

Master's Degree Examination - November 2018
I Semester

Class : I PG
Major : Chemistry

Time : 3 Hrs.
Max. Marks : 60

17MCHC02- Inorganic Chemistry - I

Part - A (10 x 1/2 = 5)
Choose the correct Answer

1. In the case of stronger ligands

- a. $\Delta_o = P$ b. $\Delta_o < P$ c. $\Delta_o > P$ d. $\Delta_o \geq P$

2. The magnetic moment is calculated by the formula

- a. $n(n+1)$ b. $n(n+2)$ c. $[(n(n+1))]^{1/2}$ d. $[n(n+2)]^{1/2}$

3. The net energy gain due to the distortion in Cu^{2+} ion in an octahedral field is

- a. $1/2\delta_1$ b. $-1/2\delta_1$ c. 0 d. δ_1

4. The number of microstates for d^2 system is

- a. 10 b. 45 c. 120 d. 210

5. Which among the following reagent is used for the estimation of aluminium

- a. oxine b. DMG c. alizarin d. aluminon

6. Cupron has the molecular formula

- a. $\text{C}_{14}\text{H}_{13}\text{NO}_2$ b. $\text{C}_6\text{H}_7\text{NO}_2$ c. $\text{C}_{14}\text{H}_{13}\text{N}_2\text{O}$ d. $\text{C}_6\text{H}_7\text{N}_2\text{O}$

7. The IR frequencies of $[\text{Mn}(\text{CO})_6]^+$, $[\text{Cr}(\text{CO})_6]$ and $[\text{V}(\text{CO})_6]^-$ are in the order

- a. 1860, 2000 and 2090 cm^{-1} b. 1860, 2090 and 2000 cm^{-1}
c. 2090, 1860 and 2000 cm^{-1} d. 2090, 2000 and 1860 cm^{-1}

8. Pt in Zeise's salt has ----- geometry

- a. tetrahedral b. square planar c. octahedral d. square pyramidal

9. The radius ratio of CsCl and the coordination number of Cs in CsCl are

- a. 0.524 and 6 b. 0.93 and 6 c. 0.524 and 8 d. 0.93 and 8

10. F- center is because of

- a. cation vacancy b. anion vacancy
c. trapped electron d. cation in the interstitial site

Part - B**(5 x 4 = 20)****Answer all Questions****Each answer should not exceed 200 words or one page**

11. a. For the $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$ ion, the mean pairing energy, P , is $23,500 \text{ cm}^{-1}$ and Δ_o is $13,900 \text{ cm}^{-1}$. Calculate the CFSE corresponding to the high spin and low spin states. Which state is more stable?

(OR)

11. b. $[\text{Ti}(\text{H}_2\text{O})_6]$ is purple in colour. Give the reason.

12. a. Give the term symbols for d^1 to d^5 states.

(OR)

12. b. Explain the intense colours of KMnO_4 and $\text{K}_2\text{Cr}_2\text{O}_7$

13. a. 20 ml of NiSO_4 solution with DMG gives 0.2246 g of Ni-DMG precipitate. Calculate the weight of nickel present in 100 ml of the given solution.

(OR)

13. b. 10 ml of aluminium sulphate solution gives 0.25 g of $\text{Al}(\text{oxine})_3$ precipitate. Calculate the amount of aluminium present in 100 ml of the given solution.

14. a. Calculate the effective atomic numbers of the following metal carbonyls and their derivatives.

(i) $\text{Ni}(\text{CO})_4$ (ii) $\text{Fe}(\text{CO})_5$ (iii) $[\text{Co}^+(\text{CO})_3(\text{NO})]^0$ (iv) $[\text{Fe}^{2+}(\text{CO})_2(\text{NO}^+)_2]^0$

(OR)

14. b. Complete the following chemical reactions.

$(\text{C}_5\text{H}_5)_2\text{Fe} + \text{C}_4\text{H}_9\text{Li} \rightarrow \text{A}$, $\text{A} + \text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{B}$, $\text{A} + \text{N}_2\text{O}_4 \rightarrow \text{C}$, $\text{C} + \text{Fe}/\text{HCl} \rightarrow \text{D}$

15. a. Draw and explain the structures of zinc blende and Wurtzite.

(OR)

15. b. Explain the structure of fluorite.

Part - C**(5 x 7 = 35)****Answer all Questions****Each answer should not exceed 600 words or three pages**

16. a. Explain with diagram the splitting of d- orbitals in an octahedral and tetrahedral field.

(OR)

16. b. Discuss the applications of CFSE in stereochemistry and trend in heats of hydration of divalent ions of first row transition elements.

17. a. Draw and explain the Tanabe-Sugano diagram for complexes of Co^{3+} with F^- and *en*.

(OR)

17. b. Write brief accounts on the following.

(i) Nephelauxetic effect (ii) Evidences for π - bonding in coordination compounds.

18. a. Discuss the common properties of organic reagents.

(OR)

18. b. Give the structures of the following.

(i) Salicylaldoxime (ii) Copper(II) salicylaldoxime (iii) α -nitroso- β -naphthol
(iv) Ni(DMG) (v) Rubeanic acid

19. a. Write notes on the following.

(i) Organometallic compounds (ii) Synergism

(iii) Preparation of Zeise's salt

(iv) preparation and structure of ferrocene

(1+1+2+3)

(OR)

19. b. How are metal nitrosyls prepared? Explain their structure?.

20. a. Explain the following.

(i) seven crystal systems with diagram (ii) n-type semi conductors

(iii) p-type semi conductors

(3+2+2)

(OR)

20. b. Discuss Schottky - Wagner defect, its consequences and its applications.
