



## Week 4: Acids and Metals

### Lesson 1: Acid Rain

#### Complete Starter (in back of class jotter)

##### Starter

1. What type of reaction takes place between acidic soil and lime?
2. Write the word equation for the reaction between sodium hydroxide and nitric acid
3. Write the word equation for the reaction between sodium carbonate and nitric acid



##### Learning Outcomes

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

- Name the gases that cause acid rain
- Write word equations for the formation of these gases
- Describe the effects of acid rain

##### Success Criteria

You will have been successful in this lesson if you:

1. Read and learn the notes given
2. Watch the links provided
3. 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 1-7 - This involves watching selected videos, reading and highlighting your **Pupil Notes**, answering questions in your class jotter and completing a Microsoft Form. 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 Acid and Metal Carbonate Neutralisation

Watch this [video](#) of the neutralisation of Copper Carbonate and Sulphuric Acid.

## Task 2: Complete Homework 22 on Carbonates and Acids (You will self-assess this)

# Carbonates and acids 22

- 1) Copper sulphate can be made by adding a carbonate to an acid. This reaction also makes a gas and water.
  - a) Name the type of reaction which takes place.
  - b) Name the carbonate which would be used in the above reaction.
  - c) Name the acid which would be used in the above reaction.
  - d) Name the gas produced in the above reaction.
- 2) Name the **three** substances made in each of the following reactions.
  - a) calcium carbonate and sulphuric acid
  - b) sodium carbonate and hydrochloric acid
  - c) potassium carbonate and nitric acid
- 3) Write word equations for each of the following reactions.
  - a) calcium carbonate and hydrochloric acid
  - b) sodium carbonate and nitric acid
  - c) potassium carbonate and sulphuric acid
- 4) Neutralisation is very useful. Our stomachs contain acid. If we have too much acid we can suffer from acid indigestion. Indigestion tablets contain substances which can neutralise the acid and so stop the indigestion.
  - a) What type of substance do you think is present in indigestion tablets?
  - b) Suggest a likely pH for the liquid in our stomachs.
  - c) What happens to the pH of the liquid in our stomachs when we take indigestion tablets?



## Task 3: Read and highlight notes on Acid Rain (pg 45 printed notes)

These do not need to be copied into jotter but read through and then highlight key sections of pages mentioned in printed notes.

If you wish to add any detail to your printed notes, feel free.

### What causes acid rain?

Acid rain is caused by the burning of fossil fuels. Burning oil, gas and coal in power stations releases Carbon Dioxide and Sulphur Dioxide into the atmosphere. When air is sparked nitrogen and oxygen react to form nitrogen oxides e.g. lightning and ignition in car engines.

Word equations for these gases forming:

Carbon + Oxygen → Carbon Dioxide

Sulphur + Oxygen → Sulphur Dioxide

Nitrogen + Oxygen → Nitrogen Dioxide

These gases mix with water droplets in the atmosphere creating weak solutions of sulphuric acid, carbonic acid and nitric acid. These are the acids that cause acid rain.



### What is acid rain?

Acid rain is defined as rain with a pH of below 4.0 - 4.5. Normal rain has a pH of about 5.6, which is slightly acidic.

### What are the effects of acid rain?

Acid rain increases the acidity levels of rivers, lakes and seas. This can poison fish. Acid rain increases the acidity levels of soils. This can slow or even kill plant growth. Acid rain affects both building and steel works, as shown in this picture. This can especially be seen in buildings made of carbonate e.g. marble is calcium carbonate.



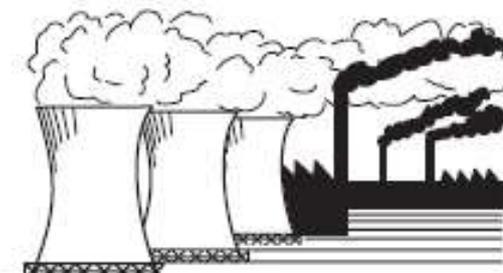
### What can be done to reduce the effects of acid rain?

Water and farmland can be treated by adding carbonates to neutralise the acidity. The only way to protect buildings, however, is to reduce the burning of fossil fuels.



**Task 4: Read the following passage and answer the questions on Acid Rain in your class jotter**

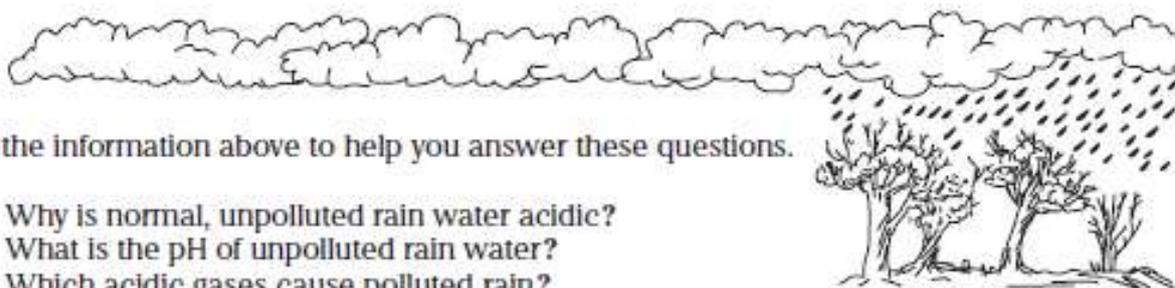
Read this information about acid rain.



