

THE ATMOSPHERE 4

Q1. This question is about substances that burn in air and the gases they produce.

Match substances, A, B, C and D, with the numbers 1– 4 in the table.

A Carbon monoxide (CO)

B Hydrogen (H₂)

C Methane (CH₄)

D Hydrogen sulfide (H₂S)

	Gases produced when the substance burns in air
1	carbon dioxide (CO ₂) and water vapour (H ₂ O)
2	water vapour (H ₂ O) only
3	water vapour (H ₂ O) and sulfur dioxide (SO ₂)
4	carbon dioxide (CO ₂) only

(4 marks)

Q2. During December 1952, many people died in London due to smog. Smog is a mixture of smoke and sulfur dioxide.

(a) Sulfur dioxide is responsible for . . .

- 1 global dimming.
- 2 global warming.
- 3 the greenhouse effect.
- 4 acid rain.

(1 mark)

The table shows the amount of sulfur dioxide in the air in three places in London in December 1952.

Amount of sulfur dioxide in parts per million								
Location within London	Mean for the whole month of December 1952	Reading on each day in first week of December 1952						
		1st	2nd	3rd	4th	5th	6th	7th
Lambeth	0.22	0.16	0.24	0.34	0.75	0.86	1.34	0.47
Southwark	0.11	0.19	0.26	0.38	0.41	1.14	0.95	0.80
Westminster	0.16	0.15	–	0.24	0.48	0.63	0.99	0.89

(b) Which of the following statements describes the pattern of the readings in the table?

- 1 The highest reading for sulfur dioxide is on the same day in each location.
- 2 The readings all rise and then fall in each location.
- 3 The sulfur dioxide readings are the same on the 6th December in each location.
- 4 The readings all rise and then stay the same in each location.

(1 mark)

(c) The most likely value for the missing reading on the 2nd December for Westminster is

- 1 0.13
- 2 0.19
- 3 0.36
- 4 0.45

(1 mark)

(d) The mean value for the whole month of December for Southwark is lower than any of the readings for the first 7 days of December for Southwark.

This is because for Southwark, . . .

- 1 the mean of the readings for the first 7 days in December is 0.11
- 2 the readings for the other days in December were all zero.
- 3 after 7th December, the smog became thicker.
- 4 most of the readings for the other days in December were lower than 0.11

(1 mark)

Q3. In June 1783, lava and gases began pouring from a number of volcanoes in Iceland.

An estimated 120 million tonnes of sulfur dioxide was released into the atmosphere. The sulfur dioxide killed a quarter of the population of Iceland. Sulfur dioxide causes clouds to reflect more sunlight. Some scientists estimate that the sulfur dioxide released in 1783 caused the northern hemisphere to cool by 0.3 °C.

Emissions of sulfur dioxide from human activities increased rapidly through the 20th century to a maximum in 1990, but then gradually decreased as developed countries became more aware of the problems that sulfur dioxide causes.

(a) Which row in the table shows two ways in which sulfur dioxide levels in the atmosphere were considerably reduced?

1	increased use of low-sulfur fuels in vehicles	use of hydrogen as a fuel in vehicles
2	a reduction in the number of vehicles	removal of sulfur dioxide from factory waste gases
3	increased use of low-sulfur fuels in vehicles	removal of sulfur dioxide from factory waste gases
4	a reduction in the number of vehicles	use of hydrogen as a fuel in vehicles

(1 mark)

(b) An increase in the level of sulfur dioxide in the atmosphere will result in . . .

- 1 less energy entering the atmosphere.
- 2 more energy entering the atmosphere, but more is then reflected.
- 3 the same amount of energy entering the atmosphere, but more is then reflected.
- 4 the same amount of energy reaching the Earth's surface, but less is absorbed.

(1 mark)

(c) If sulfur dioxide levels continue to decrease, this will . . .

- 1 reduce the effect of increasing carbon dioxide levels in the atmosphere.
- 2 have little or no effect on the level of acidity in lakes and rivers.
- 3 mean there is no need to use low-sulfur fuels.
- 4 not offset the effects of increasing carbon dioxide levels.

(1 mark)

(d) There are different views about future global temperatures.

Which of the following is not a valid reason for these different views?

