a-level exam questions & answers:

water & carbon cycles (section a) >

4-mark assorted questions (AO1)

References:

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This document is available both as a pdf and editable word document – from the water and carbon cycles topic page - which can be printed.

1) Outline factors driving change in magnitude of water stores.
Water & Carbon Cycles >> 3.1.1.2 Water/Hydrological Cycle

2) Explain the role of dynamic equilibrium in the water cycle
Water & Carbon Cycles >> 3.1.1.2 Water/Hydrological Cycle

I'm an A-Level past paper question! AQA

3) Explain the role of cryospheric change in the water cycle.
Water & Carbon Cycles >> 3.1.1.2 Water/Hydrological Cycle

4) Outline potential impacts of farming practices upon the water cycle
Water & Carbon Cycles >> 3.1.1.2 Human Impacts on Water Cycle

5) Explain the concept of feedback loops in relation to the carbon cycle
Water & Carbon Cycles >> 3.1.1.3 Factors driving change in Stores & Carbon Cycle

6) Outline the relationship between water & carbon cycles in our atmosphere
Water & Carbon Cycles >> 3.1.1.4 Water, Carbon & Life On Earth

7) Describe different strategies to mitigate the impacts of climate change
Water & Carbon Cycles >> 3.1.1.4 Water, Carbon & Life On Earth

writing tips & tricks:

These questions are answered purely on AO1 – meaning demonstrating knowledge and understanding of places, environments, concepts, processes, interactions, and change, at a variety of scales.

In recent years, the A-Level specification has changed from having 4 X 1-mark multiple choice questions to a single 4-mark answer. The key to answering these is being very concise and accurate when writing. Make and if necessary, elaborate on your points in the answer – either four distinct points, or two and explain them in more detail.

THINK! Can I see four marks in my answer? Is there enough content?

Remember to use the question command word – what is it asking? If describe, say what you know. If explain, focus on how something is occurring. If outline, break down key points from the subtopic etc…

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V1.3, last updated 13.5.22

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water & carbon cycles (section a) >

mark scheme | 4-mark assorted questions (AO1)

version stage v1.2, last updated 13.5.22

Q.:	Sp. Ref.:	Information For Markers:	B'down:	Marks:
1	3.1.1.2	Outline factors driving change in magnitude of water stores. **Point marked** Allow (1) mark for each valid point with additional marks for developed points (d). **Notes for answers** • Water stores can be changed by a number of factors and over different time periods, including: • (Rates of) Evaporation - involving turning a liquid to a gas (1) – e.g. when energy from the sun hits a body of water. (d) These rates can depend on solar energy (d), humidity (d), and temperature of the air surrounding. (d) • Condensation is the conversion of a vapour or gas in the atmosphere to liquid (1) – air is cooled and converted into droplets which then fall onto the ground and either flow into the hydrosphere or infiltrate into the lithosphere (d). • Precipitation / Rainfall / Drought can affect the levels of relative stores of water in the shorter term (1) – this, for example, is the main input into drainage basin systems. (d) • Cryospheric processes and fluctuations involve levels of water held within ice and snow (1) – this is one of the largest stores. (d) Increasing levels of ice melt have slowly depleted these supplies, usually melting into the hydrosphere. (d) For full marks, minimum of two processes explained in detail (+2 d mark each), three processes of which one in detail (+1 d), or four processes outlined briefly (+0 d marks. Credit may also be given for factual statements of changes observable, such as 'typically higher rates of evaporation will lead to greater stores of water in the atmosphere, and less in the hydrosphere whilst increased precipitation incur the opposite.' (1)	AO1= 4	4
2	3.1.1.2 AQA	**Explain the role of dynamic equilibrium in the water cycle.** **Point marked** Allow (1) mark for each valid point with additional marks for developed points (d). **Notes for answers** • Dynamic equilibrium refers to the tendency towards a natural state of balance within the hydrological cycle (1)		

