

(7 pages)

Reg. No. :

Code No. : 30758 E Sub. Code : EMCH 11/
FCCH 11

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2024

First Semester

Chemistry — Core

GENERAL CHEMISTRY — I

(For those who joined in July 2023 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer.

1. According to Planck's Quantum Theory, the energy of a quantum of radiation is directly proportional to its
(a) Wavelength (b) Amplitude
(c) Frequency (d) Speed
2. The electronic configuration of Fe^{2+} ion is
(a) $[\text{Ar}]\text{3d}^6$ (b) $[\text{Ar}]\text{3d}^5$
(c) $[\text{Ar}]\text{3d}^4$ (d) $[\text{Ar}]\text{4s}^2\text{3d}^6$

3. The concept of orbit belongs to which atomic model?
(a) Rutherford's model
(b) Bohr's model
(c) Quantum mechanical model
(d) Dalton's model
4. Which of the following ions has the highest electron affinity?
(a) F^- (b) O
(c) O^- (d) N^-
5. The value of the Madelung constant depends on _____
(a) The size of the ions only
(b) The ionization energies of the constituent ions
(c) The temperature of the ionic compound
(d) The shape of the crystal lattice
6. The bond angles in a molecule with a trigonal bipyramidal geometry are
(a) 90° and 120° (b) 109.5° and 180°
(c) 90° and 180° (d) 120° and 180°

7. Primary characteristic of insulators according to Band Theory _____.

- (a) Small band gap
- (b) Large band gap
- (c) Overlapping conduction and valence bands
- (d) High electrical conductivity

8. Which molecule demonstrates intramolecular hydrogen bonding?

- (a) Water (H₂O)
- (b) Ammonia (NH₃)
- (c) Hydrogen fluoride (HF)
- (d) Aspirin (acetylsalicylic acid)

9. _____ is formed when an alkane undergoes homolytic cleavage.

- (a) Carbanions
- (b) Carbocations
- (c) Free radicals
- (d) Hydrogen molecules

Page 3 Code No. : 30758 E

10. Which of the following is an example of a nucleophilic substitution reaction?

- (a) $\text{CH}_3\text{Cl} + \text{OH}^- \rightarrow \text{CH}_3\text{OH} + \text{Cl}^-$
- (b) $\text{CH}_4 + \text{Cl}_2 \rightarrow \text{CH}_3\text{Cl} + \text{HCl}$
- (c) $\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$
- (d) None of the above

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Explain Rutherford's model of an atom.

Or

(b) Explain the de-Broglie's equation.

12. (a) Discuss about probability and electron density in quantum mechanics.

Or

(b) Explain : Electron negativity.

13. (a) Draw and explain the Lewis dot structure of an ionic compound, using sodium chloride (NaCl) as an example.

Or

(b) Explain the types of overlapping of orbitals.

Page 4 Code No. : 30758 E

[P.T.O.]

14. (a) Bring out the difference between bonding molecular orbital, antibonding molecular orbital.

Or

- (b) Write a short note on applications of semi conductors.
15. (a) Write a note on Electrophiles and Nucleophiles.

Or

- (b) Describe the formation of reaction intermediate carbenes.

PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 600 words.

16. (a) Write a note on :
- Compton effect
 - Aufbau principle.

Or

- (b) Describe the following :
- Black body radiation
 - Heisenberg's uncertainty principle.

Page 5 Code No. : 30758 E

17. (a) Write (i) Schrodinger wave equation
(ii) Significance of ψ and ψ^2 .

Or

- (b) Describe how atomic radii and ionization energy vary across a period and down a group.

18. (a) What are Fajan's rules, and how does polarization affect the properties of ionic compounds?

Or

- (b) Illustrate VSEPR theory and explain the shapes of molecules of the type AB_2 and AB_4 .

19. (a) What is resonance? Draw and explain the resonance structures of the Carbonate Ion (CO_3^{2-}) and nitrate ion (NO_3^-).

Or

- (b) Draw the M.O. diagram of HF molecule and calculate the bond order and its magnetic properties.

Page 6 Code No. : 30758 E

20. (a) What is inductive effect? Explain the consequence of inductive effect with examples.

Or

(b) Illustrate the conditions necessary for resonance and hyperconjugation effect with suitable example.
