Exercise walk-through

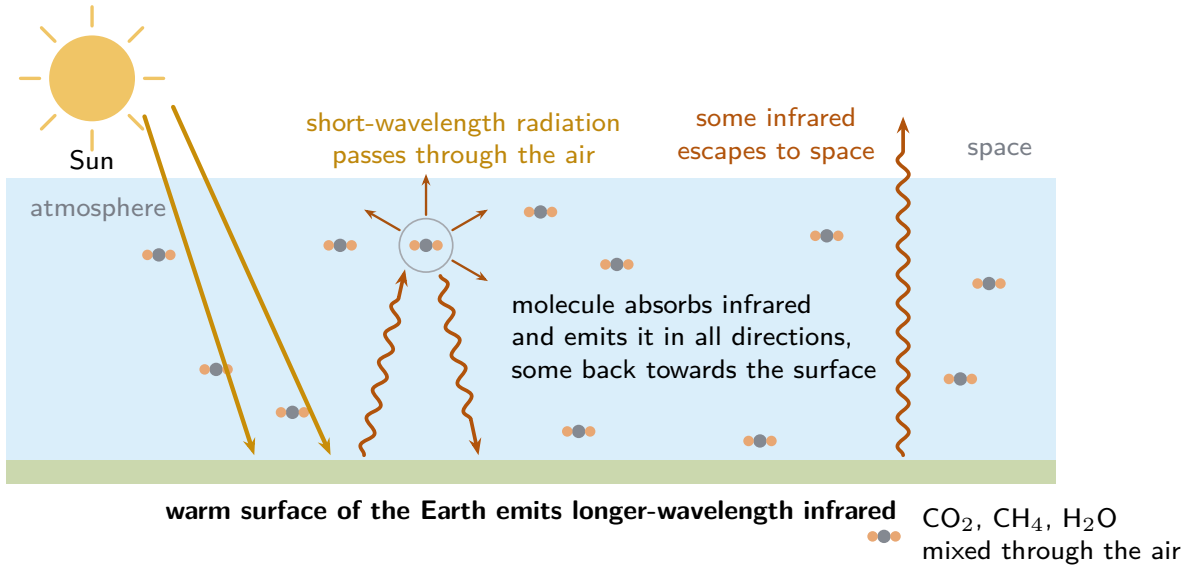
9.2
Greenhouse gases and global climate change (4.9.2.1–4.9.2.3)

AQA · GCSE · Chemistry

The greenhouse effect

- Each **greenhouse gas** , such as **water vapour**, carbon dioxide or **methane**, keeps the Earth warmer than it would otherwise be.
- Without any **greenhouse effect**, the average surface temperature would be about −18 °C instead of about 15 °C, too cold for most life.
- This is how the **greenhouse effect** works:
- 1.

Figure: The greenhouse effect



- Sunlight in; infrared out; gases absorb and re-emit.
- Less energy escapes, so the surface warms.

Human activities and climate evidence

- **Carbon dioxide** is increased by burning fossil fuels and by **deforestation**, which means fewer trees to remove carbon dioxide, and often burning or rotting wood. **Methane** is increased by cattle farming (cows release **methane** as they digest grass), by rice fields, and by organic waste rotting in **landfill** sites.
- **Judging evidence.** Most scientists agree that human activities are increasing the average global temperature.

Human activities and climate evidence (2)

- Their evidence comes from many independent measurements: temperature records, ice cores, sea levels and the Keeling curve.
- Their work goes through **peer review** : other experts check the methods and conclusions before a study is published.

