Moles calculation for zinc oxide reaction from last lesson

Limiting reagent - a reaction stops when one reactant is used up

- **Using** a measuring cylinder, **carefully measure** 25 mL of the unknown hydrochloric acid (HCl) solution and add it to the beaker.
- **Using** a spatula **add** a small (pea-sized) amount of zinc oxide to the acid and **wait** for it to dissolve (**Hold** the zinc oxide beaker **over** the acid when you do this, so none is lost).
- **Keep adding** small amounts of zinc oxide until it refuses to dissolve.
- How much ZnO did you add in grams?
- **Use** your periodic table to calculate the molar mass of ZnO.
- How many moles of zinc reacted with the HCl?

- The UNBALANCED equation for the reaction is:

- $ZnO(aq) + HCl(aq) \rightarrow ZnCl_2(aq) + H_2O(l)$

- **Balance** the equation and then **explain** how many moles of HCl must have been present in 25mL of HCl in your beaker.

Change in conductivity during a double displacement reaction

Double displacement reaction

$$\mathrm{A^+B^-} + \mathrm{C^+D^-} \rightarrow \mathrm{A^+D^-} + \mathrm{C^+B^-}$$

- This is the reaction we will be doing today:
- Na_2CO_3 (aq) + $CuCl_2$ (aq) $\rightarrow$ $CuCO_3$ (s) + 2NaCl (aq)

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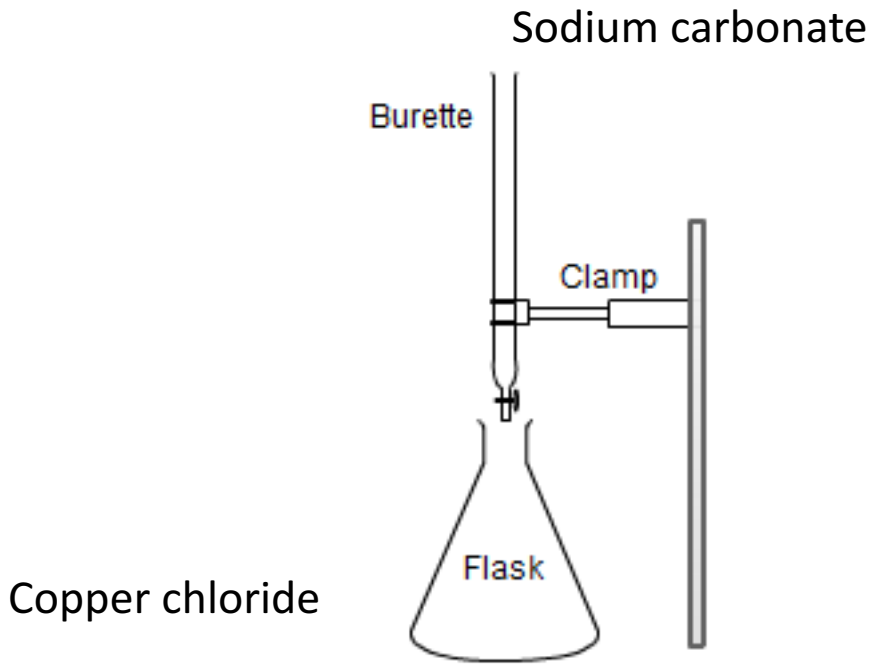
- What are the reactants?
- What are the products?
- How many ions are there in solution in the reactants
- How many ions are there in solution in the products
- Na_2CO_3, $CuCl_2$
- $CuCO_3$, NaCl
- 6 ($2 \times Na^+ + 1 \times CO_3^{2-} + 1 \times Cu^{2+} + 2 \times Cl^-$)
- 4 ($2 \times Na^+ + 2 \times Cl^-$)

Experiment

- Put 20 mL of $CuCl_2$ solution in the flask
- Measure the conductivity of the solution
- Add the sodium carbonate solution 1 mL at a time
- Stir and record the conductivity after each 1 mL of sodium carbonate solution has been added



- Why did the solution turn cloudy when we added sodium carbonate?
- $CuCO_3$ is a solid precipitate.
- Why did the conductivity go down at first and then go up again?
- The number of ions in solution decreases as the reaction progresses as $CuCO_3$ is insoluble. Once all the Cu^{2+} ions have been removed we continue adding sodium carbonate ions so the conductivity rose again.

Reaction types

- a) Double displacement reaction
- $Na_2CO_3\ (aq) + CuCl_2\ (aq) \rightarrow CuCO_3\ (s) + 2NaCl\ (aq)$
- b) Single displacement reaction
- $Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$
- c) Combustion reaction
- $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$
- d) Synthesis
- $Fe + S \rightarrow FeS$
- e) Decomposition
- $Hg_2O \rightarrow 4Hg + O_2$
- f) Neutralisation (like double displacement)
- $HCl + NaOH \rightarrow NaCl + H_2O$

What type of reactions are these Can you balance them

- $N_2 + H_2 \rightarrow NH_3$
- $CaCO_3 \rightarrow CaO + CO_2$
- $H_2SO_4 + NaOH \rightarrow Na_2SO_4 + H_2O$
- $AgNO_3\ (aq) + NaCl\ (aq) \rightarrow AgCl\ (s) + NaNO_3\ (aq)$
- $CuSO_4 + Zn \rightarrow ZnSO_4 + Cu$
- $Cr + O_2 \rightarrow Cr_2O_3$
- $Cu(OH)_2 + 2\ HC_2H_3O_2 \rightarrow Cu(C_2H_3O_2)_2 + 2\ H_2O$
- $C_3H_8 + O_2 \rightarrow CO_2 + H_2O$

What type of reactions are these Can you balance them

- $N_2 + 3H_2 \rightarrow 2NH_3$ (synthesis)
- $CaCO_3 \rightarrow CaO + CO_2$ (decomposition)
- $H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$ (neutralisation)
- $AgNO_3$ (aq) + NaCl (aq) $\rightarrow$ AgCl (s) + $NaNO_3$ (aq) (precipitation)
- $CuSO_4 + Zn \rightarrow ZnSO_4 + Cu$ (displacement)
- $4Cr + 3O_2 \rightarrow 2Cr_2O_3$ (synthesis)
- $Cu(OH)_2 + 2HC_2H_3O_2 \rightarrow Cu(C_2H_3O_2)_2 + 2H_2O$ (double displacement)
- $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$ (combustion)

H/W

- You will make a presentation to your colleagues on one of these reactions (you can talk about the reactants and products, their properties and uses, the history of the reaction if relevant) and do the reaction in front of the class.

- It has to be demonstrated following pH/temperature/conductivity etc. using labquest (the equipment we used today)

- You will present in pairs. Over the holidays, put yourself in pairs and research 3 possible reactions you may like to do and email me your ideas. Students who were not at Friday's lesson must work with somebody who was present.