



**2016 specification**  
first exams in 2018

# **Learning Grids**

## **for A Level AQA Geography**

Component 1: Physical Geography  
*Section A: Water and Carbon Cycles*

Update v1.1, September 2019

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# Learning Grid 1: Natural Systems – What are Systems?

HOD: pp. 2–3  
 CAM: p. 2  
 ZZ-RP: pp. 2–5

Question		Answer	
1	A system is:	Input	Energy/material added to a system
2	Match up the following:	Store (component)	Transfer of material or energy between two stores
		Flow (transfer)	Residence of material within a system for a period of time
		Output	Removal of energy or material from a system
3	Define the following:	Elements	
		Attributes	
		Relationships	
4	Systems are generalisations because:		
5	The inputs and outputs have no effect on the components (stores). Circle the correct answer.	True	False
6	Systems have boundaries. Circle the correct answer.	True	False
7	What is meant by each of the following terms?	Open system	
		Closed system	
		Isolated system	

Systems

Question		Answer	
8	The stores within a system don't change if the system is in a state of:		
9	Is Earth an open or closed system?		
10	Define and give an example of:	Positive feedback	Example
		Negative feedback	
11	Explain the two examples that you chose for the previous question:	Climate change	
		Plant growth	
<b>Systems</b>			



# Learning Grid 2a: The Water Cycle Part 1a

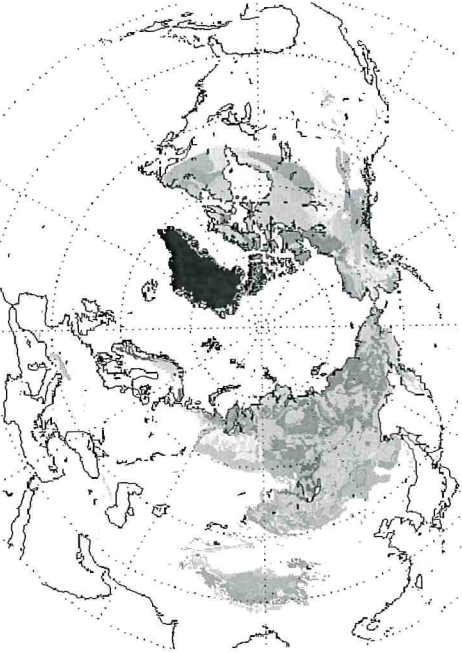
HOD: pp. 4-7  
 CAM: p. 3-7  
 ZZ-RP: pp. 8-13

Question		Answer																																							
1	In as few words as possible, give the location of each type of water.	Terrestrial																																							
		Atmospheric																																							
		Oceanic																																							
		Cryospheric																																							
2	Use the diagram to describe the distribution of Earth's water.	<table border="1"> <caption>Stores of water</caption> <thead> <tr> <th>Category</th> <th>Volume (km³)</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Oceans, seas &amp; bays</td> <td>1,338,000,000</td> <td>96.5%</td> </tr> <tr> <td>Ice caps, glaciers &amp; permanent snow</td> <td>24,064,000</td> <td>1.74%</td> </tr> <tr> <td>Ground ice &amp; permafrost</td> <td>300,000</td> <td>0.022%</td> </tr> <tr> <td>Saline groundwater</td> <td>12,870,000</td> <td>0.94%</td> </tr> <tr> <td>Fresh groundwater</td> <td>7,600</td> <td>0.76%</td> </tr> <tr> <td>Saline lakes</td> <td>85,400</td> <td>0.006%</td> </tr> <tr> <td>Fresh lakes</td> <td>91,000</td> <td>0.007%</td> </tr> <tr> <td>Swamp water</td> <td>8</td> <td>0.0008%</td> </tr> <tr> <td>Rivers</td> <td>2,120</td> <td>0.0002%</td> </tr> <tr> <td>Soil Moisture</td> <td>16,500</td> <td>0.001%</td> </tr> <tr> <td>Biological water</td> <td>1</td> <td>0.0001%</td> </tr> <tr> <td>Atmosphere</td> <td>12,900</td> <td>0.001%</td> </tr> </tbody> </table>	Category	Volume (km³)	Percentage	Oceans, seas & bays	1,338,000,000	96.5%	Ice caps, glaciers & permanent snow	24,064,000	1.74%	Ground ice & permafrost	300,000	0.022%	Saline groundwater	12,870,000	0.94%	Fresh groundwater	7,600	0.76%	Saline lakes	85,400	0.006%	Fresh lakes	91,000	0.007%	Swamp water	8	0.0008%	Rivers	2,120	0.0002%	Soil Moisture	16,500	0.001%	Biological water	1	0.0001%	Atmosphere	12,900	0.001%
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Question		Answer
<b>Stores of water</b>	3	Name two types of easily accessible water (for drinking).  1.  2.
	4	The main types of terrestrial water are:  1.  2.  3.  4.
	5	Bodies of surface water smaller than two hectares are called:
	6	The largest lake is the:
	7	Which hemisphere has the most lakes?
	8	The largest river in the world is called the:
	9	Distinguish between soil water and groundwater.
	10	Fens, peatlands and marshes are all examples of:
	11	These ecosystems are often found in:
	12	Complete the sentence:  A lot of biological water is found in the _____ ecosystem.

