

4.2 Carbon Cycling & Climate Change

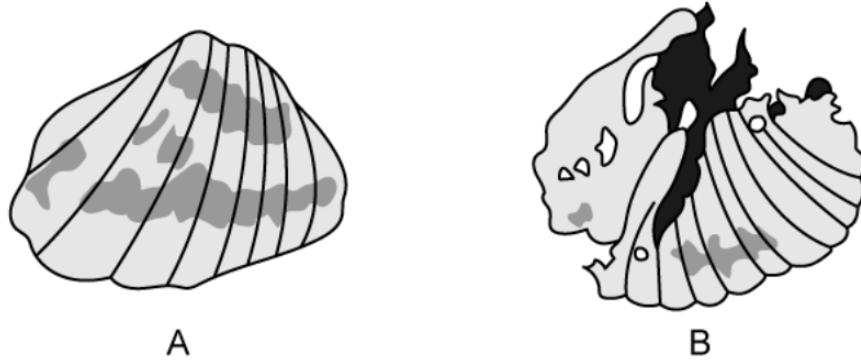
Question Paper

Course	DP IB Biology
Section	4. Ecology
Topic	4.2 Carbon Cycling & Climate Change
Difficulty	Medium

Time allowed: 60
Score: /45
Percentage: /100

Question 1a

- a) The image below shows two shells from marine organisms. Both shells were placed in a saltwater solution for 45 days; shell A at pH 8.5 and shell B at a pH of 7.



Explain the results shown in the image.

[2 marks]

Question 1b

- b) Outline the relevance of increasing atmospheric carbon dioxide levels to the results shown in part (a).

[3 marks]

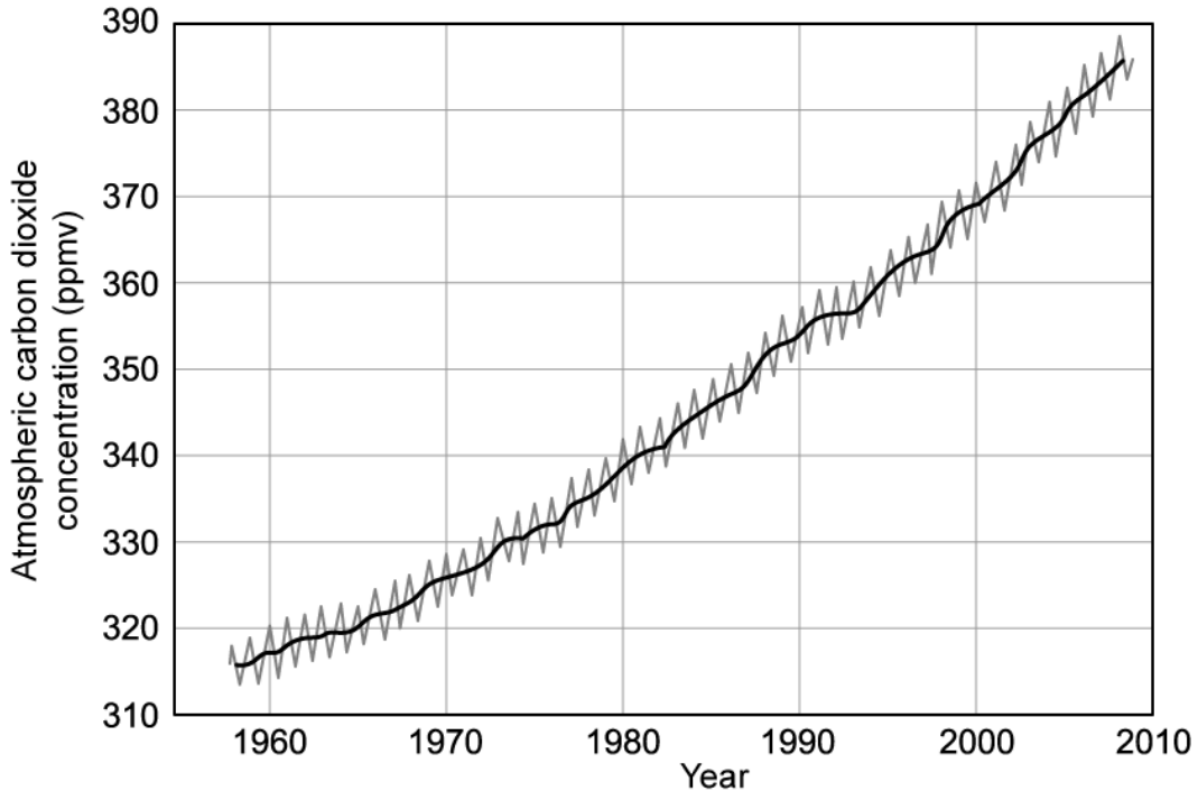
Question 1c

- c) Describe a process that removes carbon dioxide from the atmosphere **other** than that referred to in part **(b)**.

