THE GURUKUL INSTITUTE

PLOT 5C, 2ND FLOOR, GANAPATI COMPLEX, SEC-13, OPP. JAIPURIA SCHOOL, VASUNDHRA, GHAZIABAD (U.P)

THE d AND f BLOCK ELEMENTS

1. Write the outer electronic configuration of Cr atom (Z = 24).
2. Why is third ionization energy of manganese (At. No.= 25) unexpected high?
3. What is the effect of pH on $K_2Cr_2O_7$ solution?
4. Why is Ce^{4+} in aqueous solution a good oxidizing agent?
5. In the transition series, with an increase in atomic number the atomic radius does not change very much. Why is it so?
6. Why do Zr and HF exhibit similar properties?
7. Write the atomic number of the element in which the filling of 3d subshell in the atom just starts.
8. Name one ore of manganese and chromium.
9. State a consequence of lanthanoid contraction shown by transition group elements.
10. Which is the most stable oxidation state among lanthanoids?
11. State the common characteristics of actinoids and lanthanoids which places them in the f-block of elements.
12. Why is that orange solution of $K_2Cr_2O_7$ turns yellow on adding NaOH to it?
13. Write any two uses of pyrophoric alloys.
14. What is the general formula by which the electronic configuration of the transition group elements.
15. What are the two important oxidation states of group 6 elements of the periodic table?
16. Why are Zn, Cd and Hg normally not regarded as transition metals?
17. Why are the compounds of transition metals generally colored?
18. Mention the reason for Zr(Z=40) and Hf (72) having very close values of atomic radii.
19. Explain any one of the following statements:
    a. The transition metals are well known for the formation of interstitial compounds.
    b. The largest number of oxidation states are exhibited by manganese in the first series of transition elements.
20. Which element in the first series does not exhibit variable oxidation states, and why?
21. Write the chemical equation for the reactions involved in the manufacture of potassium permanganate from pyrolusite ore.
22. Why is the +2 oxidation state of manganese quite stable, while the same is not true for iron? [Mn =25, Fe = 26]
23. How is the variability in oxidation states of the transition elements different from that of the non-transition elements? Illustrate with examples.
24. Describe steps involved in the preparation of either potassium dichromate from sodium chromate or potassium permanganate from manganese dioxide.
25. Name two properties of central metal ion which enable it to form stable complex entities.
26. Account for the following:
    a. Zinc salts are white while Cu^{2+} salts are colored. (At. No. Zn =30, Cu = 29)
    b. The elements of the d-series exhibit a larger number of oxidation states than elements of f-series.
    c. All Scandium salts are white? (AT. No. Sc= 21)
27. Write balanced equations to represent what happens when
    a. Acidified $KMnO_4$ solutions reacts with iron(II) ions.
    b. Pyrolusite is fused with KOH in the presence of air.
28. Mention the direct consequences of the following factors on the chemical behavior of the transition elements:

a. They have incompletely filled d-orbitals in the ground state or in one of the oxidized states of their atoms.
b. They contribute more valence electrons pe atom in the formation of metallic bonds.

29. With the help of a equation describe what happens when
    a. pH of a solution of dichromate ions is raised.
    b. Potassium manganate is electrochemically oxidized.
30. Write balanced ionic equation for what happens when:
    a. Acidified potassium permanganate solution is treated with an oxalate ion in solution.
    b. An iodide ion is treated with acidified dichromate ion n solution.
31. The sum of first and second energies and those of third and fourth ionization energies of nickel and platinum are given below:

	$IE_1 + IE_2$ ($kJmol^{-1}$)	$IE_3 + IE_4$ ($kJmol^{-1}$)
Ni	2.49	8.80
Pt	2.66	6.70

Taking these values into account write:
    a. The most common oxidation state for Ni and Pt and its reason.
    b. The name of the metal (Ni or Pt) which can form compounds in +4 oxidation state more easily and why?
32. Explain why the first ionization energies of the elements of the first transition series do not vary much with increasing atomic number.
33. What are interstitial compounds? Mention their two important properties.
34. Write the formula of a compound in which transition metals has +7 oxidation state.
35. Which out of Sc^{3+} and Cr^{3+} exhibits paramagnetism and why?
36. How would you account for the following:
    a. The transition elements have high enthalpies of atomization.
    b. The transition metals and their compounds are found to be good catalysts in many processes.
37. a. Write the electronic configuration of the element with atomic number 102
    b. What is lanthanoid contraction? What is its effect on the chemistry of the elements which follow the lanthanoids?
38. Give reasons for each of the following:
    a. Size of trivalent lanthanoid cations decreases with increase in the atomic number.
    b. Transition metal fluorides are ionic in nature, whereas bromides and chorides are usually covalent in nature.
    c. Chemistry of all the lanthanoids is quite similar.
39. a. Give one example each of amphoteric and acidic oxides of transition metals.
    b. Describe the trends in the following cases:
    i. Melting points of elements in the 3d transition series.
    ii. Atomic sizes of elements in the 4f inner transition series.
40. a. The outer electronic configurations of two members of the lanthanoid series are as follows:
    $4f^1\ 5d^1\ 6s^2$ and $4f^7\ 5d^0\ 6s^2$
    What are their atomic numbers? Predict the oxidation states exhibited by these elements in their compounds?
    b. Assign reason : the largest number of oxidation states are exhibited by the elements in the middle of the first row of the transition elements.
41. Discuss the general trends in the following properties of the 3d transition elements(At. No. 21-29)
    i. Atomic size
    ii. Oxidation state
    iii. Formation of colored ions.