



## d and f-Block Elements Important Questions With Answers

### NEET Chemistry 2023

1. Which of the following statements is not correct?

- a) **La(OH)<sub>3</sub> is less basic than Li(OH)<sub>3</sub>**    b) In lanthanide series, ionic radius of Ln<sup>3+</sup> ion decreases  
c) La is actually an element of transition series rather lanthanide  
d) Atomic radius of Zr and Hf are same because of lanthanide contraction

**Solution : -**

In lanthanides the basic character of hydroxides decreases as the ionic radius decreases.

La<sup>3+</sup> ions are larger than Li<sup>3+</sup> so it easily gives OH<sup>-</sup> ion thus La(OH)<sub>3</sub> is more basic than Li(OH)<sub>3</sub>.

2. The transition elements have a general electronic configuration.

- a) ns<sup>2</sup>np<sup>6</sup>nd<sup>1-10</sup>    b) (n - 1)d<sup>1-10</sup>, ns<sup>0-2</sup>, np<sup>0-6</sup>    **c) (n - 1)d<sup>1-10</sup>, ns<sup>1-2</sup>**    d) nd<sup>1-10</sup>, ns<sup>2</sup>

**Solution : -**

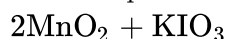
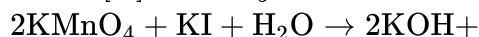
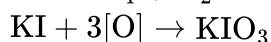
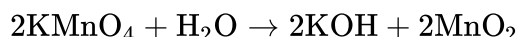
The transition elements have a general electronic configuration as (n - 1) d<sup>1-10</sup> ns<sup>1-2</sup>

3. The number of moles of KMnO<sub>4</sub> reduced by one mole of KI in alkaline medium is \_\_\_\_\_.

- a) One    **b) Two**    c) Five    d) One-fifth

**Solution : -**

Given alkaline medium then reaction.



The increase in the oxidation number of iodine is balanced with a decrease in the oxidation number of Mn if the mole ratio KMnO<sub>4</sub>:KI = 2 : 1

4. In which of the following compounds manganese has oxidation number equal to that of iodine in KIO<sub>4</sub>?

- a) Potassium manganate    **b) Potassium permanganate**    c) Dimanganese decacarbonyl  
d) Manganese chloride

**Solution : -**

Oxidation number of I in KIO<sub>4</sub> = +7

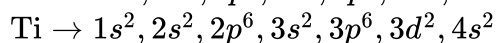
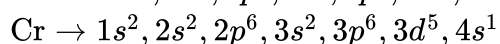
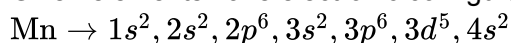
Oxidation number of Mn in potassium permanganate KMnO<sub>4</sub> = +7

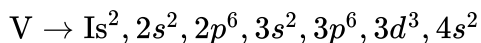
5. The correct order of decreasing second ionisation enthalpy of Ti(22), V(23), Cr(24) and Mn(25) is \_\_\_\_\_.

- a) Mn > Cr > Ti > V    b) Ti > V > Cr > Mn    **c) Cr > Mn > V > Ti**    d) V > Mn ≥ Cr > Ti

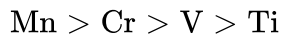
**Solution : -**

Given elements have electronic configuration.

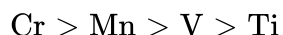




Explanation: ionization potential (both 1<sup>st</sup> and 2<sup>nd</sup>) increase from left to right across the period following increase in effective nuclear charge. Then the second IP values should exhibit the trend:



But the main observed order is:



Except chromium rest other show the normal trend. This exceptional behaviour of chromium is due to the stable configuration ( $3d^5$ ) that it achieves after the loss of first electron.