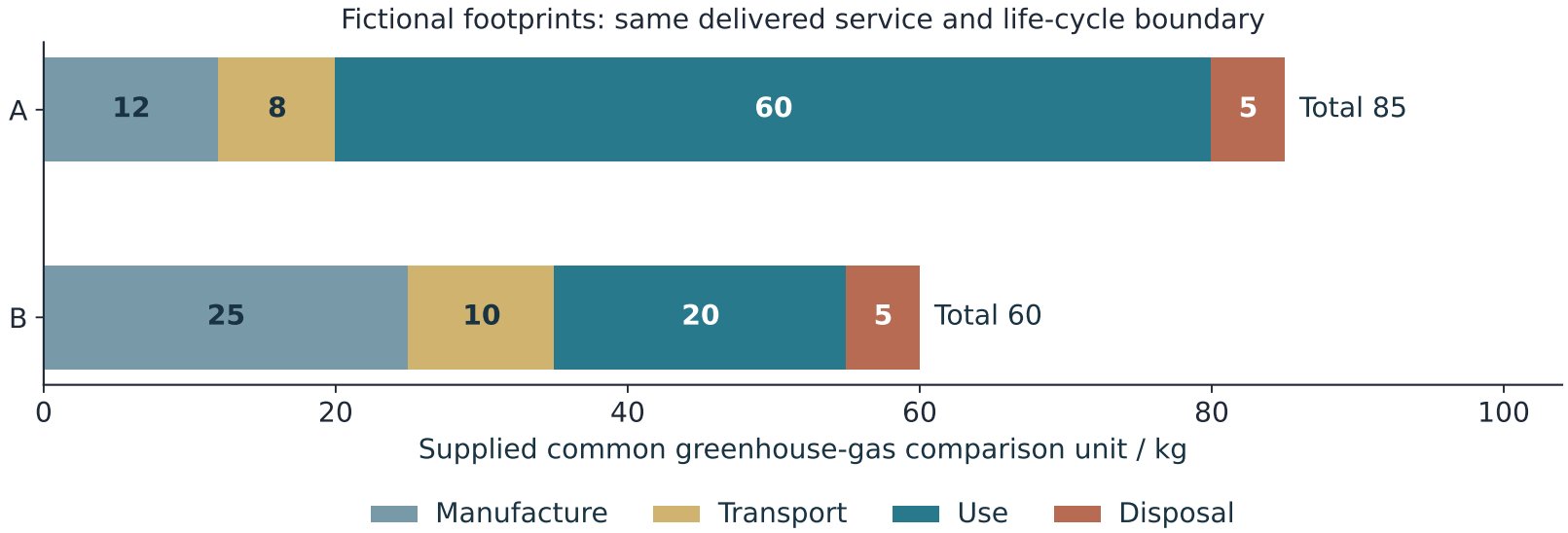
Effects of climate change

- rising sea levels, which can flood low-lying coasts and islands; sea level rises because water expands as it warms (**thermal expansion**) and because ice on land melts;
- more frequent and more severe storms, heatwaves and floods;
- changes in the amount and timing of rainfall, which can cause droughts or damage crops;
- changes to habitats, so that some species must move or die out, and pests and diseases can spread to new areas.

Carbon footprints

- Total for A $= 12 + 8 + 60 + 5 = 85$ kg; total for B $= 25 + 10 + 20 + 5 = 60$ kg.
- B is lower overall, even though it costs more carbon to make.
- Percentage reduction $= (85 - 60)/85 \times 100 = 29.4\%$.

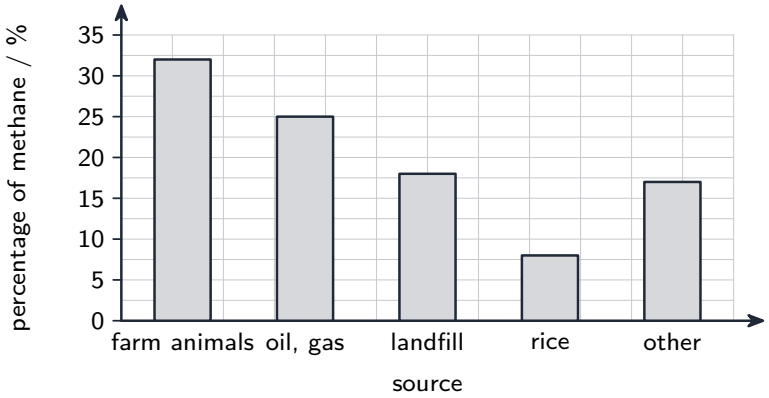
Figure: Carbon footprints



- Equal-service life-cycle totals: A85kg and B60kg in supplied common unit.
- Match each part of the diagram to the text.

