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M.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2021.

Second Semester

Chemistry — Core

INORGANIC CHEMISTRY — II

(For those who joined in July 2017 onwards)

Time : Three hours

Maximum : 75 marks

PART A — ($10 \times 1 = 10$ marks)

Answer ALL questions.

Choose the correct answer :

1. According to Molecular Orbital Theory, the shape and size of a molecular orbital depends upon
 - (a) Shape and size of the combining atomic orbitals
 - (b) Numbers of the combining atomic orbitals
 - (c) Orientation of the combining atomic orbitals
 - (d) All of the mentioned

2. The CFSE of high spin d^5
- (a) 0 (b) 1
(c) 2 (d) 3
3. The reactions of $[\text{PtCl}_4]^{2-}$ with NH_3 (reaction I) and of $[\text{PtCl}_4]^{2-}$ with $[\text{NO}_2]^-$ followed by NH_3 (reaction II) are ways of preparing
- (a) I : $\text{cis-}[\text{PtCl}_2(\text{NH}_3)_2]$;
II : $\text{trans-}[\text{PtCl}_2(\text{NH}_3)(\text{NO}_2)]^-$
- (b) I : $\text{trans-}[\text{PtCl}_2(\text{NH}_3)_2]$;
II : $\text{cis-}[\text{PtCl}_2(\text{NH}_3)(\text{NO}_2)]^-$
- (c) I : $\text{cis-}[\text{PtCl}_2(\text{NH}_3)_2]$;
II : $\text{cis-}[\text{PtCl}_2(\text{NH}_3)(\text{NO}_2)]^-$
- (d) I : $\text{trans-}[\text{PtCl}_2(\text{NH}_3)_2]$;
II : $\text{trans-}[\text{PtCl}_2(\text{NH}_3)(\text{NO}_2)]^-$
4. The inner-sphere mechanism should obey three distinct steps
- (a) substitution to form a bridge between oxidant and reductant
- (b) actual electron transfer
- (c) separation of the products (often with transfer of the bridge ligand)
- (d) all the mentioned above

5. A molecule that cannot be superimposed on its mirror image is said to exhibit which of the following?
- (a) geometrical isomerism
 - (b) optical isomerism
 - (c) linkage isomerism
 - (d) reactive isomerism
6. Which of the following molecules will not show infrared spectrum?
- (a) H_2
 - (b) HCl
 - (c) CH_4
 - (d) H_2O
7. Fe^{2+} can form both high-spin, $\text{Fe}(\text{H}_2\text{O})_6^{2+}$, and low-spin, $\text{Fe}(\text{CN})_6^{2-}$ complexes as
- (a) 4 unpaired electrons
 - (b) 2 unpaired electrons
 - (c) 1 unpaired electrons
 - (d) 3 unpaired electrons

8. Give equation for the magnetic moment _____.

(a) $\mu = \sqrt{4S(S+1)}$

(b) $\mu = \sqrt{S(S-1)}$

(c) $\mu = \sqrt{S(S+2)}$

(d) $\mu = \sqrt{S(S-2)}$

9. Bond order in cluster $[\text{Mo}_2(\text{SO}_4)_4]^{4-}$ is _____.

(a) 2 (b) 1

(c) 3 (d) 1.5

10. The formula of the pyrosilicate ion is

(a) SiO_4^{4-} (b) $\text{Si}_3\text{O}_9^{2-}$

(c) $\text{Si}_2\text{O}_7^{6-}$ (d) $\text{Si}_6\text{O}_{18}^{12}$

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) State the basic features of LFT.

Or

(b) State the features of CFT Theory.

12. (a) Account on the factors affecting the stability of the coordination compounds.

Or

- (b) What is trans effect? Explain briefly.

13. (a) Write a brief note on LS Coupling.

Or

- (b) Draw and explain Orgel diagram with example.

14. (a) Explain quenching or orbital contribution to magnetic moment.

Or

- (b) Account on Zeeman effect.

15. (a) Write a brief note on carboranes.

Or

- (b) State and explain Wade's rule.

PART C — ($5 \times 8 = 40$ marks)

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

Each answer should not exceed 600 words.

16. (a) Write a detailed note on Jahn-Teller distortion.

Or

- (b) Give a detailed note on applications of CFT.

17. (a) Describe the spectrophotometric method of determination of stability of constant.

Or

- (b) Account on complementary and non-complementary electron transfer reaction.

18. (a) Describe the effect of spin orbital coupling on spectra and LS coupling scheme.

Or

- (b) Explain the electronic spectra of lanthanide complexes.

19. (a) Account on paramagnetism of coordination complexes.

Or

- (b) Explain the magnetic moment of an atom.

20. (a) Write a note on Phosphazene.

Or

- (b) Account on metal clusters and their preparation.