



## Week 5: Acids and Metals

### Lesson 3: Acids Skills Lesson

Complete Starter (in back of class jotter)

#### Starter

- 1) Write word equations for the reactions between
  - a) Magnesium and sulphuric acid
  - b) Calcium and water
- 2) Explain how you would test for the gas produced in both reactions



#### Learning Outcomes

By the end of this lesson you should be able to:

- Use the data to draw bar graphs
- Solve problems using knowledge from Chemistry so far
- Draw conclusions from data using information given

#### Success Criteria

You will have been successful in this lesson if you:

1. Take notes on the selected video
2. Complete questions provided

If you have any questions about the content of this lesson, you should ask your **class teacher either through your class MS team or via email.**

#### What to do

Complete tasks 1-6 - This involves watching a video and taking notes, answering questions in your class jotter on Problem Solving, Drawing Conclusions and Reading for Information.

Once completed, Extension activities and the answers to today's starter can be found at the end of the document.



## Task 1: Watch video on Metal reaction word equations

[Watch this video](#) and take notes in your jotter of the two general word equations for the reactions between metals and water and metals and acid.

## Task 2: Questions to try - Drawing conclusions

- 1) Solder is made by melting together a mixture of tin and lead.
  - a) Callum investigated three types of solder. He heated the solders and recorded the temperature at which one started to melt.

The table shows Callum's results:

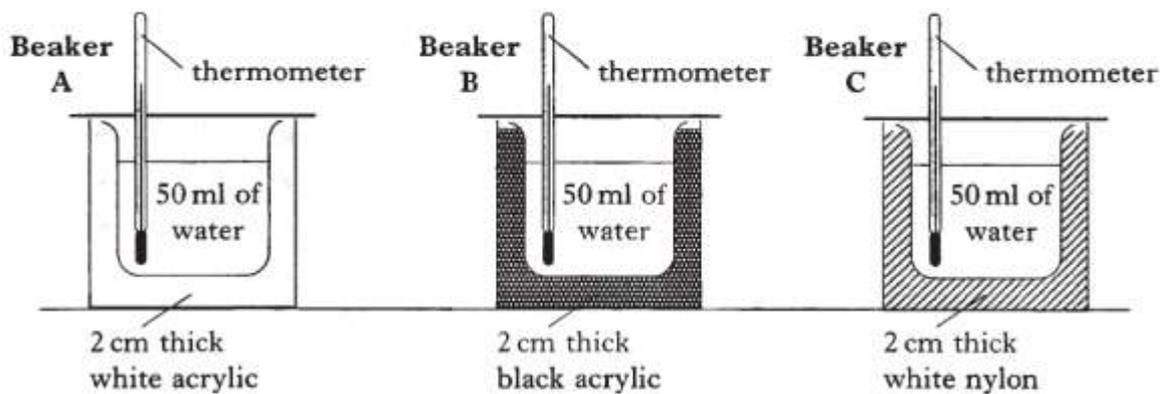
Solder	Percentage of metals present		Temperature at which the solder starts to melt (°C)
	Lead	Tin	
Type 1	67	33	265
Type 2	50	50	220
Type 3	40	60	185

Draw a conclusion from these results

- b) A new type of solder contains 45% lead.

Predict the temperature at which the new type of solder will start to melt.

2) The following investigation was carried out to find the best type of clothing material to keep a person warm.



The results are shown in the table:

Beaker	Temperature of water ( $^{\circ}\text{C}$ )	
	At start	After 10 minutes
A	80	71
B	80	68
C	80	66

- What two conclusions can be drawn from these results?
- The experiment was repeated using a 2 cm layer of black nylon.

