Strong Acids

- Here we are going to talk about strong acid, not concentrated acid
- What is the difference?
- Concentration refers to number of moles in a litre of solution
- What about acid strength – what does it mean?
- What is it that determines the strength of an acid

- Acid strength depends on the number of H^+ ions an acid can give when dissolved in water
- That is how much of the acid produces H^+ ions in water
- So, you can have a concentrated solution of a weak acid
- Or, a concentrated solution of a strong acid
- A dilute solution of a strong or weak acid

- According to Bronsted-Lowry definition, an acid is a substance that produces H^+ when dissolved in water
- $HCl + H_2O \rightleftharpoons H_3O^+ + Cl^-$
- This reaction is reversible
- But HCl ionizes almost completely, such that the reaction can be taken to be almost one way
- $HCl + H_2O \longrightarrow H_3O^+ + Cl^-$

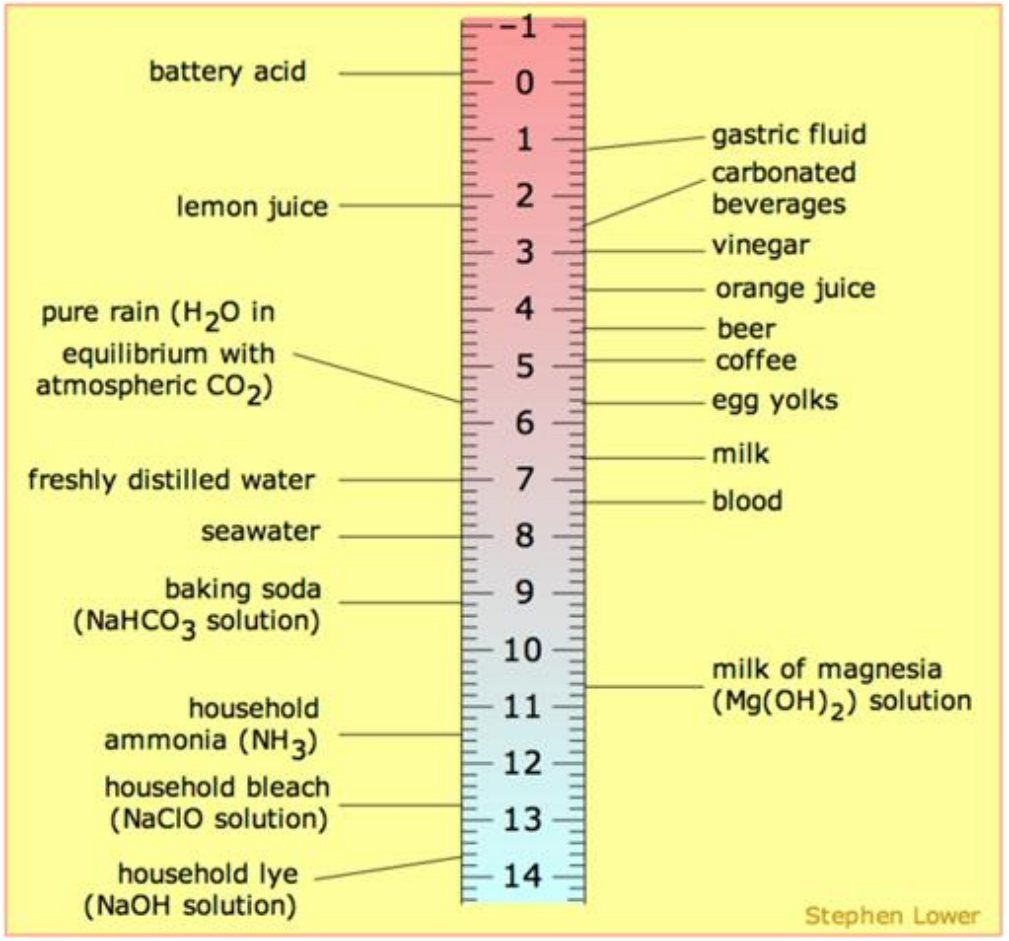
- That means HCl gets almost 100% ionized when dissolved in water
- Very little of the reverse reaction takes place
- An acid that does what HCl does – **ionizing almost completely, is called a strong acid**
- What are other strong acids that you know?
  - H_2SO_4
  - HNO_3

Strong Acids and pH

- Remember pH is a measure of the concentration of H_3O^+ or H^+ ions
- The higher the concentration of H^+ the more acidic a solution is
- Acidic solutions have a lower pH
- As the concentration of H^+ increases, the pH gets lower and lower
- Strong acids have their pH towards 0

- Strong acids like HCl have a pH of around 1 to 0.
- Also, remember: pH = -log[H^+]
- This means -log of a higher concentration of will be a smaller number (lower pH)
- While -log of a lower concentration will give a bigger number (higher pH)
  - e.g. Workout pH for the following concentrations
    - [H^+] = 3 x 10^{-1}
    - [H^+] = 3 x 10^{-13}

- Which concentration between 3×10^{-1} and 3×10^{-13} is higher?
- Which one gives a lower pH?
- Which one gives a higher pH?



A strong acid (with higher concentration of H^+ ions) has a lower pH value

Working Out pH of a Strong Acid

- If you have HCl solution of concentration 0.001M and you know that HCl dissociates completely:
  - What will be the concentration of H^+ ions in the solution?
  - Remember:
    - strong acids ionize almost completely
    - Water contributes very little H+ ions – can be ignored
  - Because HCl is a strong acid conc of HCl = Con of H^+ ions

- Calculate the pH of the HCl solution referred to above