



C9F Chemistry of the Atmosphere: Foundation Tier Practice

AQA 8462 · Calculator allowed · about 75 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** State the name of the gas that makes up about 78 percent of Earth's atmosphere.

(Total for Question 1 is 1 mark)

- 2** Name the gas that plants remove from the atmosphere during photosynthesis.

(Total for Question 2 is 1 mark)

- 3** State one human activity that increases the amount of carbon dioxide in the atmosphere.

(Total for Question 3 is 2 marks)

- 4** Which greenhouse gas is produced by growing rice in flooded fields and from cattle digestion?

(Total for Question 4 is 2 marks)

- 5** Air contains gases plus tiny particles called aerosols. Give one example of an aerosol released by human activity.

(Total for Question 5 is 2 marks)

- 6** Complete the sentence. Sulfur dioxide is released when fuels that contain sulfur are burned. Sulfur dioxide dissolves in rain to form an acid. Name this acid.

(Total for Question 6 is 2 marks)

- 7** The early atmosphere on Earth had more carbon dioxide and little oxygen. Name one process that decreased atmospheric carbon dioxide over geological time.

(Total for Question 7 is 2 marks)

- 8** A student measured the concentration of carbon dioxide in outside air at different times of day. Their results were: 08:00 - 420 ppm, 12:00 - 390 ppm, 18:00 - 430 ppm.

State one reason why the CO₂ concentration was lower at 12:00 than at 08:00 and 18:00.

(Total for Question 8 is 3 marks)

- 9** When fossil fuels are burned, nitrogen oxides (NO_x) and carbon monoxide (CO) can be produced. State one harmful effect of each of these gases on human health or the environment.

(Total for Question 9 is 2 marks)

- 10** Small particles from vehicle exhausts can cause breathing problems. Give one realistic way a town could reduce the amount of these particles in its air.

(Total for Question 10 is 2 marks)

- 11** The greenhouse effect keeps Earth warm. State whether greenhouse gases absorb infrared radiation, reflect it, or allow it to pass through.

(Total for Question 11 is 1 mark)

- 12** A factory reports that its carbon dioxide emissions are 2.4 tonnes per week. How many kilograms of carbon dioxide is this per week? (1 tonne = 1000 kg)

Show your working.

(Total for Question 12 is 2 marks)

- 13** A car emits 120 g of CO₂ per kilometre. Calculate the mass of CO₂ emitted on a 50 km trip. Give your answer in kilograms.

Show your working.

(Total for Question 13 is 3 marks)

- 14** Explain why reducing deforestation can help to lower atmospheric carbon dioxide concentrations.

(Total for Question 14 is 2 marks)

- 15** Sulfur compounds in fuel can lead to acid rain. Suggest one change to how fuels are used or processed that would reduce sulfur dioxide emissions from power stations.

(Total for Question 15 is 3 marks)

16 Extended response (6 marks).

Explain how human activities have changed the composition of the atmosphere since the start of the industrial revolution, and describe two effects these changes have on the environment or human health. You should give reasons and link causes to effects.

(Total for Question 16 is 6 marks)

Mark scheme · C9F Chemistry of the Atmosphere: Foundation Tier Practice

Question 1

- **B1** nitrogen gas
- **Answer: Nitrogen.**

Question 2

- **B1** carbon dioxide or CO₂ gas
- **Answer: Carbon dioxide (CO₂).**

Question 3

- **B1** burning fossil fuels (for energy, transport, heating) or
- **B1** deforestation or cutting down trees or
- **Answer: Burning fossil fuels; cutting down trees.**

Question 4

- **B1** methane or CH₄ gas
- **B1** mention of sources: rice paddies and cattle as sources, or
- **Answer: Methane (CH₄).**

Question 5

- **B1** soot from burning coal, diesel exhaust particles, smoke, or aerosols from spray cans, or
- **B1** a brief description linking it to human activity, or
- **Answer: Soot or smoke from burning fossil fuels; diesel exhaust particles; or spray can aerosols.**

