

# THE ATMOSPHERE 3

**Q1.** Limestone is used for building. Acid rain can damage limestone buildings because limestone is mainly calcium carbonate. Calcium carbonate reacts with acid rain to produce carbon dioxide.

A scientist tests limestone with an acid rain solution to see how much damage occurs.

The scientist:

- weighed a piece of limestone
- put the limestone in the acid rain solution
- after 1 day, took the piece of limestone out of the solution and dried the surface
- reweighed the piece of limestone.

The scientist repeated this process with the same piece of limestone for 10 days. The results are shown in the table.

Time in days	0	1	2	3	4	5	6	7	8	9	10
Mass in g	10.0	10.2	9.5	8.9	8.4	8.0	7.7	7.5	7.3	7.3	7.3

**(a)** A gas that causes acid rain is . . .

- 1 carbon monoxide.
- 2 sulfur dioxide.
- 3 carbon dioxide.
- 4 nitrogen.

(1 mark)

**(b)** The mass of the piece of limestone increased during the first day because . . .

- 1 carbon dioxide was produced.
- 2 the acid was diluted with water.
- 3 the limestone soaked up some of the acid rain solution.
- 4 the substances were mixed.

(1 mark)

**(c)** The mass of the piece of limestone decreased during the 10 days because . . .

- 1 there was an error using the balance.
- 2 carbon dioxide was given off.

- 3 the acid rain had been absorbed.  
 4 all the calcium carbonate had reacted.

(1 mark)

**(d)** After 11 days, the mass of the piece of limestone would be . . .

- 1 10.0 g.  
 2 8.4 g.  
 3 7.3 g.  
 4 6.5 g.

(1 mark)

**Q2.** The table shows the quantity of acidic gases produced in Britain, from different sources, between 1990 and 2004.

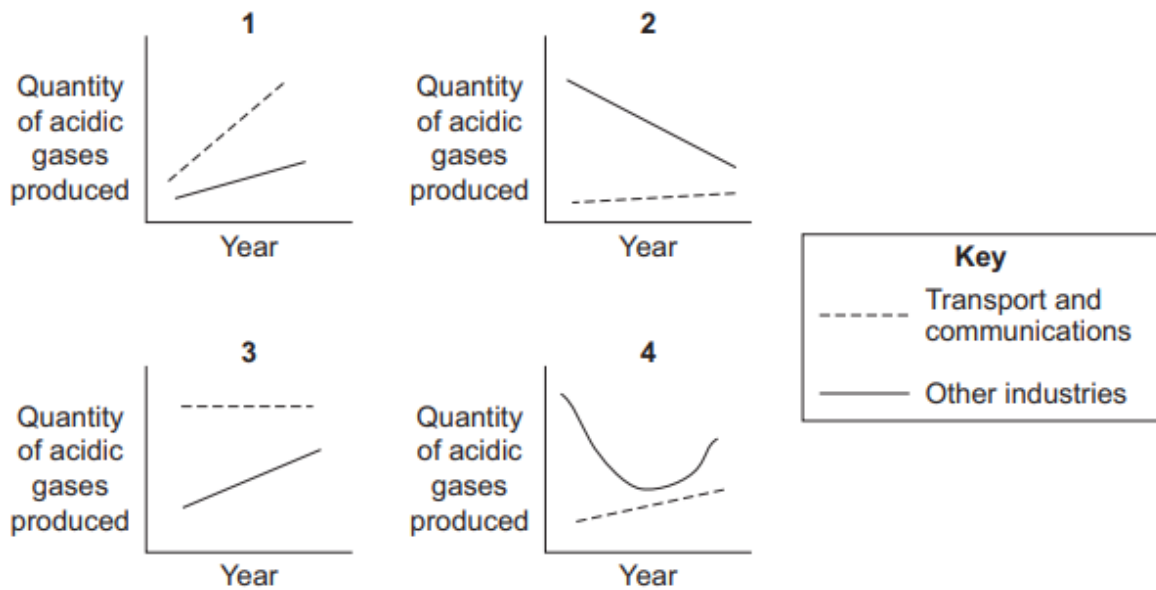
Acidic gases produced in millions of tonnes				
Year	Domestic	Transport and communications	Other industries	Total
1990	0.75	0.75	5.40	6.90
1992	0.75	0.80	5.00	6.55
1994	0.70	0.80	4.10	5.60
1996	0.60	0.80	3.40	4.80
1998	0.50	0.85	2.90	4.25
2000	0.45	0.70	2.50	3.65
2002	0.40	0.85	2.15	3.40
2004	0.35	0.90	2.05	3.30

**(a)** The decrease in the total amount of acidic gases produced between 1990 and 2004 is about . . .

- 1 5%.  
 2 25%.  
 3 50%.  
 4 75%.

