

GCSE Combined Science: Trilogy

Worksheet: Greenhouse gases

TIME 30 min	TOTAL 30 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Greenhouse gases

NAME	CLASS	DATE
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- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

0 1 . 1 Which **two** gases are greenhouse gases?

Tick (✓) **two** boxes.

Argon

☐

Carbon dioxide

☐

Methane

☐

Nitrogen

☐

Oxygen

☐

[2 marks]

0 1 . 2 Name **one** other greenhouse gas.

.....

.....

.....

.....

[1 mark]

0 1 . 3

Why are greenhouse gases important for life on Earth?

[1 mark]

0 2

0 2 . 1

What is meant by the 'greenhouse effect'?

[1 mark]

0 2 . 2

Name **two** greenhouse gases that are produced naturally, without any human activity.

[2 marks]

0 3

0 3 . 1

Which **two** of these are greenhouse gases?

Tick (✓) **two** boxes.

Nitrogen

Water vapour

Oxygen

Methane

☐
☐
☐
☐

[2 marks]

0 3 . 2

Greenhouse gases absorb radiation given out by the Earth's surface.
Name the type of radiation they absorb.

[1 mark]

0 4

In the two-bottle experiment comparing carbon dioxide and air, a clear temperature difference between the two bottles can usually be seen within about 20 minutes.

0 4 . 1

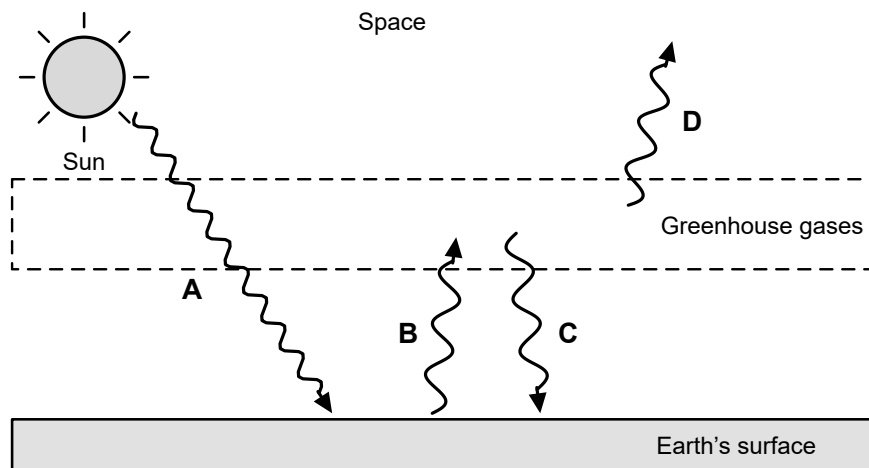
Suggest why this does **not** mean that a similar temperature difference would appear in the real atmosphere within only 20 minutes of extra carbon dioxide being released.

[2 marks]

0 5

Figure 1 shows how greenhouse gases in the atmosphere affect the temperature of the Earth. The wavy arrows A, B, C and D show radiation.

Figure 1



0 5 . 1

Which arrow shows short wavelength radiation from the Sun?

.....

.....

.....

.....

[1 mark]

0 5 . 2

Which arrow shows radiation re-emitted by greenhouse gases towards the Earth's surface?

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.....

[1 mark]

0 5 . 3

Explain how an increase in the amount of greenhouse gases in the atmosphere would affect the temperature of the Earth's surface.
Refer to the arrows in Figure 1.

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[3 marks]

0 6

0 6 . 1

Describe how you could set up an experiment, using two identical sealed bottles, a lamp and thermometers, to compare how well carbon dioxide and air absorb radiation and warm up.

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[4 marks]

0 7

Table 1 compares the atmosphere before large-scale industrialisation (around 1750) with today.

Table 1

Gas	Concentration in 1750 in ppm	Concentration today in ppm
Carbon dioxide	280	420
Methane	0.7	1.9

0 7 . 1

Calculate the percentage increase in methane concentration from 1750 to today. Give your answer to 3 significant figures.