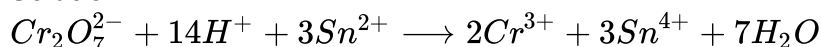
6. The electronic configuration of Eu (Atomic No. 63), Gd (Atomic No. 64) and Tb (Atomic No. 65) are

- a)  $[Xe]4f^6 s^2 6s^2, v. [Xe]4f^7 5 d^1 6s^2 \text{ and } [Xe]4f^8 5 d 6s^2$     b)  $[Xe]4f^7 6s^2, [Xe]4f^7 5 d^1 6s^2 \text{ and } [Xe]4f^9 6s^2$   
 c)  $[Xe]4f^6 s^2, [Xe]4f^8 6s^2 \text{ and } [Xe]4f^8 5 d 6s^2$     d)  $[Xe]4f^6 5 d 6s^2, [Xe]4f^7 5 d^6 6s^2 \text{ and } [Xe]4f^9 6s^2$

7. When acidified  $K_2Cr_2O_7$  solution is added to  $Sn^{2+}$  salts, then  $Sn^{2+}$  changes to

- a) Sn    b)  $Sn^{3+}$     c)  $Sn^{4+}$     d)  $Sn^+$

**Solution : -**



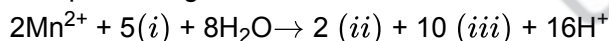
8. In the following question, a statement of assertion is followed by a statement of reason. Mark the correct choice as :

**Assertion:** Copper(II) iodide is not known.

**Reason:**  $Cu^{2+}$  oxidises  $I^-$  to  $I_2$ ,

- a) If both assertion and reason are true and reason is the correct explanation of assertion.  
 b) If both assertion and reason are true but reason is not the correct explanation of assertion  
 c) If assertion is true but reason is false    d) If both assertion and reason are false.

9. Complete the given reaction.



a)

(i)	(ii)	(iii)
$SO_4^{2-}$	$MnO_4^-$	$S_2O_8^{2-}$

b)

(i)	(ii)	(iii)
$S_2O_8^{2-}$	$MnO_4^-$	$SO_4^{2-}$

c)

(i)	(ii)	(iii)
$MnO_4^-$	$S_2O_8^{2-}$	$SO_4^{2-}$

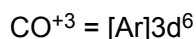
d)

(i)	(ii)	(iii)
$S_2O_8^{2-}$	$SO_4^{2-}$	$MnO_4^-$

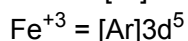
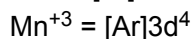
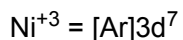
10. Which one of the following ions has electronic configuration  $[Ar] 3d^6$  ? (Atomic number Mn = 25, Fe = 26, Co = 27, Ni = 28)

- a)  $Ni^{3+}$     b)  $Mn^{3+}$     c)  $Fe^{3+}$     d)  $Co^{3+}$

**Solution : -**



For rest others



11. The actinoids showing +7 oxidation state are

- a) U, Np    b) Pu, Am    c) **Np, Pu**    d) Am, Cm

**Solution : -**

Np and Pu in  $[NpO_6]^{5-}$  and  $[PuO_6]^{5-}$  oxoanions show +7 oxidation states which are not so stable.

12. Identify the correct order of solubility in aqueous medium.

- a)  $Na_2 S > CuS > ZnS$     b)  $Na_2 S > ZnS > CuS$     c)  $CuS > ZnS > Na_2 S$     d)  $ZnS > Na_2 S > CuS$

**Solution : -**

Sodium sulphide is soluble in water. The solubility product (and hence solubility) of ZnS is larger than that of CuS.

Hence  $\text{Na}_2\text{S} > \text{ZnS} > \text{CuS}$ .

