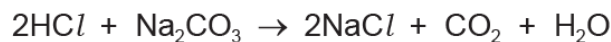


Stoichiometry – 2019 Nov IGCSE

1. 0620/41/O/N/19/No.6

Dilute hydrochloric acid, $\text{HCl}(\text{aq})$, reacts with aqueous sodium carbonate, $\text{Na}_2\text{CO}_3(\text{aq})$.

The chemical equation for the reaction is shown.



(a) A 25.0cm^3 portion of $\text{Na}_2\text{CO}_3(\text{aq})$ was placed in a conical flask with a few drops of a suitable indicator. It was titrated against $\text{HCl}(\text{aq})$ of concentration 0.180mol/dm^3 .

20.0cm^3 of $\text{HCl}(\text{aq})$ was required to reach the end-point.

Calculate the concentration of the $\text{Na}_2\text{CO}_3(\text{aq})$, in mol/dm^3 , using the following steps.

- Calculate the number of moles of HCl used in the titration.

..... mol

- Calculate the number of moles of Na_2CO_3 contained in the 25.0cm^3 portion of $\text{Na}_2\text{CO}_3(\text{aq})$.

..... mol

- Calculate the concentration of the $\text{Na}_2\text{CO}_3(\text{aq})$ in mol/dm^3 .

..... mol/dm^3
[3]

(b) In another experiment, the volume of carbon dioxide, CO_2 , produced was 48.0cm^3 , measured at room temperature and pressure.

How many moles of CO_2 is this?

moles of $\text{CO}_2 = \dots\dots\dots\text{mol}$ [1]

(c) A sample of concentrated hydrobromic acid, HBr(aq), was electrolysed using platinum electrodes.

The concentration of the hydrobromic acid was 8.89 mol/dm^3 .

(i) Calculate the concentration of the HBr(aq) in g/dm^3 .

concentration of HBr(aq) = g/dm^3 [1]

(ii) Explain why concentrated HBr(aq) can conduct electricity.

.....
.....
..... [2]

(iii) Magnesium is **not** a suitable material from which to make the electrodes.

Explain why.

.....
..... [1]

(iv) Predict the product formed at the anode when concentrated HBr(aq) is electrolysed.

..... [1]

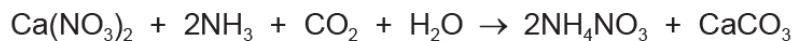
(v) Write the ionic half-equation for the reaction occurring at the cathode.

..... [2]

[Total: 11]

Nitrates such as ammonium nitrate are used as fertilisers.

The final stage in the production of ammonium nitrate is shown in the equation.



Calculate the maximum mass of ammonium nitrate that can be produced from 820 g of calcium nitrate, $\text{Ca}(\text{NO}_3)_2$, using the following steps.

The relative formula mass, M_r , of calcium nitrate, $\text{Ca}(\text{NO}_3)_2$, = 164.

- Calculate the number of moles of $\text{Ca}(\text{NO}_3)_2$ in 820 g.

..... mol

- Deduce the number of moles of NH_4NO_3 produced.

..... mol

- Calculate the M_r of NH_4NO_3 .

M_r of NH_4NO_3 =

- Calculate the maximum mass of ammonium nitrate produced.

..... g
[4]