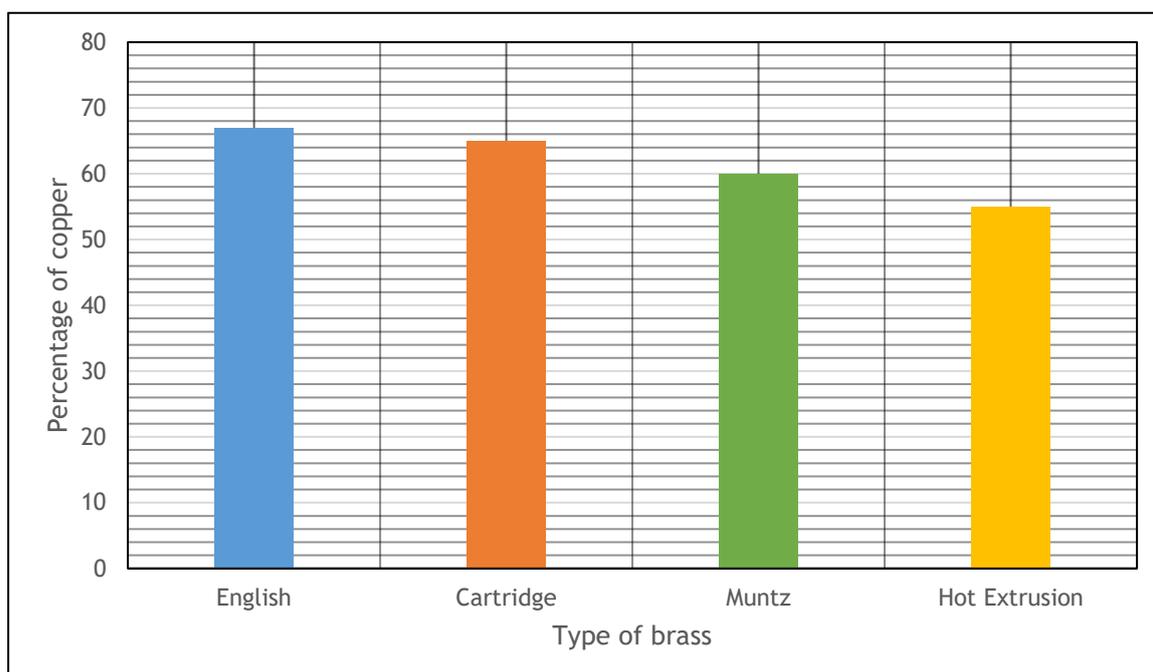
Predict the temperature of the water after 10 minutes.



- 3) The yellow alloy called brass does not corrode easily. Brass is a mixture of the metals copper and zinc. The more zinc in the brass, the lighter the yellow colour becomes. More zinc in brass makes it hard-wearing.

The bigger the percentage of copper in brass, the easier the brass is to shape. More copper in brass makes the yellow colour darker.

The graph below shows the percentage of copper in different types of brass.



Use the information in the passage and the graph to answer the following questions.

- Which type of brass would be lightest in colour?
- Do you think hot extrusion brass would be easy to shape? Explain your answer.
- Give two properties of English brass.



4) *How does temperature affect the length of a metal rod?*

The length of a steel rod was measured very accurately. At room temperature (20°C), it was exactly 1 metre long. The steel rod was then heated and the increase in its length was measured at different temperatures. The experiment was repeated with a copper rod. Here are the results of the two experiments.

Temperature (°C)	Increase in length (mm)	
	Steel rod	Copper rod
20	0.000	0.000
22	0.024	0.036
24	0.048	0.072
26	0.072	0.108
28	0.096	0.144
30	0.120	0.180

- a) The results show that the length of each rod increases as the temperature increases. Draw one other conclusion from these results.
- b) What is the increase in length of the steel rod for each 1°C increase in temperature?



### Task 3: Questions to try - Reading for Information

- 1) The properties of materials can be improved by combining two materials to make a composite material.

The construction industry often uses reinforced concrete which is a composite material made by pouring concrete around steel rods. Reinforced concrete is much stronger than concrete on its own and is much lighter than steel beams.

Glass-fibre reinforced plastic is a composite material made by mixing together plastic resin with glass fibres. Plastic resin is lightweight and quite strong but cracks easily. Glass-fibre is strong and flexible. However, glass-fibre reinforced plastic is very strong, lightweight and does not crack when bent or hit. Glass-fibre reinforced plastic is used to make the hulls of boats and the bodies of caravans.

Another example of a composite material is carbon-fibre reinforced plastic. Mixing a plastic resin with carbon fibres gives a material that is much stronger than plastic and cheaper than carbon fibre. Fishing rods, golf clubs and tennis racquets can be made from carbon-fibre reinforced plastic.

