

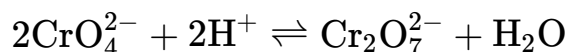
Chromium Chemistry: Option Analysis

<https://gemini.google.com/app/a3a2835d17c0fc48>

Response: The correct statement is **(3)**.

Analysis of Options

- **(1) Incorrect:** When an aqueous solution of potassium chromate (K_2CrO_4 , **yellow**) is acidified with dilute H_2SO_4 , it converts to dichromate ions ($\text{Cr}_2\text{O}_7^{2-}$, **orange**):

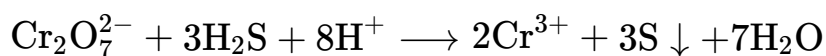


A clear color change from **yellow to orange** is observed.

- **(2) Incorrect:** Electronegativity generally increases across a period from left to right across the 3d transition series. Cobalt (Co, atomic number 27) has a higher electronegativity (≈ 1.88 on the Pauling scale) than Chromium (Cr, atomic number 24, ≈ 1.66).
- **(3) Correct:** Hexaaquachromium(II) ions, $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$, are oxidized by atmospheric oxygen/reagents to Cr^{3+} . When treated with excess NaOH , chromium forms the tetrahydroxochromate(III) complex, $[\text{Cr}(\text{OH})_4]^-$. Upon oxidation with hydrogen peroxide (H_2O_2), chromium(III) is oxidized to chromate (CrO_4^{2-}), which gives a **yellow-colored solution**:



- **(4) Incorrect:** Chromium(III) oxide (Cr_2O_3) is **amphoteric** (reacts with both acids and bases), not purely basic. (Note: CrO is basic, Cr_2O_3 is amphoteric, and CrO_3 is acidic).
- **(5) Incorrect:** When H_2S gas is passed into an acidic solution of $\text{K}_2\text{Cr}_2\text{O}_7$, the dichromate oxidizes H_2S to elemental sulfur (S):



While Cr^{3+} gives a green color, the precipitate of colloidal sulfur makes the solution **turbid/cloudy green**, not a clear solution.
