

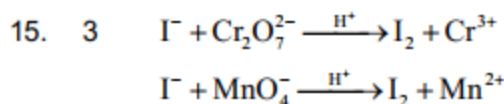
## CHAPTER - 16

# THE d- AND f- BLOCK ELEMENTS

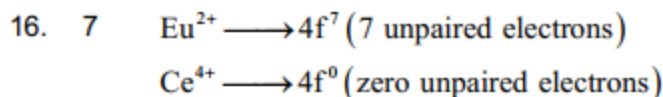
1. 2 Ionisation energy generally increases from left to right in a period
2. 1  $\text{Fe}^{2+}$  has  $3d^6$  configuration. Thus third ionisation enthalpy is minimum for Fe
3. 2 Order of atomisation enthalpy is  $\text{V} > \text{Fe} > \text{Cu} > \text{Zn}$   
Zn is not a transition element
4. 3  $E_{\text{M}^{3+}/\text{M}^{2+}}^0$  is positive for Mn, Fe and Co, whereas negative for Ti, V and Cr
5. 4  $E_{\text{Mn}^{3+}/\text{Mn}^{2+}}^0$  is positive. Thus,  $\text{Mn}^{2+}$  does not liberate hydrogen from acids
6. 4  $Z = 25 \Rightarrow \text{M} = \text{Mn}$   
 $\mu = \sqrt{24} \text{ BM} \Rightarrow \text{no. of unpaired electrons} = 4$   
Thus, Mn is present in +3 oxidation state ( $3d^4$ )
7. 3  $\text{Mn}_2\text{O}_7$  - acidic  
 $\text{V}_2\text{O}_5$  - amphoteric  
 $\text{CrO}$  - basic
8. 1  $2\text{KMnO}_4 \xrightarrow{573 \text{ K}} 2\text{K}_2\text{MnO}_4 + \text{MnO}_2 + \text{O}_2$   
 $\text{KMnO}_4$  is diamagnetic
9. 2  $\text{Gd}^{3+} \longrightarrow 4f^7$   
 $\mu = \sqrt{7 \times 9} \approx 7.9 \text{ BM}$
10. 4 Oxidation states of U are +3, +4, +5 and +6; Pu are +3, +4, +5, +6 and +7
11. 1  $\text{Sm}^{3+}$  has partially filled f-orbitals
12. 3 Mo and W have similar size due to lanthanoid contraction

13. 6 Chromate has 2 whereas dichromate has  $4\pi$  bonds

14. 4 Sc, Ti, V and Mn have larger metallic radius than Cr



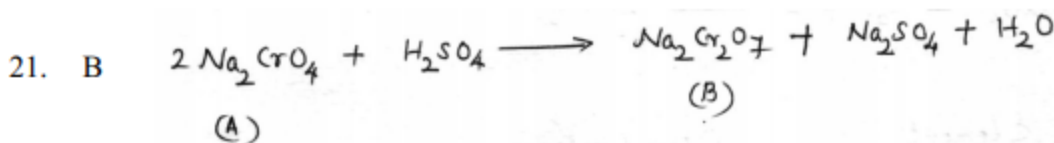
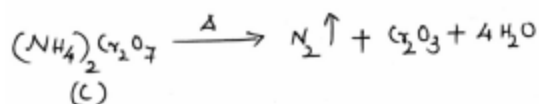
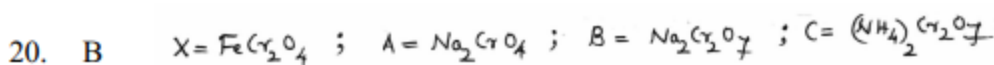
Thus,  $x = 3$  and  $y = 0$ ;  $\therefore x + y = 3$



17. D Metal with highest positive  $E_{M^{x+}/M}^0$  will be the least reactive one.

18. C Metal with positive  $E_{M^{x+}/M}^0$  does not liberate hydrogen from dilute acids

19. C Cu has high  $\Delta_a H^\theta$  and  $\text{Cu}^{2+}$  has low  $\Delta_{\text{hyd}} H^\theta$ .



22. B  $CrO_4^{2-}$  is stable in basic medium.  $Cr_2O_7^{2-}$  is stable in acidic medium

23. D  $2Na_2CrO_4 + H_2SO_4 \rightarrow Na_2Cr_2O_7 + Na_2SO_4$

$Na_2SO_4 \cdot 10H_2O$  crystallized out first.

24. D O-Cr-O bond angle in the chromate ion is  $109.5^\circ$ .

**SECTION - IV (More than one correct answer)**

25. B, C  $Sm$ ,  $Eu$  and  $Yb$  are known to exhibit +2 oxidation state

26. A, B, C, D

All are correct Statements

27. A, B, C, D

Tetrahedral  $[MO_4]^{n-}$  ions are known for  $V^{5+}$ ,  $Cr^{6+}$ ,  $Mn^{5+}$ ,  $Mn^{6+}$  and  $Mn^{7+}$

28. A, D

$V_2O_4$  dissolves in acids to form  $VO^{2+}$ .  
 $V_2O_5$  reacts with acids and alkalis to form  $VO_2^+$  and  $VO_4^{3-}$ , respectively.

29. A

Only compound (A) has an incompletely filled d-subshell.

**SECTION - V (Numerical Type - Upto two decimal place)**

30. 4.00  $\text{MnO}_4^-$  is tetrahedral.

31. 2.00

$\text{Ti}^{2+}$  and  $\text{Cr}^{2+}$  are more reducing than  $\text{V}^{2+}$ .

32. 4.00 All are true statements

33. 5.00  $3\text{H}_2\text{S} \longrightarrow 6\text{H}^+ + 3\text{S} \downarrow + 6\text{e}^-$

34. 2.00  $2\text{MnO}_4^- + \text{H}_2\text{O} + \text{I}^- \longrightarrow 2\text{MnO}_2 + 2\text{OH}^- + \text{IO}_3^-$

# SECTION - VI (Matrix Matching)

35. B

<u>Element</u>	<u>Classification</u>
Cd	d-block element, not a transition element
Rh	d-block element, transition element
Fm	f-block element, inner transition element, actinoid
Gd	f-block element, inner transition element, lanthanoid

36. D

$\text{NiSO}_4$  and  $\text{VO}^+ \Rightarrow$  Both have two unpaired electrons

$\text{TiCl}_4$  and  $\text{ZnSO}_4 \Rightarrow$  Both have zero unpaired electrons

$\text{Mn}^{2+}$  and  $\text{Ca}^{2+} \Rightarrow$  Both are pink coloured

$\text{FeCl}_3$  and  $\text{MnSO}_4 \Rightarrow$  Both have  $3d^5$  configuration