- What is a composite material?
- What advantage does reinforced concrete have over concrete on its own?
- Give two properties of glass-fibre reinforced plastic.
- What type of fibres are added to plastic resin to make a composite material used to make fishing rods?



- 2) For many years doctors have used X-rays to investigate some medical problems. An X-ray photograph shows up dense parts of the body such as bones. However, scientists are finding new ways of investigating what is happening inside the body. These new processes allow doctors to find problems early on.

Using computers, a series of X-rays can now be made into a large three-dimensional picture of the body. This is called a CT scan. Such a scan may be used to show the exact size and position of a tumour.

Pictures of soft tissues such as liver or kidney can now be built up by magnetic resonance imaging (MRI) which uses a super-conducting electromagnet.

Positron emission tomography, or PET, monitors the flow of blood to the brain. This technique can help doctors to diagnose problems such as Alzheimer's disease.

Ultrasound scans are used by doctors to check how a baby is developing inside the mother's womb. This technique uses very high-frequency sound waves which reflect off the baby to show a picture of the developing tissues.

- a)
- i) Which technique builds up a three-dimensional X-ray picture of the body?
  - ii) How is this done?
- b) Name the disease which is diagnosed using positron emission tomography.
- c) How does ultrasound scanning work?

## Task 4: Questions to try - Problem Solving

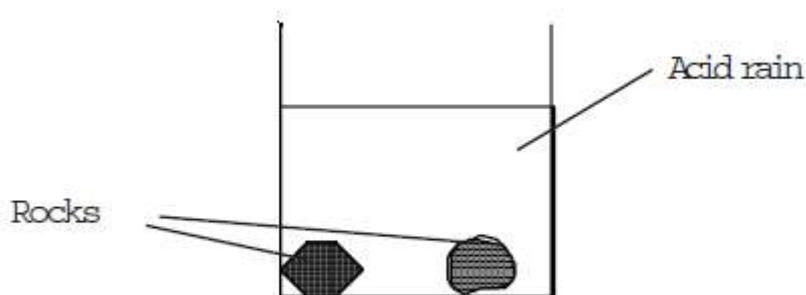
- 1) Helen and Ann were investigating the effect of acid rain on different type of rocks. The start of their report on the experiment is shown below:

Does Acid Rain wear away rocks?

We took 100ml of acid rain and put it into a beaker.  
we then took pieces of four rocks.the rocks were :

granite, marble, sandstone and chalk

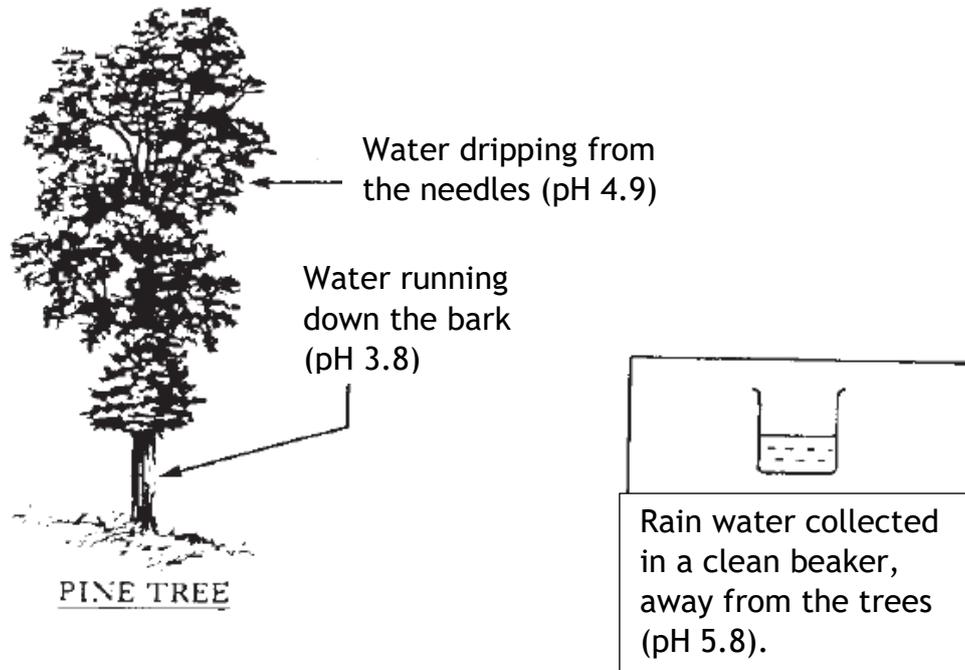
We weighed the pieces of rock and put them into the beaker with the acid rain.After a week we removed the pieces of rock, dried them, and reweighed them.



