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### **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) For a reaction  $A \varnothing B$ , both change in enthalpy (  $\Delta H$  ) and change in entropy (  $\Delta S$  ) are positive. The most favourable condition for the reaction is

- a) low pressure
- b) high pressure
- c) low temperature
- d) high temperature.
- ii) Schottky defect is found in
  - a) NaCl

b) ZnO

c) AgCl

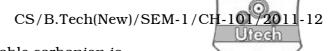
d) FeO.

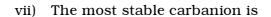
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- iii) Tetrafluoroethylene is the monomer of
  - a) Polyethylene

b) Nylon

- c) Polyvinyl chloride
- d) Teflon.
- iv) Normal hydrogen electrode has been assigned a potential of
  - a) hundred volts
- b) zero volt
- c) one volt
- d) nene of these.
- v) With the increase in temperature, conductivity of p-type semiconductor
  - a) increases
  - b) decreases
  - c) is changed but the direction of change cannot be predicted
  - d) does not change.
- vi) Which of the following is true for a galvanic cell?
  - a) The cell potential is always negative
  - b) The products are less stable than the reactants
  - c)  $\Delta G$  for the cell reaction is positive
  - d) Chemical energy is converted to electrical energy.





- a)  $Ph_3 C^-$  b)  $(C_6 H_{11})$

viii) If infinite time is required for completion of a chemical reaction, then order of the reaction is

a) zero b) first

- second c)
- d) third.

During mixing, entropy of the surrounding ix)

- a) remains unchanged
- b) increases
- c) decreases
- d) cannot be predicted.

X) The cell in which the reaction

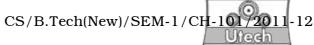
Fe + CuSO  $_4~\varnothing$  FeSO  $_4~+$  Cu takes place is

- a) Fe | CuSO  $_4$  | | FeSO  $_4$  | Cu
- b) Cu  $|FeSO_4||CuSO_4|$  Fe
- c) Cu | CuSO  $_4$  | | FeSO  $_4$  | Fe
- d) Fe | FeSO  $_4$  | | CuSO  $_4$  | Cu

- xi) The minimum amount of energy possessed by the reacting molecules to produce effective collisions is called
  - a) threshold energy
- b) internal energy
- c) activation energy
- d) kinetic energy.
- xii) Proteins are biopolymers. The monomer units present in them are
  - a) alkene

- b) amino acid
- c) fatty acid
- d) carbohydrate.
- xiii) For the redox couples Zn  $^{2+}~\mid$  Zn ( s ) and Cu  $^{2+}~\mid$  Cu ( s ) the standard reduction potentials are 0·76 V and + 0·34 V respectively. If the couples are combined then
  - a) Zn <sup>2+</sup> is reduced and Cu is oxidized

  - c) both Zn and Cu are oxidized
  - d) both Zn  $^{2+}$  and Cu  $^{2+}$  are reduced.



### **GROUP - B**

## (Short Answer Type Questions)

Answer any three of the following.



2. Define an adiabatic process and show that for a reversible adiabatic process

 $(T)^{C}v^{/R}$  . V = constant.

- 3. a) Write a short note on bio-diesel.
  - b) Define number average molecular weight of a polymer.
  - c) What is glass transition temperature of a polymer?

3 + 1 + 1

- 4. a) What is the difference between n-type and p-type semiconductors?
  - b) What do you mean by pseudounimolecular reaction ? Give an example. 2+3
- 5. a) What is equivalent conductance and what is its unit?
  - b) What is the law of independent imigration of ions?

2 + 3

- 6. a) What is the calorific value of a fuel?
  - b) Distinguish between GCV and NCV. 2 + 3

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### (Long Answer Type Questions)

Answer any three of the following.



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

- a) Biodegradable polymer
- b) Clausius-Clayperon equation
- c) Vulcanization of rubber
- d) Calomel electrode
- e) Mesomeric effect
- f) Homogenous catalyst.
- 8. a) What is a Carnot cycle? Obtain the expression for the efficiency of a reversible Carnot engine and starting from this expression state an appropriate statement of the second law of themodynamics.
  - b) What is colour centre generator? Explain with example.

12 + 3

- 9. a) Discuss the physicochemical principle involved in the measurement of pH of an aqueous solution by Hydrogen electrode method.
  - b) Write about the synthesis and uses of the following:
    - i) HDPE
    - ii) Buna-S-Rubber.
  - c) Distinguish between Frenkel and Schottky defect.

6 + 6 + 3



- 10. a) Compose the C-Cl bond length in CH  $_2$  CH.Cl and CH  $_3$  CH  $_2$  Cl.
  - b) Arrange the following in increasing acidity:
    - i) Phenol
    - ii) 2, 6-dimethyl-4-nitrophenol
    - iii) 3, 5 dimethyl-4-nitrophenol.
  - c) Give an example of hyperconjugation with explanation.
  - d) Distinguish between the following with example :
    - i) Carbonium ion and carbanion
    - ii) Addition reaction and substitution reaction.

3 + 3 + 5 + 4

- 11. a) What are water gas and semi-water gas?
  - b) How do gasoline and diesel differ in chemical composition?
  - c) Deduce the expression for the rate constant of a second order reaction where the initial concentrations of the two reactants are same.
  - d) Discuss the role of solvents in  $S_N^{-1}$  reaction.
  - e) What is inversion temperature? 3 + 3 + 5 + 2 + 2