

2025/FYUG/EVEN/SEM/
CHMDSC-252/141

FYUG Even Semester Exam., 2025

CHEMISTRY
(4th Semester)

Course No. : CHMDSC-252

(Organometallic and Analytical Chemistry)

Full Marks : 70
Pass Marks : 28

Time : 3 hours

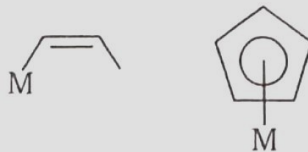
The figures in the margin indicate full marks
for the questions

UNIT—I

1. Answer any *two* of the following questions :

2×2=4

(a) What is haptacity? Mention haptacity in
the following compounds :



(b) What is 18-electron rule? Give
examples.

(c) Draw the structures of eclipsed and
staggered ferrocene.

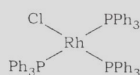
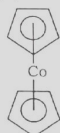
J25/1346

(Turn Over)

(2)

Answer any one of the following questions : 10

2. (a) (i) Count the number of electrons in the following molecules as per EAN rule : 2

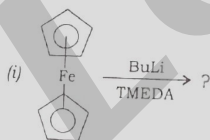


- (ii) Give an example of 16-electron species. What do you mean by polynuclear carbonyl cluster? Give examples. 3

- (b) (i) Compare the relative stabilities of ferrocene with benzene. 3

- (ii) Discuss the classification of organometallic compounds. 2

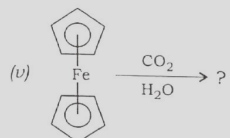
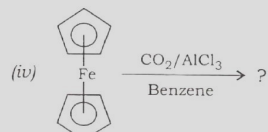
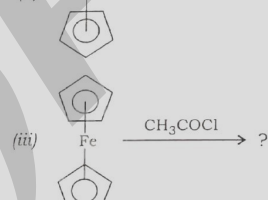
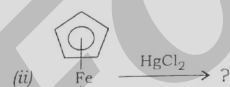
3. (a) Complete the following reactions : 1×5=5



J25/1346

(Continued)

(3)



- (b) Mention one method of preparation of ferrocene. 2

- (c) Discuss the stability of sandwich complex and half sandwich complex, taking suitable example of each. 3

J25/1346

(Turn Over)

(4)

UNIT—II

4. Answer any *two* of the following questions :

2×2=4

- (a) Mention one method of preparation of Grignard reagent.
- (b) Why is dry ether used in the preparation of Grignard reagent?
- (c) Draw the structure of triethyl aluminium along with its use.

Answer any *one* of the following questions : 10

- 5. (a) Discuss the mechanism of polymerization of ethene. 5
- (b) Taking suitable example explain the concept of multicentred bonding in organometallic compounds. 5
- 6. (a) Explain the structure of trialkyl aluminium and explain why Al—C bond lengths are not equal. 5
- (b) Mention three uses of Grignard reagents in synthetic chemistry. 3
- (c) Mention the factors affecting Schlenk equilibrium. 2

J25/1346

(Continued)

(5)

UNIT—III

7. Answer any *two* of the following questions :

2×2=4

- (a) What is acid hydrolysis? Give example.
- (b) What are inert and labile complexes?
- (c) What is *trans*-effect?

Answer any *one* of the following questions : 10

- 8. (a) Explain the mechanism of ligand substitution reaction in square planar complexes. 5
- (b) Discuss any one theory of *trans*-effect taking a suitable example. 5
- 9. (a) What is inert ligand? What types of intermediate are formed by pi-acceptor and pi-donor ligands? 5
- (b) Discuss S_N1 (CB) mechanism taking suitable example. 5

UNIT—IV

10. Answer any *two* of the following questions :

2×2=4

- (a) Why is Wilkinson catalyst called homogeneous catalyst?

J25/1346

(Turn Over)

(6)

- (b) What is water-gas shift reaction?
Mention the suitable catalyst. 1+1=2

- (c) What do you mean by rate determining step in catalytic reaction?

Answer any *one* of the following questions : 10

11. (a) Discuss the mechanism of hydroformylation reaction. 5

- (b) Discuss catalytic cycle of alkene hydrogenation. 5

12. (a) Discuss the preparation of synthesis gas by metal carbonyl complex. 5

- (b) What is syn gas? Mention its uses. 1+2=3

- (c) Mention the hybridization state of central metal atom in Wilkinson catalyst and comment on its geometry. 2

UNIT—V

13. Answer any *two* of the following questions : 2×2=4

- (a) What are meant by group reagents? Mention group reagent of group I.

- (b) Discuss solubility product and its relation with precipitation.

- (c) What do you mean by interfering radicals?

J25/1346

(Continued)

(7)

Answer any *one* of the following questions : 10

14. (a) Discuss the removal of PO_4^{3-} from the inorganic salt mixture. 5

- (b) What is common ion effect? Explain why Zn^{2+} cannot be precipitated as ZnS in acidic medium. 5

15. (a) Discuss the process of detection and removal of borate from inorganic samples. 5

- (b) Discuss the detection of PO_4^{3-} , oxalate and F^- from the sample along with reactions. 5

2025/FYUG/EVEN/SEM/
CHMDSC-252/141

J25—460/1346