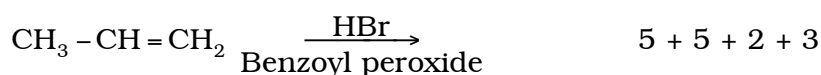


**GROUP – C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

7. a) Prove that  $C_p - C_v = T \left( \frac{\partial P}{\partial T} \right)_V \left( \frac{\partial V}{\partial T} \right)_P$  ( Symbols have usual significances ).
- b) Consider a 1st order reaction  $A \rightarrow B$ , where  $A$  is reactant and  $B$  is product. Assuming  $a$  is the initial concentration of the reactant and  $x$  is the concentration of the product after time  $t$ , show that half-life decomposition period of the reaction is independent of  $a$ .
- c) Write the chemical structures of the repeat units of Nylon 6, 6 and Nylon 6. Why are they so named ?
- d) Explain Octane Number and Cetane Number with their significances.  $4 + 4 + 4 + 3$
8. a) Explain the order of acid strength  $\text{HCOOH} > \text{Cl-CH}_2\text{COOH} > \text{CH}_3\text{COOH} > \text{Phenol} > \text{Ethanol}$ .
- b) Distinguish between  $\text{SN}^1$  and  $\text{SN}^2$  reactions giving examples.
- c) Explain why benzoic acid is weaker than formic acid.
- d) Write down the products of the following reaction with mechanism :





9. a) Distinguish between Order and Molecularity.
- b) A first order reaction is never complete. Justify.
- c) What is activation energy ? Write down its physical significance.
- d) Write the main features of Transition State theory.
- e) Write down Arrhenius equation for the temperature dependent on specific rate. Plot  $\log K$  vs  $1/T$  and explain the significance of the slope of the plot. 2 + 3 + 3 + 4 + 3
10. a) Distinguish between intensive and extensive properties.
- b) Show that Joule–Thomson expansion is an isenthalpic process.
- c) State the significance of Gibbs free energy.
- d) State the differences between molecularity and order of a chemical reaction.
- e) The half-life period of the decomposition of a compound is 5 min. If the initial concentration is halved, the half-life period is reduced to 25 min. Find the order of reaction. 2 + 4 + 2 + 3 + 4



11. Write short notes on any *three* of the following :  $3 \times 5$

- a) Bio-diesel
- b) Reference electrode
- c) Storage cell
- d) Resonance and Hypercojugation
- e) Role of germanium as semiconductor
- f) Carbonisation of coal and its utility.

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