Global water stores and changes in magnitude *3.1.1.2* ANSWERS

Q1	***Match the terms with their water state***	
A	Fresh and saline water largely in a liquid state	Hydrosphere
B	Liquid water contained within soil, may sometimes be frozen	Pedosphere
C	Water in a solid state. May be liable to melting into a liquid form	Cryosphere
D	Liquid water contained in rocks, may occasionally be frozen	Lithosphere
E	Water vapour plus condensation of fresh water and may be frozen	Atmosphere
Lithosphere Cryosphere Atmosphere Hydrosphere Pedosphere		

Q2	**Tick if these are primarily water Transfers, Stores – or Both**	**Transfer**	**Store**
A	Evaporation	✓	
B	Underground aquifer		✓
C	Ice sheet		✓
D	Percolation	✓	
E	Precipitation	✓	
F	Glacier	✓	✓
G	River	✓	✓
While water is frozen within a moving glacier or contained within a river channel it is a transfer, but held within a consistent state – so also a store, though far more temporary in the case of a river.			

Q3	**Place a + (increase) or -- (decrease) in the pairs of stores under the following change conditions**		
		Water store	***Change + / --***
A	A glacial advance (ice maximum)	Cryosphere	+
		Hydrosphere	-
Ice-sheets and glaciers extend their range. The flow of rivers to the sea reduces as water is locked into a solid state so sea level falls			
B	Global warming	Atmosphere	+
		Cryosphere	-
A warmer planet will increase evaporation and put more water vapour into the atmosphere while ice-sheets and glaciers reduce in size as they melt			
C	An interglacial (warm phase between ice advances)	Pedosphere	+
		Lithosphere	+
As ice-sheets melt and the ground unfreeze, infiltration into the soil and percolation of much melt-water will recharge groundwater stores			
D	A prolonged drought	Hydrosphere	-
		Atmosphere	+ then -
Lakes and rivers will evaporate faster than they are replenished, reducing the hydrosphere. Increased evaporation will initially put moisture into the atmosphere, but as sources dry up, this later reduces.			
E	Human water abstraction for irrigation from bore wells	Lithosphere	-
		Atmosphere	+
Removing water from underground stores reduces that held in rocks. By placing the water on the surface it is likely to be evaporated (it is irrigation water after all) and increased atmospheric moisture			

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Q4	***Given that global warming is occurring, what are the likely changes in the following water stores, why and with what consequences?***
Cryosphere	***Hydrosphere***
Will get smaller as snow and ice melts under warmer atmospheric and ocean temperatures. Sea-ice is less likely to form. River flow will increase initially from glacier-melt, increasing the hydrosphere (possibly leading to localised flooding of flood plains). But later, loss of glaciers may cause severe water shortages in communities that rely on this water source in the Andes and Himalayas.	River flow and ocean levels are likely to increase as glacier and snow-melt are more rapid. Increased evaporation is likely to regulate the rate of sea level rise, but the latter is likely to be much greater, leading to threats to coastal communities from more frequent flooding and infiltration of saline water into the lithosphere at the coast.
Atmosphere	***Lithosphere***
Increased evaporation is likely to occur as conditions become warmer, increasing the atmospheric moisture content. However, this is likely to be balanced by greater precipitation rates as cloud-formation occurs more regularly. Heavy rainfall will be an increased output from atmospheric water is it reaches a new equilibrium state. It is likely to result in increased, and more intense flooding for some regions.	The underground stores of water take much longer to absorb the higher temperatures in the atmosphere. The volume is likely to increase from greater surface flow (glacier melt and more frequent rainfall) with more percolation resulting to add to their store. On the other hand, there is likely to be an increase in human abstraction of ground water supplies that may reduce them at an even faster rate of depletion.

Q5	***Classify these elements in a drainage basin system as 'input' , 'store', 'flow/transfer' or 'output'. Some are independent of the system and are 'controls'. Identify those too.***