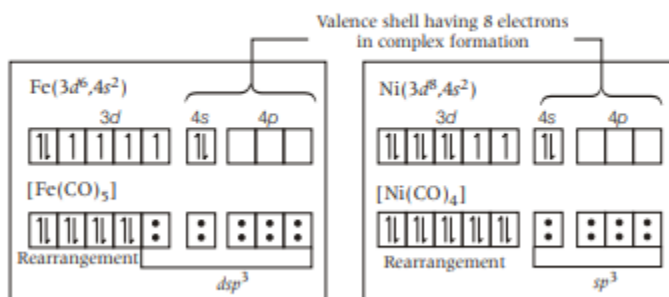


The correct statement (s) regarding the binary transition metal carbonyl compounds is (are) (Atomic numbers : Fe = 26, Ni = 28) (2018 Adv.)

- (a) Total number of valence shell electrons at metal centre in  $\text{Fe}(\text{CO})_5$  or  $\text{Ni}(\text{CO})_4$  is 16  
 (b) These are predominantly low spin in nature  
 (c) Metal-carbon bond strengthens when the oxidation state of the metal is lowered  
 (d) The carbonyl C—O bond weakens when the oxidation state of the metal is increased

- (i) **Statement (a)** The total number of valence shell electrons at metal centre in  $\text{Fe}(\text{CO})_5$  or  $\text{Ni}(\text{CO})_4$  is 8 instead of 16 as shown below



Hence, this statement is incorrect.

- (ii) **Statement (b)** Carbonyl complexes are predominantly low spin complexes due to strong ligand fields. Hence, this statement is correct.
- (iii) **Statement (c)** For central metal lowering of oxidation state results to increase in electron density on it. This in turn results to increase in extent of synergic bonding. Thus, we can say "metal carbonyl bond strengthens, when oxidation state of metal is lowered".  
 Hence, it is a correct statement.
- (iv) **Statement (d)** Increase in positive charge on metal (i.e., increase in oxidation state) results to decrease in synergic bonding strength.  
 This in turn makes C—O bond stronger instead of weaker.  
 Hence this statement is also incorrect.