



Name :

Roll No. :

Invigilator's Signature :

CS/B.SC.(H), GENET/BT/MOL.BIO/MICRO.BIO/SEM-2/CH-201/2012

2012

CHEMISTRY

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 high energy lasers can be produced by
 - a) Helium
 - b) Neon
 - c) Argon
 - d) Krypton.
- ii) Hydration of alkenes gives
 - a) Aldehyde
 - b) Alcohol
 - c) Acid
 - d) Amine.
- iii) The viscosity of air depends on
 - a) pressure
 - b) density
 - c) temperature
 - d) volume.
- iv) Amagat's curve is related to
 - a) Boyle's law
 - b) Charles law
 - c) deviation from ideal gas behaviour
 - d) ideal gas equation.
- v) The mathematical expression of 1st law of thermodynamics is
 - a) $dQ = dE + PdV$
 - b) $dQ = dE - PdV$
 - c) $dQ = dE / PdV$
 - d) $dE = dQ + PdV$.



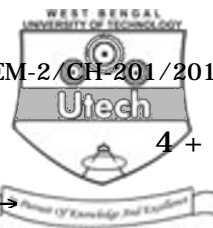
- vi) Entropy is
 a) intensive property b) extensive property
 c) both (a) and (b) d) none of these.
- vii) Number of stereoisomer of tartaric acid is
 a) 3 b) 2
 c) 4 d) 0.
- viii) Which relation is true ?
 a) $RT_c/P_c V_c = 3.66$ b) $RT_c/P_c V_c = 2.66$
 c) $Rt_c/P_c V_c = 4.66$ d) None of these.
- ix) Stability of alkene is attributed due to
 a) mesomeric effect b) hyperconjugation
 c) inductive effect d) all of these.
- x) The order of electron affinity is
 a) $C > N > O > F$ b) $C < N < O < F$
 c) $F > O > C > N$ d) $F < O < C > N$.
- xi) A thermodynamic state function is a quantity
 a) used to determine heat changes
 b) whose value is independent of path
 c) used to determine pressure volume work
 d) whose value depends on temperature only.
- xii) $K_4 [Fe (CN)_6]$ is
 a) pyramidal b) tetrahedral
 c) trigonal bipyramid d) octahedral.

GROUP - B

(Short Answer Type Questions)

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

2. What is 'Ideal gas equation' ? Write down the van der Waals equation. Describe volume correction and pressure correction.
3. Write short note on optical isomerism and geometrical isomerism of coordination compound, $2\frac{1}{2} + 2\frac{1}{2}$
4. Write down the structures of the following compounds on the basis of VSEPR :
 i) XeF_4 ii) ClF_3
 iii) NH_3 iv) IF_7
 v) SF_6 (1 + 1 + 1 + 1 + 1)



5. Complete the following equation : 4 + 1


$$\text{CH}_3\text{COCH}_3 \xrightarrow{\text{NaNH}_2} ? \xrightarrow{\text{C}_2\text{H}_2} ? \xrightarrow{\text{H}^+} ?$$

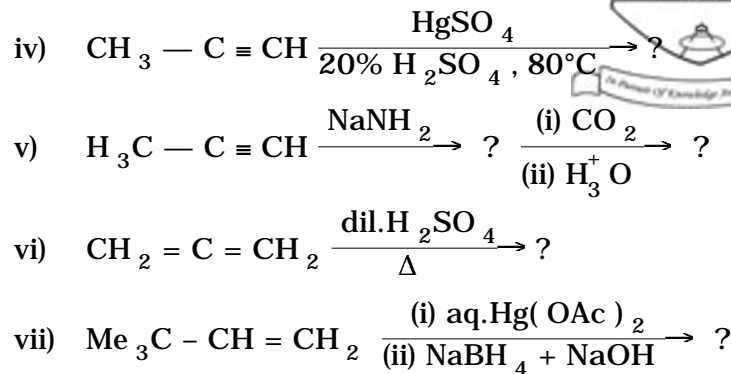
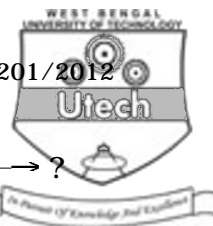
$$(\text{CH}_3)_2\text{C}(\text{OH})\text{C}\equiv\text{CH} \xrightarrow[\text{H}_2]{\text{Pd}} ? \xrightarrow[400^\circ\text{C}]{\text{Al}_2\text{O}_3} ?$$
6. Calculate the work done when a quantity of gas is expanded isothermally and reversibly against the external pressure.
7. Show the general mechanism of electrophilic substitution of benzene by nitration reaction. Give example of side chain halogenation of benzene. 4 + 1

GROUP - C

(Long Answer Type Questions)

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

8. a) Define : Open system, isolated system & closed system, isothermal & adiabatic process, reversible & irreversible process and Enthalpy. 9
 b) Prove that work done in reversible process is greater than that of irreversible process. 6
9. Define chelate complex. Give two analytical uses of chelate ligand. Give the difference between perfect complex and imperfect complex with example. State Werner's theory of coordination compound. Give the IUPAC name of the following complexes :
 i) $\text{K}_4 [\text{Fe}(\text{CN})_5\text{NO}]$
 ii) $[\text{Co}(\text{NH}_3)_6] [\text{CoCl}_6]$. 2 + 4 + 4 + 3 + 2
10. a) Complete the following reactions : 7 × 2
 i) $\text{CH}_3 - \text{CH} = \text{CH}_2 + \text{HB}_r \xrightarrow{h\nu} ?$
 ii)  + $\text{B}_2\text{H}_6 \rightarrow ? \xrightarrow{\text{CH}_3\text{COOH}} ?$
 iii) $\text{CH}_3 - \overset{\text{O}}{\parallel}{\text{C}} - \text{CH}_3 + \text{NaBH}_4 \rightarrow ? \xrightarrow[300^\circ\text{C}]{\text{Al}_2\text{O}_3} ?$



b) Give the orbital picture of allene. 1

11. What is Boyle point temperature ? Prove that $T_b = a/Rb$ where T_b is Boyle point temperature. Explain the term, 'compressibility factor'. One litre real gas is compressed from 600 atm at 473 K to 600 atm at 273 K. The compressibility factor at initial and final states are 1.072 and 1.375. Calculate final volume. Give example of two real gases. 2 + 4 + 3 + 4 + 2
12. Write explanatory notes on the following : 5 × 3
- Sigma and pi bond
 - Hybrid orbitals
 - Valence bond theory
 - Resonance
 - Hydrogen bonding.
13. State the first law of thermodynamics with mathematical expression. What is the limitation of first law of thermodynamics ? Define the term internal energy. 56 gm of nitrogen gas was initially at 40 atm. and 25°C. It was allowed to expand isothermally against a constant external pressure of one atmosphere. Calculate ΔH , ΔU , ΔQ and ΔW , assume that the gas behave ideally. What is heat capacity ? Prove that heat capacities, $C_p - C_v = R$ for an ideal gas. 2 + 1 + 1 + 4 + 3 + 4