

## Guidance AC1.1.2 How much of the air is oxygen?

### Teaching notes

This activity can be run in two ways:

#### 1 In advance

The experiment may be set up in advance in which case the initial length of the air column must be recorded. Alternatively the apparatus could be photographed with a ruler by the side so students can take the measurement themselves.

The class can look at the apparatus as a demonstration and a volunteer can measure the final length of the air column.

#### 2 Class practical

Students could set up the apparatus during the lesson. They could think about what calculation they will need to do in order to calculate the percentage of oxygen in the air and predict what the answer will be. More able students may be able to work this out with help, while less able students will need to be given the following equation:

$$\text{fraction of air used up} = \frac{(\text{length of air column at start}) - (\text{length of air column at end})}{(\text{length of air column at start})}$$

Multiply the answer by 100 to get the percentage.

They will need to measure their results at least one week later.

Collect the results of the class and discuss the fact that there is a range of different results. Ask students to consider reasons why their results are different.

Please note that rusting is a complex process and is not the focus of this activity. Rust is here assumed to be simply iron oxide. Students need to know that iron oxide is formed by the combination of iron with oxygen.

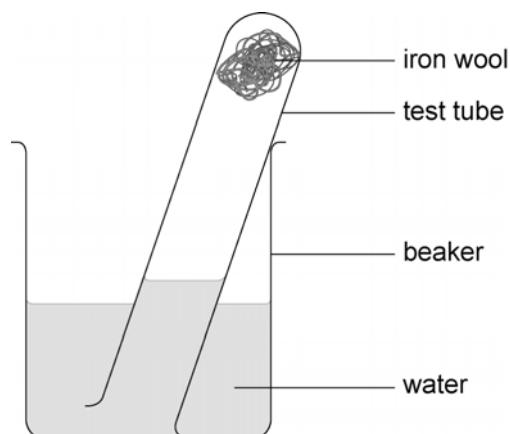
### Answers to questions

- 1 Correct measurement of the length of the air column at start or measurement provided
- 2 Correct measurement of length of air column at the end of the experiment
- 3 Oxygen has been used up. It has formed a compound with the iron, making iron oxide.
- 4 Check that the measurements have been correctly used in the calculation.

### Requirements

(for the class or per pair)

- Activity sheet AC1.1.2
- 250 ml beaker
- test tube
- iron wool
- rule



### Technical notes

The test tubes used in this experiment can get stained by the rust. They can be cleaned with a 'Stain Devil'®.

- 5 Students should expect the answer to be about 20%.
- 6 If the result is less than 20% students could suggest that the rusting process is not complete. If the result is more than 20% then there may have been some error with measurements. Some of the air may have been accidentally allowed to escape.