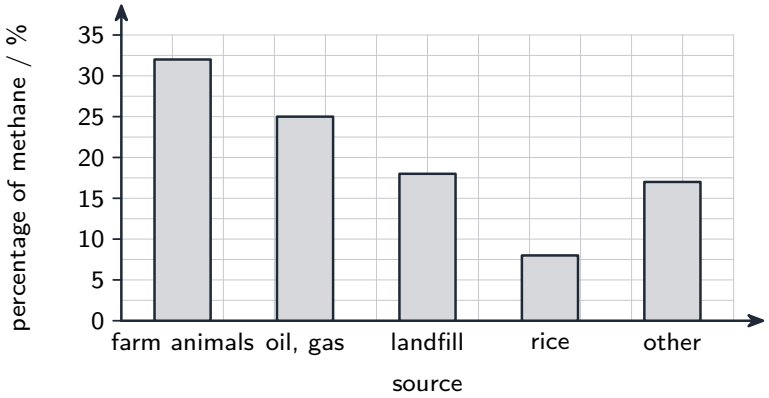
Exercise 2.1

2.1 The chart shows sources of methane from human activity. Name the **two** largest sources. [2]



Exercise 2.1

2.1 The chart shows sources of methane from human activity. Name the **two** largest sources. [2]

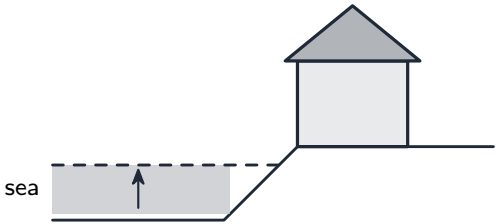


2.1

- farm animals; oil and gas

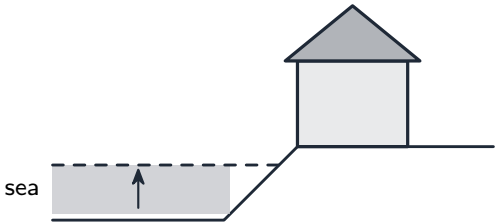
Exercise 2.2

2.2 Give **two** possible effects of global climate change. [2]



Exercise 2.2

2.2 Give **two** possible effects of global climate change. [2]

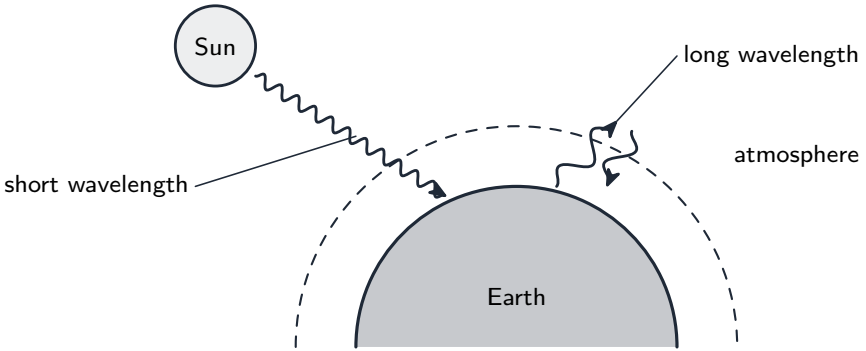


2.2

- any two: sea levels rise; more extreme weather, e.g. storms; changes in rainfall; changes to where species can live