(1 mark)

**(b)** Which graph correctly shows the data in the table for 'Transport and communications' and for 'Other industries'?



(1 mark)

**(c)** In 2000, 'Transport and communications' produced an unexpected amount of acidic gases, when compared to the trend in values. Which one of the following could help to explain the unexpected amount of acidic gases produced?

- 1 a decrease in the number of aircraft flights
- 2 a decrease in the cost of crude oil
- 3 more traffic on the roads because of an increase in car production
- 4 more homes being built in the countryside

(1 mark)

**Q3.** National Parks are large, attractive areas where people can enjoy the countryside. In one particular National Park, a company has a large limestone quarry and a cement factory close to it. There is a village about one kilometre from the cement factory.

**(a)** Although the quarry is a scar on the landscape and increases pollution in the area, local people gain some benefit because . . .

- 1 it provides a new recreational area.
- 2 it creates a new habitat for wildlife.
- 3 it provides employment.
- 4 it attracts tourists to the area.

(1 mark)

**(b)** The main advantage to the company of having a cement factory close to the quarry rather than many kilometres away is that . . .

- 1 the factory can be operated 365 days a year.
- 2 transport costs will be less.
- 3 visual pollution near the village will be minimised.
- 4 there will be less atmospheric pollution near the village.

(1 mark)

Local people are concerned that a different fuel being used at the cement factory is releasing sulfur dioxide when it is burned. The table shows the sulfur dioxide concentration in the atmosphere, recorded on one day.

Distance from the cement factory in metres	Concentration of sulfur dioxide in parts per million
0	65
500	48
1000	16
1500	10
2000	5

**(c)** The conclusion from these results is that . . .

- 1 as the distance in metres doubles, the concentration of the sulfur dioxide is halved.
- 2 the concentration of sulfur dioxide is lower further away from the cement factory.
- 3 children should not play within 1000 metres of the cement factory.
- 4 there is no sulfur dioxide 4000 metres from the cement factory.

(1 mark)

**(d)** On another day later in the year, the sulfur dioxide concentrations in the atmosphere were measured at the same places. The concentrations were much lower.

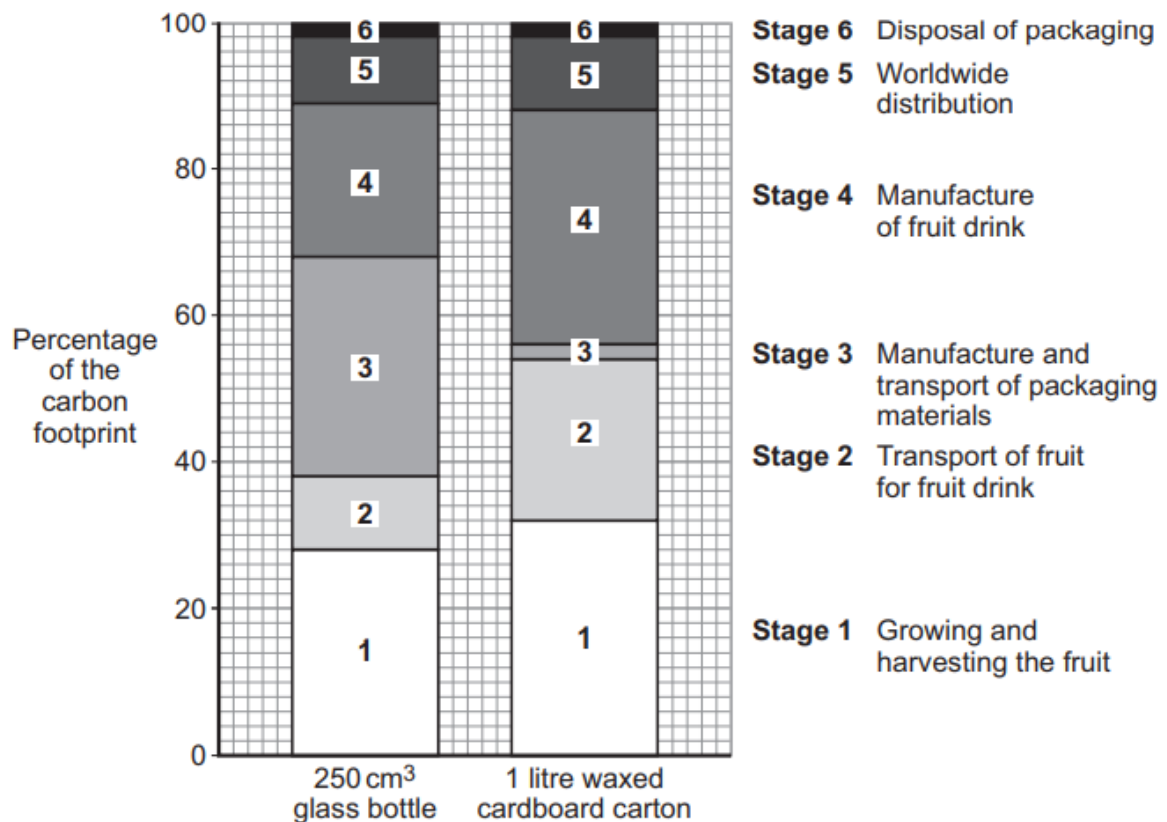
Which of the following is the most likely reason for this change?

