GEOGRAPHY GCE A LEVEL PHYSICAL GEOGRAPHY UNIT 1

Title of Unit	**Year Group**	**Term**	**Duration**	**Assessment Outcomes**
• Water and Carbon Cycles	12	September to January Year 1	16 weeks	**Resources:** **AQA Geography, Ross et al, chapter 1** **AQA Geography, Skinner et al, chapter 1** **www.coolgeography.co.uk** **www.timeforgeography.co.uk**

3.1.1 Water and Carbon Cycles 3.1.1.1 Water and Carbon Cycles as Natural Systems 3.1.1.2 The Water Cycle 3.1.1.3 The Carbon Cycle 3.1.1.4 Water, carbon, climate & life on Earth 3.1.1.5 Quantitative and qualitative skills 3.1.1.6 Case Studies	**Unit Map – Approximately 32 lessons** • Water cycle Systems, frameworks & their applications • The Water cycle • The River Ouse Case Study • The carbon cycle • Water, carbon, climate and life on earth • The Amazon Tropical Rainforest Case Study

Objectives Framework Sub-strands	**Sequence of Learning**	
Systems in physical geography: systems concepts and their application to the water and carbon cycles inputs – outputs, energy, stores/components, flows/transfers, positive/negative feedback, dynamic equilibrium.	**Introduction:** • Concept of a systems approach to physical geography • Inputs and outputs • Energy transfers • The major stores and components • Flows and transfers including their variability • Concept of positive and negative feedbacks plus dynamic equilibrium	This part of the specification is theoretical so illustrate with examples as much as possible. Students will struggle with the interdependence of one part and its influence on other parts. They need to be able to sequence an explanation of which parts influence other parts and the variabilities within the water cycle. The concept of positive and negative feedback will confuse most students; for most, a realisation that feedbacks exist will be a win, an accurate description of the feedback mechanism will get them through. Expect confusion about exactly what is a positive/negative feedback mechanism. Take a similar approach for both the water cycle and the carbon cycle but it is easier to teach carbon cycle concepts with the other carbon cycle topics This is also fertile ground for 4-mark questions in the exam e.g. Outline energy transfers in the water cycle or outline water transfers on a slope. Outline the role of soil in the carbon cycle or outline the processes of natural sequestration in the carbon cycle Allow approximately 2 weeks

GEOGRAPHY GCE A LEVEL PHYSICAL GEOGRAPHY UNIT 1

Global distribution and size of major stores of water – lithosphere, hydrosphere, cryosphere and atmosphere. **Processes driving change in the magnitude of these stores over time and space, including flows and transfers: evaporation, condensation, cloud formation, causes of precipitation and cryospheric processes at hill slope, drainage basin and global scales with reference to varying timescales involved.** **Drainage basins as open systems – inputs and outputs, to include precipitation, evapo transpiration and runoff; stores and flows, to include interception, surface, soil water, groundwater and channel storage; stemflow, infiltration overland flow, and channel flow.** **Concept of water balance. Runoff variation and the flood hydrograph. Changes in the water cycle over time to include natural variation including storm events, seasonal changes and human impact including farming practices, land use change and water abstraction.**	Sequentially teach the major stores • **Lithosphere** • **Hydrosphere** • **Cryosphere** • **Atmosphere**	The AO1 part of this is what are the major stores, their size (relative and absolute) but the more challenging aspect is to apply a systems approach so that the variability on one influence one or more of the others. Many students find this difficult as they tend to look at individual parts and processes rather than see the big picture. Look to develop sequencing skills and synoptic comments/view where possible as these are an easy way of accessing level 3 on the examination papers. A good tester is to ask the students to explain how base flow changes during a storm event. (Most can do this for peak discharge) Again, in isolation, these parts of the specification are an opportunity to set 4-mark questions e.g., Outline the role of the cryosphere in the water cycle. In addition, start looking for opportunities to set the ubiquitous “Analyse the data” question. These are the only AO3 marks available in papers 7037/1 and 7037/2. Analyse the data questions have no marks for explanation and are all levels marked. Data manipulation is the quick route into L2. Questions from this section are more likely to test understanding as well as knowledge so look for the opportunity to explain and sequence. There are 20-mark opportunities here, for example “Assess the relative importance of human influences on a named drainage basin” Allow approximately3 - 4 weeks (to around half term)
Case study of a river catchment(s) at a local scale to illustrate and analyse the key themes above, engage with field	The variabilities of a river’s regime	Good examples to use include the River Eden or River Ouse (Yorkshire). Whilst there are decent fieldwork opportunities, these are difficult to find in the managed East Anglian rivers.