		• The cycle is a closed system as no water enters or leaves the system; it is simply recycled around the system (d) (1). • The drainage basin element of the hydrological cycle is an open system where the inputs and outputs can change (d) (1). • The dynamic equilibrium is easily upset by extreme events such as storms or droughts (1). • Human activity can also cause disruption to the dynamic equilibrium, eg by modifying the drainage basin (1). • This causes disruption or interference to the dynamic equilibrium and is evidenced through flooding for example (1). • Such events and processes cause sudden changes in the state of the system and disrupt or interfere with dynamic equilibrium as is the case with flooding (1) No credit for straight reversals.		
3	3.1.1.2 AQA	**Explain the role of cryospheric change in the water cycle.** **Point marked** Allow (1) mark for each valid point with additional marks for developed points (d). **Notes for answers** • Cryospheric change has a regulatory role in sea levels (1). • The cryosphere is a major store of water (1). • In a period of cooling (glacial period) the cryosphere will grow in size (1). • This is because the water cycle is slowed considerably as the ice restricts the return of the water to the sea and ocean (d) • In a period of warming the cryosphere will add water to the cycle (1). As the water cycle restarts more of the ice melts and returns water to the sea (d). • This increased the size of ocean store causing sea levels to rise through increased volumes of water (1) and thermal expansion (d). • Consideration of changes in permafrost is also valid (1).		
4	3.1.1.3	**Outline potential impacts of farming practices upon the water cycle.** **Point marked** Allow (1) mark for each valid point with additional marks for developed points (d). Notes for answers • Farming (particularly larger scale or industrial) can have significant impacts on flows, transfers and stores of water. (1) • (As an example) Irrigation for plants can lower channel levels in rivers (1), together with groundwater levels if underground wells are the source for the irrigation through excessive water abstraction (d)		

		• Farming practices may also involve changing land use, for example through deforestation (1) (and an increase in smaller, lower lying vegetation such as grasses) – this leads to more rainfall reaching ground level, easily saturating soil and causing higher levels of infiltration and runoff. (d) In the long term, this washes away soil and reduces transpiration which over time causes less precipitation (1) – local river systems may dry up as a result. (d) Credit should also be given for the implementation of appropriate case study examples, for example in India or Cape Town, South Africa.		
5	3.1.1.4	**Explain the concept of feedback loops in relation to the carbon cycle.** **Point marked** Allow (1) mark for each valid point with additional marks for developed points (d). **Notes for answers** • Feedback loops can either be positive (multiplying) or negative (dampening / trying to return to dynamic equilibrium) (in the carbon cycle.) (1) An example of an obvious positive feedback loop that many students may include: • Increasing levels of atmospheric CO_2 causes increased temperatures (as carbon is a greenhouse gas which blocks solar radiation leaving our atmosphere) (1) – leading to global warming, which in turn leads to higher rates of sea ice / tundra permafrost melting (an important store of carbon) into the atmosphere (thus increasing CO_2 level further) (d) An example of an obvious negative feedback loop that many students may include: • Levels of carbon increase slightly, about 33% of which is regulated into the oceans (1) – here it is dissolved within water and circulated, thus joining the slow carbon cycle, reducing atmospheric carbon levels (d) (this is known as the ocean solubility pump) (d) Credit any further relevant examples given by students. Both positive and negative feedback loops need to be at least referenced in example for (1) point each minimum for a candidate to score full marks.		
6	3.1.1.4	**Outline the relationship between water & carbon cycles in our atmosphere.** **Point marked** Allow (1) mark for each valid point with additional marks for developed points (d).		

		Notes for answers There are numerous and significant feedbacks between water and carbon cycles in our atmosphere: • High levels of carbon lead to snow and ice melting (also permafrost) (1) which exposes dark ocean (or marshland) during the summer. (Snow cover on land is also decreasing annually.) These are often stores of (cryospheric) carbon which is released into the atmosphere thus increasing global warming further (a positive feedback of melting and carbon.) (d) • (Water) vapour is a strong greenhouse gas, the relative abundance of water in the atmosphere means it causes around two-thirds of greenhouse warming. (1) As temperatures rise, more vapour evaporates into the atmosphere as clouds – further rising temperatures. (d) • Carbon dioxide and water are released via anthropogenic (human) activity / industry into the atmosphere (1) – which acts as a catalyst for more carbon to be released (e.g. through melting) and more water to evaporate (e.g. in areas of drought) (d) Credit any further examples given – this is a non-exhaustive list.		
7	3.1.1.4	**Describe different strategies to mitigate the impacts of climate change.** **Point marked** Allow (1) mark for each valid point with additional marks for developed points (d). **Notes for answers** • (The key to this question is the term 'mitigate.') This refers to means to reduce or prevent the effects of climate change from happening. (1) • Using alternative renewable energy sources (1) such as solar, wind or hydroelectric power (HEP) can reduce the reliance on hydrocarbons / fossil fuels – less carbon into the atmosphere (d) • Carbon capture and storage (ccs) can remove up to 90% of harmful pollutants from power stations (1), storing it underground or in deep ocean – (thus joining slow carbon cycle.) (d) • Afforestation / planting trees – which act as a natural carbon sink / absorb carbon (1) • International agreements (such as the 2005 Kyoto Protocol) became international law. (1) Mandating countries to act and pledge to reduce their overall carbon emissions (d) This list is not exhaustive, and students are able to critique techniques for marks, though this strategy wasn't often seen as only four marks are available. At least two strategies explained or three mentioned for full marks.		