

(7 pages)

Reg. No. :

Code No. : 20371 E Sub. Code : EMCH 41

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2025.

Fourth Semester

Chemistry — Core

GENERAL CHEMISTRY – IV

(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. During Joule-Thomson experiment, when an ideal gas expands, its temperature
- (a) does not change
 - (b) increases
 - (c) decreases
 - (d) first decreases and then increases

2. Which one is correct?

- (a) $\Delta E = \Delta H$
- (b) $\Delta H = \Delta E + \Delta nRT$
- (c) $\Delta E = \Delta H + \Delta nRT$
- (d) $\Delta H = \Delta E - \Delta nRT$

3. When two different gases are mixed then the entropy of the mixture?

- (a) does not change
- (b) becomes zero
- (c) increases
- (d) increases then decreases

4. Gibbs-Helmholtz equation is

- (a) $\Delta G = \Delta H + T\Delta S$
- (b) $\Delta H = \Delta G - T\Delta S$
- (c) $\Delta G = \Delta H - T\Delta S$
- (d) $\Delta H = T\Delta S - \Delta G$

5. The first artificially created element is

- (a) Tc
- (b) Tl
- (c) Pu
- (d) Ra

6. The ground state electronic configuration of chromium is

- (a) $[Ar]3d^4 4s^2$
- (b) $[Ar]3d^6 4s^0$
- (c) $[Ar]3d^5 4s^1$
- (d) $[Ar]3d^4 4s^0 4p^1$

7. Aldol condensation takes place in the presence of

- (a) HCl
- (b) NaOH
- (c) NaCl
- (d) H_2O

8. Cyclic ethers are also known as

- (a) Epoxides
- (b) Ethoxides
- (c) Epoxy resins
- (d) None of these

9. Acetoacetic ester is prepared by

- (a) Reformatsky reaction
- (b) MPV reduction
- (c) Oppenauer oxidation
- (d) Claisen condensation

10. The group which enhances the acid strength?

- (a) Electron releasing group
- (b) Electron withdrawing group
- (c) Alkyl group
- (d) None

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Derive expressions for ΔH and q of a real gas. ($2\frac{1}{2} \times 2 = 5$)

Or

(b) Derive Kirchoff's equation. (5)

12. (a) Calculate the entropy change when 1 mole of water in the solid state is change to liquid at $0^\circ C$. The heat of fusion of ice is 79.9 Cal/g. (5)

Or

(b) Derive Gibbs-Helmholtz equation. (5)

13. (a) Explain the following preparation of transition elements.
(i) Catalytic properties
(ii) Magnetic properties. $(2\frac{1}{2} \times 2 = 5)$

Or

- (b) Discuss the chemistry of iron group elements.
14. (a) Give any two methods of preparation of ethers.

Or

- (b) Explain MPV reduction.
15. (a) Explain Blanc's rule. (5)

Or

- (b) Explain Keto-Enol tautomerism with suitable examples.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

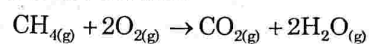
Each answer should not exceed 600 words.

16. (a) (i) State zeroth law of thermodynamics.
(ii) Bring out Joule-Thomson coefficient of an ideal gas. $(2 + 6 = 8)$

Or

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- (b) For the reaction



$\Delta H^0 = -802.24 \text{ kJ}$. Calculate $D_{\text{C=O}}$ from the following bond energy data :

$$D_{\text{C-H}} = 412.2 \text{ kJmol}^{-1}, D_{\text{O-H}} = 464.4 \text{ kJmol}^{-1};$$

$D_{\text{O=O}} = 495 \text{ kJmol}^{-1}$. D-stands for dissociation energy.

17. (a) Describe Carnot's cycle. Derive an expression for the efficiency of a heat engine.

Or

- (b) (i) Explain the exceptions of III law of thermodynamics. (4)
(ii) Deduce the expression for entropy change in reversible and irreversible process.

18. (a) Discuss the group study of Nickel group.

Or

- (b) Briefly discuss chromium group elements.

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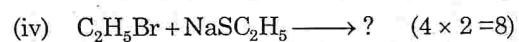
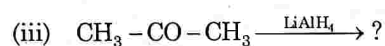
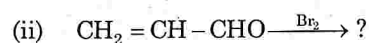
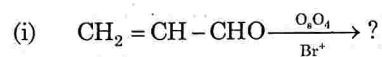
19. (a) Explain the following reactions with mechanism.

(i) Cannizzaro's reaction

(ii) Benzoin condensation. (4 + 4 = 8)

Or

(b) Complete the following reaction :



20. (a) Discuss any four methods of preparation hydroxy acids. (4 × 2 = 8)

Or

(b) Discuss the following reaction with mechanisms.

(i) Huns-Dicker reaction

(ii) Claisen condensation. (2 × 4 = 8)