

CIE Chemistry IGCSE

Topic 11 - Air and Water

Flashcards



Describe the chemical test for water
using cobalt (II) chloride



Describe the chemical test for water using cobalt(II) chloride

Blue anhydrous cobalt (II) chloride turns pink in the presence of water.



Describe the chemical test for water
using copper (II) sulfate



Describe the chemical test for water using copper(II) sulfate

White anhydrous copper (II) sulfate turns blue in the presence of water.



What are the implications of inadequate
water supplies?
(extended only)



What are the implications of inadequate water supplies? (extended only)

- Humans need safe drinking water that contains low levels of dissolved salts and microbes. Inadequate water supplies would be unsafe to drink.
- Water is also required for irrigating crops and helping plants develop. Inadequate water supplies will affect the crop yield.



What does potable mean?



What does potable mean?

Safe to drink



What 2 main stages are required to make drinking water potable?



What two main stages are required to make water potable?

1. Filtration: Removes insoluble particles by passing the water through layers of sand and filters.
2. Chlorination: Kills bacteria and microorganisms which are too small to be removed by filtration.



How is water used in the home?



How is water used in the home?

- Drinking
- Cooking
- Plumbing
- Heating
- Dishwasher



How is water used in industry?



How is water used in industry?

- Solvent
- Coolant
- Washing / cleaning



What is the percentage composition of gases in the atmosphere?



What is the percentage composition of gases in the atmosphere?

78% Nitrogen

21% Oxygen

0.93% Argon

0.04% Carbon dioxide



Describe how oxygen and nitrogen can
be separated from liquid air
(extended only)



Describe how oxygen and nitrogen can be separated from liquid air (**extended only**)

Fractional distillation:

1. Air is liquified at -200°C and placed in the fractionating column.
2. The temperature of the fractional distillation column is slowly increased until nitrogen boils and rises to the top of the column, where the gas is collected and removed.
3. The temperature is further increased until oxygen evaporates and is collected from the top of the fractionating column.



Name the common pollutants in air



Name the common pollutants in air

- Carbon monoxide
- Sulfur dioxide
- Oxides of nitrogen
- Lead compounds



What are the sources of pollutant gases
in the air?



What are the sources of pollutant gases in the air?

- Carbon monoxide: incomplete combustion of carbon containing compounds.
- Sulfur dioxide: combustion of fossil fuels which contain sulfur.
- Oxides of nitrogen: car engines.
- Lead compounds: leaded petrol.



What conditions in car engines lead to the production of oxides of nitrogen?
(extended only)



What conditions in car engines lead to the production of oxides of nitrogen? (extended only)

High temperature and pressure



What is a catalytic converter? Explain
how it works
(extended only)



What is a catalytic converter? Explain how it works
(extended only)

Catalytic converters are fitted in cars to remove oxides of nitrogen.

They catalyse the reaction between carbon monoxide and nitrogen monoxide, forming nitrogen and carbon dioxide.

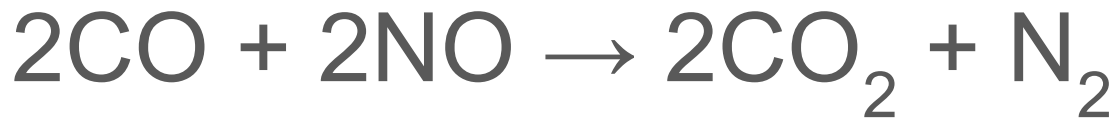


Write the word and symbol equation for
the reaction that takes place in a
catalytic converter
(extended only)



Write the word and symbol equation for the reaction that takes place in a catalytic converter
(extended only)

carbon monoxide + nitrogen monoxide → carbon dioxide + nitrogen



What are the problems associated with carbon monoxide?



What are the problems associated with carbon monoxide?

Carbon monoxide is a toxic gas.

It is colourless and odourless and if breathed in can cause death by preventing the red blood cells from carrying oxygen around the body.



What are the problems associated with sulfur dioxide?



What are the problems associated with sulfur dioxide?

Sulfur dioxide combines with water vapour in the clouds to form acid rain. Acid rain causes the following problems:

- Corrodes limestone buildings and statues.
- Lowers the pH of large bodies of water, killing the wildlife.
- Damages and kills vegetation.



What problems are associated with
oxides of nitrogen?



What problems are associated with oxides of nitrogen?

- Produces acid rain with similar effects as SO_2 .
- Reacts with other pollutants to form a smog which causes respiratory problems.



What problems are associated with lead compounds?



What problems are associated with lead compounds?

Lead is toxic so causes health issues if ingested.



Why is pollution a global concern?



Why is pollution a global concern?

Fossil fuels are used globally and so these pollutants are largely found all over the world. Pollution enters the atmosphere where it affects all countries, not just those that use fossil fuels heavily.



What is rusting?



What is rusting?

