

# SRIGAYATRI EDUCATIONAL INSTITUTIONS

## INDIA

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### D and F Block elements

- Which of the following element does not exhibit variable oxidation states  
1) Manganese      2) Iron      3) Scandium      4) Zinc
- Which of the following elements exhibits the largest number of oxidation states.  
1) Scandium      2) Manganese      3) Titanium      4) Nickel
- Among the following series of transition metal ions, the one where all metal ions have  $3d^2$  electronic configuration is  
1)  $Ti^{+3}, V^{+2}, Cr^{+3}, Mn^{+4}$       2)  $Ti^{+3}, V^{+3}, Cr^{+4}, Mn^{+5}$   
3)  $Ti^{+}, V^{+4}, Cr^{+6}, Mn^{+4}$       4)  $Ti^{+4}, V^{+3}, Cr^{+2}, Mn^{+3}$
- Which has the largest radius ?  
1)  $Co^{+3}$       2)  $Mn^{+3}$       3)  $Fe^{+3}$       4)  $Cr^{+3}$
- Among 3d transition series the IE  
1) Increases regularly in moving from left to right  
2) Remains constant within the period  
3) Increase gradually within the period but the relative increase is not sharp.  
4) Decrease regularly in moving from left to right
- Which of the following compound is not coloured ?  
1) Copper (II) Sulphate      2) Zinc (II) Chloride  
3) Chromium (II) Sulphate      4) Manganese (II) Oxalate
- $Cr^{+2}$  and  $Mn^{+3}$  both have  $d^4$  configuration thus  
1) both are oxidizing agents      2) both are reducing agents  
3)  $Mn^{+3}$  is an oxidizing agent while  $Cr^{2+}$  is a reducing agent  
4)  $Cr^{2+}$  is an oxidizing agent while  $Mn^{+3}$  is a reducing agent

8. The colour of  $KMnO_4$  is due to
- 1)  $M \rightarrow L$  charge transfer transition
  - 2) d – d transition
  - 3)  $L \rightarrow M$  charge transfer transition
  - 4)  $\sigma - \sigma^*$  transition
9.  $KMnO_4$  can be prepared from  $K_2MnO_4$  as per the reaction .  
 $3MnO_4^{2-} + 2H_2O \rightarrow 2MnO_4^- + MnO_2 + 4OH^-$ . The reaction can go the completion by removing  $OH^-$  ions by adding
- 1)  $CO_2$
  - 2)  $SO_2$
  - 3)  $HCl$
  - 4)  $KOH$
10. Which of the following combination will produce  $H_2$  gas ?
- 1) Fe metal and conc.  $HNO_3$
  - 2) Zn metal and  $NaOH_{(aq)}$
  - 3) Au metal and  $NaCN_{(aq)}$  in the presence of air
  - 4) Cu metal and Conc.  $HNO_3$
11. When  $MnO_2$  is fused with KOH, a coloured compound is formed, the product and its colour are
- 1)  $K_2MnO_4$ , purple
  - 2)  $KMnO_4$ , purple
  - 3)  $Mn_2O_3$ , brown
  - 4)  $Mn_3O_4$ , black
12. Which of the following lanthanoid ions is diamagnetic ? ( Atomic no. of Ce=58, Sm=62 , Eu=63, Yb=70)
- 1)  $Eu^{+2}$
  - 2)  $Yb^{2+}$
  - 3)  $Ce^{+2}$
  - 4)  $Sm^{+2}$
13. During titration,  $H_2SO_4$  is preferably used over HCl and  $HNO_3$  to make the solution acidic because
- 1)  $H_2SO_4$  is a strong oxidizing agent and it reacts with  $KMnO_4$  during titration
  - 2) Some  $KMnO_4$  is consumed during the reaction with  $H_2SO_4$
  - 3)  $H_2SO_4$  does not react with  $KMnO_4$  or the reducing agent used
  - 4)  $H_2SO_4$  can turn colourless  $KMnO_4$  to pink at the end point.
14. Number of moles of  $K_2Cr_2O_7$  reduced by one mole of  $Sn^{+2}$  ion is

