SUBJECT - CHEMISTRY
CLASS. BSc(Hons) PART-II
PAPER - III
GROUP - B
TOPIC - CHEMISTRY OF CHROMIUM

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Chromium is a member of Gr. VIB of period table: other member 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 element and they are more closely related to their respect neighbours in Series than to the member of Group VI A

The only point in which they resemble the elements of groups VIA is in Compounds in which the elements are hexa Covalent. Thus they all formed acid trioxides CrO_3. MnO_3 and WO_3. They are acidic with decreases in acidic character from Cr to tangustun. Their Salts examples are chromates and molybdates are isomorphous with the Corrosponding Sulphates and Selenates. They also resembles in their Salibelities 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 posses strong oxidising properties owing to the tendency of Chromium to pass into +3 oxidation stable.

Malybdic acid passes only a weak oxidising property while tungustan 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 ($Fe^{II}Cr^{III}O_4$)

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 reverberatary furnace at 1100°C in the presence of Sufficient quantity of air when Sodium or potassium chremate is formed.

$$4FeCr_2O_4 + 8Na_2CO_3 + 7O_2 \longrightarrow 8Na_2CrO_4 + 2Fe_2O_3 + 8CO_2.$$

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

$$Na_2Cr_2O_7 + 2C \longrightarrow Na_2Cr_2O_4 + 3CO + CO$$

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

$$Na_2Cr_2O_4 + H_2O \longrightarrow Cr_2O_3\downarrow + 2NaOH$$

$$Cr_2O_3 + 2Al \longrightarrow Al_2O_3 + 2Cr \quad (\Delta H = -112\ K.Cal.)$$

(III) preparation of dichromate from chromate:

$Na_2Cr_2O_7$ or $K_2Cr_2O_7$

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

Uses: Chromium is used in the manufactured of steels such as Stanless steel (Fe-80%. Cr-19% Ni-1%.) It is also used in the production of nichrome Ni-60%. Cr-15%. Fe-25%.) An important use of Cromium is cromium plating.