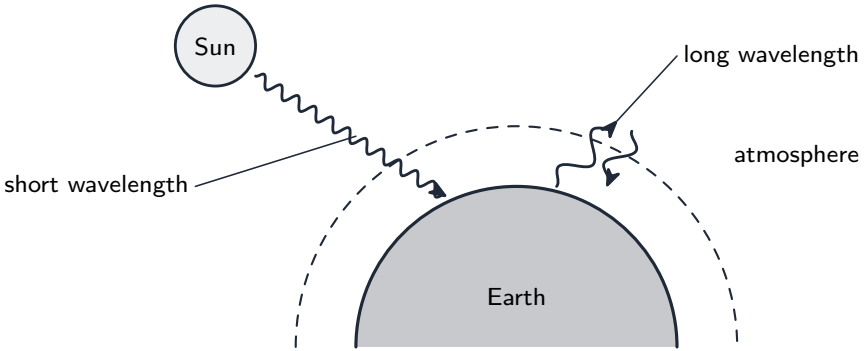
Exercise 3.1

3.1 Use the diagram to explain the greenhouse effect. [3]



Exercise 3.1

3.1 Use the diagram to explain the greenhouse effect. [3]



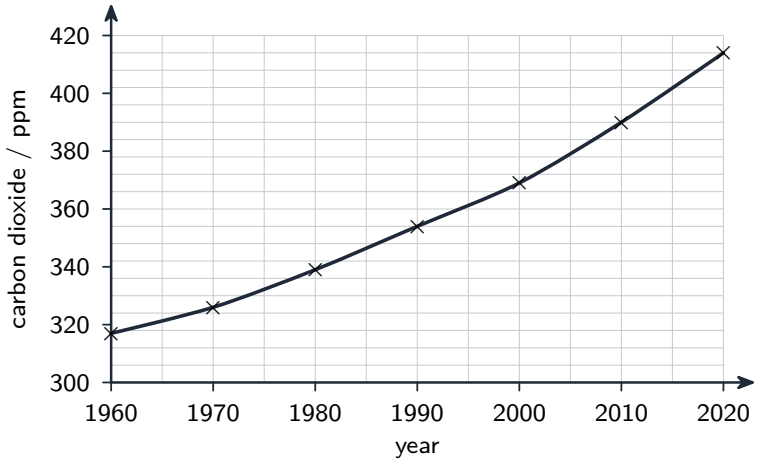
3.1

- short-wavelength radiation from the Sun passes through the atmosphere
- the Earth gives out long-wavelength (infrared) radiation
- greenhouse gases absorb it and give it out again, so the Earth stays warm

Exercise 3.2 (a)

3.2 The graph shows the concentration of carbon dioxide in the air from 1960 to 2020.

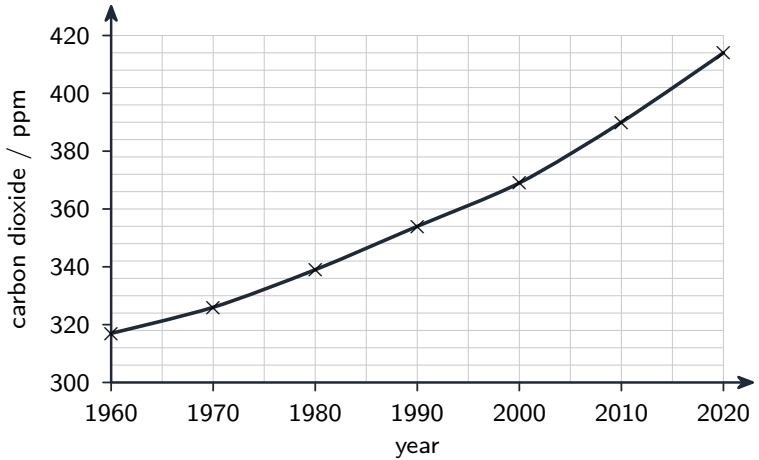
(a) Use the graph to find the increase in concentration from 1960 to 2020. [2]



Exercise 3.2 (a)

3.2 The graph shows the concentration of carbon dioxide in the air from 1960 to 2020.

(a) Use the graph to find the increase in concentration from 1960 to 2020. [2]



(a) 317 and 414 ppm read; about 97 ppm, accept 95–99

Exercise 3.2 (b)

3.2 The graph shows the concentration of carbon dioxide in the air from 1960 to 2020.

(b) Calculate the percentage increase from 1960 to 2020. [3]

Exercise 3.2 (b)

3.2 The graph shows the concentration of carbon dioxide in the air from 1960 to 2020.

(b) Calculate the percentage increase from 1960 to 2020. [3]

(b) $97 \div 317$; $\times 100$; $=$ **31**%, accept 30–31%

Exercise 3.2 (c)

3.2 The graph shows the concentration of carbon dioxide in the air from 1960 to 2020.

(c) Give **two** human activities that caused this increase. [2]

Exercise 3.2 (c)

3.2 The graph shows the concentration of carbon dioxide in the air from 1960 to 2020.

(c) Give **two** human activities that caused this increase. [2]

(c) burning fossil fuels; cutting down forests

Exercise 3.2 (d)

3.2 The graph shows the concentration of carbon dioxide in the air from 1960 to 2020.

(d) Evaluate ways of reducing carbon dioxide emissions, and the problems with them. [6]

Exercise 3.2 (d)

3.2 The graph shows the concentration of carbon dioxide in the air from 1960 to 2020.

(d) Evaluate ways of reducing carbon dioxide emissions, and the problems with them. [6]

(d) points to include:

- use renewable energy (wind, solar) instead of fossil fuels
- save energy, e.g. insulate homes and use public transport
- carbon capture: store carbon dioxide underground
- carbon taxes or limits on emissions
- problems: these cost money, and some countries need cheap energy to develop
- countries may not agree, and people may not want to change how they live
- a conclusion that weighs these points

Levels: **5–6** a full, logical answer with correct chemistry and correct terms; **3–4** several correct points, partly linked; **1–2** one or two relevant points.