Question		Answer	
		Ice sheet	Canada
		Ice cap	Vatnajökull, Iceland
		Ice shelf	Greenland
		Permafrost	Grindelwald, Switzerland
		Alpine glacier	Filchner-Ronne, Antarctica
			_____ create icebergs, and are formed when sheets of land ice extend over the _____.
13	Match each type of cryospheric water to an example.		
14	Complete the sentence:		
15	Why does sea ice shrink and contract?		
16	Minimum size of ice sheets:		
17	Ice sheets form because:		
18	If the Antarctic and Greenland ice sheets melted, by how much would sea level rise?		
19	These two ice sheets hold what percentage of Earth's frozen fresh water?		
20	What is an ice stream?		
21	Size of the following ice sheets (km <sup>2</sup> ):	Antarctic	
		Greenland	
22	Ice sheets flow because:		
23	Permafrost is:		

**Cryospheric water**

Question		Answer
24	<p>The map shows ice sheets in black. All land-based permafrost is shown in shades of grey.</p> <p>Describe the areas in which permafrost is found.</p>	
25	The map above shows land-based permafrost. What other type of permafrost is there?	
26	This type of permafrost formed when:	
27	Land-based permafrost mainly formed during the:	
28	The youngest permafrost formed during the:	
29	Ice caps are smaller than ice sheets, and are found across the world on:	
30	Alpine glaciers are found at low latitudes, but form because of the low winter temperature at high:	
31	Give two types of alpine glacier:	<p>1.</p> <p>2.</p>
32	Alpine glaciers are important because:	

Cryospheric water

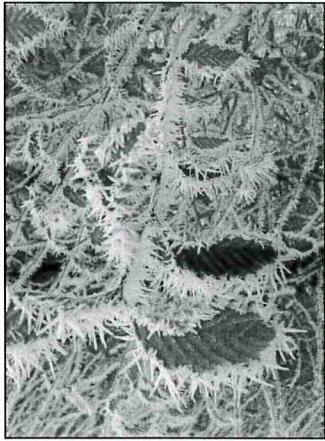


# Learning Grid 2b: The Water Cycle Part 1b

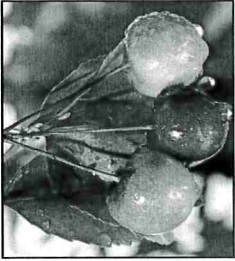
HOD: pp. 4-9  
 CAM: p. 3-7  
 ZZ-RP: pp. 8-13

Question		Answer
1	What percentage of Earth's water is in the oceans?	
2	Oceans cover:	_____ of Earth's surface.
3	Oceans hold:	At least _____ km <sup>3</sup> of water.
Oceanic and atmospheric water		1.
		2.
		3.
4	What are the three states of air that can hold water?	
5	Which is the commonest form of atmospheric water?	
6	What governs how much water air can hold?	
7	Use this notion to explain the amount of water vapour from pole to equator.	
8	'Water vapour has no effect on our climate.' True or false?	
Oceanic and atmospheric water		1.
		2.
9	Name the two components of clouds:	
10	Clouds form because:	



