

**2025/TDC (CBCS)/ODD/SEM/
CHMDSC/GE-101T/431**

TDC (CBCS) Odd Semester Exam., 2025

CHEMISTRY

(1st Semester)

Course No. : CHMDSC/GE-101T

**(Atomic Structure, Bonding, General Organic
Chemistry and Aliphatic Hydrocarbons)**

Full Marks : 50

Pass Marks : 20

Time : 3 hours

*The figures in the margin indicate full marks
for the questions*

UNIT—I

1. Answer any *three* from the following : 1×3=3
- (a) State two limitations of Bohr's theory.
 - (b) What are quantum numbers?
 - (c) State Heisenberg's uncertainty principle.
 - (d) Write electronic configuration of Cu.
2. Answer any *one* of the following : 2
- (a) State the postulates of Bohr's atomic model.
 - (b) Explain why half-filled and completely filled orbitals are more stable than other configurations.

3. Answer any *one* of the following : 5

- (a) (i) State de Broglie's hypothesis. Prove that

$$\lambda = \frac{h}{\sqrt{2mE}}$$

where λ is the wavelength of matter wave, m is the mass, E is the KE of electron and h is the Planck's constant. 3

- (ii) What is the significance of ψ and ψ^2 ? 2

- (b) (i) Discuss various types of quantum numbers with their significance. 4

- (ii) What is Pauli's exclusion principle? 1

UNIT—II

4. Answer any *three* of the following : 1×3=3

- (a) Define lattice energy.
(b) What are bonding and antibonding molecular orbitals?
(c) State Fajans' rule.
(d) Draw the resonance structure of CO_3^{2-} .

5. Answer any *one* of the following : 2

- (a) Explain why He_2 molecule does not exist but He_2^+ molecule exists.
(b) Explain why NH_3 is more polar than NF_3 .

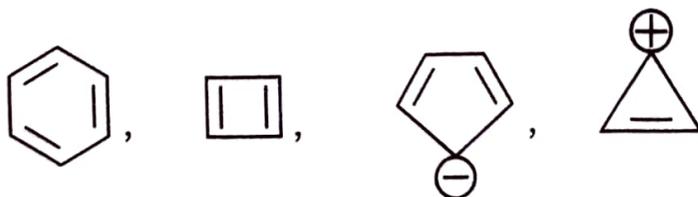
6. Answer any *one* of the following : 5
- (a) (i) Draw the energy level diagram of NO molecule and calculate its bond order. 3
- (ii) Using VSEPR theory, predict the geometry of XeF₂. 2
- (b) (i) Draw the energy level diagram of N₂ molecule and comment on its bond order and magnetic property. 3
- (ii) Using VSEPR theory, predict the geometry of SF₄. 2

UNIT—III

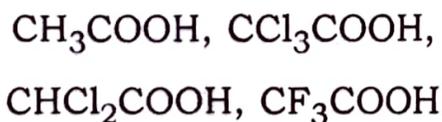
7. Answer any *three* of the following : 1×3=3
- (a) What is inductive effect?
- (b) Explain the term electrophiles and nucleophiles with example.
- (c) State Hückel's rule of aromaticity.
- (d) What is resonance?
8. Answer any *one* of the following : 2
- (a) Explain hyperconjugation by taking suitable example.
- (b) What are carbocations? Discuss the structure of carbocations.

9. Answer any one of the following : 5

(a) (i) Identify aromatic, non-aromatic and anti-aromatic compounds from the following : 3

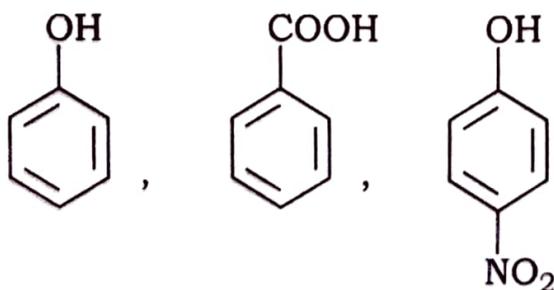


(ii) Arrange the following in increasing order of acid strength : 2



(b) (i) What are carbanions? Discuss the structure and stability of carbanions. 3

(ii) Arrange the following in the increasing order of acid strength : 2



UNIT—IV

10. Answer any *three* of the following : 1×3=3

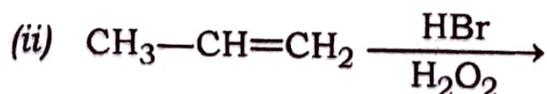
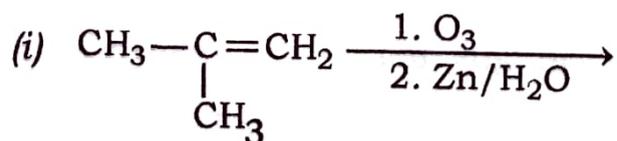
- (a) What is Grignard's reagent?
- (b) State Markovnikov's rule and explain with suitable example.
- (c) What happens when 1-chloropropane is treated with KOH in alcoholic medium?
- (d) Explain Wurtz reaction with suitable example.

11. Answer any *one* of the following : 2

- (a) What happens when Grignard's reagent reacts with water? Explain with reaction.
- (b) What is Saytzeff's rule? Explain by taking a suitable example.

12. Answer any *one* of the following : 5

- (a) Predict the product and depict the mechanism : 2½×2=5



- (b) (i) Discuss the mechanism of bromination of alkene by taking suitable example. 3
- (ii) Discuss one method of preparation of alkyne with reaction. 2

UNIT—V

13. Answer any *three* of the following : 1×3=3

- (a) What happens when phenol is treated with zinc dust and heated?
- (b) What happens when toluene is treated with alkaline KMnO_4 and refluxed?
- (c) What is Friedel-Crafts alkylation?
- (d) How can benzene be prepared from acetylene?

14. Answer any *one* of the following : 2

- (a) Explain the role of Lewis acid ($\text{AlCl}_3/\text{FeCl}_3$) in electrophilic substitution reaction of benzene.
- (b) How can you convert benzene to benzoic acid?

15. Answer any *one* of the following : 5

- (a) (i) Discuss Friedel-Crafts acylation reaction by taking suitable example. 3
- (ii) Explain why nitrobenzene does not undergo Friedel-Crafts reaction. 2

(7)

(b) Predict the product of the following reactions : 1×5=5

