2.10 Chemistry of the Atmosphere: 30-minute Pack

AQA 8462 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 State two human activities that increase the amount of carbon dioxide in the atmosphere.

(Total for Question 1 is 2 marks)

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2 The early atmosphere on Earth had more carbon dioxide and little oxygen. Name two processes that decreased atmospheric carbon dioxide over geological time.

(Total for Question 2 is 2 marks)

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3 Over hundreds of millions of years, much of the carbon dioxide in the early atmosphere was removed and locked away.

(a) Explain how the formation of the oceans helped to reduce the amount of carbon dioxide in the early atmosphere. **(3)**

(b) Describe how carbon dissolved in the oceans became locked away in sedimentary rocks and fossil fuels over millions of years. **(3)**

(Total for Question 3 is 6 marks)

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4 A car emits 120 g of CO_2 per kilometre. Calculate the mass of CO_2 emitted on a 50 km trip. Give your answer in kilograms.

Show your working.

(Total for Question 4 is 3 marks)

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5 Explain why reducing deforestation can help to lower atmospheric carbon dioxide concentrations.

(Total for Question 5 is 2 marks)

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6 Sulfur compounds in fuel can lead to acid rain. Suggest two changes to how fuels are used or processed that would reduce sulfur dioxide emissions from power stations, and explain how one of them works.

(Total for Question 6 is 3 marks)

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7 For roughly the first billion years of Earth's history, the atmosphere was very different from today's.

(a) Describe the composition of the Earth's atmosphere during its first billion years. **(2)**

(b) Give two reasons why scientists cannot be completely certain about the exact composition of the Earth's early atmosphere. **(2)**

(Total for Question 7 is 4 marks)

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8 Incomplete combustion of fossil fuels can produce carbon monoxide. Give one reason why carbon monoxide is hazardous to humans.

(Total for Question 8 is 1 mark)

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Mark scheme · 2.10 Chemistry of the Atmosphere: 30-minute Pack

Question 1

burning fossil fuels (for energy, transport, heating) oe **B1**

deforestation or cutting down trees oe **B1**

Answer: Burning fossil fuels; cutting down trees.

Question 2

photosynthesis by plants and algae removing CO_2 oe **B1**

formation of sedimentary rocks or carbonate rocks locking up CO_2 (eg formation of limestone) oe **B1**

Answer: Photosynthesis by plants and algae; formation of carbonate rocks like limestone.

Question 3

(a) water vapour in the atmosphere cooled and condensed to form the oceans (oe) **B1**

(a) carbon dioxide gas dissolved into the ocean water (oe) **B1**

(a) this reduced the concentration/proportion of carbon dioxide in the atmosphere **B1**

(a) Answer: Water vapour condensed to form the oceans, and carbon dioxide from the atmosphere dissolved into the ocean water, reducing the amount of carbon dioxide in the atmosphere.

(b) marine organisms used dissolved carbon dioxide (and calcium) to form carbonate shells and skeletons (oe) **B1**

(b) when these organisms died, their remains/shells sank and accumulated on the sea floor **B1**

(b) over millions of years, these deposits were compressed to form sedimentary rock such as limestone, or, where oxygen was absent, were transformed into fossil fuels (oe) **B1**

(b) Answer: Sea organisms used dissolved carbon dioxide to build carbonate shells and skeletons; when they died, these sank and built up on the seabed, and over millions of years were compressed into sedimentary rock (e.g. limestone) or, without oxygen, into fossil fuels.

Question 4

calculates total grams: 120 x 50 = 6000 g **M1**

converts grams to kilograms: 6000 g = 6.0 kg **M1**

6.0 kg cao **A1**

Answer: 6.0 kg

Question 5

states that trees remove CO_2 by photosynthesis (they take in CO_2) **M1**

explains that keeping or planting trees increases CO_2 uptake and so reduces the amount in the atmosphere, oe **A1**

Answer: Trees remove CO_2 by photosynthesis; reducing deforestation keeps more trees to take in CO_2, lowering atmospheric CO_2.

Question 6

suggests using low-sulfur fuels or switching to natural gas or renewables **M1**

suggests using flue gas desulfurisation (removal technology) or scrubbers **M1**

links the suggested change to a reduction in SO_2 emissions, oe **A1**

Answer: Use low-sulfur fuels or switch to gas/renewables; use flue gas desulfurisation (scrubbers) to remove SO_2 from emissions.

Question 7

(a) mostly carbon dioxide (oe) **B1**

(a) little or no oxygen present, with some water vapour and nitrogen (oe, any one of these gases named) **B1**

(a) Answer: The early atmosphere was mostly carbon dioxide, with little or no oxygen, and some water vapour and nitrogen.

(b) the events happened billions of years ago, so there were no direct measurements or observers at the time (oe) **B1**

(b) evidence has to be worked out indirectly, e.g. from volcanic gases or from rock/mineral evidence, which is limited and open to interpretation (oe) **B1**

(b) Answer: Any two from: the atmosphere existed so long ago that no direct measurements exist; evidence must be inferred indirectly (e.g. from volcanic gases or ancient rocks), which is incomplete and open to interpretation.

Question 8

it binds to haemoglobin, reducing oxygen transport in blood **B1**

Answer: It binds to haemoglobin, reducing oxygen transport in the blood.

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