

GCSE Combined Science: Trilogy

Worksheet: How carbon dioxide decreased

TIME 30 min	TOTAL 27 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: How carbon dioxide decreased

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** processes reduced the amount of carbon dioxide in the Earth's early atmosphere?

Tick (✓) **two** boxes.

Carbon dioxide dissolving in the oceans

☐

Volcanic eruptions

☐

The formation of sedimentary rocks such as limestone

☐

The combustion of fuels

☐

Respiration by animals

☐

[2 marks]

0 1 . 2

Name the process by which plants and algae remove carbon dioxide from the atmosphere.

.....

.....

.....

[1 mark]

0 2

0 2 . 1

Give **two** ways in which the amount of carbon dioxide in the atmosphere was decreased.

.....

.....

.....

.....

[2 marks]

0 2 . 2

Which rock was formed from the shells and skeletons of marine organisms?

Tick (✓) **one** box.

Basalt

☐

Coal

☐

Granite

☐

Limestone

☐

[1 mark]

0 2 . 3

The shells and skeletons of marine organisms are made mainly of one compound.

Name this compound.

.....

.....

.....

.....

[1 mark]

0 3

Coal, crude oil and natural gas are fossil fuels. They contain carbon that was once in the atmosphere as carbon dioxide.

0 3 . 1

Describe how coal was formed.

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[2 marks]

0 3 . 2

Describe how crude oil and natural gas were formed.

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[2 marks]

0 3 . 3

Explain how the formation of coal reduced the amount of carbon dioxide in the atmosphere.

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[2 marks]

0 4

Scientists estimate that the mass of carbon stored in the oceans today is about 38 000 billion tonnes, and the mass of carbon stored in fossil fuels is about 4000 billion tonnes.

0 4 . 1

Calculate how many times greater the mass of carbon in the oceans is than the mass of carbon in fossil fuels.

.....

.....

.....

.....

Factor =

[2 marks]

0 4 . 2

Describe how carbon dioxide from the Earth's early atmosphere came to be stored in the oceans and in sedimentary rocks.

.....

.....

.....

.....

[2 marks]

0 5

0 5 . 1

Give **one** way, other than photosynthesis, that carbon dioxide was removed from the Earth's early atmosphere.

.....

.....

[1 mark]

0 5 . 2

Explain why removing carbon dioxide from the atmosphere caused the atmosphere's temperature to fall.

.....

.....

[1 mark]

0 6

Table 1 shows estimates of the mass of carbon in some carbon stores on Earth today.

Table 1

Carbon store	Approximate mass of carbon in billions of tonnes
Sedimentary rocks, e.g. limestone	60 000 000
Oceans	38 000
Fossil fuels	4000
Living plants	550
Atmosphere	870

0 6 . 1

Calculate how many times more carbon is stored in sedimentary rocks than in the atmosphere.
Give your answer to 1 significant figure.

.....

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.....

.....
[2 marks]

0 6 . 2

Use Table 1 to explain what happened to most of the carbon dioxide that was in the Earth's early atmosphere.

.....

.....

.....

.....

[2 marks]

0 6 . 3

Suggest why the value for fossil fuels in Table 1 is only an estimate.

.....

.....

[1 mark]

0 7

Three processes reduced the amount of carbon dioxide in the Earth's atmosphere over billions of years: photosynthesis, dissolving in the oceans, and the formation of sedimentary rocks and fossil fuels.

0 7 . 1

Explain how each of these three processes removes carbon and locks it away, so that it does not quickly return to the atmosphere.

.....

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.....

[3 marks]

END OF QUESTIONS

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Mark scheme

GCSE Combined Science: Trilogy · Worksheet: How carbon dioxide decreased · 27 marks

Question 1 (3 marks)

01.1 [2 marks]

Correct: Carbon dioxide dissolving in the oceans; The formation of sedimentary rocks such as limestone

01.2 [1 mark]

Answer: photosynthesis

- photosynthesis (1)
-
-

Question 2 (4 marks)

02.1 [2 marks]

- photosynthesis by algae and plants (1)
- dissolving in the oceans (1)
- formation of sedimentary rocks / carbonates (1)
- formation of fossil fuels (1)

Any 2 of the points above.

02.2 [1 mark]

Correct: Limestone

02.3 [1 mark]

Answer: calcium carbonate

- calcium carbonate (1)
-

Question 3 (6 marks)

03.1 [2 marks]

- from the remains of plants (that lived millions of years ago) (1)
- buried and compressed over millions of years (without oxygen) (1)

03.2 [2 marks]

- from the remains of plankton / tiny sea organisms buried in mud (1)
- heat and pressure over millions of years (without oxygen) (1)

03.3 [2 marks]

- plants took in carbon dioxide for photosynthesis (1)
 - the carbon was locked up in the coal instead of returning to the atmosphere (when the plants decayed) (1)
-

Question 4 (4 marks)

04.1 [2 marks]

Answer: 9.5

- $38\,000 \div 4000$ (1)
- 9.5 (1)

04.2 [2 marks]

- carbon dioxide dissolved in the oceans (1)
 - carbonates were precipitated / used by marine organisms to make shells, forming sediments that became sedimentary rocks (e.g. limestone) (1)
-

Question 5 (2 marks)

05.1 [1 mark]

- dissolving in the oceans (allow: forming sedimentary rocks / fossil fuels) (1)

05.2 [1 mark]

- carbon dioxide is a greenhouse gas, so less of it means less long wavelength radiation is absorbed and re-emitted back to the surface, reducing the greenhouse effect (1)
-

Question 6 (5 marks)

06.1 [2 marks]

Answer: 70 000 times

- $60\,000\,000 \div 870 (= 68\,966)$ (1)
- $70\,000 / 7 \times 10^4$ (1)

Notes: An answer of 70 000 scores 2 marks. 68 966 or 69 000 (not 1 significant figure) scores 1 mark.

06.2 [2 marks]

- most of the carbon is now locked up in sedimentary rocks (e.g. limestone) (1)
 - carbon dioxide dissolved in the oceans / was used by organisms, and formed carbonate sediments / shells and skeletons that became rock (1)
-

06.3 [1 mark]

- not all fossil fuel deposits have been discovered / it is hard to measure deposits deep underground (1)
-

Question 7 (3 marks)

07.1 [3 marks]

- photosynthesis converts carbon dioxide into carbon compounds in plants / algae; if these are buried before decomposing (e.g. forming fossil fuels), the carbon stays locked away rather than being released again by respiration or decay (1)
- dissolving in the oceans: carbon dioxide reacts with water and is used by marine organisms to make shells and skeletons (calcium carbonate), which settle as sediment when the organisms die (1)
- sedimentary rock formation: compressed shells, skeletons and sediment form rock such as limestone, which can lock carbon away for millions of years unless the rock is later weathered or heated (1)

Notes: For the second mark, allow: carbonates were precipitated from the oceans, forming sediments.