As rain falls through the air it can dissolve gases. The carbon dioxide which we breathe out is dissolved by the rain. Carbon dioxide is acidic. This means that normal rain has a pH of 5 or 6. Animals and plants are used to this weakly-acidic rain. However, there are other acids in the atmosphere. These make the rain water much more acidic and more harmful. The pH can fall to 4 or even lower.

These other acids are oxides of sulphur and oxides of nitrogen. Sulphur dioxide is made when some fuels, containing sulphur, burn in air. It can be made at power stations. Nitrogen dioxide comes from the exhaust fumes of cars.

This acid rain is a serious problem. It can attack building materials, such as metals and limestone. It can be washed into rivers and lakes. This can lower the pH so much that all the plants and fish die. The acid rain can also destroy trees. Acid rain can be blown to other countries too, by the wind. Forests in Norway and Sweden are being affected by acid rain. This may be from the pollution in Britain.



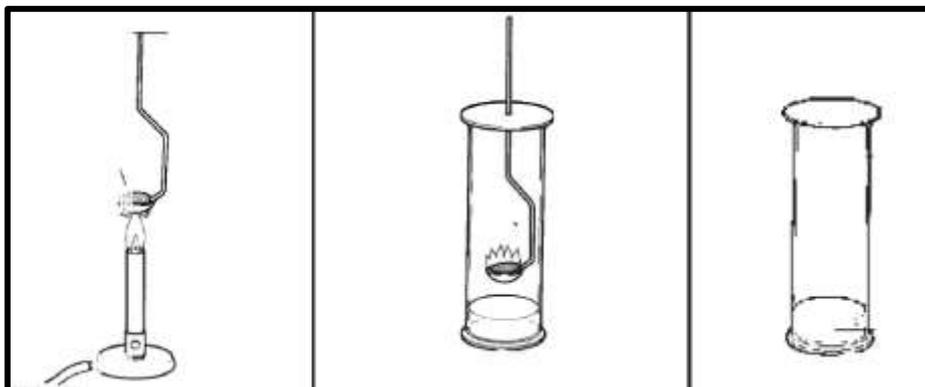
Use the information above to help you answer these questions.

- 1 Why is normal, unpolluted rain water acidic?
- 2 What is the pH of unpolluted rain water?
- 3 Which acidic gases cause polluted rain?
- 4 How does sulphur dioxide get into the air?
- 5 How do cars contribute to acid rain problems?
- 6 What does acid rain do to stonework?
- 7 Gutters and drainpipes used to be made from iron. Nowadays they are usually made from plastic. Use the information above to suggest one reason why iron is no longer used.
- 8 How are fish being killed by acid rain?
- 9 How could the acid rain problem in Britain affect people in Norway?
- 10 Suggest a way of preventing acid rain.

## Task 5: Questions to try

### Self Check 9

- 1) Frank used the apparatus below to burn samples of the elements sulphur and carbon.

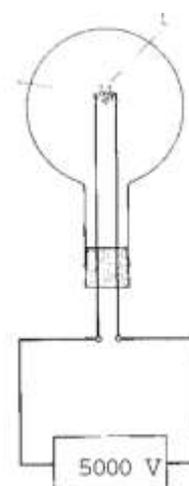


Step one: set the element alight in a burning spoon

Step two: put the burning element into a jar with water & universal indicator

Step three: remove the burning spoon, cover the jar and shake.

- What was the original colour of the universal indicator?
  - Which chemical was made when the sulphur was burned?
  - What was made when the carbon was burned?
  - In both experiments the same colour change occurred in the universal indicator.
    - What colour did the universal indicator turn?
    - What did this tell us about the substances which were made?
  - Give a word equation for the reaction between carbon and oxygen.
  - Give a word equation for the reaction between sulphur and oxygen.
- 2) When air is sparked using the apparatus on the right, the nitrogen in the air reacts with oxygen.
- The pH of this new substance can be tested for by adding some universal indicator to the flask and shaking.
- What new substance is made when the nitrogen and oxygen react together?
  - What pH would you expect this new substance to have?
  - Give a word equation for the reaction which occurs above.





**Self Check Answers will be published on S2 Chemistry Team on Wednesday 10<sup>th</sup> February along with a video explaining Homework 22 solutions.**

**Task 6: Complete the following Microsoft Form on Reactions of Acids and Acid Rain**

[Follow this link](#) to the Microsoft Form.

After submitting you will immediately receive feedback and a score.

**Task 7: Correct today's starter**

Starter answers

1. A neutralisation reaction
2. Sodium hydroxide + nitric acid  $\rightarrow$  Sodium nitrate + water
3. Sodium carbonate + nitric acid  $\rightarrow$  Sodium nitrate + carbon dioxide + water

## Extension activities

Once completed all your Chemistry work, here are some links to look further into the Acids and Metals topic:

- Watch [this video](#) on Acid Rain
  - Take note of the two types of acid deposition that can occur via acid rain.
  - Take note of the three reactions shown at 3m in the video explaining the formation of the three acids involved in acid rain formation
  - Take note of the two effects of acid rain
- Go to [BBC Bitesize - Acids and Bases Revision guide](#)
  - Read through the revision guide pages 5-7 and then attempt the 10-question test linked [here](#).