

(DCHE 01 (NR))

M.Sc. (Previous) DEGREE EXAMINATION, DECEMBER 2012.

First Year

Chemistry

Paper I — GENERAL CHEMISTRY

Time : Three hours

Maximum : 80 marks

PART A — (4 × 8 = 32 marks)

Answer any FOUR questions.

1. Write about the nature of radiation and various sources used in different light radiations.
2. Explain the basic components and principle of NMR spectroscopy.
3. Write about various regions of Infra Red (IR) spectroscopy, their energies and light sources used in different regions of IR spectroscopy.
4. How do you express the rotations and frequencies of diatomic molecule in IR spectroscopy?
5. Discuss the sampling techniques in the collection of liquid samples for analysis.
6. Explain the classification of errors with suitable examples.
7. Explain the logical IF and GO TO statements with relevant examples.
8. Discuss the uses of software to evaluate the problems in chemistry.

PART B — (4 × 12 = 48 marks)

Answer ALL questions.

9. (a) (i) Explain the rotational spectra of diatomic molecules with suitable examples in microwave spectroscopy.
- (ii) What do you understand by quantization of energy in spectroscopy?

Or

- (b) (i) Discuss the isotopic effects in rotation spectra of microwave spectroscopy.
- (ii) Explain the basic principle of ESR spectroscopy.
10. (a) (i) Explain the electronic spectra of diatomic molecules in UV-visible spectroscopy.
- (ii) Discuss the vibrational spectra of an harmonic oscillator.

Or

- (b) (i) Write the classification of bands in UV-visible spectroscopy.
- (ii) Write the applications of Infra red spectroscopy.
11. (a) (i) Explain student 't' test and 'F' test.
- (ii) How do you minimize errors in analytical experiments?

Or

- (b) (i) Write in detail about control charts and its significance.
- (ii) Write about significant figures in representing analytical data with examples.

12. (a) Write a flow chart and Fortran programme to calculate the molar extinction coefficient using Beer-Lambert's law by linear least square method.

Or

- (b) Write a flow chart and Fortran program to calculate the pH and hydrogen ion concentration of an aqueous solution of a strong acid taking into account the auto ionization of water.
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(DCHE 02 (NR))

M.Sc. (Previous) DEGREE EXAMINATION, DECEMBER 2012.

First Year

Chemistry

Paper II — INORGANIC CHEMISTRY

Time : Three hours

Maximum : 80 marks

PART A — ($4 \times 8 = 32$ marks)

Answer any FOUR questions.

1. What are Russell–Saunders coupling? Derive term symbols for carbon atom and identify the ground states.
2. Explain the dual nature of wave particle. Write and explain Heisenberg's uncertainty principle.
3. Write and explain the assumptions of linear combination of atomic orbitals (LCAO) hybridisation.
4. Explain Born Haber cycle.
5. What are spectrochemical series? Explain the order of arrangement of ligands in the spectrochemicals series.
6. Draw and explain the crystal field splitting of 'd' orbitals in octahedral and tetrahedral geometries.
7. Write a note on carboranes.
8. Explain electron transfer reactions with suitable examples.

PART B — ($4 \times 12 = 48$ marks)

Answer ALL questions.

9. (a) Derive the wave equation for hydrogen.

Or

- (b) Describe the interaction of matter through photoelectric effect and Compton effect.
10. (a) Write the important postulates of valence bond theory. Draw and explain molecular orbital diagram (MO) of H_2 molecule.

Or

- (b) What is VSEPR theory? Explain the structures of SF_4 and XeF_6 molecules based on VSEPR theory.
11. (a) State and explain John-Teller effect with a typical example.

Or

- (b) Discuss the various factors affecting the magnitude of ' Δ_0 ' in octahedral complexes.
12. (a) Discuss the classification and structures of higher boranes.

Or

- (b) What are metal nitrosyls? Discuss the structure and bonding in metal nitrosyls with suitable examples.
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(DCHE 03 (NR))

M.Sc. (Previous) DEGREE EXAMINATION, DECEMBER 2012.

