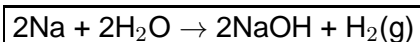




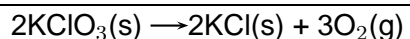
## 5 Worksheet: Mole concept and stoichiometric calculations

### QUESTION 1

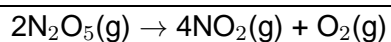
- 1.1 Calculate how many CO<sub>2</sub> molecules there are in 8,8 g gas.
- 1.2 Calculate what volume of a 0,3 mol.dm<sup>-3</sup> oxalic acid solution contains 22,5 g oxalic acid ((COOH)<sub>2</sub>).
- 1.3 Calculate the how many sodium atoms must react **completely** to give 33,6 dm<sup>3</sup> hydrogen gas at STP.



- 1.4 What mass of KClO<sub>3</sub> must decompose **completely** to produce 3,36 dm<sup>3</sup> of oxygen gas at STP?



- 1.5 Consider the following reaction:

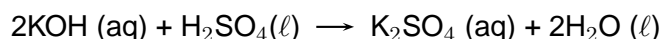


The reaction take place in a container where CONDITIONS ARE NOT STP! Calculate the volume N<sub>2</sub>O<sub>5</sub> that must decompose completely to produce 9,64 dm<sup>3</sup> nitrogen dioxide.

- 1.6 A standard sodium carbonate solution is prepared by dissolving 5,3 g of the crystals in 250 cm<sup>3</sup> water. 25 cm<sup>3</sup> of this solution neutralises 10 cm<sup>3</sup> of a hydrochloric acid solution.
- Calculate the concentration of the sodium carbonate solution.
  - Write a balanced equation for the neutralisation reaction.
  - Calculate the concentration of the hydrochloric acid.

- 1.7 Eastern Cape 2015 Preperatory exam Question 7.2:

0,28 g of potassium hydroxide is dissolved in water and titrated against a solution of sulphuric acid. The end point is reached after adding exactly 20 cm<sup>3</sup> of a sulphuric acid solution. The balanced equation for this reaction is:



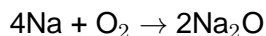
Calculate the concentration of the sulphuric acid solution. (5)



(The following questions focus on study material covered in Video 3)

## QUESTION 2

2.1 Sodium burns in oxygen according to the following equation:



483 g sodium is placed in a container with 5,8 mol oxygen gas..

- Determine which substance acts as limiting agent. Show all calculations
- Calculate the mass of sodium oxide that can be produced.

2.2 Two solutions are mixed:

Solution	Volume (cm <sup>3</sup> )	Concentration (mol·dm <sup>-3</sup> )
H <sub>2</sub> SO <sub>4</sub>	200	0,2
KOH	100	0,3

Calculate the pH of the solution.

(Hint: Determine the mole and concentration that is left over from the reactant that is in excess after the reaction.)

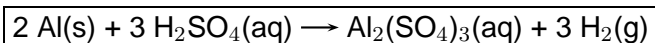
(The following questions focus on study material covered in Video 4)

## QUESTION 3

3.1  $4\text{Al(s)} + 3\text{O}_2\text{(g)} \rightarrow 2\text{Al}_2\text{O}_3\text{(s)}$

97,2 g Al reacts and produce 150 g aluminium oxide. Calculate the percentage yield.

3.2 In an experiment 8 g of unpure aluminium is added to an excess of sulphuric acid. The following reaction occurs:



The volume of H<sub>2</sub>(g) that is produced is 6,72 dm<sup>3</sup>. Calculate the percentage purity of the aluminium.

3.3 An impure magnesium sample with mass 0,45 g reacts with 200 cm<sup>3</sup> of a 0,2 mol·dm<sup>-3</sup> nitric acid solution. The acids is in excess. The acid that remain is neutralised by 35 cm<sup>3</sup> of a 0,2 mol·dm<sup>-3</sup> sodium hydroxide solution. Calculate percentage purity of the magnesium sample.

