

KAMARAJ COLLEGE (Autonomous)

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(Affiliated to Manonmaniam Sundaranar University, Tirunelveli)

THOOTHUKUDI – 628 003

(7 Pages)

Reg. No:

Question Code No : 25000304

Course Code : 24UMCH31

UG Degree - End Semester Examinations, November 2025

Third Semester

B.Sc. CHEMISTRY

General Chemistry - III

(For those who joined in July 2024 onwards)

Time : 3Hours

Maximum : 75 Marks

PART – A (10 × 1 = 10 Marks)

Answer ALL Questions

Choose the correct answer:

1. The free path is the distance travelled by the molecule
(a) Before collision (b) In one minute
(c) In one second (d) After collision
2. Which of the following gases will have the highest rate of diffusion?
(a) NH₃ (b) CO₂

- (a) Diazo coupling (b) Dakin reaction
(c) Pechmann (d) Reimer-Tiemann reaction
condensation

10. Picric acid on distillation with alkaline solution of bleaching powder gives

- (a) Chloropicrin (b) Alizarin
(c) Picrate (d) Picryl chloride

PART - B (5 X 5 = 25 Marks)

Answer ALL Questions choosing either (a) or (b).

Answer should not exceed 250 words.

11. (a) Apply the van der Waal's equation to find the Boyle's temperature.

(OR)

(b) Derive an expression that interrelates P_r , V_r and T_r for a van der Waal's equation.

12. (a) How is X-ray diffraction used in the investigation of internal structure of a solid?

(OR)

(b) Account for the fact that graphite and diamonds are both allotropic forms of carbon yet graphite is soft while diamond is hard.

13. (a) How would you examine the stability of the nucleus in

terms of neutron-proton ratio and binding energy?

(OR)

(b) Analyze why the storage and disposal of nuclear waste is a major concern of society.

14. (a) How will you convert ethanol into methanol and vice versa?

(OR)

(b) How does Lucas reagent help in the distinction of primary, secondary and tertiary alcohols? Discuss the reaction involved.

15. (a) Identify the reagents and reaction conditions for the preparation of the following from benzyl alcohol:

- i. Benzyl acetate
- ii. Benzoxide
- iii. Toluene

(OR)

(b) How do you account for the following:

- i. p-nitrophenol is more acidic than phenol.
- ii. In Kolbe's reaction instead of phenol, phenoxide ion is treated with carbon dioxide.

PART - C (5 X 8 = 40 Marks)

Answer ALL Questions choosing either (a) or (b).

Answer should not exceed 500 words.

16. (a) How will you derive the van der Waals equation for real gases by applying the correction term for pressure and volume?

(OR)

- (b) How would you derive the kinetic gas equation by applying the laws of classical mechanics?

17. (a) How do you examine the following symmetry elements of a crystal?

- i. Centre of symmetry
- ii. Plane of symmetry
- iii. Rotation axis of symmetry

(OR)

- (b) Classify the liquid crystals and list their applications.

18. (a) (i) Interpret the group displacement law in radioactivity.

- (ii) Explain the different types of radioactive decay.

(OR)

- (b) i. How will you determine the age of rocks using the radiocarbon dating method?
- ii. Assess the binding energy per nucleon (in MeV) in He atom ${}^4_2\text{He}$ which has a mass of 4.00260 amu. Mass of an electron = 1.008655 amu and mass of 1 hydrogen atom = 1.007825 mass.

19. (a) Interpret the mechanism and stereochemistry of $\text{S}_{\text{N}}1$ and $\text{S}_{\text{N}}2$ reactions.

(OR)

- (b) Using evidence for the formation benzyne intermediate, explain the elimination-addition mechanism for the nucleophilic aromatic substitution reaction.

20. (a) Discuss the following
- Raschig process
 - Cannizzaro reaction
 - Gattermann synthesis
 - Fries rearrangement

(OR)

- (b) What happens when
- Resorcinol is treated with phthalic anhydride
 - Quinol is treated with ferric chloride

- iii. Benzyl alcohol is treated with thionyl chloride and HI
- iv. Phenol is treated with phthalic anhydride