

10 Chemistry of the environment

10.1 Water

1 Describe chemical tests for the presence of water using anhydrous cobalt(II) chloride and anhydrous copper(II) sulfate

- When water is added to anhydrous cobalt(II) chloride(blue) it becomes hydrated and turns pink.
- When water is added to anhydrous copper(II) sulfate (white) it becomes hydrated and turns blue.

2 Describe how to test for the purity of water using melting point and boiling point

- The melting point of water is 0 degrees Celsius. If the water is impure(contains impurities), the melting point will be LOWER than 0 degrees Celsius.
- The boiling point of water is 100 degrees Celsius. If the water is impure, the boiling point will be HIGHER than 100 degrees Celsius.

3 Explain that distilled water is used in practical chemistry rather than tap water because it contains fewer chemical impurities

- Impurities are contaminants that could interfere with the final result of an experiment.

4 State that water from natural sources may contain substances, including:

(a) dissolved oxygen

(b) metal compounds

(c) plastics

(d) sewage

(e) harmful microbes

(f) nitrates from fertilisers

(g) phosphates from fertilisers and detergents

5 State that some of these substances are beneficial, including:

(a) dissolved oxygen for aquatic life

(b) some metal compounds provide essential minerals for life

6 State that some of these substances are potentially harmful, including:

(a) some metal compounds are toxic

(b) some plastics harm aquatic life

(c) sewage contains harmful microbes which cause disease

(d) nitrates and phosphates lead to deoxygenation of water and damage to aquatic life

Details of the eutrophication process are not required

7 Describe the treatment of the domestic water supply in terms of:

(a) sedimentation and filtration to remove solids

(b) use of carbon to remove tastes and odours

(c) chlorination to kill microbes

- The impure sample of water is left for some time until all the solid impurities settle at the bottom (sedimentation).
- The water is then filtered to remove these solid impurities.(filtration)
- Carbon is then added to remove awful odours and tastes
- Chlorine/chlorine compounds are added to the water to kill microbes (chlorination). this water is pumped into reservoirs for human consumption.

10.2 Fertilisers

1 State that ammonium salts and nitrates are used as fertilisers

2 Describe the use of NPK fertilisers to provide the elements nitrogen, phosphorus and potassium for improved plant growth

- Nitrogen and phosphorus is needed for protein synthesis. Potassium is needed for regulating water loss/gain by plant.

10.3 Air quality and climate

1 State the composition of clean, dry air as approximately 78% nitrogen, N_2 , 21% oxygen, O_2 and the remainder as a mixture of noble gases and carbon dioxide, CO_2

2 State the source of each of these air pollutants, limited to:

(a) carbon dioxide from the complete combustion of carbon-containing fuels

(b) carbon monoxide and particulates from the incomplete combustion of carbon-containing fuels

(c) methane from the decomposition of vegetation and waste gases from digestion in animals

(d) oxides of nitrogen from car engines

(e) sulfur dioxide from the combustion of fossil fuels which contain sulfur compounds

3 State the adverse effect of these air pollutants, limited to:

(a) carbon dioxide: higher levels of carbon dioxide leading to increased global warming, which leads to climate change

(b) carbon monoxide: toxic gas

(c) particulates: increased risk of respiratory problems and cancer

(d) methane: higher levels of methane leading to increased global warming, which leads to climate change

(e) oxides of nitrogen: acid rain, photochemical smog and respiratory problems

(f) sulfur dioxide: acid rain

7 Describe how the greenhouse gases carbon dioxide and methane cause global warming, limited to:

(a) the absorption, reflection and emission of thermal energy

(b) reducing thermal energy loss to space

- Greenhouse gases absorb some thermal energy emitted from the sun. The remaining heat energy is reflected into space.
- An increase in greenhouse gases leads to more thermal energy getting absorbed and less getting reflected into space. This increases the Earth's temperature to increase, leading to global warming.

END OF CHAPTER