

**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

I. 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

(a)

(i) What is one of the following questions?
its cause.

(ii) How prepared? Can Marshall's applications? Write the structure of Marshall's acid. Mention nature of the terminal and bridging bond in B_2H_6 .

(iii) What happens when B_2H_6 reacts with aq. NaOH? Give equation. Mention the hybridization state of Xe in it.

(iv) What are clathrates? Mention its uses.

(b)

(i) Give reasons why B shows anomalous behaviour compared to other group 13 elements. Citing tendency of O and S.

(ii) Why is diborane called an electron-deficient compound? Classify the arachno type:

- (1) B_5H_{11} $1+1=2$
(2) $C_2B_{10}H_{12}$ $1+(1 \times 2)=3$

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

UNIT—II

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 $[Si_2O_7]^{6-}$. 2

(d) Answer any one of the following questions: 10

(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. $1+3=4$

(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. 3

(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:

- (a) What is inner orbital complex? Taking a suitable example, write the hybridization state of inner orbital complex. 2+2=4

(b) Give the IUPAC (2005) names of the following: 1+1=2



- (c) What is an ambidentate ligand? How does it differ from polydentate ligand? 1+1=2

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(5) 10

- Answer any one of the following questions: 3
- (i) Discuss the factors affecting the magnitude of Δ_0 consequence of the structure 3

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

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

(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

(Turn Over)

26J/783

(6)

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

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



8. Answer any one of the following questions:

(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?

(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.

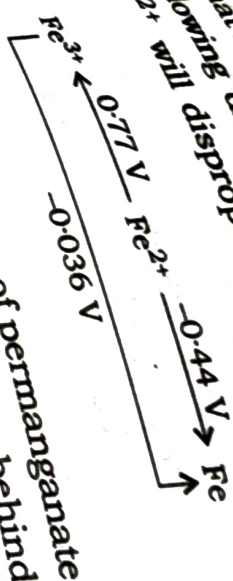
(iii) Which out of the two, $\text{La}(\text{OH})_3$ and $\text{Lu}(\text{OH})_3$, is more basic and why?

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

(7)

1+3=4

What is Latimer diagram, predict whether the following will disproportionate or not.



(i) Draw the structure of permanganate ion. Mention the reason behind the intense purple colour of the permanganate ion. 1+1=2

(ii) Why are Sm^{2+} , Eu^{2+} and Yb^{2+} good reducing agents but an aqueous solution of Ce^{4+} is a good oxidizing agent? 2

(iii) Comment on the magnetic behaviour of Lu^{3+} ion. Write the formula for calculating magnetic moment of lanthanides. 1+1=2

UNIT-V

2×2=4

Answer any two of the following questions:

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

(Turn Over)

- (b) Define porphyrin. Give two examples of metalloporphyrins.
- (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?

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

- (a) (i) Discuss the structure of active site of haemoglobin. How does this structure change upon O_2 binding?
- (ii) Explain the roles of Hb and Mb in transporting oxygen.
- (iii) What are heavy metals? Explain the toxic effects of cadmium on human health.
- (b) (i) What is chelation therapy? Give one example of its applications in detoxification of lead and mercury.
- (ii) Discuss the characteristics of chelating agents used in chelation therapy.
- (iii) Explain the biochemical roles of Ca^{2+} and Mg^{2+} in the body.

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