13. Match the column I with column II and mark the appropriate choice.

Column I (Property)	Column II (Metal)
(A) Element with highest second ionisation enthalpy	(i) Cr
(B) Element with highest third ionisation enthalpy	(ii) Cu
(C) M in $\text{M}(\text{CO})_6$ is	(iii) Zn
(D) Element with highest heat of atomisation	(iv) V

- a) (A) → (ii), (B) → (iii), (C) → (i), (D) → (iv)    b) (A) → (iv), (B) → (iii), (C) → (i), (D) → (ii)  
 c) (A) → (iii), (B) → (i), (C) → (ii), (D) → (iv)    d) (A) → (i), (B) → (ii), (C) → (iii), (D) → (iv)

14. In the following question, a statement of assertion is followed by a statement of reason. Mark the correct choice as

**Assertion:** In the series Sc to Zn, the enthalpy of atomisation of zinc is the lowest.

**Reason :** Zinc has greater number of unpaired electrons.

- a) If both assertion and reason are true and reason is the correct explanation of assertion.  
 b) If both assertion and reason are true but reason is not the correct explanation of assertion  
 c) If assertion is true but reason is false.    d) If both assertion and reason are false.

**Solution : -**

Zinc does not have unpaired electrons in ground state as well as in its common oxidation state. Enthalpy of atomisation depends upon the number of unpaired electrons. Greater the number of unpaired electrons, stronger is the interatomic metallic bonding and higher is the enthalpy of atomisation.

15. Which of the following ions will exhibit colour in aqueous solutions?

- a)  $\text{La}^{3+}$  (Z = 57)    b)  $\text{Ti}^{3+}$  (Z = 22)    c)  $\text{Lu}^{3+}$  (Z = 71)    d)  $\text{Sc}^{3+}$  (Z = 21)

**Solution : -**

Those having unpaired electrons will show colour in aqueous solution.

$\text{La}^{3+} = [\text{Xe}]4f^0 5d^0 6s^0 \rightarrow$  Zero unpaired electron

$\text{Ti}^{3+} = [\text{Ar}]3d^1 4s^0 \rightarrow$  1 unpaired electron

$\text{Lu}^{3+} = [\text{Xe}]4f^{14} 5d^0 6s^0 \rightarrow$  Zero unpaired electron

$\text{Sc}^{3+} = [\text{Ar}]3d^0 4s^0 \rightarrow$  Zero unpaired electron

16. The second and third row elements of transition metals resemble each other much more than they resemble the first row because of

- a) **lanthanoid contraction which results in almost same radii of second and third row metals**  
 b) diagonal relationship between second and third row elements  
 c) similar ionisation enthalpy of second and third row elements  
 d) similar oxidation states of second and third row metals.

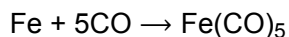
17. The melting point of copper is higher than that of zinc because

- a) the s, p as well as d-electrons of copper are involved in metallic bonding  
 b) the atomic volume of copper is higher    c) **the d-electrons of copper are involved in metallic bonding**  
 d) the s as well as d-electrons of copper are involved in metallic bonding

18. Which of the following processes does not involve oxidation of iron?

- a) **Formation of  $\text{Fe}(\text{CO})_5$  from Fe**    b) Liberation of  $\text{H}_2$  from steam by iron at a high temperature.  
 c) Rusting of iron sheets    d) Decolourisation of blue  $\text{CuSO}_4$  solution by iron

**Solution : -**



Thus, formation of  $\text{Fe}(\text{CO})_5$  from Fe does not involve oxidation of iron because there is no change in oxidation state.

Rest in all options there is a change in oxidation state of Fe.

19. The oxidation state of Cr in  $\text{K}_2\text{Cr}_2\text{O}_7$  is:

- a) +5   b) +3   **c) +6**   d) +7

**Solution : -**

In  $\text{K}_2\text{Cr}_2\text{O}_7$

$$2(+1) + 2x + 7(-2) = 0$$

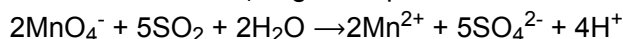
$$\Rightarrow x = +6$$

20. Name the gas that can readily decolourise acidified  $\text{KMnO}_4$  solution.

- a)  $\text{CO}_2$    **b)  $\text{SO}_2$**    c)  $\text{NO}_2$    d)  $\text{P}_2\text{O}_5$

**Solution : -**

Acidified  $\text{KMnO}_4$  is a strong oxidizing agent thus, among the given option which readily undergoes oxidation with  $\text{KMnO}_4$  will decolourise it.  $\text{CO}_2$ ,  $\text{NO}_2$  and  $\text{P}_2\text{O}_5$  are already in their highest oxidation state while  $\text{SO}_2$  can further oxidize with  $\text{KMnO}_4$  to give sulphate ions.



