

Bromine water – this is liquid bromine dissolved in water – written as $\text{Br}_2(\text{aq})$.

- Reacts rapidly (virtually instantly) if shaken with an alkene/alkyne; bromine water is decolourised (orange to colourless). (ADDITION REACTION)
- Reacts VERY, VERY slowly with alkane and only in UV light and/or heat. (SUBSTITUTION REACTION). Bromine water is decolourised very slowly.



All sorts of stuff that's useful for detecting a carboxylic acid.

- Litmus paper (blue to red)
- UI paper / solution (green to orange)
- Add a reactive metal eg **Mg or Zn** – see bubbles of gas (H_2 gas)
- Add a **carbonate** or **hydrogen carbonate** eg NaHCO_3 – see bubbles of gas (CO_2 gas).
- Has a “sharp” smell or has an “acidic smell” or a “vinegar like smell”.

SOLUBILITY: Only small polar molecules (alcohols C1-4, c. acids C1-4 and amines C1-5) are soluble in water – ALL others make 2 LAYERS with water or an (aq) reagent e.g. Br_2 water or $\text{NaHCO}_3(\text{aq})$ as they are either completely non polar molecules or have a large non polar portion.

HEAT with conc. sulfuric acid – acts as a dehydrating agent.

Turns an alcohol into an alkene (elim. reaction).

Ammonia (alc) Converts haloalkane to amine (subs. reaction)

Testing for amines

- Turns red litmus & green UI paper blue.
- Small ones soluble in water.
- Evil fishy /rotting smell!
- React with acid to make salts.

Heat alkene with **sulfuric acid $\text{H}^+/\text{H}_2\text{O}$** to add water across $\text{C}=\text{C}$ and make an alcohol.

Dilute NaOH (aq)

Acid-base reaction with RCOOH to make the salt RCOONa

Dilute KOH (aq) /heat

Converts haloalkane to an alcohol (subs. reaction) **BUT**

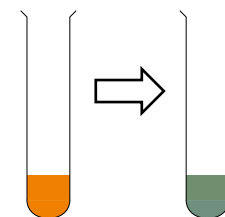
Dilute KOH (alc) /heat Converts haloalkane to an alkene (elim. reaction).

☒ No Brain Too Small ●
● CHEMISTRY ☒

Acidified potassium dichromate – $\text{H}^+/\text{Cr}_2\text{O}_7^{2-}$

It's ORANGE in colour & an OXIDISING AGENT

It oxidises a primary alcohol (to an aldehyde and then) to a carboxylic acid!



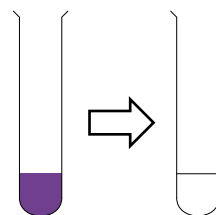
Orange dichromate ion is REDUCED to green chromium(III) ion Cr^{3+}

Heat with acidified potassium permanganate – another oxidising agent

$\text{MnO}_4^-/\text{H}^+$ It's PURPLE!

It will also oxidise a primary alcohol to an aldehyde and then to a carboxylic acid

e.g. propan-1-ol (to propanal and then) to propanoic acid. Colour change as purple MnO_4^- is reduced to colourless Mn^{2+}



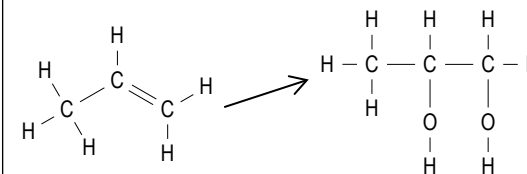
AS 91165 Demonstrate understanding of the properties of selected organic compounds

And the “odd” reaction of **potassium permanganate (MnO_4^-)** an OXIDATION reaction & a test for unsaturation / $\text{C}=\text{C}$ double bond.

Does NOT need heat.

alkene \rightarrow diol : yes – it has TWO alcohol groups. Colour change purple MnO_4^- to brown MnO_2 ppt. (Or to colourless Mn^{2+} if $\text{MnO}_4^-/\text{H}^+$ is used)
Eg $\text{CH}_3\text{CH}=\text{CH}_2 \rightarrow \text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{OH}$

propane-1,2-diol



PCl_3 or PCl_5 or SOCl_2 or even hydrogen halide HX

Will convert an alcohol into a haloalkane. (SOCl_2 works well for 1°, 2° and 3° alcohols)