WORKBOOK

PEARSON EDEXCEL A-LEVEL

Geography 1

PHYSICAL GEOGRAPHY

- Tectonic processes and hazards
- Glaciated landscapes and change
- Coastal landscapes and change
- The water cycle and water insecurity
- The carbon cycle and energy security

- ✔ Confidently prepare for assessment with exam-style questions
- ✔ Online answers to every question

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Topic 6 The carbon cycle and energy security

How does the carbon cycle operate to maintain planetary health?

The main features of the carbon cycle should be familiar to you from GCSE science. For A-level geography there will be several areas with new terminology, which makes it potentially complex and a barrier to understanding, so compiling a glossary is recommended. Try to think about the relative sizes of stores and flows, and build up a mental map to help you evaluate information when required. This topic includes many complex social, economic and geopolitical links to other aspects of geography.

The carbon cycle operates at different spatial and temporal scales. Different physical processes control the movement of carbon between stores on land, in the oceans and in the atmosphere. Biological processes sequester carbon both in the oceans and on land, tending to operate as a 'fast' cycle. Phytoplankton and terrestrial primary producers sequester atmospheric carbon during photosynthesis. Biological carbon can be stored as dead organic matter either on the ocean floor or in the soil.

A balanced carbon cycle is important. However, the burning of fossil fuels is a persistent and controversial issue, with little global agreement on how to deal with the problems it brings.

Practice questions

1 List **three** rocks that store carbon.

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2 Describe the difference between a store and a flux.

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3 Name two factors controlling the movement of carbon within the oceans.

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4 What is meant by the process of sequestration?

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12 Study Table 6.1, which shows a sample of carbon fluxes.

Table 6.1

Flux	Rate (PgC per year)
Photosynthesis	103
Respiration	50
Volcanic eruption gases	50
Diffusion from ocean	9.3
Vegetation to soil decomposition	5
Weathering and erosion	0.9
Sedimentation/fossilisation	0.2

a Calculate the percentage difference in fluxes between weathering and erosion and photosynthesis.

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b If these data were plotted as a bar chart, explain **one** difficulty with completing the plot.

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Worked example

There is a very large range of rates in this table of carbon fluxes — from 0.2 to 103. This would make the plotting of any bars problematic because the lowest values (0.5–5 PgC/yr) would be so small as to be unreadable against a scale that went from 0 to 105 on a piece of linear graph paper.

Logarithmic paper can be used when there is a wide range of values on a graph. You sometimes see graphs plotted as log graphs (along the *x*-, *y*- or both axes) as part of A-level geography exams.

13 Complete Table 6.2 to show the four main stores of carbon, and state the form of carbon present in each store. An example has been completed for you.

Table 6.2

Name of carbon store	Form of carbon present
Ocean	Dissolved inorganic carbon and carbon dioxide

14 Explain the link between carbon sequestration and photosynthesis.

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10 Study Figure 5.1.

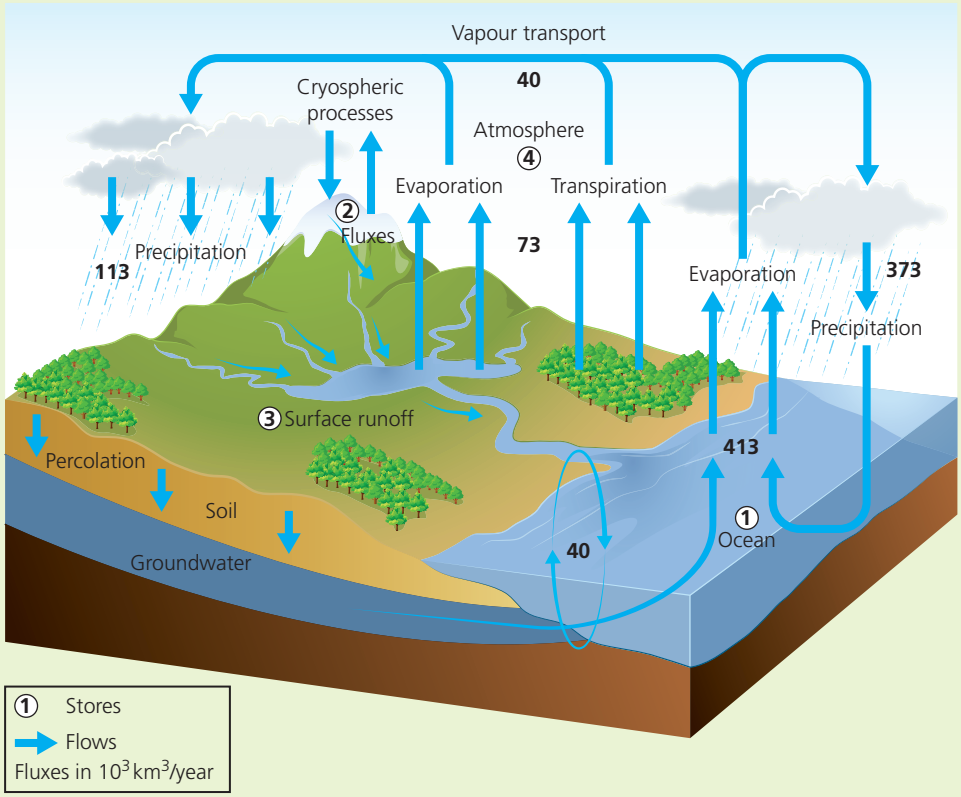

Figure 5.1

a Calculate the total flows from precipitation.

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b Describe **two** problems with this diagram.

Worked example

Firstly, the diagram does not have values for all the different flows, for example evaporation and transpiration. There are also no values for percolation, soil flows, etc.

A second problem is that the stores are identified but there is no indication of their relative size or scale. This means that making judgements about their importance, for example, is difficult to do since we cannot see their spatial extent.

A third issue is that this model is generalised and figures need to be seen as 'best guesses' rather than absolute data, since at this scale the flows and stores can only be modelled and estimated rather than actually measured to give empirical data.

There is no indication of the relative sizes of stores, so making judgements about scale or importance of these different components is difficult.

The global water cycle is a model of how scientists expect the system to work. It is very much a simplification of reality, with numbers provided as a rough guide. This is useful knowledge if you are ever asked to assess, judge or analyse information such as this.

11 What are the **three** largest stores in size order?

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Exam-style questions

1 Study Figure 5.6, which shows the converging costs of supplying fresh and desalinated water in the USA.

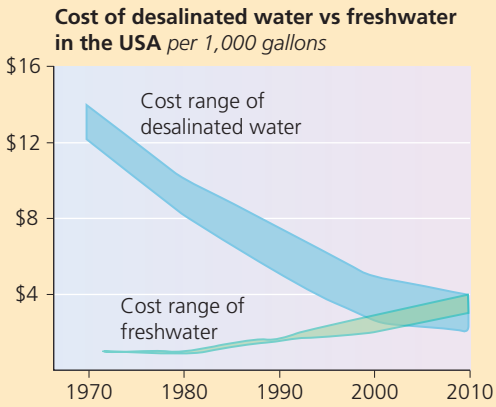

Figure 5.6

a Explain **one** reason why the two cost curves are converging. (AO1, AO2) **3 marks**

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b Explain why land use changes can increase flood risk. (AO1) **6 marks**

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c Explain why, at a global scale, the price of water can vary in different places. (AO1) **8 marks**

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