



Climate change: practice questions

8 questions • 26 marks • mark scheme at the back

For IB Diploma Biology, Standard Level and Higher Level (first assessment 2025). **HL only** is additional higher level content, for HL students only.

Name

Total / 26

1 PAPER 1A STYLE [1 mark]

Which is an example of a positive feedback cycle in global warming?

- A. ☐ Increased photosynthesis by trees absorbs more CO₂
- B. ☐ Melting ice exposes darker surfaces that absorb more solar radiation
- C. ☐ Warmer oceans increase upwelling of nutrients
- D. ☐ More cloud reflects sunlight back into space

2 PAPER 1A STYLE [1 mark]

What is the cause of coral bleaching?

- A. ☐ Ocean acidification dissolving coral skeletons
- B. ☐ Microplastics blocking coral polyps
- C. ☐ Increased water temperature causing corals to expel their symbiotic algae
- D. ☐ Reduced upwelling of nutrients

3 PAPER 1B STYLE

[5 marks]

The table shows the annual mean concentration of atmospheric carbon dioxide measured at Mauna Loa Observatory, Hawaii (values rounded to the nearest ppm). (a) Calculate the percentage increase in CO₂ concentration from 1960 to 2020. [2] (b) Compare the rate of increase between 1960-1980 and 2000-2020. [1] (c) Outline two anthropogenic causes of the increase. [2]

Annual mean atmospheric CO ₂ concentration at Mauna Loa (NOAA data)	
Year	CO ₂ concentration / ppm
1960	317
1980	339
2000	370
2020	414

Answer =

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4 PAPER 2A STYLE

[3 marks]

Explain how early breakout of landfast ice threatens emperor penguins.

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PAPER 2B STYLE

Explain how climate change could cause boreal forests to change from net carbon accumulation to net carbon loss.

[illegible]

PAPER 2A STYLE

Explain how warmer surface water can reduce energy flow through marine food chains.

[illegible]

PAPER 2A STYLE

HL only

Using the example of great tits and caterpillars in north European forests, explain how climate change can disrupt the synchrony of phenological events.

[illegible]

HL only

Explain how reduced snow cover has caused evolution in the tawny owl (*Strix aluco*).

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Mark scheme

One mark for each point unless a maximum is given. Words in brackets are not needed for the mark.

1. [1]

B B [1]

2. [1]

C C [1]

3. [5]

- (a) $(414 - 317) \div 317 \times 100$ [1]
- (a) 30.6% / 31% [1]
- (b) rate doubled / 22 ppm per 20 years in 1960–1980 compared with 44 ppm per 20 years in 2000–2020 [1]
- (c) combustion of fossil fuels, e.g. coal / oil / natural gas [1]
- (c) deforestation / burning of forests, reducing CO₂ uptake and releasing CO₂ [1]
- (c) cement production [1]
- max 5

4. [3]

- emperor penguins breed on landfast ice / ice attached to the coast [1]
- chicks need stable ice until they have grown waterproof feathers [1]
- early breakout causes chicks to drown / die of cold [1]
- breeding grounds lost / breeding fails / population falls [1]
- max 3

5. [6]

- boreal forests / taiga currently store more carbon than they release / carbon sink [1]
- warmer temperatures [1]
- decreased winter snowfall / less spring meltwater [1]
- increased incidence of drought [1]
- reduced primary production / less photosynthesis so less CO₂ absorbed [1]
- forest browning / trees die [1]
- more frequent and intense forest fires [1]
- combustion of legacy carbon / old soil organic matter releases CO₂ [1]
- positive feedback: released CO₂ causes further warming [1]
- this is a tipping point / change becomes self-sustaining OWTTE [1]
- max 6

6. [3]

- warm surface water forms a stable layer that does not mix with deeper water [1]
- prevents upwelling of nutrients / nitrate / phosphate to the surface [1]
- phytoplankton growth / ocean primary production decreases [1]
- less energy available to consumers such as fish / seabirds [1]
- max 3

7. [4] HL only

- phenology is the timing of biological events [1]
- caterpillar emergence / peak biomass is cued by temperature / leaf budburst [1]
- great tit breeding / laying date relies partly on photoperiod / changes less [1]
- warmer springs make caterpillar peak earlier [1]
- chicks hatch after the peak food supply / mismatch [1]
- fewer chicks survive / lower breeding success [1]
- max 4

8. [3] HL only

- tawny owls have heritable grey and brown colour variants [1]
- grey owls had higher survival / fitness in snowy winters (better camouflaged) [1]
- with less snow, brown owls have higher fitness than before / survive and reproduce more [1]
- frequency of brown owls / allele for brown colour increases in the population [1]
- max 3