First Year

Chemistry

Paper III — ORGANIC CHEMISTRY

Time : Three hours

Maximum : 80 marks

PART A — (4 × 8 = 32 marks)

Answer any FOUR questions.

1. Describe resonance effect. Give conditions necessary for resonance.
2. Write a note on :
 - (a) Huckel's rule
 - (b) Aromaticity.
3. How do you differentiate transition states and intermediate states? Draw the potential energy diagram of transition and intermediate states.
4. Explain the following :
 - (a) Non classical carbocation
 - (b) S_N^i reaction.
5.
 - (a) Discuss the general mechanism and draw an energy profile diagram of Aromatic electrophilic substitution reactions.
 - (b) Write the mechanism of Hunsdiecker reaction.

6. (a) Discuss about hydrogenation of aromatic rings.
(b) Write the mechanism of hydroboration.
7. (a) Write the mechanism of metal hydride of unsaturated carbonyl compounds give examples.
(b) Write the mechanism of Benzoin condensation.
8. Write the mechanism and orientation in pyrolytic elimination.

PART B — (4 × 12 = 48 marks)

Answer FOUR questions.

UNIT I

9. (a) (i) Explain alternate and non-alternate hydrocarbons give examples.
(ii) Explain P-Nitroaniline is less basic than m-Nitroaniline.

Or

- (b) (i) Give an account of optical activity in allene and biphenyl derivatives.
(ii) Discuss the relative stabilities of chair and boat conformations of cyclohexane.

UNIT II

10. (a) (i) What are carbocations? Discuss their characteristics, stability and structure.
(ii) Explain Hammett equation and linear free energy relationship.

Or

- (b) Discuss the factors influencing the relative reactivity in substitution reactions.

UNIT III

11. (a) Write a note on :
- (i) Diazonium coupling
 - (ii) Gattermann – Koch reaction.

Or

- (b) (i) What are free radicals? Discuss their characteristics, structure and stability?
- (ii) Write a note on allylic Bromination give examples.

UNIT IV

12. (a) Explain the following :
- (i) Perkin reaction
 - (ii) Grignard reagent
 - (iii) Claisen condensation.

Or

- (b) (i) Discuss various factors which effect the extent of E^1 and E^2 eliminations.
- (ii) Write a note on E_{1CB} reaction give examples.
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(DCHE 04 (NR))

M.Sc. (Previous) DEGREE EXAMINATION, DECEMBER 2012.

First Year

Chemistry

Paper IV — PHYSICAL CHEMISTRY

Time : Three hours

Maximum : 80 marks

PART A — ($4 \times 8 = 32$ marks)

Answer any FOUR questions.

1. Draw and explain Vant Hoff reaction isotherm. What are its applications.
2. Define Gibbs Helmholtz equation.
3. Explain Schottky and Frenkel defects in solids.
4. Explain the mechanism of nuclear reactions with examples.
5. Describe the Lindamann's theory of unimolecular reaction.
6. Discuss in detail photochemical process.
7. Define transport number. How do you determine the transport number of an electrolyte?
8. Explain the terms conductance, specific conductance and equivalent conductance. Write units for each category.

PART B — (4 × 12 = 48 marks)

Answer ALL questions.

9. (a) Derive Classius-Clapeyran equation and write its applications.

Or

- (b) Describe the variation of chemical potential with temperature and pressure.
10. (a) Explain the principle and applications of ionization chamber, proportional counter and Geiger Muller counter.

Or

- (b) Write the applications of radio isotopes in agriculture, medicine and industry.
11. (a) Derive an equation for EMF of a cell with transference.

Or

- (b) Define activity coefficient. Explain how activity coefficient is determined by EMF method.
12. (a) Write note on
- (i) Heterogeneous catalysis
 - (ii) Laws of photochemistry.

Or

- (b) Describe the Collision theory of reaction rate with examples.
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