

**2025/FYUG/ODD/SEM/
CHMDSC-201T/459**

FYUG Odd Semester Exam., 2025

CHEMISTRY

(3rd Semester)

Course No. : CHMDSC-201T

(Inorganic Chemistry—II)

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) Out of the following, which is a better oxidizing agent and why? 2

Pb^{+4} or Sn^{+4}

(b) Define allotropy. Write the allotropic forms of sulphur. 1+1=2

(c) Draw the structure of borazine. Why is borazine called inorganic benzene? 1+1=2

2. Answer any one of the following questions : 10

(a) (i) What is inert pair effect? Mention its cause. 1+1=2

(ii) How can Marshall's acid be prepared? Write the structure and applications of Marshall's acid. 1+2=3

(iii) What happens when B_2H_6 undergoes hydrolysis? Write the nature of the terminal and bridging bond in B_2H_6 . 1+1=2

(iv) What happens when XeF_6 reacts with aq. NaOH? Give equation. Draw the structure of $XeOF_4$ and mention the hybridization state of Xe in it. 1+2=3

(b) (i) What are clathrates? Mention its uses. 1+1=2

(ii) Give reasons why B shows anomalous behaviour compared to other group 13 elements. Citing reasons, compare the catenation tendency of O and S. 1+1=2

(iii) Why is diborane called an electron-deficient compound? Classify the following into closo, nido or arachno type : 1+(1×2)=3



(3)

- (iv) ClF_3 exists but ClF_2 does not. Why? Explain the structure and bonding in ClF_3 . 1+2=3

UNIT—II

3. Answer any *two* of the following questions : 2×2=4
- (a) What do you mean by conjugate acid-base pair? Illustrate using a suitable example. 1+1=2
- (b) Mention two points of differences between inorganic and organic polymers. 2
- (c) Draw the structure of $[\text{Si}_2\text{O}_7]^{6-}$. 2
4. Answer any *one* of the following questions : 10
- (a) (i) Explain Lewis concept of acids and bases using suitable examples. 3
- (ii) What is HSAB principle? Explain why AgI_2^- is stable but AgF_2^- does not exist. 1+2=3
- (iii) What are silicones? Give a brief account of its applications in the field of technology. 1+3=4

- (b) (i) What are silicates? Illustrate the structural features of four different types of silicates and also give the name and formula of one example of each type. 1+5=6
- (ii) What do you mean by levelling solvent and differentiating solvent? Taking suitable example, show that 'water' acts both as levelling as well as differentiating solvent. 2+2=4

UNIT—III

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

2×2=4

- (a) What is inner orbital complex? Taking a suitable example, write the hybridization state of inner orbital complex. 1+1=2
- (b) Give the IUPAC (2005) names of the following : 1+1=2
- (i) $[\text{Pt}(\text{NH}_3)_4][\text{PtCl}_4]$
- (ii) $[\text{Co}(\text{en})_2(\text{ONO})\text{Cl}]\text{Cl}$
- (c) What is an ambidentate ligand? How does it differ from polydentate ligand? 1+1=2

6. Answer any *one* of the following questions : 10

(a) (i) Discuss the factors affecting the magnitude of Δ_0 values. 3

(ii) Explain the consequence of Jahn-Teller effect on the structure of $[\text{CuCl}_6]^{4-}$. 3

(iii) Calculate the CFSE and expected magnetic moment in BM for $[\text{Fe}(\text{CN})_6]^{4-}$ and $[\text{NiCl}_4]^{2-}$ complexes. 2+2=4

(b) (i) Give the hydrate isomers of $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$ in solution. How can you detect them experimentally? 2+2=4

(ii) Draw all the possible stereoisomers of $[\text{Co}(\text{en})_2\text{Cl}_2]^+$. Indicate which isomers are optically active. 3

(iii) Discuss the splitting of *d*-orbitals in case of tetrahedral complexes. 3

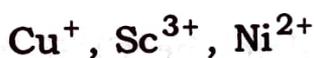
UNIT—IV

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

(a) Write the electronic configurations of Gd and Lu and comment on their stability. 2

(b) Give an example of a transition metal compound that acts as a catalyst. Write the reaction in which it shows catalytic behaviour. 1+1=2

(c) Citing reasons, indicate which of the following ions would be coloured : 2



8. Answer any *one* of the following questions : 10

(a) (i) Why do transition elements show variable oxidation states? A substance is found to have a magnetic moment of 3.9 BM. How many unpaired electrons does it contain? 1+2=3

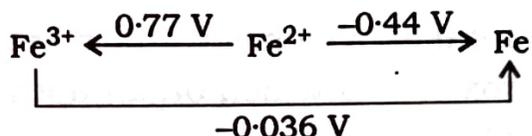
(ii) What happens when acidified $\text{K}_2\text{Cr}_2\text{O}_7$ solution reacts with H_2O_2 ? Give the chemical equation and draw the structure of the product formed. 1+1=2

(iii) Which out of the two, $\text{La}(\text{OH})_3$ and $\text{Lu}(\text{OH})_3$, is more basic and why? 2

(iv) How can a mixture of lanthanide ions be separated by ion-exchange chromatography? 3

- (b) (i) What is Latimer diagram? Using the following diagram, predict whether Fe^{2+} will disproportionate or not.

1+3=4



- (ii) Draw the structure of permanganate ion. Mention the reason behind the intense purple colour of permanganate ion. 1+1=2
- (iii) Why are Sm^{2+} , Eu^{2+} and Yb^{2+} ions in solution act as good reducing agents but an aqueous solution of Ce^{4+} is a good oxidizing agent? 2
- (iv) Comment on the magnetic behaviour of Lu^{3+} ion. Write the formula for calculating magnetic moment of lanthanides. 1+1=2

UNIT—V

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

2×2=4

- (a) Name two essential trace elements that are required for the body and mention their functions. 2

(b) Define porphyrin. Give two examples of metalloporphyrins. 1+1=2

(c) Name the abnormalities caused by (i) iodine deficiency and (ii) excess iodine intake. Which form of mercury is most toxic, and which organ does it primarily affect? 1+1=2

10. Answer any one of the following questions : 10

(a) (i) Discuss the structure of active site of haemoglobin. How does this structure change upon O_2 binding? 3+2=5

(ii) Explain the roles of Hb and Mb in transporting oxygen. 2

(iii) What are heavy metals? Explain the toxic effects of cadmium on human health. 1+2=3

(b) (i) What is chelation therapy? Give one example of its applications in detoxification of lead and mercury. 1+2=3

(ii) Discuss the characteristics of chelating agents used in chelation therapy. 3

(iii) Explain the biochemical roles of Ca^{2+} and Mg^{2+} in the body. 2+2=4

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