- 1) 1/3                      2) 3                      3) 1/6                      4) 6
15. The blue colour produced on adding  $H_2O_2$  to acidified  $K_2Cr_2O_7$  is due to the formation of
- 1)  $CrO_5$                       2)  $Cr_2O_3$                       3)  $CrO_4^{2-}$                       4)  $CrO_3$
16. Gold dissolves in aqua regia forming
- 1)  $Au(NO_3)_2$                       2)  $H[AuCl_4]$                       3)  $AuCl$                       4)  $AuNO_3$
17. When  $H_2S$  gas is passed through an orange red solution (X), the solution turns milky. When an alkali is added to this orange red solution it turns yellow and on acidifying this yellow solution again turns orange red X is
- 1)  $K_2Cr_2O_7$                       2)  $KMnO_4$                       3)  $Na_2Cr_2O_7$                       4)  $K_2CrO_4$
18. Which of the following is correct ?
- 1)  $Cr^{2+}$  ion has greater magnetic moment as compared to  $CO^{+3}$
- 2) The magnitude of IP of iron ion would be equal to electron gain enthalpy of iron.
- 3) Lanthanoids contraction is cause of lower IE of Pb than Sn
- 4) If IE are 332,738,849,4080,4958 (in kJ/mol) then this element can't be of 15<sup>th</sup> group.
19. Although +3 is the characteristic oxidation state for lanthanoids but cerium also show +4 oxidation state because.
- a) It has variable ionisation enthalpy                      b) It has a tendency to attain noble gas configuration
- c) It has a tendency to attain  $f^0$  configuration                      d) It resembles  $Pb^{+4}$
- 1) a ,b                      2) b, c                      3)c ,d                      4) a , d
20. Which of the following actinoids show oxidation states upto +7 ?
- 1) Am                      2)  $Pu$                       3) U                      4) Th
21. Which of the following arrangements does not represent the correct order of the property stated against it ?
- 1)  $V^{+2} < Cr^{+2} < Mn^{+2} < Fe^{+2}$  : paramagnetic
- 2)  $Ni^{+2} < CO^{+2} < Fe^{2+} < Mn^{+2}$  : ionic size

- 3)  $CO^{+3} < Fe^{+3} < Cr^{+3} < Sc^{+3}$  : Stability of aq solution
- 4)  $Sc < Ti < Cr < Mn$  : number of oxidation states.
22. Spin only magnetic momentum of  $Fe^{+2}$  is
- 1) 1.72 B                      2) 2.83 Bm                      3) 4.91 BM                      4) 3.87
23. An inorganic compound 'y' on heating gives a green coloration and evolves  $O_2$  gas. Then, y is
- 1)  $(NH_4)_2Cr_2O_7$       2)  $K_2Cr_2O_7$                       3)  $CrO_2Cl_2$                       4) Both 1 & 3
24. In the dichromate dianion :
- 1) 4 Cr-O bonds are equivalent                      2) 6 Cr-O bonds are equivalent
- 3) All Cr-O bonds are equivalent                      4) All Cr-O bonds are non-equivalent
25. Which of the following is an alloy of a metal and a non metal
- 1) Bronze                      2) Nichrome                      3) Gun metal                      4) Steel

### INTEGER TYPE QUESTIONS

26. The magnetic moment is associated with its spin angular momentum and orbital angular momentum. Spin only magnetic momentum value of  $Cr^{+3}$  ion is ; in BM
27. E.C of a transition element X in +3 oxidation state is  $[Ar] 3d^5$ . What is its atomic number ?
28. When  $KMnO_4$  acts as oxidising agent in acidic medium, the oxidation number of Mn decreases of
29. In lanthanoids the last electron enters (n-2) f subshell where n is equal to :
- 1) 2                      2) 4                      3) 6                      4) 8
30. The total no. of unpaired electrons, present in an atom of Gd (64), are :
- 1) 2                      2) 4                      3) 6                      4) 8