21. Cinnabar is an ore of :

- a) Hg**   b) Cu   c) Pb   d) Zn

**Solution : -**

Cinnabar is an ore of Hg (mercury) which has formula  $\text{HgS}$ .

22. Bell-metal is an alloy of :

- a) Cu + Pb   **b) Cu + Sn**   c) Cu + Zn   d) Cu + Ni

**Solution : -**

Bell-metal contains Cu (80%) and Sn (20%).

23. For  $\text{Zn}^{2+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Cu}^{2+}$  and  $\text{Cr}^{2+}$  which of the following statements is correct?

- a) Only  $\text{Zn}^{2+}$  is colourless and  $\text{Ni}^{2+}$ ,  $\text{Cu}^{2+}$  and  $\text{Cr}^{2+}$  are coloured.**   b) All the ions are coloured  
c) All the ions are colourless.   d)  $\text{Zn}^{2+}$  and  $\text{Cu}^{2+}$  are colourless while  $\text{Ni}^{2+}$  and  $\text{Cr}^{2+}$  are coloured

**Solution : -**

$\text{Zn}^{2+}(3d^{10})$  has zero unpaired electron (colourless).

$\text{Ni}^{2+}(3d^8)$  has 2 unpaired electrons (coloured).

$\text{Cu}^{2+}(3d^9)$  has 1 unpaired electron (coloured).

$\text{Cr}^{2+}(3d^4)$  has 4 unpaired electrons (coloured).

24. Which of the following compounds is not coloured?

- a)  $\text{Na}_2[\text{CuCl}_4]$    **b)  $\text{Na}_2[\text{CdCl}_4]$**    c)  $\text{K}_4[\text{Fe}(\text{CN})_{16}]$    d)  $\text{K}_3[\text{Fe}(\text{CN})_6]$

25. Because of lanthanoid contraction, which of the following pairs of elements have nearly same atomic radii ? (Numbers in the parenthesis are atomic numbers).

- a) Ti (22) and Zr (40)   b) Zr (40) and Nb (41)   **c) Zr (40) and Hf (72)**   d) Zr (40) and Ta (73)

**Solution : -**

Because of the lanthanoid contraction Zr (atomic radii 160 pm) and Hf (atomic radii 158 pm) have nearly same atomic radii.

26. Gadolinium belongs to 4f series. It's atomic number is 64. Which of the following is the correct electronic configuration of gadolinium?

- a)  $[\text{Xe}]4f^8 6s^2$    b)  $[\text{Xe}]4f^9 5s^1$    c)  $[\text{Xe}]4f^7 5d^1 6s^2$    d)  $[\text{Xe}]4f^6 5d^2 6s^2$

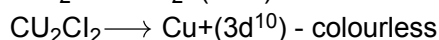
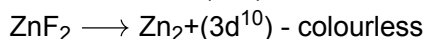
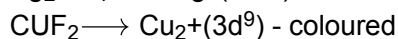
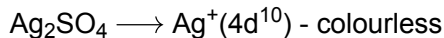
**Solution :** -



27. Generally transition elements form coloured salts due to the presence of unpaired electrons. Which of the following compounds will be coloured in solid state?

- a)  $\text{Ag}_2\text{SO}_4$    b)  $\text{CuF}_2$    c)  $\text{ZnF}_2$    d)  $\text{Cu}_2\text{Cl}_2$

**Solution :** -

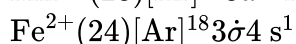
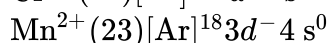


28. Four successive members of the first row transition elements are listed below with their atomic numbers. Which one of them is expected to have the highest third ionisation enthalpy?

