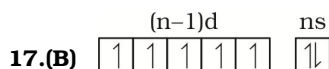
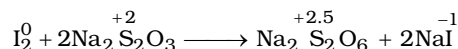
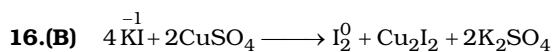


Daily Tutorial Sheet 2

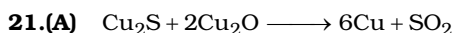
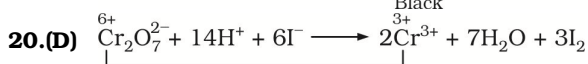
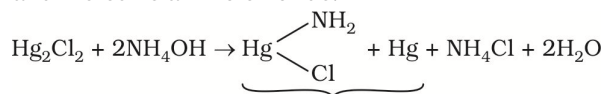
JEE Main (Archive)



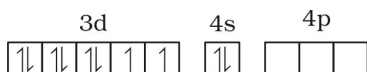
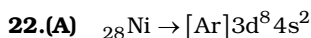
$(n-1)d^5ns^2$ can achieve the maximum oxidation state of +7.

18.(C) In each vertical column of transition elements, the element of second and third transition series resemble each other more closely than the elements of first and second transition series on account of lanthanide contraction. The pairs of elements such as Zn - Hf, Mo - W, Nb - Ta, etc; possess almost the same properties.

19.(A) Calomel on reaction with ammonium hydroxide turns black. The black structure is a mixture of mercury and mercuric amino chloride.

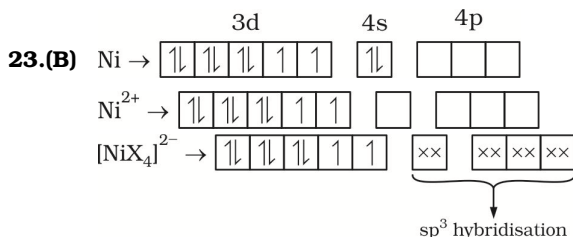


This is an example of auto-reduction.



Number of unpaired electrons (n) = 2

$$\mu = \sqrt{n(n+2)} = \sqrt{2(2+2)} = \sqrt{8} \approx 2.84 \text{ B.M.}$$



Number of unpaired electrons = 2

Geometry = tetrahedral

24.(A) As we proceed from one element to the next element in the lanthanide series, the nuclear charge, i.e. atomic number increases by one unit and the addition of one electron occurs at the same time in 4f-energy shell. On account of the very diffused shapes of 4f-orbitals, the 4f-electrons shield each other quite poorly from the nuclear charge. Thus, the effect of nuclear charge increase is somewhat more than the charged shielding effect. This brings the valence shell nearer to the nucleus and hence the size of

atom or ion goes on decreasing as we move in the series. The sum of the successive reactions is equal to the total lanthanide contraction.

- 25.(A)** As the distance between the nucleus and 5f-orbitals (actinides) is more than the distance between the nucleus and 4f-orbitals (lanthanides) hence the hold of nucleus on valence electron decrease in actinides. For this reason the actinides exhibit more number of oxidation state in general.
- 26.(A)** The decrease in the force of attraction exerted by the nucleus on the valency electrons due to presence of electrons in the inner shells is called shielding effect. A 4f-orbitals is nearer to the nucleus than 5f-orbitals. Hence, shielding of 4f is more than 5f.
- 27.(B)** Strong field ligand such as CN^- , usually produce low spin complexes and large crystal field splittings. H_2O is a weaker field ligand than NH_3 and $\text{C}_2\text{O}_4^{2-}$ therefore,
- $$\Delta_{\text{oct}} [\text{Co}(\text{H}_2\text{O})_6]^{3+} < \Delta_{\text{oct}} [\text{Co}(\text{C}_2\text{O}_4)_3]^{3-} < \Delta_{\text{oct}} [\text{Co}(\text{NH}_3)_6]^{3+} < \Delta_{\text{oct}} [\text{Co}(\text{CN})_6]^{3-}$$
- Common ligands in order of increasing crystal field strength are given below :
- $$\text{I}^- < \text{Br}^- < \text{Cl}^- < \text{F}^- < \text{OH}^- < \text{C}_2\text{O}_4^{2-} < \text{H}_2\text{O} < \text{NH}_3 < \text{en} < \text{NO}_2^- < \text{CN}^-$$
- 28.(C)** Actinides show different oxidation states such as +2, +3, +4, +5, +6 and +7. However +3 oxidation state is most common among all the actinides.
The wide range of oxidation states of actinides is attributed to the fact that the 5f, 6d, 7s energy levels are of comparable energies. Therefore, all these three subshells can participate.
- 29.(B)** When the transition metals are in their highest oxidation state, they no longer have tendency to give away electrons, thus they are not basic but show acidic character and form anionic complexes.
- 30.(C)** Ln^{3+} compounds are generally coloured in the solid state as well as in aqueous solutions. Colour appears due to presence of unpaired f-electrons which undergo f-f transition.