

SUBJECT - CHEMISTRY
CLASS - BSc (Hons) PART - II

Page - 01
Date - 30.4.20

PAPER - III

GROUP - B

TOPIC - CHEMISTRY OF CHROMIUM

Dr Hazi Mohan Prasad Singh
Department of Chemistry

Dr. L. K. V. D College Tajpur Samastipur

Chromium is a member of Gr. VIB of period table. Other members of this group with their atomic and electronic configuration are given below

Chromium - Cr - 24 [Ar] $3d^5 4s^1$

Molybdenum - Mo - 42 [Kr] $4d^5 5s^1$

Tungsten - W - 74 [Xe] $4f^{14} 5d^4 6s^2$

Since they are transition elements and they are more closely related to their respective neighbours in series than to the members of Group VIA

The only point in which they resemble the elements of Group VIA is in compounds in which the elements are hexavalent. Thus they all form acid trioxides CrO_3 , MnO_3 and WO_3 .

They are acidic with decreases in acidic character from Cr to tungsten. Their salts examples are chromates and molybdates are isomorphous with the corresponding sulphates and selenates. They also resemble in their solubilities in water. Thus barium and lead chromate like barium and lead sulphate are sparingly soluble in water.

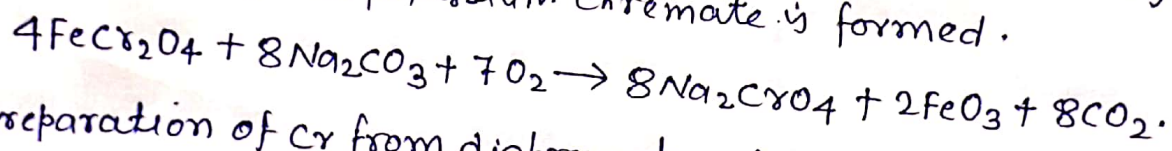
The stable oxidation state of group VIB elements is +6. But the stability of +6 oxidation state increases with atomic number. However chromium acid possesses strong oxidising properties owing to the tendency of chromium to pass into +3 oxidation state.

Molybdic acid passes only a weak oxidising property while tungsten acid has no oxidising property.

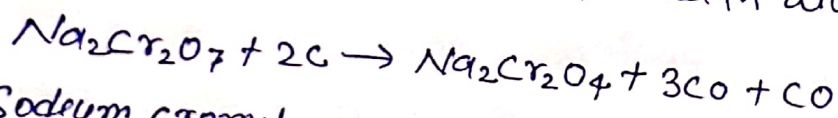
(b) Chromium does not occur in free state in nature; The only main ore of Cr is ferrous chromite or Chrome iron stone ($\text{Fe}^{\text{II}}\text{Cr}^{\text{III}}\text{O}_4$)

Extraction: The extraction of Cr from the ferrous chromite ore is carried out in the following three steps.

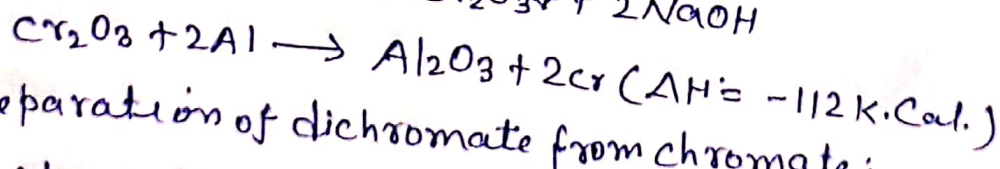
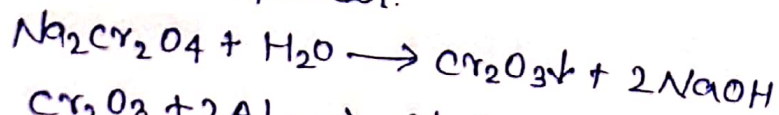
(I) preparation of chromate from the ore: The powdered ferrous chromite is mixed with sufficient quantity of Sodium or potassium carbonate. The mixture is heated in reverberatory furnace at 1100°C in the presence of sufficient quantity of air when Sodium or potassium chromate is formed.



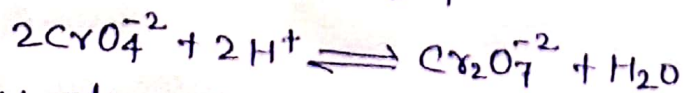
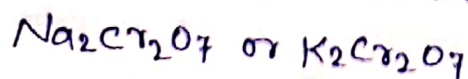
(II) preparation of Cr from dichromate: - The dichromate is thus reduced with Carbon to yield Sodium chromite which is then further reduced to the metal with aluminium powder



Sodium chromite is treated with water to give a precipitate of Chromium oxide Cr_2O_3 which is finally reduced to chromium by Aluminium powder.



(III) preparation of dichromate from chromate:



Uses: Chromium is used in the manufacture of steels such as stainless steel (Fe-80%, Cr-19%, Ni-11%) It is also used in the production of nichrome (Ni-60%, Cr-15%, Fe-25%) An important use of Chromium is chromium plating.