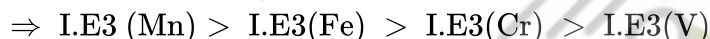
- a) Vanadium (Z=23)   b) Chromium (Z=24)   c) **Manganese(Z=25)**   d) Iron(Z=26)

**Solution :** -

Electronic configuration



**Explanation:** We first see electronic configuration, to find ionization enthalpy. Then we see shell. If shell are same then see charge. Then see extra stability (Half filled and fully filled)



29. Which of the following does not represent the correct order of the properties indicated?

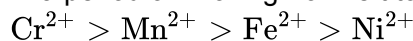
- a)  $\text{Ni}^{2+} > \text{Cr}^{2+} > \text{Fe}^{2+} > \text{Mn}^{2+}$  (size)   b)  $\text{Sc} > \text{Ti} > \text{Cr} > \text{Mn}$  (size)

- c)  $\text{Mn}^{2+} > \text{Ni}^{2+} > \text{Co}^{2+} > \text{Fe}^{2+}$  (unpaired electron)

- d)  $\text{Fe}^{2+} > \text{Co}^{2+} > \text{Ni}^{2+} > \text{Cu}^{2+}$  (unpaired electron)

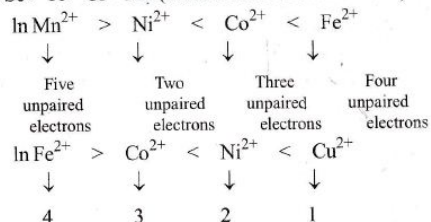
**Solution :** -

In a period on moving from left to right ionic radii decreases. So, the order of cationic radii is



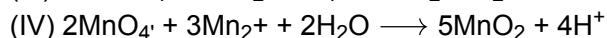
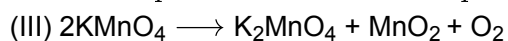
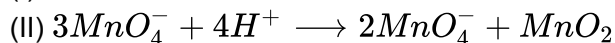
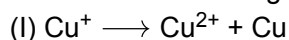
In  $\text{Sc} > \text{Ti} > \text{Cr} > \text{Mn}$  (correct order of atomic radii)

In  $\text{Sc} > \text{Ti} > \text{Cr} > \text{Mn}$  (correct order of atomic radii)



Number of unpaired electrons

30. Which of the following reactions are disproportionation reactions?



- a) (I), (II)   b) (I), (II), (III)   c) (II), (III), (IV)   d) (I), (IV)

**Solution :** -

In (I),  $\text{Cu}^+$  is oxidised as well as reduced. In (II),  $\text{MnO}_4^-$  ions are oxidised as well as reduced.

31. Magnetic moment 2.83 BM is given by which of the following ions?

(At. nos. Ti = 22, Cr = 24, Mn = 25, Ni = 28)

- a)  $\text{Ti}^{3+}$    b)  $\text{Ni}^{2+}$    c)  $\text{Cr}^{3+}$    d)  $\text{Mn}^{2+}$

**Solution : -**

Given magnetic moment

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

[where n = no. of unpaired electron]

When n=2, then  $\mu=2.83 \text{ B.M}$

For  $\text{Ti}^{3+}$  ( $3d^1$ ),  $n = 1$ ;  $\text{Cr}^{3+}$  ( $3d^3$ ),  $n = 3$

$\text{Ni}^{2+}$  ( $3d^8$ ),  $n = 2$ ;  $\text{Mn}^{2+}$  ( $3d^5$ ),  $n = 5$

Therefore  $\text{Ni}^{2+}$  has two unpaired electrons, with magnetic moment 2.83 B.M.