## KEY SHEET

1) 3	2) 2	3) 2	4) 4	5) 3	6) 2	7) 3	8) 3	9) 1	10) 2
11) 1	12) 2	13) 3	14) 1	15) 1	16) 2	17) 1	18) 2	19) 3	20) 2
21) 1	22) 3	23) 2	24) 2	25) 4	26) 3.87	27) 26	28) 3	29) 6	30) 8

## HINTS

1.  $Sc \rightarrow 4s^2 3d^1$      $Sc^{+3} \rightarrow 4s^0 3d^0$
2.  $Mn \rightarrow +7$  Oxidation state
3. Conceptual
4. Conceptual
5. Conceptual
6.  $Zn^{+2} \rightarrow 4s^0 3d^{10}$  no unpaired electrons
7.  $Mn^{3+}$  is an oxidizing agent while  $Cr^{2+}$  is a reducing agent  

$$Mn^{3+} + e^- \rightarrow Mn^{2+}$$

$$3d^4 \rightarrow 3d^5 \text{ stable}$$

$$Cr^{+2} \rightarrow Cr^{+3} + e^-$$

$$3d^4 \rightarrow t_{2g}^3 \text{ (half filled stable } t_{2g})$$
8. Ligand to metal charge transfer transition
9.  $\overline{OH}$  can be removed by adding  $HCl$  or  $CO_2$ . Since  $MnO_4^-$  is formed in the product, while oxidised  $HCl$  to  $Cl_2$ .  $CO_2$  is used
10.  $Zn + 2NaOH \rightarrow Na_2ZnO_2 + H_2 \uparrow$
11.  $2MnO_2 + 4KOH + O_2 \rightarrow 2K_2MnO_4 + 2H_2O$  purple.

12. Due to paired electrons

13. Conceptual

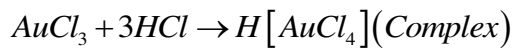
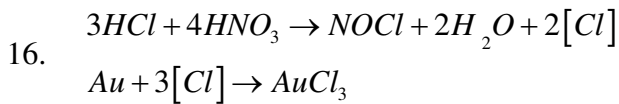
14. Equation of  $Cr_2O_7^{2-} = \frac{1}{2} mol.of sn^{+2}$

$n\ factor = 6, n - factor = 2$

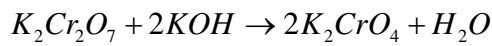
$$\frac{1}{6} mol.of Cr_2O_7^{2-} = \frac{1}{2} mol.of sn^{+2}$$

$$\therefore 1\ mol.of sn^{2+} = \frac{2}{6} = \frac{1}{3} mol.of Cr_2O_7^{2-}$$

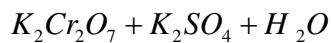
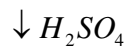
15. Conceptual



17. X can be either  $Na_2Cr_2O_7$  or  $K_2Cr_2O_7$ .  $K_2Cr_2O_7$  gives orange red solution.



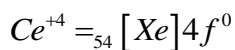
Yellow



orange red

18. Conceptual

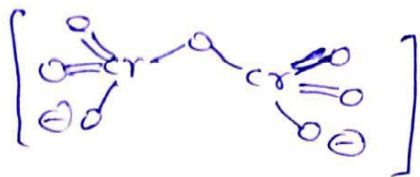
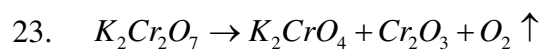
19.  ${}_{58}Ce = 54[Xe]4f^25d^06s^2$



20. Oxidation states shown by  $P_4 = +3, +4, +5, +6, +7$

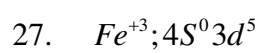
21.  $Mn^{+2} > Cr^{+2} = Fe^{+2} > V^{+2}$

22.  $U_s = \sqrt{n(n+2)}BM$



25. Conceptual

26.  $U_s = \sqrt{n(n+2)}BM.$



28. Conceptual

29. Conceptual

30. Conceptual