

Reg. No. :

D 2667

Q.P. Code : [D 07 PCH 01]

(For the candidates admitted from 2007 onwards)

M.Sc. DEGREE EXAMINATION, JUNE 2008.

First Year

Chemistry

ORGANIC CHEMISTRY - I

Time : Three hours

Maximum : 100 marks

Answer any FIVE questions.

All questions carry equal marks.

(5 × 20 = 100)

1. (a) Discuss the aromaticity of Azulene and ferrocene.

(b) What is Hammond's postulate.

(c) Illustrate with suitable example, how isotopic labelling and cross over experiments can be used to find out reaction mechanism. (10 + 2 + 8)

2. (a) Discuss the orientation in electrophilic substitution of disubstituted benzenes with reactions.

(b) Write an account of the following :

(i) Gattermann reaction

(ii) Jacobson reaction

(iii) Haffmann - Marties reaction. (8 + 12)

3. (a) Give any two examples of ambident nucleophiles.

(b) Explain how the nature of substrate and solvent affects the nucleophilic substitution with suitable examples.

(c) Give the mechanism and synthetic use of claisen condensation.

(d) Discuss the nucleophilic substitution at vinyl carbon. (2 + 8 + 5 + 5)

4. (a) Write the reactions of Nitrenes and give the mechanism.

(b) Discuss with suitable substrate, the competition between elimination and substitution.

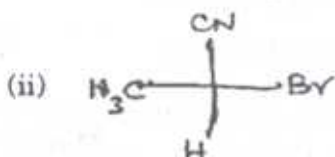
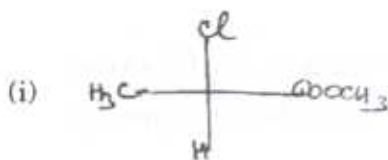
(c) Give the mechanism and point out the stereochemistry of the following :

(i) Chugaev elimination.

(ii) Cope elimination. (4 + 8 + 8)

5. (a) How short lived free radicals are generated?
- (b) What are the characteristics of free radical reactions?
- (c) Write a note on the following :
- (i) Free radical elimination.
 - (ii) Gamberg reaction.
 - (iii) Pschorr reaction. (4 + 4 + 12)
6. (a) Compare the hydration by oxymercuration - demercuration and hydroboration - oxidation methods.
- (b) Explain the stereochemistry involved in the hydroxylation by O_3 , O_4 .
- (c) Discuss the mechanism of the following :
- (i) Dickmann reaction.
 - (ii) Wittig reaction
 - (iii) Mannich reaction. (6 + 2 + 12)
7. (a) Write an account of Woodward Hoffmann rules for $4n+2$ π electro system.
- (b) Discuss the mechanisms of Cope and Claisen rearrangements.
- (c) Draw the orbital correlation diagram for thermal ring closure of hexa - 1, 3, 5 - triene to cyclohexa. 1, 3 - diene. (4 + 8 + 8)

8. (a) Designate R, S notation to the following and justify.



(b) Describe the optical isomerism in Nitrogen compounds.

(c) Give the conformational structure of decalin and discuss their stabilities.

(d) Discuss the optical activity and stability of cis and trans - 1, 3-dimethylcyclohexane. (4 + 4 + 6 + 6)

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M.Sc. DEGREE EXAMINATION, JUNE 2008.

First Year

Chemistry

INORGANIC CHEMISTRY — I

Time : Three hours

Maximum : 100 marks

Answer any FIVE questions.

All questions carry equal marks.

(5 × 20 = 100)

- (a) Explain the structure and bonding in diborane. How the orbitals are formed? (10)

(b) Draw the molecular orbitals in the compound DIBORANE. (10)
- (a) Write a short note on phosphonitrilic compounds. (10)

(b) Explain Frenkel and Schotkey defects in solids. (10)

3. Explain the basic phenomena. (20)
- (a) Diamagnetism
 - (b) Paramagnetism
 - (c) Ferro magnetism and
 - (d) Anti ferromagnetism.
4. (a) Explain the stability of nuclei on the basis of N/P ratio. (10)
- (b) Explain liquid drop model of nucleus. How this model can explain various reactions of the nucleus? (10)
5. (a) What is meant by nuclear cross section? Explain the importance of it. (10)
- (b) Describe the theory of α -decay. (10)
6. Explain the applications of radio isotopes in
- (a) Agriculture
 - (b) Reaction mechanism
 - (c) Medicine
 - (d) Biotechnology. (20)
7. Describe the principle and working of cyclotron and betatron. Draw the diagrams showing the essential parts. (20)

8. (a) What is meant by Auger electron spectroscopy? Explain the principle. (10)

(b) Briefly explain the theory and application of UV photoelectron spectroscopy. (10)

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Q.P. Code : [D 07 PCH 03]

(For the candidates admitted from 2007 onwards)

M.Sc. DEGREE EXAMINATION, JUNE 2008.

First Year

Chemistry

PHYSICAL CHEMISTRY - I

Time : Three hours

Maximum : 100 marks

Answer any FIVE questions.

All questions carry equal marks.

(5 × 20 = 100)

1. (a) What is meant by symmetry elements and symmetry operations? (5)
- (b) Define the following terms :
- (i) Abelian and non abelian group
 - (ii) Similarly Transformations
 - (iii) Class
 - (iv) Multiplication Tables. (10)
- (c) What is meant by point groups? Illustrate with examples. (5)

2. (a) Explain the Reducible representation and irreducible representation. (5)
- (b) Discuss the construction of character table for C_{2v} point group. (10)
- (c) Discuss the orthogonality theorem and the consequences. (5)
3. (a) What are the postulates of Quantum mechanics. (5)
- (b) Explain the time-dependent and time independent Schrodinger equations. (10)
- (c) What is meant by eigen value and eigen function? Explain with an example. (5)
4. (a) Set up and solve the Schrodinger wave equation for a particle in an infinite one dimensional box, with potential energy zero inside the box. Normalise the wave equation. (10)
- (b) Derive an expression for the energy of a rigid rotor using the Schrodinger wave equation. (10)
5. (a) Using the variation method solve the Schrodinger wave equation for the ground state energy of Helium atom. (10)
- (b) Write the Schrodinger wave equation for Hydrogen atom in terms of polar coordinates. Separate the resultant expression into three equations using the technique of separation of variables. (10)

6. (a) What is meant by fugacity? Explain how will you determine the fugacity of gases by graphical method. (10)
- (b) Discuss the determination of activity of solute. (10)
7. (a) Explain the concept of partition function. (5)
- (b) Discuss the Maxwell Boltzmann distribution law and explain the evaluation of α and β in Maxwell Boltzmann distribution law. (10)
- (c) Compare MB, BE and FD statistics. (5)
8. (a) Explain the Einstein's theory of heat capacities of solids. What are its limitation? Discuss how Debye theory could overcome those limitations. (10)
- (b) Derive an expression for the molecular translation partition function of an ideal gas. (5)
- (c) Calculate the rotational partition function of F_2 at 25°C , given that $I = 32.5 \times 10^{-47} \text{ Kg m}^2$. (5)
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