Question		Answer			
		State Change		Latent Heat of V/F/S	
	Match the words to the state changes.	Melting	Solid to gas		
		Deposition	Gas to liquid		
		Evaporation	Solid to liquid		
		Condensation	Liquid to gas		
		Freezing	Gas to solid		
		Sublimation	Liquid to solid		
	11 In the right-hand column, write: V for latent heat of vaporisation F for latent heat of fusion S for latent heat of sublimation				
	12 Fill in the gaps:	_____ helps control the evaporation rate because _____ air can absorb more water than _____ air. _____ is also important – if the air is _____, i.e. not saturated, more evaporation can occur than if the air was already very _____.			
	13 An evaporating surface is cooled due to:	Cold	Warm	Dry	Humid
	14 Dew point is:				Temperature
	15 The frost on these leaves formed because:				

**Processes and drivers**

Question		Answer
16	<p>How does the liquid water on these leaves and cherries differ from the frost in the previous question?</p> 	
17	Clouds can form on particles such as smoke or dust. What are such particles called?	
18	Dew, fog and frosts are common at night because:	
19	Adiabatic cooling is when:	
20	Give three different forms of adiabatic cooling.	1.
		2.
		3.
21	All of these three methods of cooling result in:	
22	Distinguish between glacial and interglacial periods.	Glacial
		Interglacial
23	How has climate changed over the past 740,000 years?	

**Processes and drivers**

# Learning Grid 3: The Water Cycle Part 2

HOD: pp. 10-24  
 CAM: p. 6-11 ZZ-  
 ZZ-RP: pp. 17-24

	Question	Answer
<p style="text-align: center;"><b>Drainage basins as open systems</b></p> <p style="text-align: center;"><b>1</b></p> <p style="text-align: center;">Use the diagram of the water cycle to help you fill in the table on the following page.</p>		

Question		Answer		
		Inputs	Outputs	Stores
<b>Drainage basins as open systems</b>	<b>1</b>	Use the diagram of the water cycle on the previous page to help you fill in the table.		
	<b>2</b>	A drainage basin is defined as:		
	<b>3</b>	Drainage basins are open systems because:		
	<b>4</b>	Why can drainage basins also be described as 'cascading systems'?		



Question	Answer
<p style="text-align: center;"><b>Drainage basins as open systems</b></p> <p style="text-align: center;"><b>5</b></p> <p style="text-align: center;"><b>Fill in the gaps to complete the paragraphs.</b></p>	<p>Precipitation falls on the catchment. Precipitation can be rain, drizzle, _____, hail, sleet or mist. The water can flow through many pathways, and can be _____ in many sinks. The rate of flow, or the time spent in storage (the residence time) is reliant on many different factors. By the time water reaches the _____, it will have passed through many stores and flows.</p> <p>_____ is the storage of water by objects on the land surface – for example, vegetation. This is why you can walk under a tree after it has stopped raining and can be dripped on. Some water will flow down the tree's trunk – _____ – the rest will drip off the leaves – _____. Some will _____ from the surface of the leaves. Plants also release water into the atmosphere via _____ – water is drawn up from the soil through the roots and evaporated through the leaves. Vegetation can also store water</p> <p>If there is little interception, water is likely to quickly flow across the land surface (called overland or _____ flow) – air-filled voids can quickly fill with water during the rainfall event, reducing the _____. If the rainfall is intense, and infiltration cannot keep pace, this leads to overland flow. Overland flow will also occur if the soil is already _____ from prior rainfall events. Physical factors such as soil type, particle size and amount of organic material can also affect the infiltration rate and the amount of water that can be stored in the soil. _____ are a temporary surface store.</p> <p><i>stemflow</i>      <i>stored</i>      <i>interception</i>      <i>throughfall</i>  <i>snow</i>            <i>puddles</i>        <i>sheet</i>            <i>evaporate</i>  <i>transpiration</i>    <i>saturated</i>       <i>infiltration rate</i>    <i>sea</i></p>

Question		Answer
6	Rock which can store and transmit water is called:	
7	Distinguish between infiltration and percolation.	
8	The water that leaves a drainage basin is called:	
9	Highlight or underline the factors that increase the speed of surface run-off.	Natural systems
		Bare surfaces
		Steep slopes
		Urban areas and hard surfaces
10	A River doesn't stop flowing when it stops raining - explain.	Sandy, free-draining soils
		Tunnels from burrowing animals
		Few rivers and tributaries
11	Give the equation for the water balance (budget).	Clay soils
		Woodland
12	River regime is:	
		Gentle slopes