32. The salts of Cu in +1 oxidation state are unstable because

- a)  $\text{Cu}^+$  has  $3d^{10}$  configuration   b)  **$\text{Cu}^+$  disproportionates easily to  $\text{Cu(O)}$  and  $\text{Cu}^{2+}$**   
c)  $\text{Cu}^+$  disproportionates easily to  $\text{Cu}^{2+}$  and  $\text{Cu}^{3+}$    d)  $\text{Cu}^+$  is easily reduced to  $\text{Cu}^{2+}$ .

**Solution : -**

$\text{Cu}^+$  ions undergo disproportionation,  $2\text{Cu}^+ \rightarrow \text{Cu}^{2+} + \text{Cu}$

33. Which of the following compounds is used as the starting material for the preparation of potassium dichromate?

- a)  $\text{K}_2\text{SO}_4 \cdot \text{Cr}_2(\text{SO}_4)_3 \cdot 24\text{H}_2\text{O}$  (Chrome alum)   b)  $\text{PbCrO}_4$  (Chromite yellow)   c)  **$\text{FeCr}_2\text{O}_4$  (Chromite)**  
d)  $\text{PbCrO}_4 \cdot \text{PbO}$  (Chrome red)

34. Which of the following have maximum and minimum ionic character out of  $\text{MnO}$ ,  $\text{MnF}_2$ ,  $\text{MnO}_2$ ,  $\text{Mn}_2\text{O}_7$ ?

- a)  $\text{MnO}$ ,  $\text{Mn}_2\text{O}_7$  respectively   b)  **$\text{MnF}_2$ ,  $\text{Mn}_2\text{O}_7$  respectively**   c)  $\text{MnO}_2$ ,  $\text{MnO}$  respectively  
d)  $\text{Mn}_2\text{O}_7$ ,  $\text{MnO}$  respectively

**Solution : -**

Minimum ionic character =  $\text{Mn}_2\text{O}_7$ , due to ( $\text{Mn}^{7+}$ )

Maximum ionic character =  $\text{MnF}_2$  ( $\text{Mn}^{2+}$ )

35. Stainless steel contains iron and:

- a) **Cr + Ni**   b) Cr + Zn   c) Zn + Pb   d) Fe + Cr + Ni

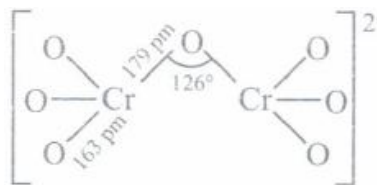
**Solution : -**

Stainless steel contains 73% iron, 18% chromium and 8% nickel.

36. In the dichromate anion ( $\text{Cr}_2\text{O}_7^{2-}$ ),

- a) all Cr - O bonds are equivalent   b) **6 Cr - O bonds are equivalent**   c) 3 Cr - O bonds are equivalent  
d) no bonds in  $\text{Cr}_2\text{O}_7^{2-}$  are equivalent.

**Solution : -**



37. Consider the following statements

- I.  $\text{La(OH)}_3$  is least basic among hydroxides of lanthanides.  
II.  $\text{Zr}^{4+}$  and  $\text{Hf}^{4+}$  possess almost the same ionic radii.  
III.  $\text{Ce}^{4+}$  can act as an oxidising agent.

Which of the above is/are true?

- a) I and III   **b) II and III**   c) II only   d) II only

**Solution : -**

La(OH)<sub>3</sub> is most basic. Hence, (I) is wrong. (II) is correct due to lanthanoid contraction. (III) is correct because Ce<sup>4+</sup> tends to change to stable Ce<sup>3+</sup>.

