



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) 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°C rise in temperature, by what factor does the rate of the reaction increase when temperature is raised from 30°C to 80°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

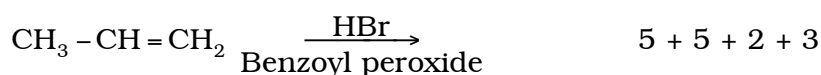


GROUP – C

(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 SN^1 and 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 : 3×5

- 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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