

JEE (Main)-2025 (Online) Session-2

4 April 2025 Shift – 1

PART : CHEMISTRY

1. For the complex $[\text{Cr}(\text{ox})_2\text{Cl}_2]^{-3}$ and $[\text{CrCl}_3(\text{py})_3]$ total number of stereo isomers is respectively:
(1) 3, 2 (2) 2, 3 (3) 2, 2 (4) 3, 3

Ans. (1)

Sol. In $[\text{Cr}(\text{ox})_2\text{Cl}_2]^{-3}$ out of cis and trans, cis isomers is optically active.
 $[\text{CrCl}_3(\text{py})_3]$ is of type $[\text{Ma}_3\text{b}_3]$ and will have fac and mer geometric isomers.

2. Amongst the following species in which number of unpaired electrons is same is :
(1) Cr^{+2} , Mn^{+2} (2) Ti^{+2} , Co^{+2} (3) V^{+2} , Co^{+2} (4) Cu^{+2} , Zn^{+2}

Ans. (3)

Sol. $\text{V}^{+2} [\text{Ar}]3d^3$, $n = 3$
 ${}_{27}\text{Co}^{+2} [\text{Ar}]3d^7$, $n = 3$

3. Determine ratio of radius of 5th Bohr's orbit for He^+ and Li^{+2}
(1) $\frac{2}{3}$ (2) $\frac{3}{2}$ (3) 2 (4) 3

Ans. (2)

Sol. $r \propto \frac{n^2}{Z}$ or $r \propto \frac{1}{Z}$ (if n same)
 $\frac{r_{\text{He}^+}}{r_{\text{Li}^{+2}}} = \frac{3}{2}$

4. Given rate law $r = k [\text{A}]^n [\text{B}]^m$. If conc. of B is halved and A is doubled then determine ratio of final rate to initial rate
(1) 2^n (2) 2^m (3) 2^{n-m} (4) 2^{m-n}

Ans. (3)

Sol. $\frac{r'}{r} = \frac{k \left(\frac{2}{1}\right)^n \left(\frac{1}{2}\right)^m}{k \left(\frac{1}{1}\right)^n \left(\frac{1}{1}\right)^m} = 2^{n-m}$

5. Given following pairs for atomic radius
(I) (B < Al) (II) (Al < Ga) (III) (Ga < In) (IV) (In < Tl)
Among these one pair is incorrect. In, incorrect pair in +3 oxidation state element's whose ionic radius is more is having atomic number :
(1) 13 (2) 31 (3) 49 (4) 5

Ans. (2)

Sol. $r : {}_{13}\text{Al} > {}_{31}\text{Ga}$
where as ionic radius : $\text{Al}^{+3} < \text{Ga}^{+3}$

6. Among the following paramagnetic species are
 O_2 , F_2 , N_2 , H_2 , S_2 (vapour)
(1) N_2 , H_2 , S_2 (vapour) (2) O_2 , S_2 (vapour)
(3) N_2 , O_2 (4) H_2 , O_2 , S_2 (vapour)

Ans. (2)

Sol. Theory based

7. In one L, HCl solution of pH = 1, how many liter of water should be added so that pH becomes 2 ?

Ans. (9)

Sol. Dilution formula

$$10^{-1} \times 1 = 10^{-2} \times V_f$$

$$V_f = 10 \text{ L}$$

$$\Delta V = 9 \text{ L}$$

8. In lead storage battery during use what is change in oxidation number of lead at anode & cathode ?

	Anode	Cathode
(1)	0 \rightarrow 2	4 \rightarrow 2
(2)	4 \rightarrow 2	0 \rightarrow 2
(3)	0 \rightarrow 2	2 \rightarrow 4
(4)	2 \rightarrow 0	4 \rightarrow 2

Ans. (1)

Sol. In use $\text{Pb} + \text{PbO}_2 + \text{H}_2\text{SO}_4 \rightarrow \text{PbSO}_4 + \text{H}_2\text{O}$

9. $\text{MnO}_4^- \xrightarrow{\text{H}^+}$

Then change in oxidation number of Mn = x

$\text{Fe}^{+3} + \text{CH}_3\text{COO}^- \rightarrow$ deep red complex

In complex in configuration of Fe number of d electrons = y

Determine x + y

Ans. (10)

Sol. x = 5



Non redox reaction ${}_{26}\text{Fe}^{+3} : [\text{Ar}] 3d^5$

y = 5

10. At 300 K in isothermal expansion of 1 mol of an ideal gas volume increases from 10 dm³ to 20 dm³. Determine ΔE , W and Q

$$\{R = 8.3 \frac{\text{J}}{\text{mole/K}}\} \quad \{\log 2 = 0.30\}$$

	ΔE	W	Q
(1)	0	-1720.34 J	+1720.34 J
(2)	0	+1720.34 J	-1720.34 J
(3)	+1720.34 J	-1720.34 J	0
(4)	-1720.34 J	0	+1720.34 J

Ans. (1)

Sol. $W = -2.303 nRT \log \frac{V_2}{V_1}$

$$= -2.303 \times 1 \times 8.3 \times 300 \times \log 2$$

$$= -1720.34 \text{ J}$$

$\Delta E = 0 = Q + W$ {for isothermal process of an IG}

11. Amongs the following in which complex CFSE = 0 and spin only magnetic moment is 5.91 BM

(1) $[\text{FeF}_6]^{4-}$ (2) $[\text{Mn}(\text{SCN})_6]^{4-}$ (3) $[\text{Fe}(\text{CN})_6]^{4-}$ (4) $[\text{Co}(\text{NH}_3)_6]^{+3}$

Ans. (2)

Sol. In Mn^{+2} (d^5) with wfl

$$t_{2g}^{111}, e_g^{11}$$

$$\text{CFSE} = 3 \times (-0.4 \Delta_0) + 2 \times (0.6 \Delta_0) = 0$$

12. Select incorrect statement regarding H-atom:
- (1) Probability density is highest at nucleus
 - (2) s-orbital is spherical in shape
 - (3) At a_0 (Bohr's radius) energy of electron is maximum
 - (4) 1s orbital has no radial node

Ans. (3)

Sol. Energy of electron is minimum at a_0

13. **Statement-I:** N forms with O compounds in +1 to +5 oxidation state due to $p\pi-p\pi$ bonding.

Statement-II: NCls cannot be formed due to unavailability of 2d subshell.

- (1) Statement I is correct but Statement II is incorrect.
- (2) Both Statement I & Statement II are correct.
- (3) Statement I is incorrect but Statement II is correct.
- (4) Both Statement I & Statement II are incorrect.

Ans. (2)

Sol. Theory based.

