

# Introduction to acids

## 1 Definition - Arrhenius Rule

- Hydrogen-containing covalent compound that dissolves in water to ionize  $H^+$  as the only positive ion → ionization (离子化)
- $[H^+] > [OH^-]$
- eg.
  - >  $HCl(aq) \rightarrow H^+ + Cl^-$
  - >  $H_2SO_4(aq) \rightarrow 2H^+ + SO_4^{2-}$

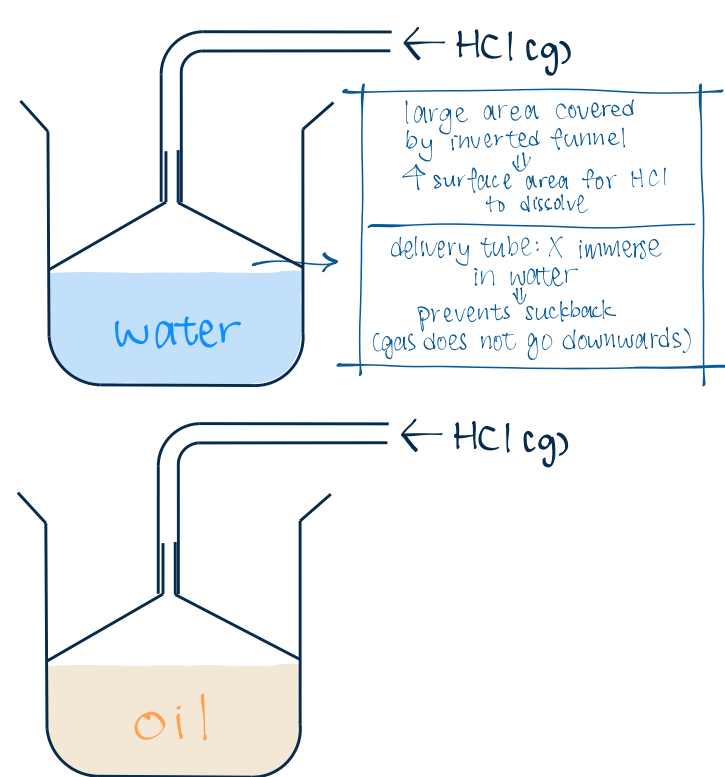
## 2 Acidic properties

- tastes sour
- conducts electricity (✓ mobile ions)
- reacts w/ bases / other substances

## 3 Importance of water to acids

- acids must be dissolved in water to possess acidic properties  
(Arrhenius rule: "...dissolves in water to ionize  $H^+$ ..." →  $x \text{ water} = x \text{ } H^+$ )

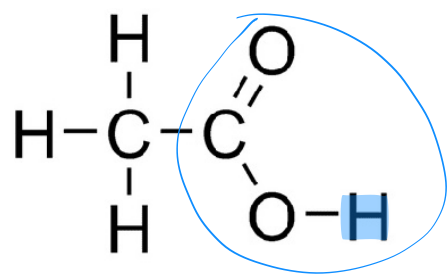
### EXPERIMENT TO DEMONSTRATE WATER'S IMPORTANCE



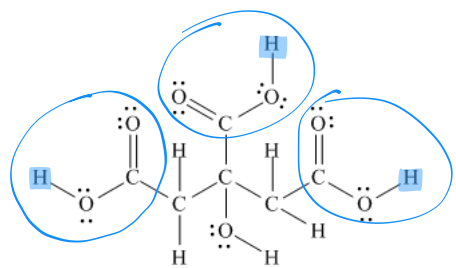
1. Pump  $HCl(g)$  into water and oil respectively.
  2. Use blue litmus paper to test if the liquids are acids.
    - > water: blue → red
    - > oil: remains blue
- ↳ Only  $HCl$  dissolved in water exhibits acidic properties
- 可不可以用加 Iron → 看有没有 OC (应是 colourless gas bubbles) 的方法判断是不是 acid?
  - ↳ 不可以
  - ↳ oil 一开始也会有气泡 (泵气进液体自然会产生气泡), 但之后因  $HCl$  溶进油里了 ( $HCl$  为 SMS, 并且 non-polar, like dissolves like) 气泡会消失

## 4 注意点

1. Dilute acids 不一定是 corrosive, 保险起见写 irritant 较好
2. Acidic gas (除  $CO_2$ ) 都是 corrosive (吸入体内, 在肺泡少量的水 ionize 成 acid ⇒ concentrated)
3. 如果 acid 有  $COOH$ , 则只有  $COOH$  里面的  $H$  才会 ionize 成  $H^+$ 
  - ∴ acid molecule 里面  $H$  atoms 的数量不代表 acid (completely ionize 后) 掉落  $H^+$  的数量
  - eg 1.  $CH_3COOH \rightleftharpoons CH_3COO^- + H^+$



- eg 2. citric acid (tribasic)



## 5 Acids 的分类

1. strong vs weak acids
  2. conc. vs dilute acids
  3. basicity
  4. mineral acid vs organic acid
- } 影响 pH
- obtained from minerals / living things
  - mineral acids:  $HCl$ ,  $H_2SO_4$ ,  $HNO_3$ ,  $H_3PO_4$ ...
  - organic acids:  $CH_3COOH$  (ethanoic acid), citric acid...