- 1 an increase in wind speed

- 2 an increase in cement production
- 3 the factory using a fuel with a higher sulfur content
- 4 less rain when measurements were taken

(1 mark)

**Q4.** The carbon footprint of a food product is the total amount of carbon dioxide that is produced in its preparation, distribution and disposal. The bar chart shows the percentage (%) of the carbon footprint for each stage of the overall process for a natural fruit drink. The fruit drink is packaged either in a 250 cm<sup>3</sup> glass bottle or in a 1 litre waxed cardboard carton.



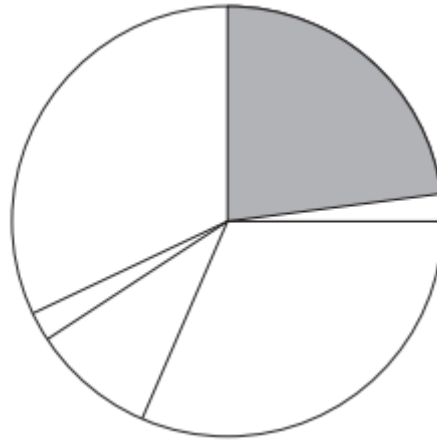
**(a)** Most of the carbon dioxide produced at Stage 5 will be . . .

- 1 by electric trolleys at the supermarket storage depot.
- 2 by lorries delivering bottles and cartons of the fruit drink.
- 3 by refrigerators at the supermarket storage depot.
- 4 by the large workforce at the distribution centre.

(1 mark)

**(b)** Which stage on the bar chart for a 1 litre carton corresponds to the shaded area on the pie chart?

**Percentage (%) of carbon footprint for a  
1 litre carton of natural fruit drink**



**1 Stage 1**

**2 Stage 2**

**3 Stage 3**

**4 Stage 4**

(1 mark)

**(c)** One reason why, at Stage 2, the carbon footprint percentage is much smaller for a 250 cm<sup>3</sup> glass bottle than for a 1 litre carton is that . . .

- 1 a bottle contains a larger volume of liquid than a carton.
- 2 a bottle is heavier than a carton.
- 3 more fruit is needed to make the juice in a carton than in a bottle.
- 4 the fruit for the juice in the bottles is transported further than that for the juice in the cartons.

(1 mark)

**(d)** There is a large difference in the percentages at Stage 3. One possible reason for this is that . . .

- 1 cartons are made of renewable materials.
- 2 making glass bottles needs a lot of energy.
- 3 cartons need more protective packaging than bottles.
- 4 glass bottles can be recycled but cartons cannot.

