Chemistry Study Materials for Class 12
(Questions – Answers of Chapter -08)
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d – block and f -block elements

34. Explain giving reason "transition metals form a large number of complex compounds".

Ans. Transition metals form a large number of complex compounds due to

(i) Small size & high charge density of the ions of transition metals.

(ii) Presence of vacant d orbitals of suitable for bond formation.

35. What is the effect of increasing pH on a solution of potassium dichromate?

Ans. On increasing the pH of the solution Potassium dichromate (orange) becomes potassium chromate (yellow)

$$Cr_2O_7^{2-} + 2OH^- \rightarrow 2CrO_4^{2-} + H_2O$$

36. What happens when H_2S is passed into potassium dichromate in acidic medium? Give the equation.

Ans. H_2S gets oxidized to sulphur

$$Cr_2O_7^{-2} + 14H^+ + 6e^- \rightarrow 2Cr^{+3} + 7H_2O$$

$$3H_2S \rightarrow 6H^+ + 3S + 6e^-$$

$$Cr_2O_7^{-2} + 3H_2S + 8H^+ \rightarrow 2Cr^{+3} + 7H_2O + 3S$$

37. What is 'disproportionation' of an oxidation state? Give one example of disproportionation reaction in aqueous solution.

Ans. A particular oxidation state, which is relatively less stable compared to other oxidation states, under goes disproportion.

Manganese (VI) which is relatively less stable changes over to manganese (VII) and manganese (IV) in acid solution.

$$3\,MnO_4^{-2} + 4H^+ \rightarrow MnO_2 + 2MnO_4^- + 2\,H_2O$$

38. What is lanthanoid contraction? Write any one consequence of lanthanoid contraction.

Ans. Steady decrease in the size of lanthanides with increase in atomic number is known as lanthanoid contraction. Due to lanthanoid contraction radii of members of 3rd transition series are very much similar to corresponding members of 2nd series.

39. Write any two consequences of lanthanoid contraction.

Ans. Two consequences of lanthanoid contractions are

(i) The radii of the members of the third transition series to be very similar to those of the corresponding members of the second series. Ex. The almost identical radii of Zr (160 pm) and Hf (159 pm) & Nb (146pm) & Ta (146pm)

(ii) Difficulty in separation of lanthanoids due to similarity in chemical properties.

40. Name the two series of f-block.

Ans. The *f*-block consists of the two series, lanthanoids (the fourteen elements following lanthanum) and actinoids (the fourteen elements following actinium.

41. The chemistry of actionoids is more complicated than lanthanoids. Why?

Ans. The actinoids are radioactive elements having half lifes varying. Some members can be prepared only in monogram quantities. These facts render their study more difficult.

42. Write two comparisons of variability in oxidation states of transition metals and non transition elements (p- block elements)?

Ans. 1. In transition elements , variable oxidation state differ from each other by unity, whereas in case of non transition elements , oxidation state differ by units of two.(For example Fe exhibits o.s of +2 and +3 similarly copper exhibits two o.s of +1 and +2 . on the other hand, Sn, Pb exhibit o.s of +2 and +4.)

2. In transition elements, higher o.s are more favoured in elements of higher atomic mass, whereas in p-block elements lower o.s are favoured by heavier members (due to inert pair effect, For example Mo(VI) and W(VI) are more stable than Cr(VI).

On the other hand Pb(II) is more stable than Sn(II))

43.What happens when

(a) A lanthanoid reacts with dilute acids?

(b) A lanthanoid reacts with water?

Ans.(a) When lanthanoid reacts with dilute acids , it liberates hydrogen gas.

(b)When lanthanoid reacts with water, it forms lanthanoid hydroxide and liberate hydrogen gas.

44.What is the gas liberated when

i) Crystals of potassium permanganate is heated to 513K ?

ii) Acidified potassium permanganate is treated with oxalate ion at 333K?

Ans. i) When crystals of potassium permanganate is heated to 513K Oxygen (O_2) gas is liberated.

ii) Acidified potassium permanganate when treated with oxalate ion at 333K liberates Carbon dioxide (CO2) gas.

45.What is the composition of Mischmetall? Give its one use.

Ans. The composition of Mischmetall is lanthanoid metal (~ 95%) and iron (~ 5%) and traces of S, C, Ca and Al. Mischmetall is used in Mg-based alloy to produce bullets, shell and lighter flint

46. Show the interconversion of chromate and dichromate

Ans. The chromates and dichromates are interconvertible in aqueous solution depending upon pH of the solution.

At pH less than 7: Chromate (yellow) on adding acid becomes dichromate (orange)

$$2CrO_4^{2-} + 2H^+ \rightarrow Cr_2O_7^{2-} + H_2O$$

At pH more than 7 : Dichromate (orange) on adding base becomes Chromate (yellow)

$$Cr_2O_7^{2-} + 2OH^- \rightarrow 2CrO_4^{2-} + H_2O$$

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