The atmosphere and pollution

AQA GCSE Chemistry (8462) · Foundation and Higher

Show your working where needed. Check the worked answers when you finish.

Name _____ Date _____

1. Read the present atmosphere

Name the two most abundant gases in dry air and give their approximate percentages.

2. An early atmosphere model

A model of early Earth links the first oceans with a fall in atmospheric carbon dioxide. Explain how the oceans formed and how they could remove some carbon dioxide from the air.

3. Later changes to atmospheric gases

Much later in an early Earth model, primitive organisms spread through the oceans. The amount of atmospheric oxygen began to rise as carbon dioxide fell. Name a biological process that explains both changes and explain the link.

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4. The greenhouse effect

Explain how an increase in methane can result in a warmer surface, even when the amount of sunlight arriving at Earth stays the same.

5. Pollutants with different sources

Give one source of sulfur dioxide when fuels burn. Explain why petrol or diesel engines may also emit nitrogen oxides.

6. A carbon monoxide hazard

An appliance burns a hydrocarbon with a limited supply of oxygen. Name one poisonous gas that can form. Explain why a person in the room may fail to notice it and why exposure is dangerous.

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7. Interpreting a short record

In one region, the CO_2 reading rises from 370 to 406 parts per million over a study period. The average temperature there also rises. Calculate the CO_2 increase. State what evidence would make the conclusion that warming is worldwide stronger.

8. Comparing school transport plans

Two plans carry the same number of pupils over the same weekly journeys. Plan A is estimated to emit 92 kg CO_2 equivalent and B 65 kg. Calculate the saving from using B. Explain one assumption you would check before relying on it.

9. Extra challenge · Check a carbon-footprint claim

Two coaches each make the same journey. A produces 54 kg CO_2 equivalent and carries 18 passengers. B produces 72 kg and carries 36.

Calculate the footprint per passenger in each. Explain whether converting every trip from A to B must reduce passenger footprints. Name one overlooked emission that could affect the comparison.

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Worked answers

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1. Read the present atmosphere

Nitrogen is about 78% and oxygen about 21%. Approximately 80% and 20% are suitable GCSE estimates.

2. An early atmosphere model

As Earth cooled, water vapour condensed to form oceans. Some atmospheric carbon dioxide dissolved into that water, reducing the amount in the air.

3. Later changes to atmospheric gases

Photosynthesis uses carbon dioxide and releases oxygen. The spread of photosynthesising organisms increased the rate at which this process removed carbon dioxide and added oxygen.

4. The greenhouse effect

Methane absorbs some infrared emitted by Earth’s surface and emits radiation in all directions. More methane can reduce energy loss to space at the original temperature. More energy then arrives than leaves, so the surface warms.

5. Pollutants with different sources

Sulfur impurities in some fuels burn to form sulfur dioxide. In an engine, high temperatures allow nitrogen and oxygen from air to react, forming nitrogen oxides.

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Worked answers

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6. A carbon monoxide hazard

Incomplete combustion can form carbon monoxide. It has no colour or smell. It reduces the amount of oxygen the blood can carry, so vital organs may receive too little oxygen.

7. Interpreting a short record

The increase is 406 − 370 = 36 parts per million. Comparable records from many regions, including a range of land and ocean locations, across a longer period could show if the temperature trend is widespread.

8. Comparing school transport plans

The estimated weekly saving is 92 − 65 = 27 kg CO_2 equivalent. Check an input that could change the estimate, such as actual distance, the number of vehicles needed, fuel consumption or emissions from generating the electricity for an electric vehicle.

9. Extra challenge · Check a carbon-footprint claim

For A, 54 ÷ 18 = 3.0 kg CO_2 equivalent per passenger. For B, 72 ÷ 36 = 2.0 kg. B is lower for the stated loads.

The result depends on the passenger numbers. B carrying only 18 would give 4.0 kg per passenger. Including emissions from fuel production or the manufacture of the coaches could change the comparison.

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