(1 mark)

**Q5.** New substances are formed when fuels are burned. Some of these substances affect the environment.

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

A carbon dioxide

B particles

C sulfur dioxide

D water vapour

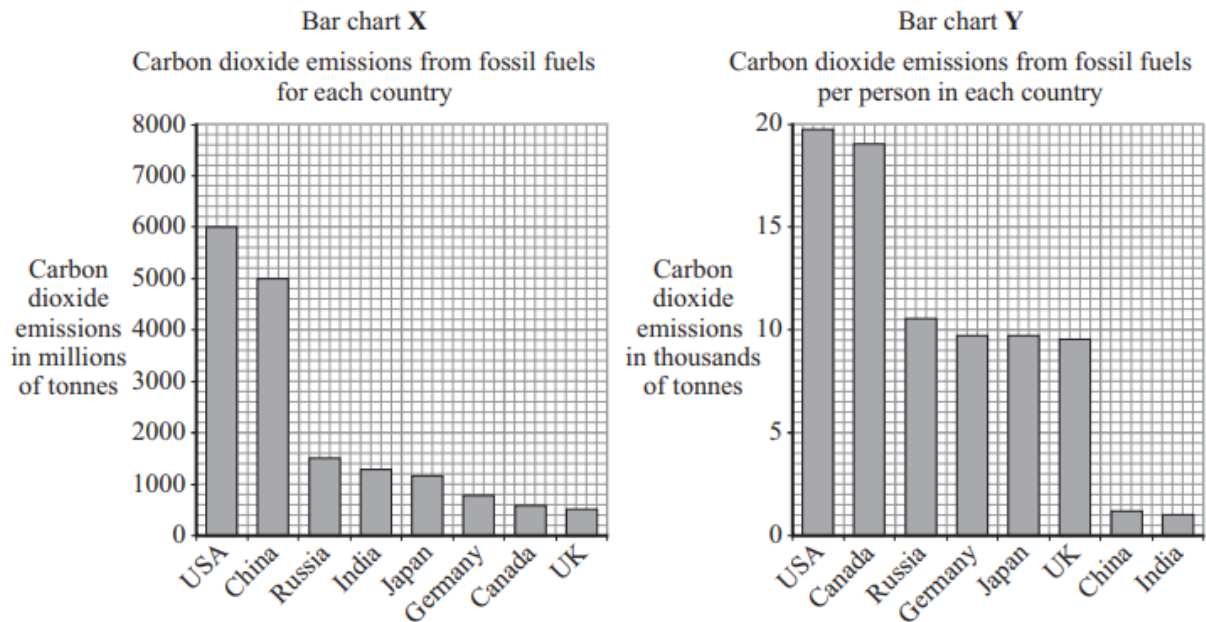
	<b>Environmental effect</b>
<b>1</b>	acid rain
<b>2</b>	global dimming
<b>3</b>	global warming
<b>4</b>	non-polluting

(4 marks)

**Q6.** The bar charts show the carbon dioxide emissions from burning fossil fuels only, for several countries, during 2004.

Bar chart X shows the carbon dioxide emissions for each country.

Bar chart Y shows the carbon dioxide emissions per person in each country.



**(a)** In the two bar charts, the countries are ranked in a different order. Which statement explains the difference?

- 1 The units for carbon dioxide emissions are different and so the bar charts cannot be compared.
- 2 India's population is less than Japan's.
- 3 China and the USA have similar populations.
- 4 China has a very large population but very few people drive vehicles.

(1 mark)

**(b)** There has been rapid economic expansion in China and India. New industry is being developed in these countries and this increases the use of fossil fuels. Which of the following statements is correct if the economic expansion continues and the population in each country stays the same?

- 1 The bar for China will be higher in chart X, but will be lower in chart Y.
- 2 The bars for China and India will be lower in both charts X and Y.
- 3 The bars for China and India will be higher in both charts X and Y.
- 4 The bar for India will be higher in chart X, but will be lower in chart Y.



(1 mark)

**(c)** The data in the bar charts could be displayed in a different way. Which one of the following gives a suitable display method with an appropriate explanation?

- 1 A straight line graph could be used because the dependent variable is continuous.
- 2 A pie chart could be used because the independent variable is categoric.
- 3 A smooth curve graph could be used because the independent variable is continuous.
- 4 A scattergraph could be used because there is a gradual change in carbon dioxide emissions.

(1 mark)

**(d)** Which one of the following would reduce the height of the bars in both bar charts?

- 1 compulsory use of catalytic converters that convert carbon monoxide to carbon dioxide
- 2 hanging the vertical axis on bar chart X to measure in thousands of tonnes
- 3 planting more trees, which will absorb carbon dioxide
- 4 using more efficient engines that burn less fossil fuel per mile

(1 mark)

Total marks (23)