- 1 The future impact of volcanic activity cannot be predicted.
- 2 Some evidence may be ignored because of its political significance.
- 3 The data over the past 150 years show that global temperatures have been increasing.
- 4 Some researchers could be influenced by the company that employs them.

(1 mark)

Q4. The table shows some information about four of the gases, A, B, C and D, in the Earth's atmosphere.

	Gas	Percentage (%) in the atmosphere	Melting point in °C	Boiling point in °C	Density in g per litre
A	Nitrogen	78	-210	-196	1.25
B	Oxygen	20	-218	-183	1.43
C	Carbon dioxide	0.04	-57	-78	1.98
D	Argon	1	-189	-186	1.78

Match gases, A, B, C and D, with the numbers 1– 4 in the sentences.

The gas with the highest density is . . . 1

The gas that makes up the largest percentage of the atmosphere is . . . 2

The gas with the lowest melting point is . . . 3

The gas with the smallest difference between its melting point and its boiling point is . . . 4 . .

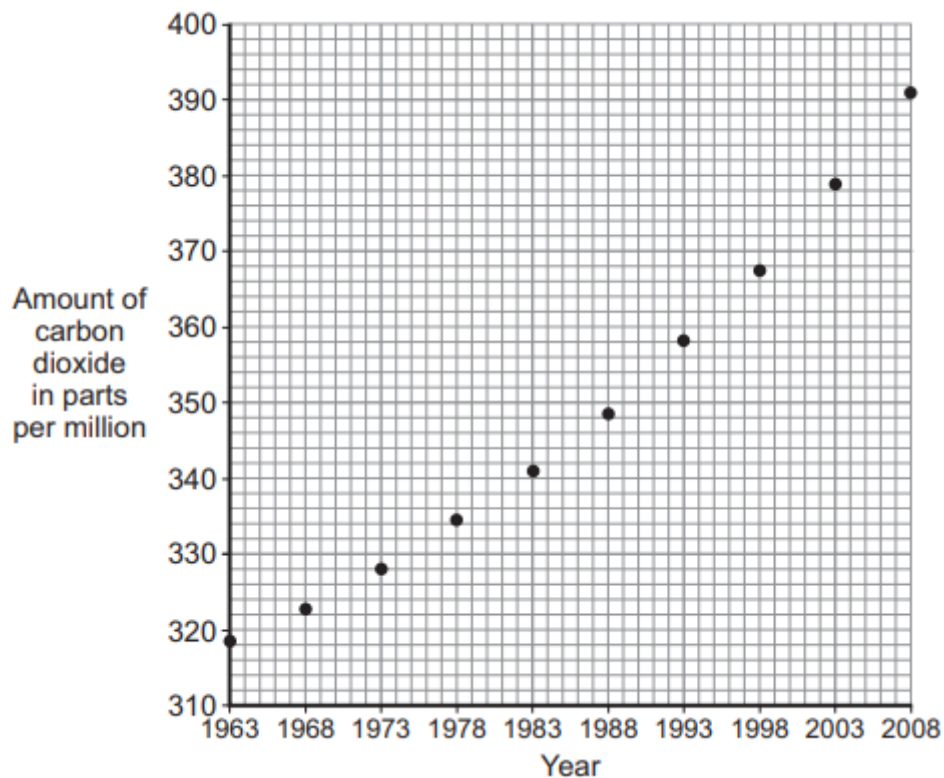
(4 marks)

Q5. Scientists have been measuring the amount of carbon dioxide in the atmosphere high above a remote island in the Pacific Ocean.

The table shows some data that they collected over 45 years.

The data is plotted on the graph.

Year	1963	1968	1973	1978	1983	1988	1993	1998	2003	2008
Amount of carbon dioxide in parts per million	318.9	323.1	328.0	334.2	340.9	348.9	358.1	367.7	378.8	391.0



(a) What is the best way of showing the trend in the amount of carbon dioxide on the graph?

- 1 Draw a series of straight lines linking one point to the next.
- 2 Add points between those already plotted to estimate the missing years.
- 3 Draw a bar chart.
- 4 Draw a smooth curve as close as possible to the points.

(1 mark)

(b) What does the data show about the amounts of carbon dioxide above the island?