Rusting is the name specifically given to the corrosion of iron when it reacts to oxygen and water in the air.



What two substances need to be excluded to prevent rusting?



What two substances need to be excluded to prevent rusting?

Oxygen (O_2)

Water (H_2O)



How can oxygen and water be excluded to prevent iron rusting?



How can oxygen and water be excluded to prevent iron rusting?

- Paint the metal
- Coat the metal in oil / grease
- Cover the metal in plastic
- Keep the metal in a vacuum container



What is sacrificial protection? How does
it prevent corrosion?
(extended only)



What is sacrificial protection? How does it prevent corrosion? (**extended only**)

Sacrificial protection involves coating the metal being protected with a more reactive metal.

The outer metal will corrode first and will prevent the corrosion of the inner metal.



Link the reactivity series to the metals
used in sacrificial protection
(extended only)



Link the reactivity series to the metals used in sacrificial protection (**extended only**)

The metal used for protection must be higher up the reactivity series than the other metal so that it is more reactive. This means it will corrode first.



What is galvanisation?

(extended only)



What is galvanisation? (extended only)

The sacrificial protection of iron using zinc



Compounds of which three elements are commonly found in fertilisers? Why?



Compounds of which three elements are commonly found in fertilisers? Why?

Nitrogen, phosphorus and potassium.

Fertilisers contain compounds of these elements because it improves agricultural production. These compounds are absorbed by the plants roots to help growth and development.



How can ammonia be produced from an ammonium salt by a displacement reaction?



How can ammonia be produced from an ammonium salt by a displacement reaction?

When an ammonium salt is reacted with a strong base, ammonia is produced along with water and a different salt.



Write the chemical equation for the reaction that takes place between ammonium chloride and sodium hydroxide



Write the chemical equation for the reaction that takes place between ammonium chloride and sodium hydroxide



What is the Haber process? (extended only)



What is the Haber process? (extended only)

An industrial process used to produce ammonia (for fertilisers).



What conditions are used for the Haber
process?
(extended only)



What conditions are used for the Haber process?
(extended only)

- 450°C temperature
- 200 atm pressure
- Iron catalyst



Describe the steps in the Haber process
(extended only)



Describe the steps in the Haber process (extended only)

1. Obtain hydrogen and nitrogen from natural gas (or steam) and air.
2. Compress the gases to 200 atm and heat them to 450°C.
3. Pump the gases into a tank containing layers of catalytic iron beads.
Nitrogen and hydrogen react to form ammonia.
4. Ammonia and any unreacted hydrogen and nitrogen pass into a cooling tank. Ammonia is collected as a liquid.
5. The unreacted hydrogen and nitrogen are recycled back into the tank.

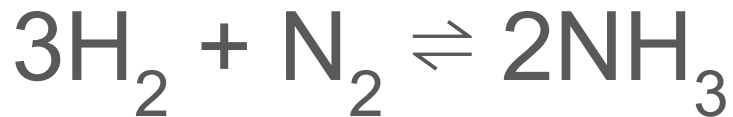


Write the chemical equation for the reaction that takes place in the Haber process
(extended only)



Write the chemical equation for the reaction that takes place in the Haber process?

(extended only)



What are greenhouse gases? Give two common examples



What are greenhouse gases? Give two common examples

Greenhouse gases are responsible for maintaining the Earth's temperature so that life can survive.

Common examples include:

Carbon dioxide, methane and water vapour.



How do greenhouse gases contribute to climate change?



How do greenhouse gases contribute to climate change?

The greenhouse gases cause the greenhouse effect which contributes to climate change:

- Electromagnetic radiation from the sun passes through the atmosphere. Some radiation is absorbed by Earth so temperature increases.
- Heat is radiated from the Earth as infrared radiation which is absorbed by greenhouse gases in the atmosphere.
- This causes the atmosphere to warm up even further, contributing to global warming.



What are the global effects of climate change?



What are the global effects of climate change?

- Rising sea levels.
- Crops unable to grow.
- Extinction of species.
- More extreme weather.
- Higher risks of skin cancer due to increased exposure to harmful UV rays.



What are the different ways that carbon dioxide can be produced?



What are the different ways that carbon dioxide can be produced?

- Complete combustion of carbon containing compounds.
- Thermal decomposition of a carbonate.
- Reaction between an acid and a carbonate.
- Product of respiration.



Describe the carbon cycle (extended only)



Describe the carbon cycle (extended only)

1. CO_2 is produced during respiration and combustion.
2. CO_2 is absorbed during photosynthesis to make carbohydrates in plants.
3. Animals eat the plants containing carbohydrates so carbon is released as carbon dioxide when the animals respire.
4. When animals and plants die, decomposers feed on the dead organisms and release the carbon from the organisms during respiration.



What are the sources of methane gas?



What are the sources of methane gas?

- Combustion of fossil fuels.
- Decomposition of vegetation.
- Waste gas from digestion in livestock.