[2 marks]

Question 2a

- a) The graph below shows changes in atmospheric carbon dioxide levels between 1960-2010, recorded at Mauna Loa observatory, Hawaii.



Key: — = Average carbon dioxide concentration per year
 — = Actual carbon dioxide concentration

Estimate the increase in average atmospheric carbon dioxide concentration between 1960 and 2000.

[1 mark]

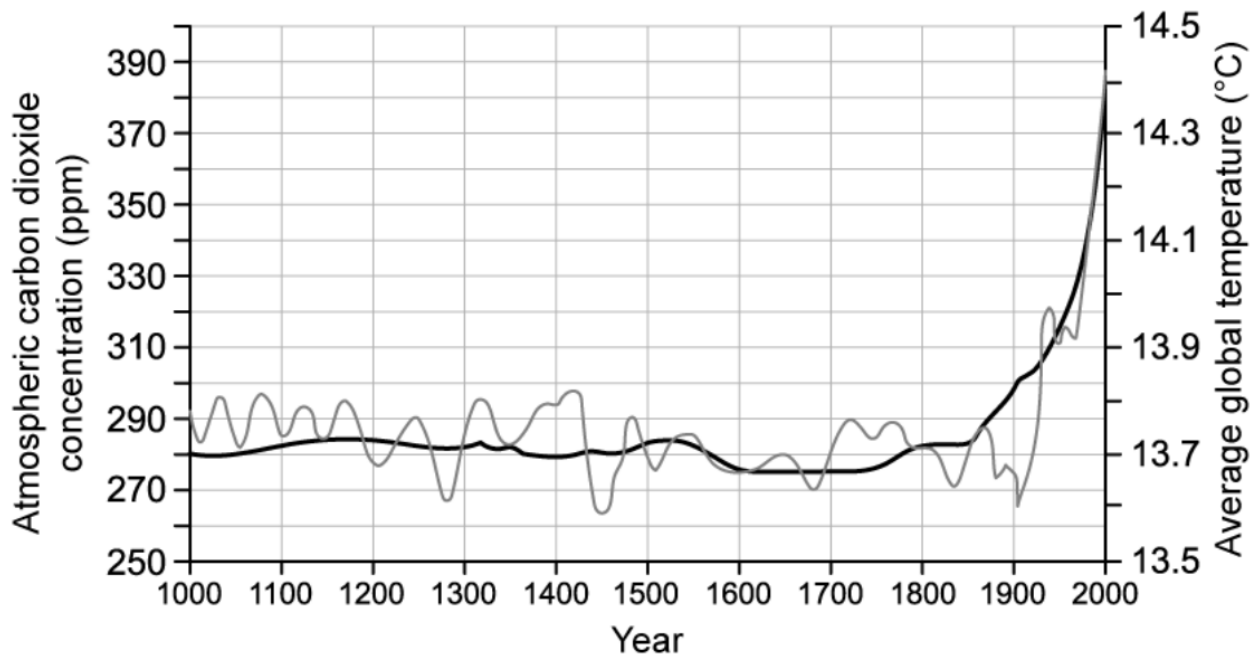
Question 2b

- b) Suggest why yearly fluctuations occur in actual atmospheric carbon dioxide concentration, as seen in the graph in part (a) above.

[2 marks]

Question 2c

- c) In addition to collecting data on atmospheric carbon dioxide levels, scientists also collect data on average global temperatures. Both sets of data between the years 1000 and 2000 are shown together in the graph below.



Key: — = Carbon dioxide — = Temperature

Evaluate the claim that rising global temperatures are caused by rising atmospheric carbon dioxide levels.

[3 marks]

