

**MAULANA ABUL KALAM AZAD UNIVERSITY OF
TECHNOLOGY, WEST BENGAL**

Paper Code : CH-201

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) Bakelite is an example of
 - a) metal
 - b) thermoplastic
 - c) rubber
 - ☒ d) thermoset.
- ii) The unit of specific conductance is
 - a) ohm-cm
 - b) ohm/cm
 - c) mho
 - ☒ d) mho/cm.
- iii) If a system interacts with the surroundings by exchanging energy only, then it is called a
 - a) open system
 - ☒ b) closed system
 - c) isolated system
 - d) none of these.

- iv) Which of the following compounds have the least bond angle ?

- a) NH_3
- b) CH_4
- c) BeF_2
- ☒ d) H_2O .

- v) The shape of a carbanion is

- a) linear
- ☒ b) planar
- ☒ c) pyramidal
- d) None of these.

- vi) The hybridized orbital in XeOF_4 is

- ☒ a) sp^3d^2
- b) sp^3d
- c) sp^3
- d) sp^2 .

- vii) Colour of KCl crystal due to metal excess defect changes to

- a) Yellow
- b) Red
- ☒ c) Violet
- d) Pink.

- viii) Most stable alkene is

- ☒ a) 2, 3-dimethyl-2-butene
- b) 2-methyl-2-butene
- c) E-2-butene
- d) propane.

ix) *n*-type semiconductor conducts electricity by

- a) ☒ electrons b) holes
c) ions d) none of these.

x) The polydispersity index of a commercial polymer is

- a) 1.0 b) 5.0
c) 50 d) 100.

xi) Which of the following is a negative catalyst?

- a) TEL ☒ b) MnO_2
c) V_2O_5 ☒ d) Fe + Mo.

xii) Rate constant of a zero order reaction is

- a) dimensionless ☒ b) $\text{L mole}^{-1} \text{s}^{-1}$
c) s^{-1} ☒ d) $\text{mole L}^{-1} \text{s}^{-1}$.

GROUP - B

(Short Answer Type Questions)

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

2. a) Define specific and equivalent conductance and show how they are related.
b) Define transport number and ionic mobility. $3 + 2$
3. a) Why carboxylic acid is stronger acid than phenol?

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b) All the carbon-carbon distance in benzene are equal. Explain. $3 + 2$

4. a) Discuss in brief the second law of thermodynamics.
b) Prove that for ideal gas in adiabatic reversible process

$$w_{\text{ad}} = \frac{P_1 V_1 - P_2 V_2}{\gamma - 1} \quad 2 + 3$$

5. Give mathematical expression and the physical significance of

- (i) number-average molecular weight (ii) weight-average molecular weight for synthetic polymers.

☒ 6. Draw the structure of the following compounds :

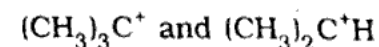
- a) SF_6
b) IF_7
c) ClF_3
d) CO_2
e) XeF_4 .

GROUP - C

(Long Answer Type Questions)

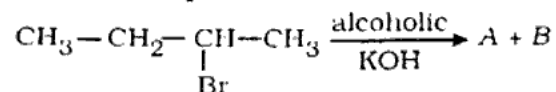
Answer any three of the following. $3 \times 15 = 45$

7. a) Which one is more stable and why?



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- b) Predict the products :



Which one is major product ?

- c) In aprotic solvents, the basic character of amines follows the order :

$(\text{CH}_3)_3\text{N} > (\text{CH}_3)_2\text{NH} > \text{CH}_3\text{NH}_2$. Comment this statement.

- d) What is hyperconjugation ? Explain it with one example.
e) Aniline is less basic than ethylamine. Explain.
f) Nitrobenzene is less reactive than benzene in electrophilic substitution reactions. Why ?

2 + 3 + 3 + 3 + 2 + 2

8. a) What is degree of polymerisation ? If the degree of polymerization of polystyrene is 1000 what is its molecular weight ?

b) Distinguish thermoplastic polymers and thermosetting polymers.

c) What are addition and condensation polymerization ? Explain with suitable examples.

- d) What is glass transition temperature (T_g) ? What are the factors that influence the T_g value ?

- e) Distinguish between HDPE and LDPE.

3 + 3 + 3 + 3 + 3

9. a) Explain Hoffmann and Saytzeff rule for elimination reaction.
b) What will be the hydrolysis products of isobutyl chloride ?
c) What is electromeric effect ? Malonic acid is a dibasic acid with two different pK_a values ($\text{pK}_{a1} = 2.83$ and $\text{pK}_{a2} = 5.69$). Why ?
d) Discuss the construction of Hydrogen half cell. What is Reference electrode ?
10. a) What is conductometric titration ? Discuss the conductometric titration of AgNO_3 with KCl with graphical representation.
b) What is Calomel electrode ? How can you measure pH of a solution using Calomel electrode ?
c) Write down the Maxwell's relations. Prove that Joule-Thomson effect is iso-enthalpic.

2 + 2 + 3 + 3 + 2 + 3

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11. What are the major fractions obtained from the refining of crude petroleum? Specify the temperature ranges at which these fractions distill over. Mention the important uses of these fractions. What is meant by cracking? What is the role of catalyst in catalytic cracking of petroleum fractions?

4 + 3 + 4 + 2 + 2

12. a) State Hess's law of constant heat summation. How does it follow from the First Law of Thermodynamics?

b) A diatomic ideal gas ($\gamma = 1.4$), initially at 600 K and 10 atm undergoes reversible adiabatic expansion till the final pressure becomes 2 atm. Find out its final volume.

c) What are the differences between inductive effect and mesomeric effect?

d) Explain the conditions of heating and cooling.

(2 + 3) + 4 + 4 + 2

 $C_1 - C_2$