.....

.....

.....

.....

Percentage increase = %

[2 marks]

0 7 . 2

Explain why an increase in the concentration of these gases leads to an increase in global temperature.

.....

.....

.....

.....

[2 marks]

.....

0 8

Greenhouse gases in the atmosphere keep the Earth warm.

0 8 . 1

What type of radiation is mainly given out by the Earth's surface?

Tick (✓) **one** box.

Long wavelength (infrared) radiation

☐

Short wavelength visible light

☐

Ultraviolet radiation

☐

Gamma radiation

☐

[1 mark]

0 8 . 2

Describe how greenhouse gases keep the Earth warm.

Use ideas about short wavelength and long wavelength radiation in your answer.

[4 marks]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Combined Science: Trilogy · Worksheet: Greenhouse gases · 30 marks

Question 1 (4 marks)

01.1 [2 marks]

Correct: Carbon dioxide; Methane

01.2 [1 mark]

Answer: water vapour

- water vapour (1)

Notes: Allow other correct greenhouse gases, e.g. dinitrogen oxide (nitrous oxide), ozone or CFCs. Do not accept carbon dioxide or methane.

01.3 [1 mark]

- they keep the Earth's temperature high enough to support life (1)
-

Question 2 (3 marks)

02.1 [1 mark]

- greenhouse gases in the atmosphere absorb and re-emit long wavelength radiation from the Earth's surface, keeping the Earth's surface and lower atmosphere warmer than they would otherwise be (1)
-

02.2 [2 marks]

- water vapour (1)
- carbon dioxide (e.g. from respiration, volcanoes, natural decay) (1)
- methane (e.g. from wetlands, natural decay) (1)

Any 2 of the points above.

Question 3 (3 marks)

03.1 [2 marks]

Correct: Water vapour; Methane

03.2 [1 mark]

- long wavelength radiation / infrared (radiation) (1)
-

Question 4 (2 marks)

04.1 [2 marks]

- the real atmosphere is an enormous, open system that exchanges energy with the oceans, land and space over long timescales, unlike a small sealed bottle heated directly by a nearby lamp (1)
 - real climate warming from rising carbon dioxide levels happens gradually, over years to decades, as the whole climate system responds, not within minutes (1)
-

Question 5 (5 marks)

05.1 [1 mark]

Answer: A

- A (1)
-

05.2 [1 mark]

Answer: C

- C (1)
-

05.3 [3 marks]

- more of the long wavelength radiation (B) is absorbed by the greenhouse gases (1)
 - more radiation is re-emitted back towards the Earth (C increases) / less escapes to space (1)
 - so the (mean) temperature of the Earth's surface increases (1)
-

Question 6 (4 marks)

06.1 [4 marks]

- fill one bottle with carbon dioxide and the other with air (as a comparison) (1)
 - seal each bottle and place a thermometer inside each, so it can be read without opening the bottle (1)
 - place both bottles the same distance from an identical lamp, and record the starting temperature in each (1)
 - switch on the lamp and record the temperature in each bottle at regular time intervals (e.g. every 2 minutes) for the same total time (1)
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Question 7 (4 marks)

07.1 [2 marks]

Answer: 171%

- $(1.9 - 0.7) \div 0.7 \times 100$ (1)
 - 171 (%) (1)
-

07.2 [2 marks]

- more greenhouse gas molecules are present to absorb long wavelength radiation emitted by the Earth's surface (1)
 - so more radiation is re-emitted back towards the Earth's surface, rather than escaping to space, increasing the mean temperature (1)
-

Question 8 (5 marks)

08.1 [1 mark]

Correct: Long wavelength (infrared) radiation

08.2 [4 marks]

- short wavelength radiation from the Sun passes through the atmosphere (1)
 - the Earth's surface absorbs this radiation and emits long wavelength (infrared) radiation (1)
 - greenhouse gases absorb (some of) the long wavelength radiation (1)
 - and re-emit it in all directions, including back towards the Earth, so the Earth's surface and lower atmosphere are warmer (1)
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