**Runoff and hydrographs**

Question		Answer										
13	The diagram shows a soil moisture budget graph. Label each arrow.											
14	Potential evapotranspiration is determined by:	<table border="1"> <tr> <td>Discharge</td> <td rowspan="5">River flow from groundwater and soil water</td> </tr> <tr> <td>Peak discharge</td> <td>Greatest river flow</td> </tr> <tr> <td>Base flow</td> <td>Discharge from a rainfall event, including surface and subsurface flow</td> </tr> <tr> <td>Storm flow</td> <td>Flow of a river at a defined point</td> </tr> <tr> <td>Lag time</td> <td>Time to reach peak discharge from peak rainfall</td> </tr> </table>	Discharge	River flow from groundwater and soil water	Peak discharge	Greatest river flow	Base flow	Discharge from a rainfall event, including surface and subsurface flow	Storm flow	Flow of a river at a defined point	Lag time	Time to reach peak discharge from peak rainfall
Discharge	River flow from groundwater and soil water											
Peak discharge		Greatest river flow										
Base flow		Discharge from a rainfall event, including surface and subsurface flow										
Storm flow		Flow of a river at a defined point										
Lag time		Time to reach peak discharge from peak rainfall										
15	Match the keywords to the definitions.											

**Runoff and hydrographs**

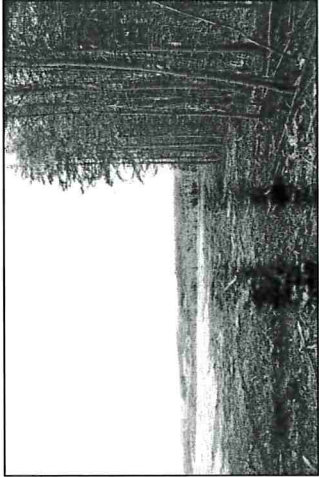
Question		Answer
16	Discharge is measured in cumecs. How is discharge calculated?	
17	A river's regime is:	
	1.	
	2.	
18	A river's regime can be influenced by:	
	3.	
	4.	
	5.	
Runoff and hydrographs		
19	<p>Label the hydrograph with the following:</p> <ul style="list-style-type: none"> <li>• Rising limb</li> <li>• Receding limb</li> <li>• Peak discharge</li> <li>• Peak rainfall</li> <li>• Baseflow</li> <li>• Lag time</li> </ul>	<p>The hydrograph displays rainfall (mm) on the left y-axis (0 to 5) and discharge (m³/s) on the right y-axis (0 to 2). The x-axis represents 'Hours from start of storm' (0 to 80). Rainfall is shown as bars: 1 mm at 0-5h, 2 mm at 5-10h, 4 mm at 10-15h, and 1 mm at 15-20h. The discharge curve starts at 0, rises to a peak of ~1.6 m³/s at 30h, and then recedes to ~0.5 m³/s at 80h.</p>



Question		Answer
20	A flashy hydrograph means:	
21	In one sentence per scenario, explain why each of the following river basin scenarios will result in a flashy hydrograph.	<ol style="list-style-type: none"> <li>1. Antecedent rainfall</li> <li>2. Impermeable catchment</li> <li>3. Steep slope</li> <li>4. Not much vegetation</li> <li>5. Small drainage basin</li> <li>6. Circular catchment</li> <li>7. Heavy rainfall</li> <li>8. High drainage density</li> <li>9. Urban area</li> <li>10. Ploughing</li> <li>11. Deforestation</li> </ol>
<b>Runoff and hydrographs</b>		

Question		Answer
22	Engineering projects can reduce the flashiness of a hydrograph by:	
23	Suggest how natural factors can affect the water cycle.	
24	Farmers drain land to:	1.
		2.
		3.
		4.
		5.
25	Complete the paragraph:	<p>When land is _____, the hydrographs of nearby rivers become _____ as water is quickly drained away through the installed _____ into the channel. The _____ of rivers is also increased because the _____ is quicker. The risk of _____ is, therefore, increased.</p> <p><i>base flow</i>                      <i>throughflow</i>                      <i>flashier</i>  <i>pipes</i>                              <i>flooding</i>                      <i>drained</i></p>