data and consider the impact of precipitation upon drainage basin stores and transfers and implications for sustainable water supply and/or flooding.	• Precipitation patters including antecedent rainfall/snow melt • Geology • Drainage density • Upland land use • Urban areas • Drainage modification • Hard/soft engineering	Specification states local river catchment but it is useful to use the Amazon to help illustrate the TRF case study. There are two approaches either do the rivers part with the water cycle and then the Amazon carbon cycle or take a rounded approach and do both together as per the specification at the end of the unit. There is a 20-mark opportunity here with for example "To what extent are physical factors more important than human factors in determining the impacts of flooding". Allow approximately 1 -2 weeks for the local river catchment
Global distribution, and size of major stores of carbon – lithosphere, hydrosphere, cryosphere biosphere, atmosphere. Factors driving change in the magnitude of these stores over time and space, including flows and transfers at plant, sere and continental scales. Photosynthesis, respiration, decomposition, combustion, carbon sequestration in oceans and sediments, weathering. **Changes in the carbon cycle over time, to include natural variation (including wildfires, volcanic activity) and human impact (including hydrocarbon fuel extraction and burning, farming practices, deforestation, land use changes). The carbon budget and the impact of the carbon cycle upon land, ocean and atmosphere, including global climate.**	Sequentially teach the major stores • **Lithosphere** • **Hydrosphere** • **Cryosphere** • **Atmosphere**	This one the students find conceptually difficult as they have little previous holistic understanding. There are various approaches to consider, relative size of stores, rates of natural transfer plus anthropogenic factors. Burning fossil fuels and deforestation the most obvious but agriculture (pastoral in HIC and rice farming in some LIC release significant amounts of methane (CH4). Quite a lot of students tend to overlook sequestration either natural or anthropogenic. As before many will confuse positive and negative feedback mechanisms. As for the water cycle, there are plenty of 4-mark question opportunities here e.g., "Outline the role of the cryosphere in the carbon cycle." Likewise, there are plenty of analyse type opportunities available using carbon cycle data over time. Allow approximately 3 - 4 weeks (aim to complete by early December)
The key role of the carbon and water stores and cycles in supporting life on	**This part of the specification is about processes**	There are some good video clips on the BBC for this one, see Iain Stewart's series e.g. The Power of the Planet". Once the basic are covered and understood, look to link water and carbon. Students will be tested by

GEOGRAPHY GCE A LEVEL PHYSICAL GEOGRAPHY UNIT 1

Earth with particular reference to climate. The relationship between the water cycle and carbon cycle in the atmosphere. The role of feedbacks within and between cycles and their link to climate change and implications for life on Earth. Human interventions in the carbon cycle designed to influence carbon transfers and mitigate the impacts of climate change.	• **Stores** • **Cycles** • **Links between water and carbon cycles**	feedback, be aware. There is plenty of material on Rio, Paris, and Glasgow. Be aware of the students who confuse carbon dioxide and ozone layers; they are not the same. Possible questions. Outline the role of tectonic processes in the carbon cycle (4 marks) Explain feedback mechanisms in the carbon cycle. (6 marks) “Assess the relative importance of anthropogenic and natural carbon sequestration.” (20 marks) “Assess the relative importance of carbon dioxide and water in climate change.” (20 marks) Allow approximately 4 weeks
Case study of a tropical rainforest setting to illustrate and analyse key themes in water and carbon cycles and their relationship to environmental change and human activity.	**The Amazon is the most obvious case study but there are others which will also work.** **Think how human activity Has caused/accelerated changes in the water and carbon cycles plus how this has impacted or will impact on the rainforest.**	This is an opportunity to bring the theory together in a single, large scale case study. Where possible think synoptically e.g., Deforestation in the Amazon has twice the impact on natural carbon sequestration as that in the UK because TRF has twice the NPP of temperate forest in Europe. Also look to sequence explanation and be able to illustrate in detail. Exam questions tend to be on one or the other cycles but to allow cross over of points by way of illustration. For example, deforestation in the Amazon will decrease evapotranspiration which will dry out tropical soils releasing stored CO2. In turn, this will raise temperatures and further dry out soils which will lower river base flow as there will be less groundwater. Allow approximately 1-2 weeks