- 1 The amount of carbon dioxide has increased at an increasing rate since 1963.
- 2 Recent efforts to slow the increase in the amount of carbon dioxide have been successful.
- 3 Amounts of carbon dioxide before 1963 were lower than 300 parts per million.
- 4 The amount of carbon dioxide has increased because there are now more cars on the island.

(1 mark)

(c) Is there enough data to support the theory that global carbon dioxide levels have increased over the period studied?

- 1 No, because the scientists would need to measure the amount of carbon dioxide every year to be certain.
- 2 Yes, because it is obvious that the amount of carbon dioxide is the same all over the world.
- 3 No, because data from many different sites worldwide would be needed to make sure.
- 4 Yes, because the amount of carbon dioxide went up every time a measurement was made.

(1 mark)

(d) Scientists have compared the amount of carbon dioxide in the atmosphere today with the amount they estimate there was during the first billion years of the Earth's existence. They think that . . .

- 1 there is more carbon dioxide today because of the burning of fossil fuels.
- 2 there is less carbon dioxide today because a lot became trapped in carbonate rocks.
- 3 the amount of carbon dioxide has remained much the same until very recently.
- 4 there was no carbon dioxide to begin with because there were no humans to burn fuels.

(1 mark)

Q6. 'Food miles' is the distance that food is transported from the time of its production until it reaches the consumer. Environmentalists are concerned that food miles are increasing and that this is causing increased carbon dioxide emissions.

The table shows some of the social costs of transporting food to and within the UK in 2002.

At the time there were about 32 million vehicles on UK roads, 25 million of which were cars. The values shown are an indication of the damage to the environment caused by the transport of food. The larger the number, the greater the environmental damage.

Type of transport	Carbon dioxide emissions	Reduction in air quality	Noise from transport	Congestion due to transport
Lorry	120	170	120	1400
Van	30	50	30	1100
Car	50	20	40	2600
Train	0	20	0	0

(a) Which one of the following would explain the difference between the congestion values due to 'Vans' and 'Cars'?

- 1 A van will cover more distance than a car on a tank of fuel.
- 2 Cars will travel down more minor roads than vans.
- 3 Vans can carry larger loads than cars.
- 4 There are more cars than vans on UK roads.

(1 mark)

(b) The table shows that there is no damage caused by carbon dioxide emissions from trains. This is because the trains referred to in the table are electric trains.

This is misleading, mainly because . . .

- 1 it does not take into account the lighting used at railway stations.
- 2 the carbon dioxide emissions given off by railway staff travelling to work should also be included.
- 3 carbon dioxide is given off when electricity is generated using fossil fuels.
- 4 the environmental effect of driving goods to railway stations should be included.

(1 mark)

(c) Haulage companies suggest that transporting goods by lorries is preferable to using vans. If all environmental aspects are considered, how many vans cause as much environmental damage as one lorry?

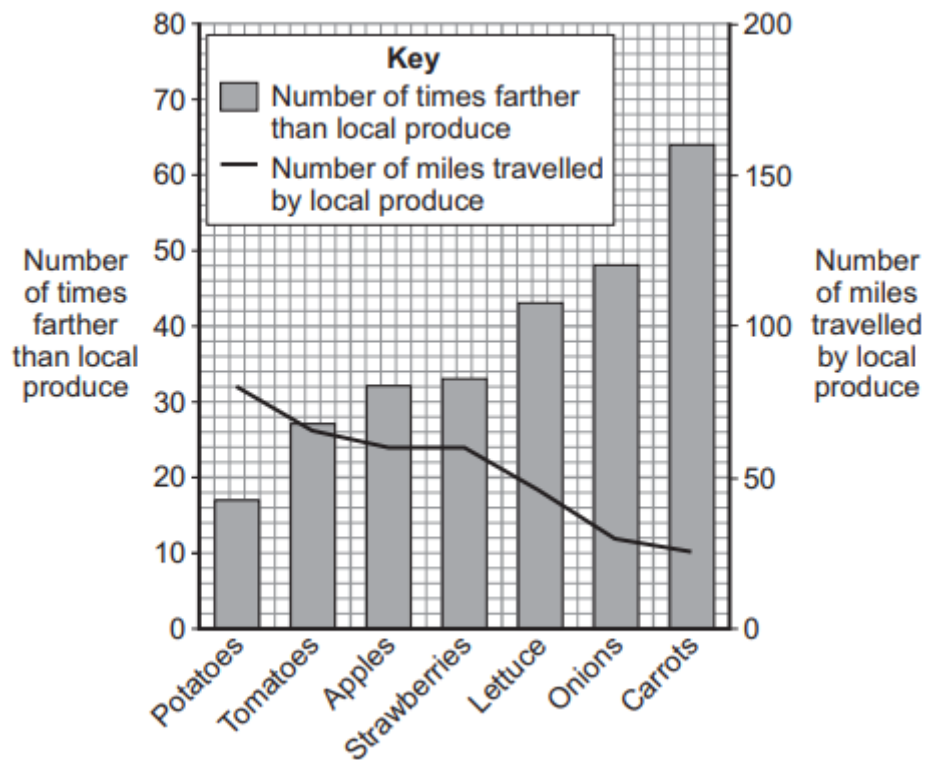
- 1 less than one
- 2 between one and two