Question 6

- **B1** sulfuric acid or H₂SO₄ gas
- **B1** or mention of acid rain as causing damage to buildings and plants, or
- **Answer: Sulfuric acid (H₂SO₄).**

Question 7

- **B1** photosynthesis by plants and algae removing CO₂ or
- **B1** formation of sedimentary rocks or carbonate rocks locking up CO₂ (eg formation of limestone) or
- **Answer: Photosynthesis by plants and algae; formation of carbonate rocks like limestone.**

Question 8

- **M1** identifies increased photosynthesis around midday as a reason, or
- **A1** links daytime higher light intensity to more CO₂ uptake by plants, reducing atmospheric CO₂ at 12:00, or
- **B1** alternatively mentions that traffic emissions are lower at midday than at rush hour (and so fewer emissions), or
- **Answer: More photosynthesis at midday (more light) so plants remove more CO₂; also midday traffic emissions can be lower than rush hour.**

Question 9

- **B1** NO_x causes respiratory problems or contributes to acid rain or creates smog/photochemical ozone, or
- **B1** CO reduces the oxygen-carrying capacity of blood and can cause illness or death, or
- **Answer: NO_x can cause respiratory problems, acid rain or smog formation; CO reduces blood oxygen carrying capacity and can cause illness or death.**

Question 10

- **B1** encourage public transport, cycling and walking to reduce car use, or
- **B1** implement low emission zones, restrict diesel vehicles, or promote electric vehicles, or
- **Answer: Encourage public transport, cycling and walking; introduce low emission zones or restrict diesel vehicles.**

Question 11

- **B1** absorb infrared radiation cao
- **Answer: They absorb infrared radiation.**

Question 12

- **M1** converts 2.4×1000 or shows correct method to change tonnes to kg
- **A1** 2400 kg cao
- **Answer: 2400 kg per week.**

Question 13

- **M1** calculates total grams: $120 \times 50 = 6000$ g
- **M1** converts grams to kilograms: $6000 \text{ g} = 6.0 \text{ kg}$
- **A1** 6.0 kg cao
- **Answer: 6.0 kg**

Question 14

- **M1** states that trees remove CO₂ by photosynthesis (they take in CO₂)
- **A1** explains that keeping or planting trees increases CO₂ uptake and so reduces the amount in the atmosphere, oe
- **Answer: Trees remove CO₂ by photosynthesis; reducing deforestation keeps more trees to take in CO₂, lowering atmospheric CO₂.**

Question 15

- **M1** suggests using low-sulfur fuels or switching to natural gas or renewables
- **M1** suggests using flue gas desulfurisation (removal technology) or scrubbers
- **A1** links the suggested change to a reduction in SO₂ emissions, oe
- **Answer: Use low-sulfur fuels or switch to gas/renewables; use flue gas desulfurisation (scrubbers) to remove SO₂ from emissions.**

Question 16

- **Level 3** (5-6): Detailed explanation. Links multiple human activities to specific changes in atmospheric composition and gives two developed effects with clear cause-effect links and relevant examples.
- **Level 2** (3-4): Some explanation. Mentions at least one human activity and one change in atmospheric composition plus one effect with some linking comment.
- **Level 1** (1-2): Simple statements. Limited link between activities and atmospheric change or only lists effects without explanation.
- **Indicative content:**
 - Human activities such as burning fossil fuels for energy, transport and industry have increased CO₂ concentrations.
 - Agriculture and waste produce methane from livestock and decomposition.
 - Burning fuels and industry release nitrogen oxides and sulfur dioxide.
 - These changes increase greenhouse gases, enhancing the greenhouse effect and causing global warming and climate change - give example such as sea level rise or changing weather patterns.
 - Air pollutants like NO_x, SO₂ and particulates cause respiratory illnesses and contribute to acid rain damaging buildings, rivers and soils.
 - Link causes to effects: more fossil fuel burning -> more CO₂ -> more trapped infrared radiation -> higher global temperatures; more SO₂ -> acid rain -> damaged ecosystems and buildings.