

1.4 Human effect on the atmosphere and tests for gases

Global warming:

The balance between combustion, respiration and photosynthesis has been affected by human's behaviour. An increase in deforestation and a rise in the combustion of fossil fuels have resulted in increased levels of the gas carbon dioxide.

The carbon dioxide gas traps heat energy and therefore an increase in the level of carbon dioxide results in an increase in the average global temperature. This effect is called global warming.

One of the effects of global warming is that ice caps melt faster and as a consequence, sea level rises. Global warming is also changing the climate, e.g. warmer summers in some parts of the world (leading to droughts) and increased rainfall in other parts (flooding).

Personally, we can reduce the impact of global warming by using renewable sources to get energy, reduce the amount of energy consumed in our home, use public transport whenever possible etc. But industry can do a process called carbon capture. The process catches the carbon dioxide that is formed by industry, it's then removed by pipes and then stored securely in geological sites like old coal mines.

Separating gases:

It's possible to separate gases by using fractional distillation as they have different boiling points. The process is similar to separating crude oil into fractions.

Tests to identify gases:

Name of gas	Test to identify	Result of test
oxygen	Place in the presence of a glowing splint.	Relights the glowing splint.
hydrogen	Place in the presence of a lit splint.	Hear a squeaky 'pop'.
carbon dioxide	Bubble the gas through limewater.	Limewater turns milky.

Acid rain:

Fossil fuels contain many impurities, including many sulfur containing compounds. In the combustion of fossil fuels, the sulfur impurities produce sulfur dioxide. Sulfur dioxide forms a solution of sulfuric acid when it comes into contact with water in the atmosphere and this falls as acid rain. ['Clean' rain contains weak levels of acid (pH of about 5.5) and acid rain has a pH of about 2 to 4].

Some of the effects of acid rain include lowering the pH of lakes etc., damaging aquatic life (kills fish) and damaging forests and vegetation. Acid rain damages buildings (especially those made of limestone) and it increases the rate of corrosion of metal structures such as bridges and sculptures.

Personally, we can reduce the effects of acid rain in the same way as global warming by using renewable sources for energy. In addition we can use weak alkalis to neutralise soil and lakes that have been affected by acid rain. But industrially, the process that can reduce the effects of acid rain is sulfur scrubbing. Sulfur scrubbing is the process by which slaked lime (calcium hydroxide) is sprayed onto the waste gases to neutralise them before they leave the chimneys.

Possible 6QER questions:

1. The burning of fossil fuels, such as coal, oil and natural gas, is the main cause of global warming. Describe how burning fossil fuels causes global warming and how global warming affects the environment.
2. Fossil fuels, such as coal, release sulfur dioxide into the atmosphere when burned. This causes acid rain. Describe how acid rain is formed and its effects on the environment.
3. You have been given three gases, **A**, **B** and **C**. The gases are carbon dioxide, hydrogen and oxygen, but not necessarily in that order. Describe the tests for carbon dioxide, hydrogen and oxygen and plan a method to identify gases **A**, **B** and **C** without using all three tests.