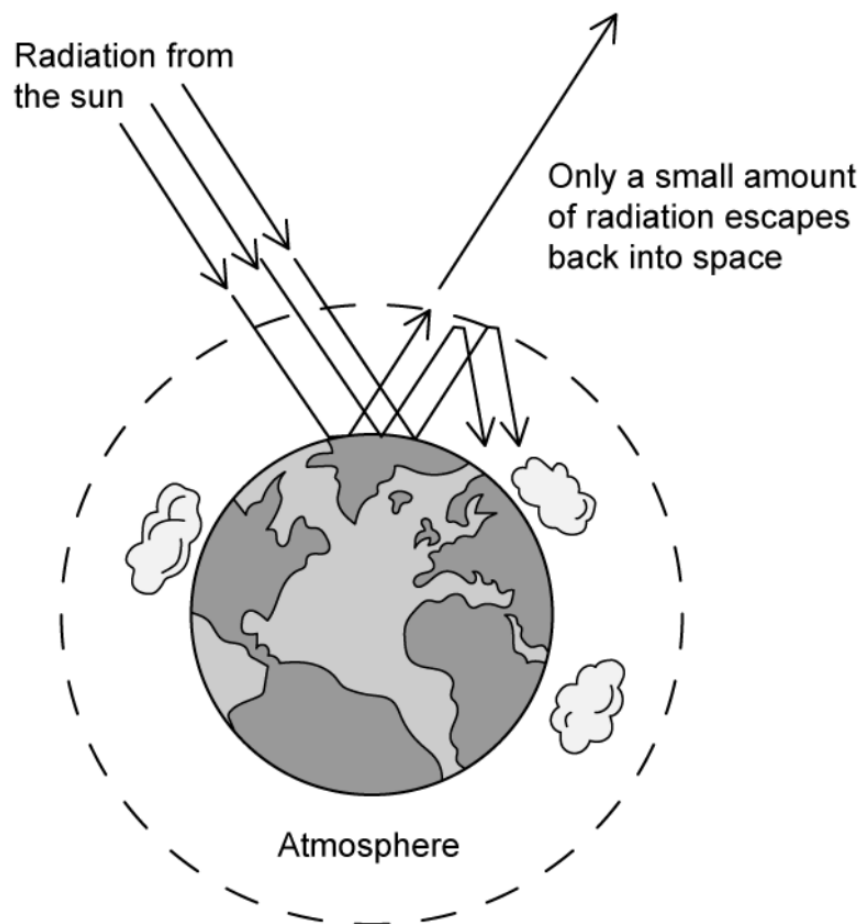
Question 2d

- d) State what the graph shows about the impact of human activities on atmospheric carbon dioxide levels **and** average global temperatures. Note that the industrial revolution began in the mid 1700s.

[1 mark]

Question 3a

- a) The diagram below illustrates the greenhouse effect.



Explain why a higher proportion of the sun's radiation reaches the earth's surface than escapes back into space.

[3 marks]

Question 3b

- b) The table below shows the global warming potential (GWP) of some other greenhouse gases in relation to carbon dioxide.

Gas	GWP over 100 years
Carbon dioxide	1
Methane	21
Water vapour	<0.0005

Methane has more than 80 times the radiation absorbing ability of carbon dioxide. Given that this is the case, explain the GWP value for methane shown in the table above.

[2 marks]

Question 3c

- c) Despite the GWP of water vapour shown in the table in part (a) it has a very powerful short-term warming effect.

Suggest why water vapour has such a strong short-term warming effect.

[1 mark]

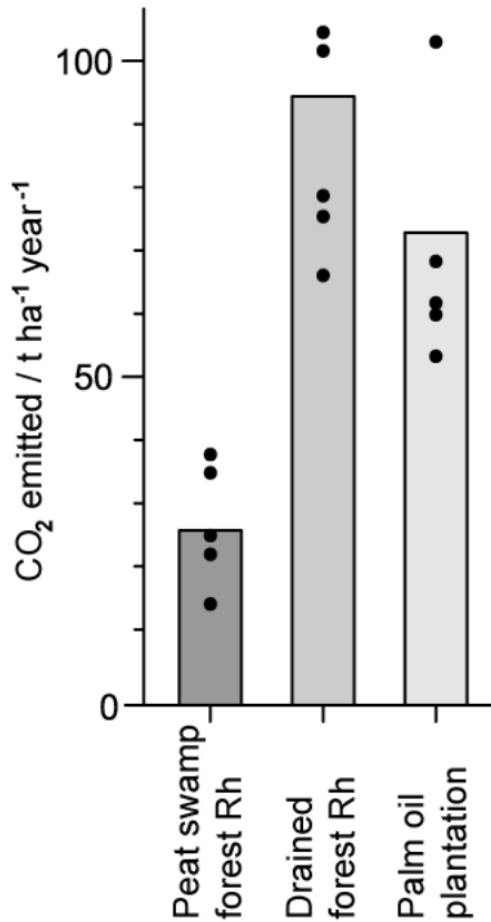
Question 3d

- d) **Other** than the burning of fossil fuels, state **three** sources of atmospheric greenhouse gases.

[3 marks]

Question 4a

- a) A study was carried out on the impact of peat swamp forest drainage for the purpose of planting palm oil plantations on greenhouse gas emissions. Some of the results are shown below. Note that Rh denotes heterotrophic respiration.



Explain the difference in carbon dioxide emissions between peat swamp forest Rh and drained forest Rh.

[3 marks]

Question 4b

- b) A local councillor suggested that the data shows that planting oil palms would go some way to reducing the climate damage caused by draining the peat swamp.

Evaluate this suggestion.

[2 marks]

Question 4c

- c) The study described in part (a) was carried out by analysing the processes taking place in 25 m by 25 m quadrats.

Outline how the researchers could have ensured that their results from quadrat sampling were valid.

[2 marks]

Question 5a

One mark is available for clarity of communication throughout this question.

- a) Draw a labelled diagram of the carbon cycle.

[5 marks]

Question 5b

- b) Outline the impacts of increasing average global temperatures.

[4 marks]

Question 5c

- c) A common claim among people who are skeptical of climate science is that because rates of warming have not been consistent, global warming has in fact slowed down or stopped.

Discuss the factors that should be considered when deciding whether or not a claim such as this is valid.

[6 marks]