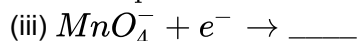
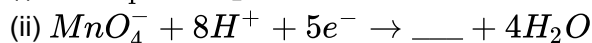
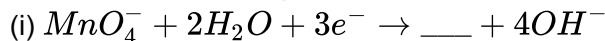
38. The most durable metal plating on iron to protect against corrosion is :

- a) nickel plating   b) tin plating   c) copper plating   **d) zinc plating**

**Solution : -**

Zinc is commonly used for covering iron surfaces. This is due to the fact that because of scratches both Zn and Fe gets exposed to oxidation but zinc undergoes oxidation in preference to iron because  $E_{Fe^{2+}/Fe}^0$  is more than  $E_{Zn^{2+}/Zn}^0$ .

39. Complete the following reactions.

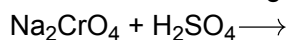


- a) MnO<sub>2</sub>, Mn<sup>2+</sup>, MnO<sub>4</sub><sup>-</sup>**   b) Mn<sup>2+</sup>, MnO<sub>2</sub>, MnO<sub>4</sub><sup>-</sup>   c) MnO<sub>4</sub><sup>-</sup>, Mn<sup>2+</sup>, MnO<sub>2</sub>   d) MnO<sub>2</sub>, MnO<sub>4</sub><sup>-</sup>, Mn<sup>2+</sup>

40. Which of the following statements is wrong?

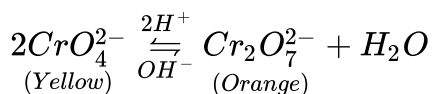
- a) Ti<sup>4+</sup> and Ag<sup>+</sup> are repelled by magnetic field  
 b) Mn<sup>2+</sup> shows maximum magnetic character among the first transition series  
**c) Fe<sup>2+</sup> is more stable than Mn<sup>2+</sup> towards oxidation to +3 state**  
 d) Cr in CrO<sub>4</sub><sup>2-</sup> ion involves sp<sup>3</sup>d<sup>2</sup> hybridisation

41. Which of the following statements for the reaction, is correct?



- a) It is a redox reaction in which green solution of [Cr(H<sub>2</sub>O)<sub>6</sub>]<sup>+3</sup> is produced  
 b) One of the product in reaction has trigonal planar structure.  
**c) Dimeric bridged tetrahedral metal ion is produced.**   d) Dark blue colour is obtained in reaction

**Solution : -**



42.  $E_{Mn^{3+}/Fe^{2+}}$  is highly positive than that of  $E_{Cr^{3+}/Cr^{2+}}$  or  $E_{Fe^{3+}/Fe^{2+}}$  because:

- a) Mn<sup>2+</sup> (d<sup>5</sup>) can be easily oxidised to Mn<sup>3+</sup> (d<sup>4</sup>) due to low ionisation enthalpy

**b)**

**third ionisation enthalpy of Mn is much larger due to stable half filled d<sup>5</sup> electronic configuration of Mn<sup>2+</sup>**

- c) Mn<sup>3+</sup> is more stable than Mn<sup>2+</sup> due to higher oxidation state

- d) second ionisation enthalpy of Mn is higher than third ionisation enthalpy.

43. Select the correct option, among Sc(III), Ti(IV), Pd(II) and Cu(II) ions

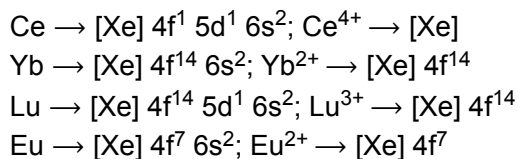
- a) all are paramagnetic**   b) all are diamagnetic  
 c) Sc(III), Ti(IV) are paramagnetic and Pd(II), Cu(II) are diamagnetic  
 d) Sc(III), Ti(IV) are diamagnetic and Pd(II), Cu(II) are paramagnetic.

44. Which of the following lanthanide ion is paramagnetic?

- a) Ce<sup>4+</sup>   b) Yb<sup>2+</sup>   c) Lu<sup>3+</sup>   **d) Eu<sup>2+</sup>**

**Solution : -**





45. Which of the following transition metal ions has highest magnetic moment?

- a)  $Cu^{2+}$    b)  $Ni^{2+}$    c)  $CO^{2+}$    d)  $Fe^{2+}$

**Solution :** -

More the number of unpaired d-electrons, more is the magnetic moment.