Rock	Mass at start (g)	Mass at end (g)
Granite	23.57	23.57
Marble	22.64	21.67
Sandstone	31.62	31.60
Chalk	17.83	15.25

- a) What is the change in mass for each rock?
- b) Which rock is most resistant to acid rain?

2) Maureen carried out a project on acid rain. She took samples and recorded the following pH values.



Maureen made four conclusions:

A - The rain water is acidic.

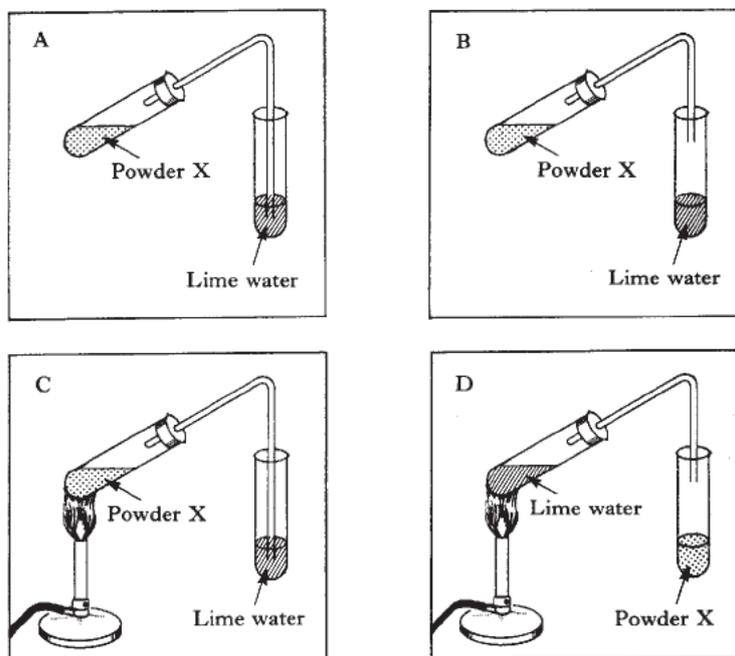
B - The water running down the bark is more acidic than the water dripping from the needles.

C - Pine bark has no effect on the acidity of rain water.

D - Pine needles increase the acidity of rain water.

State whether each conclusion is true or false.

3) Chalk gives off carbon dioxide gas when it is heated. If carbon dioxide is bubbled through lime water, the lime water will turn milky-white.



Which set of apparatus should be used to find out if a powder X could be chalk?

4) This table shows the sulphur dioxide emitted by the European Union in 1992.

Source of sulphur dioxide emitted	Sulphur dioxide emitted (millions of tonnes)
Homes	2.0
Heavy industry	6.0
Refineries	7.0
Power stations	19.0

Use the information to make a bar graph displaying this data.

**Hint:** Use the tips on bar graph drawing from Week 3 Lesson 3.



## Task 5: Correct today's starter

### Starter answers

- 1)
  - a) Magnesium + Sulphuric acid  $\rightarrow$  Magnesium sulphate + Hydrogen
  - b) Calcium + Water  $\rightarrow$  Calcium Hydroxide + Hydrogen
- 2) A wooden splint would be lit and angled towards the top of the test tube/ conical flask where the hydrogen gas was produced. If it was indeed hydrogen gas, a squeaky pop would be produced.

### Extension activity

Once completed all your Chemistry work, here is a link to look further into the Acids and Metals topic:

- Watch [this video on Reactivity Series of Metals](#) up to 1:30
  - You will see first a reaction of metals with water - write down the results of this reaction shown at 0:50. Rank the metals from most to least reactive with water.
  - Compare your results to the answers shown at 0:57
  - Use the results from the reaction with dilute Hydrochloric Acid to help determine the difference between reactivity of Mg, Zn, Cu and Fe
  - A full reactivity series of the metals selected in the video should then be written out in your jotter, label on this which metals react with water and with acid as well as the metals that do not react with either.