Personalised Learning Checklist

	Met this in lesson	Rewritten classnotes	Completed given tasks well	Need further practice	Understand it well	Applied knowledge to exam questions	Reviewed after 3 weeks	Reviewed after 6 weeks	Reviewed after 12 weeks	I am exam ready
3 Physical Systems and Sustainabilty										
6 Carbon Cycle and Energy Security										
1. How does the carbon cycle operate to maintain planetary health?										
Describe the biogeochemical carbon cycle consisting of carbon stores of different sizes (terrestrial, oceans and atmosphere), with annual fluxes between stores of varying size (measured in Pg/Gt), rates and on different timescales.										
Describe and understand the production of the earth's geological carbon.										
Know how how carbon is released in to the earth's atmosphere through volcanic out-gassing at ocean ridges/subduction zones and chemical weathering of rocks.										
Explain how phytoplankton equester atmospheric carbon during photosynthesis in surface ocean waters; carbonate shells/tests move into the deep ocean water through the carbonate pump and action of the thermohaline circulation.										
Explain how terrestrial primary producers sequester carbon during photosynthesis; some of this carbon is returned to the atmosphere during respiration by consumer organisms.										
Describe how biological carbon can be stored as dead organic matter in soils, or returned to the atmosphere via biological decomposition over several years.										
Explain how the greenhouse effect is impluenced by the concentration of atmospheric carbon (carbon dioxide and methane), which then determines the distribution of temperature and precipitation.										
Understand the role that ocean and terrestrial photosynthesis plays in regulating the composition of the atmosphere.										
Explain that soil health is influenced by stored carbon, which is important for ecosystem productivity.										
Explain how and why the process of fossil fuel combustion has altered the balance of carbon pathways and stores with implications for climate, ecosystems and the hydrological cycle.										
2. What are the consequences for people and the environment of our increasing demand for energy?										
Define and understand energy consumption (per capita and in terms of units of GDP) and energy mix (domestic and foreign, primary and secondary energy, renewable versus non-renewable).										
Explain why access to/consumption of energy resources depends on physical availability, cost, technology, public perception, level of economic development and environmental priorities. (See: national comparisons USA versus France).										
Describe the roles of energy players (P: role TNCs, The Organisation of the Petroleum Exporting Countries (OPEC), consumers, governments) in securing pathways and energy supplies.										
Discuss (and give examples of) the mismatch between locations of conventional fossil fuel supply (oil, gas, coal) and regions where demand is highest, resulting from physical geography.										
Understand that energy pathways (pipelines, transmission lines, shipping routes, road and rail) are a key aspect of security but can be prone to disruption especially as conventional fossil fuel sources deplete. (See: Russian gas to Europe).										
Discuss the social costs and benefits of the development of unconventional fossil fuel energy resources (tar sands, oil shale, shale gas, deep water oil). (See: Canadian tar sands, USA fracking, Brazilian deep water oil). Refer to the role of business vs environmental groups and affected communities).										
Discuss the implications for the carbon cycle of the development of unconventional fossil fuel energy resources (tar sands, oil shale, shale gas, deep water oil). (See: Canadian tar sands, USA fracking, Brazilian deep water oil). Refer to the role of business vs environmental groups and affected communities).										
Discuss the consequences for the resilience of fragile environments of the development of unconventional fossil fuel energy resources (tar sands, oil shale, shale gas, deep water oil). (See: Canadian tar sands, USA fracking, Brazilian deep water oil). Refer to the role of business vs environmental groups and affected communities).										
Evaluate the role that renewable and recyclable energy could play to help decouple fossil fuel from economic growth (nuclear, wind and solar power).										
Evaluate the costs and benefits economically, socially, and environmentally and in terms of their contribution renewable and recyclable energies can make to energy security. (See: Changing UK energy mix).										
Discuss the pros and cons of biofuels (implications for food supply as well as uncertainty over how 'carbon neutral' they are). (See: Biofuels in Brazil).										
Discuss the pros and cons of radical technologies including carbon capture and storage and alternative energy sources (hydrogen fuel cells, electric vehicles) could reduce carbon emissions but uncertainty exists as to how far this is possible.										
3. How are the carbon and water cycles linked to the global climate system?										
Explain why the growing demand for food fuel and other resources globally has led to contrasting regional trends in land-use cover (deforestation, afforestation, conversion of grasslands to (farming) affecting terrestrial carbon stores with wider implications for the water cycle and soil health.										
Explain how the health of coral reefs and other marine ecosystems are being affected by ocean acidification, as a result of its role as a carbon sink, increasing due to fossil fuel combustion.										
Explain howh the frequency of drought mayy increase due to climate change from the enhanced greenhouse effect.										
Describe and explain the link to shifting climate belts, which may impact on the health of forests as carbon stores. (See: Amazonian drought events).										

Discuss the implications of forest loss on human well-being.										
Recall and understand evidence that forest stores are being protected and even expanded, especially in countries at higher levels of development (environmental Kuznets' curve model). Refer to attitudes of global consumers to environmental issues)										
Describe how increased temperatures affect evaporation rates and the quantity of water vapour in the atmosphere.										
Discuss the implications this might have for precipitation patterns, river regimes and water stores (cryosphere and drainage basin). (See: Arctic).										
Explain why threats to ocean health impacts on human wellbeing, especially in develop ing regions that depend on marine resources as a food source and for tourism and coastal protection.										
Describe and explain the factors that mean future emissions, atmospheric concentration levels and climate warming are uncertain (natural factors (the role of carbon sinks), human factors (economic growth, population, energy sources) and feedback mechanisms (carbon release from peatlands and permafrost, and tipping points, including forest die back and alterations to the thermohaline circulation).										
Evaluate the adaptation strategies for a changed climate (water conservation and management, resilient agricultural systems, land-use planning, flood-risk management, solar radiation management).										
Describe how the carbon cycle could be re-balanced through mitigation (carbon taxation, renewable switching, energy efficiency, afforestation, carbon capture and storage).										
Discuss the requirement for global scale agreement and national actions both of which have proved to be problematic.										