$Cu^{2+}$  -  $3d^9$  No. of unpaired electrons = 1

$Ni^{2+}$  -  $3d^8$  No. of unpaired electrons = 2

$CO^{2+}$  -  $3d^7$  No. of unpaired electrons = 3

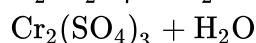
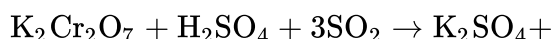
$Fe^{2+}$  -  $3d^6$  No. of unpaired electrons = 4

46. Which one of the following statements is correct when  $SO_2$  is passed through acidified  $K_2Cr_2O_7$  solution?

- a)  $SO_2$  is reduced.   b) **Green  $Cr_2(SO_4)_3$  is formed.**   c) The solution turns blue.  
d) The solution is decolourised.

**Solution :** -

Reaction:



*Green*

47. In the following question, a statement of assertion is followed by a statement of reason. Mark the correct choice as :

**Assertion:** In acidic medium,  $K_2Cr_2O_7$  exists as  $CrO_4^{2-}$  - (orange) while in basic medium it is converted to  $CrO_4^{2-}$  - (yellow).

**Reason:**  $K_2Cr_2O_7$  is hygroscopic in nature and changes colour on reaction with water.

- a) If both assertion and reason are true and reason is the correct explanation of assertion.  
b) If both assertion and reason are true but reason is not the correct explanation of assertion.  
**c) If assertion is true but reason is false.**   d) If both assertion and reason are false.

**Solution :** -

$K_2Cr_2O_7$  changes colour only with change in pH of aqueous solution.

48. Pick out the correct statement with respect to  $[Mn(CN)_6]^{3-}$

- a) It is  $sp^3d^2$  hybridised and octahedral   b) It is  $sp^3d^2$  hybridised and tetrahedral  
**c) It is  $d^2sp^3$  hybridised and octahedral**   d) It is  $dsp^2$  hybridised and square planar

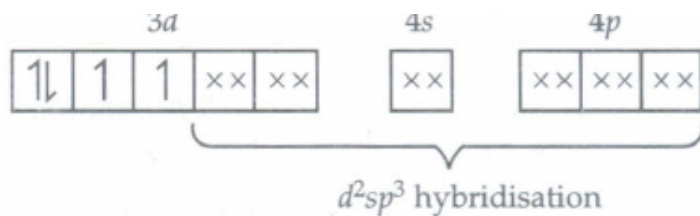
**Solution :** -

In  $[Mn(CN)_6]^{3-}$ , Mn exists as  $Mn^{3+}$  Electronic configuration of  $Mn^{3+}$  is  $3d^4 4s^0$



$CN^-$  being strong ligand causes pairing of electrons  $[Mn(CN)_6]^{3-}$





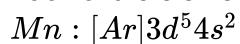
The geometry of complex with six bond pairs of electrons is octahedral.

49. Which of the following shows maximum number of oxidation states?

- a) Cr   b) Fe   **c) Mn**   d) V

**Solution : -**

Each of the element in group III B to VII B can show the maximum oxidation state equal to its group number.



Mn is in group seven shows a maximum oxidation state of +7 in  $KMnO_4$ .

50. In the following question, a statement of assertion is followed by a statement of reason. Mark the correct choice as :

**Assertion:** The ability of oxygen to stabilize high oxidation states exceeds that of fluorine.

**Reason:** The highest oxidation number in the oxides coincides with the group number.

- a) If both assertion and reason are true and reason is the correct explanation of assertion.  
**b) If both assertion and reason are true but reason is not the correct explanation of assertion**  
 c) If assertion is true but reason is false.   d) If both assertion and reason are false.

**Solution : -**

Oxygen can stabilize high oxidation states because of its ability to form multiple bonds to metals.

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