Exam Papers Practice

4.2 Carbon Cycling & Climate Change

Mark Schemes

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

Exam Papers Practice

To be used by all students preparing for DP IB Biology HL
Students of other boards may also find this useful

1

The correct answer is **B**

As noted in statement I, plants fix carbon during photosynthesis, converting it into organic molecules such as carbohydrates.

While terrestrial plants gain carbon dioxide by diffusion into their stomata from the air, aquatic plants gain it by direct diffusion into their cells from the water, as noted in statement II.

Statement III is incorrect; carbonic acid dissociates into hydrogen carbonate ions and H^+ ions **reducing** the pH of water rather than raising it.

2

The correct answer is **B** because all statements are conclusions that can be drawn directly from the data with no additional information required.

A, **C** and **D** all contain incorrect statements:

The statement about seasonal changes in photosynthesis may be factually accurate, but the graph contains no information about photosynthesis, so this cannot be concluded directly from the data.

It is not possible to conclude that carbon dioxide levels **are** increasing; we may know this to be true, but the graph only provides data up until 2010

Average carbon dioxide levels do not increase in a linear fashion; the light grey line is not straight, but shows larger increases in some years than others.

Exam Papers Practice

3

The correct answer is **D** because accurate, quantitative data enables trends to be identified

A, B and **C** are all relevant pieces of research, and information on levels of atmospheric carbon dioxide may form part of a body of evidence that scientists can gather on each of these topics. Gathering CO_2 data alone however will not enable identification of **sources** of greenhouse gases or of **direct** impacts of deforestation. This data alone will also not **prove** that human activities are responsible for climate change.

4

The correct answer is **A**. Drained peat bogs are no longer waterlogged and anaerobic, allowing saprotrophs to break down the organic matter and release the stored carbon when they respire.

B implies that peat stores carbon in the form of a gas trapped underground; carbon in peat is stored in the form of organic molecules inside dead plant material.

C may occur, and could lead to the release of the carbon stored in surface vegetation on the peat bog should the grazers die and decompose, but the carbon stored in surface vegetation is only a tiny fraction of the carbon stored under the surface in peat.

D is incorrect as it implies that plants extract carbon from the soil in the same way that they gain minerals such as nitrates; plants gain their carbon by diffusion from the air or water around them, not from the soil.

5

The correct answer is **D**; greenhouse gases absorb mainly longwave radiation, which is the type of radiation re-emitted by the earth.

A, B and **C** are not scientifically accurate statements.

Exam Papers Practice

6

The correct answer is **B**; the impact of a gas on the greenhouse effect depends on its ability to absorb radiation and its relative abundance in the atmosphere.

A and **D** are incorrect because neither is the **only** factor involved.

C is incorrect because while all three of these factors are relevant, atmospheric lifetime is only important because it affects the atmospheric concentration of a gas; it is therefore effectively repeating the same factor twice to include both in the list.

7

The correct answer is **C** because neither of statements I or II are directly related to global warming.

A, B and **D** all contain either statement I, II, or both.

- The depletion of ozone in statement I results from the emission of gases such as CFCs, not from increasing global temperatures.
- Ocean acidification in statement II results from increasing concentrations of atmospheric carbon dioxide, so while it shares a cause with global warming, it is not caused **by** global warming. Be careful not to confuse this with coral bleaching which can be caused by global warming.

Exam Papers Practice

8

The correct answer is **C** because the graph shows a clear correlation; as one variable shows an overall increase beginning in the mid 1700s, so does the other.

A, B and **D** all contain causal statements which cannot be concluded from the graph and would require more evidence to support them.

- Note that both **A** and **D** are considered to be correct, but more evidence than just this graph is required to reach these conclusions.

9

The correct answer is **C** because all of the statements are important considerations when assessing scientific claims.

A, **B** and **D** all contain at least one incorrect statement:

- One particular extreme weather event on its own cannot provide evidence of climate change, but must be considered in the light of other weather events and whether or not it forms part of a trend
- Scientific research must be **peer reviewed**, that is reviewed by other **scientists** in the same field; this ensures that the method used and the interpretation of results is valid. Journalists may well be knowledgeable and should ask questions, but they are unlikely to have the same level of expertise as scientific professionals
- The accumulated wealth of an individual does not affect their ability to carry out high quality research or assess the quality of the research of others; it is the potential for their finances to be affected by the outcome of research that is important

10

The correct answer is **D** because this contains the correctly named processes for each stage.

A is incorrect because it incorrectly identifies stage I as fossilisation and stage IV as decomposition

B is incorrect because it identifies stage II as absorption and stage III as photosynthesis. While stage II does involve absorption of carbon dioxide, the process that transfers carbon from an inorganic to an organic form is photosynthesis.

C is incorrect because it again identifies stage II as absorption and stage III as photosynthesis, while also identifying stage IV as decomposition.

Exam Papers Practice