JEE Main 1 February 2024 Shift 1 Question Paper

Chemistry

1. 3 NaCl samples have their van't Hoff factor as follows:
   Sample 1 of 0.1 M - i_1
   Sample 2 of 0.01 M - i_2
   Sample 3 of 0.001 M - i_3
   Find the relation between i_1, i_2, and i_3.

2. Complementary stand of DNA ATGCTTCA is:
   i. TACGAAGA
   ii. TACGAAGT
   iii. TAGCAACA
   iv. TAGCTACT

3. $Cr_2O_7^{2-} + xH^+ + ye^- \rightarrow 2Cr^{3+} + AH_2O$
   Balance the above reaction and find x, y and A.

4. Find out the total possible optical isomers of 2-chlorobutane.

5. How many oxides are amphoteric in nature?
   SnO_2, PbO_2, SiO_2, P_2O_5, Al_2O_3, CO_2, CO, NO, N_2O

6. In Kjeldahl's estimation of nitrogen, CuSO4 acts as:
   i. Oxidising Agent
   ii. Reducing Agent
   iii. Catalyst
   iv. Reagent

7. Match the following:
   Column 1: i. $[Cr(H_2O)_6]^{3+}$, ii. $[Fe(H_2O)_6]^{3+}$, iii. $[Ni(H_2O)_6]^{2+}$, iv. $[V(H_2O)_6]^{3+}$
   Column 2: a. $t_{2g}^2eg^0$, b. $t_{2g}^3eg^0$, c. $t_{2g}^3eg^2$, d. $t_{2g}^6eg^2$

8. Statement I: PH_3 will have a lower boiling point than NH_3.
   Statement II: There are strong van der Waals forces in NH_3 and strong hydrogen bonding in PH_3.
   i. Both statements I and II are correct.
   ii. Both statements I and II are incorrect.

iii. Statement I is correct and statement II is incorrect.

iv. Statement I is incorrect and statement Il is correct.

9. Statement I: S_8 disproportionates into $H_2S_2O_3$ and S_2^- in an alkaline medium.

   Statement II: ClO_4^- undergoes disproportionation in an acidic medium

   i. Both statements I and II are correct.

   ii. Both statements I and II are incorrect.

   iii. Statement I is correct and statement II is incorrect.

   iv. Statement I is incorrect and statement Il is correct.

10. The total number of deactivating groups among the following is:

    -CN, -NH-CO-CH_3, -CO-CH_3, -NH-CH_3

11. We are given with following cell reaction:

    $2H^+ + 2\ e^- \rightarrow H_2$

    $P_{H2} = 2$ atm

    $[H^+] = 1M$

    $(2.303RT / F = 0.06)$

    If E_{cell} of the reaction is given by $-x * 10^{-3}$ V. Find out x.

12. What is the pH of $CH_3COONH_4^+$? (At 25°C)

    Given: K_a of $CH_3COOH = 1.8 \times 10^{-5}$, K_b of $NH_4OH = 1.8 \times 10^{-5}$

13. Which of the following have a trigonal bipyramidal shape?

    PF_5, PBr_5, $[PtCl_4]^-$, SF_6, BF_3, BrF_5, PCl_5, $[Fe(CO)_5]$

14. Which of the following is most likely attacked by an electrophile?

15. Which of the following is the correct for adiabatic free expansion against vacuum?

    i. $q = 0, \Delta U = 0, w = 0$

    ii. $q \neq 0, w = 0, \Delta U = 0$

    iii. $q = 0, \Delta U \neq 0, w = 0$

    iv. $q = 0, \Delta U \neq 0, w \neq 0$