3 between two and three

4 between three and four

(1 mark)

(d) The graph shows the relative distances travelled when transporting food to the UK from a distant source compared with locally produced food.



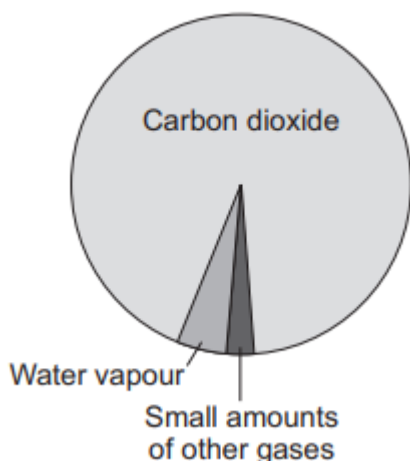
Which food from a distant source travels the least food miles compared with when it is produced locally?

- 1 potatoes
- 2 strawberries
- 3 lettuce
- 4 carrots

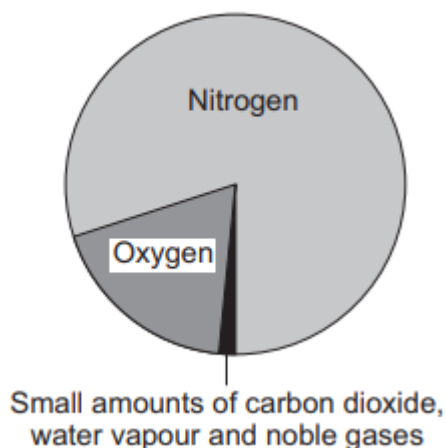
(1 mark)

Q7. The pie charts show the amounts of gases in the Earth's early atmosphere and in the Earth's atmosphere today.

Earth's early atmosphere



Earth's atmosphere today



(a) Very small amounts of a hydrocarbon gas are thought to have been in the Earth's early atmosphere. This gas is . . .

- 1 ammonia, NH₃
- 2 helium, He
- 3 methane, CH₄
- 4 oxygen, O₂

(1 mark)

(b) As the Earth's early atmosphere was forming, it contained water vapour. Which row in the table shows where the water vapour came from and why the quantity in the atmosphere reduced?

	Water vapour came from	Water vapour reduced because
1	evaporation from the ground.	it condensed to form the oceans.
2	evaporation from the ground.	there was less rainfall.
3	volcanic activity.	it condensed to form the oceans.
4	volcanic activity.	there was less rainfall.

(1 mark)

(c) Why was there no oxygen in the Earth's early atmosphere?

- 1 There was no carbon dioxide for the plants to use to make oxygen.
- 2 Living organisms had used up the oxygen.

3 There were no plants on Earth.

4 Oxygen is a very reactive gas.

(1 mark)

(d) The quantity of carbon dioxide in the Earth's atmosphere today is very different from the quantity that was in the Earth's early atmosphere. One of the reasons why it is very different is that . . .

1 there are a lot of cars on our roads today.

2 it is locked up as carbon in fossil fuels.

3 most homes use fossil fuels for central heating.

4 plants produce carbon dioxide by photosynthesis.

(1 mark)

Total marks (28)