



Name :

Roll No. :

Invigilator's Signature :

CS/B.Sc. (H), BT/Genetics/MolBio/MicroBio/SEM-2/CH-201/2011

**2011
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) What is the oxidation state of iron in $K_3[Fe(CN)_6]$?

a) + 2

b) + 3

c) + 4

d) - 4.

ii) An octahedral complex is formed when hybrid orbital of
following type is involved

a) sp^3

b) dsp^2

c) sp^3d^2

d) sp^3d .



- iii) The compressibility factor Z is given by
- a) $Z = PV/RT^2$ b) $Z = PV/2RT$
- c) $Z = PV/RT$ d) $Z = 2PV/RT$.
- iv) The real gases show nearly ideal behaviour at
- a) low pressure and low temperature
- b) high pressure and low temperature
- c) high pressure and high temperature
- d) low pressure and high temperature.
- v) Coefficient of viscosity is expressed in
- a) dynes b) dynes sq
- c) dynes per sq. cm d) none of these.
- vi) Which of the following compounds will show geometrical isomerism ?
- a) Propene b) 2-Butene
- c) Propyne d) 2-Butyne.
- vii) Markowinkoff's addition of HBr is not applicable in
- a) Propene b) 1-Butene
- c) 1-Pentene d) 2-Butene.



viii) Number of lone pairs in oxygen in POCl_3 is

- a) 1
- b) 2
- c) 3
- d) 4.

ix) An example of radioactive inert gas is

- a) At
- b) Rn
- c) Ra
- d) Cf.

x) As charge remains same on the cation with decrease in size of the polarising power of the cation

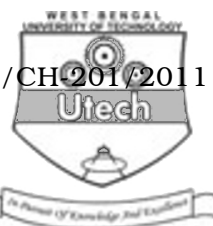
- a) increases
- b) decreases
- c) remains same
- d) none of these.

xi) What is the limiting radius ratio for ZnS type crystals ?

- a) $0.225 - 0.414$
- b) $0.414 - 0.732$
- c) $0.732 - 0.783$
- d) none of these.

xii) Which one is a state function ?

- a) enthalpy
- b) work done
- c) heat change
- d) all of these.



GROUP – B
(Short Answer Type Questions)

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

2. State VSEPR theory and in the light of the theory compare the bond angles in NH_3 and H_2O . 3 + 2

3. Define and explain common ion effect. Using this effect how can NaCl be prepared from sea-water ? 3 + 2

4. What is enthalpy ? How is it represented ? What are the adiabatic and isothermal processes ? $1 + 1 + \left(1\frac{1}{2} \times 2\right)$

5. Write the Newmann projection of the following compounds having the specified conformation noted against each compound.
 - a) $\text{CHCl}_2 \text{ CHCl}_2 (+ac)$

 - b) $\text{CH}_3 \text{ CH NO}_2 \text{ CH Cl NO}_2 (+sp)$

 - c) $\text{CH Cl Br CH (OH) NH}_2 (+sc)$

What are conformers ? 3 + 2

6. Discuss Stoke's law with equation. 5

7. Discuss the structures of XeF_2 and XeOF_4 . $2\frac{1}{2} \times 2$



GROUP – C

(Long Answer Type Questions)

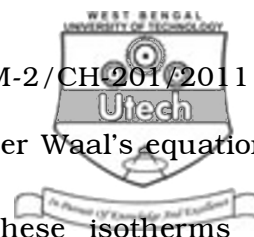
Answer any *three* of the following. $3 \times 15 = 45$

8. a) What is Friedel – Crafts alkylation reaction ? Explain the mechanism.
- b) Write down the anti-Markownikoff's rule and explain it.
- c) Illustrate polymerization with example.

$(2 + 3) + (3 + 3) + 4$

9. Write short notes on any *three* of the following : 3×5
- a) Dipole-dipole interaction
- b) Hydrogen bonding
- c) Hybridisation
- d) $C_p - C_v = R$.

10. Define lattice energy and explain. Establish Barn-Haber cycle for the formation of sodium chloride crystal starting from metallic sodium and gaseous chlorine. What is radius ratio rule ? What are its limitations ? $(2 + 2) + 7 + 2 + 2$



11. Draw Amagat's isotherms. How can van der Waal's equation be applied to explain the nature of these isotherms ?

Establish the relation between critical constants and van der Waal's constants of a gas. Derive the equation of corresponding state. 3 + 3 + 6 + 3

12. Chelate effect is an entropy effect – explain with example.

Draw the structure and write hybridization state of the central atom in each of the following compounds :

i) Ni (CO)

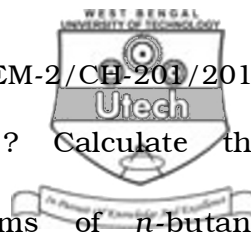
ii) $[\text{CO}(\text{NH}_3)_4 \text{Cl}_2]$.

Write the IUPAC names of the following compounds :

i) $[\text{CO Cl}(\text{NO}_2) (\text{NH}_3)_4] \text{Cl}$

ii) $[\text{Fe}(\text{CO})_5]$.

What are stepwise and overall stability constants of equilibrium concept ? $5 + 3 + \left(1\frac{1}{2} + 1\frac{1}{2}\right) + 4$



13. What is 'butane-gauche' interaction ? Calculate the percentage of anti and gauche forms of *n*-butane at 298° K ($\Delta H^\circ = -0.8 \text{ kcal mol}^{-1}$ for anti-gauche equilibrium).

Write down the preferred conformation for the following compounds :

- i) $\text{CH}_3 \text{ CH}_2 \text{ CH}_2 \text{ Cl}$
- ii) $\text{CH}_3 \text{ CH}_2 \text{ CH} = \text{O}$.

Write down the 'chair' and 'boat' conformations of cyclohexane and discuss their relative stability.

$$3 + 4 + \left(1\frac{1}{2} + 1\frac{1}{2}\right) + (2 + 3)$$
