

**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; 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 (orange to colourless) PLUS makes some HBr gas.



**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 ( $\text{H}_2$  gas)
- Add a **carbonate** or **hydrogen carbonate** eg  $\text{NaHCO}_3$  – see bubbles of gas ( $\text{CO}_2$  gas).
- Has a “sharp” smell or has an “acidic smell” or a “vinegar like smell”.

**SOLUBILITY:** Only small polar molecules (alcohols & esters C1 to 3/4, and amines C1-5) are soluble in water – ALL others make 2 LAYERS with water or an (aq) reagent eg  $\text{Br}_2$  water or  $\text{NaHCO}_3(\text{aq})$  as they are either 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  $\text{NaOH}$  (aq)**

Acid-base reaction with  $\text{RCOOH}$  to make the salt  $\text{RCOONa}$

**Dilute  $\text{KOH}$  (aq) /heat**

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

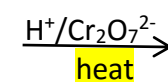
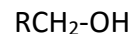
**Dilute  $\text{KOH}$  (alc) /heat** Converts haloalkane to an alkene (elim. reaction).

⌘ 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!



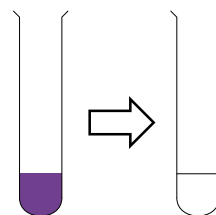
Orange dichromate ion is REDUCED to green chromium(III) ion  $\text{Cr}^{3+}$

**Heat with acidified potassium permanganate** – another oxidising agent

$\text{H}^+/\text{MnO}_4^-$  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  $\text{MnO}_4^-$  is reduced to colourless  $\text{Mn}^{2+}$

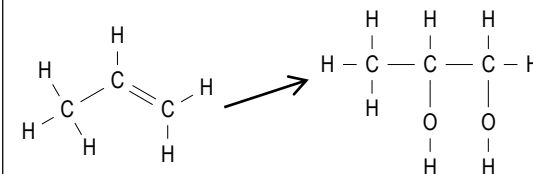


And the “odd” reaction of **acidified potassium permanganate** ..... an OXIDATION reaction & a test for unsaturation /  $\text{C}=\text{C}$  double bond.

Does NOT need heat.

alkene  $\rightarrow$  diol : yes – it has TWO alcohol groups. Colour change purple  $\text{MnO}_4^-$  to colourless  $\text{Mn}^{2+}$

Eg  $\text{CH}_3\text{CH}=\text{CH}_2 \rightarrow \text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{OH}$   
propan-1,2-diol



**$\text{PCl}_3$  or  $\text{PCl}_5$  or  $\text{SOCl}_2$**

Will convert an alcohol into a haloalkane. ( $\text{SOCl}_2$  works well for 1°, 2° and 3° alcohols)

**AS 91165 Demonstrate understanding of the properties of selected organic compounds**