**Runoff and hydrographs**

Question		Answer
26	Fields are subject to water erosion because:	
27	The soil in fields is likely to be drier. This means that:	
28	Suggest an area or region where deforestation is a big issue.	
29	<p>a. In the photo below, which area (left or right) will have the greatest of the following processes?</p>  <p>b. Therefore:</p>	<p>Evapotranspiration</p> <p>Overland flow</p> <p>Deforestation can _____ the volume of water in nearby rivers, increasing flood risk (assuming that deforestation rates stay the same).</p>
30	Deforestation can cause a positive feedback cycle to occur which will reduce rainfall. How?	
<b>Changes to the water cycle over time</b>		

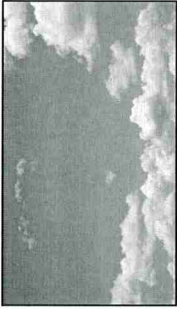




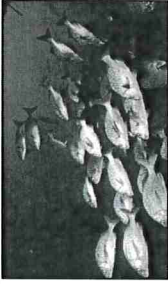
<b>Question</b>		<b>Answer</b>
<b>31</b>	Water supplies can be obtained from below ground using:	
<b>32</b>	If too much water is pumped out, the water table is:	
<b>33</b>	This means that the baseflow of rivers is:	
<b>34</b>	In coastal areas, seawater can:	
<b>35</b>	In addition to a supply for drinking, much subsurface water is used for:	
<b>36</b>	A reduction in streamflow causes the following wildlife problem:	

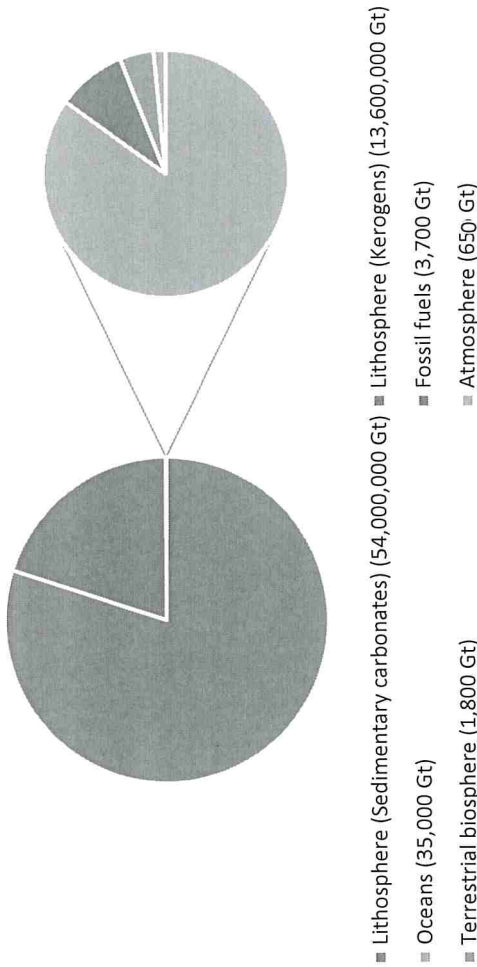
**Changes to the water cycle over time**



# Learning Grid 4a: The Carbon Cycle Part 1a

HOD: pp. 24–29  
 CAM: pp. 14–17, 22  
 ZZ-RP: pp. 27–32

Question		Answer	
Image	What shown	Where found	
	Identify two gases that would be identifiable in the picture:		
			
			
			
			
	Identify a dissolved gas:		
<p>The general distribution of carbon</p> <p>1 Complete the table:</p>			

Question		Answer
2	Carbon sequestration is:	
3	The main source of Earth's carbon is:	
4	Volcanoes release CO <sub>2</sub> because:	
5	Stores of CO <sub>2</sub> are measured in:	
6	<p>Study the graph which shows the size of different stores of carbon (in gigatonnes).</p> <p>Which sink holds the most carbon?</p>	<p style="text-align: center;"><b>Gigatonnes of Carbon</b></p>  <ul style="list-style-type: none"> <li>■ Lithosphere (Sedimentary carbonates) (54,000,000 Gt)</li> <li>■ Oceans (35,000 Gt)</li> <li>■ Terrestrial biosphere (1,800 Gt)</li> <li>■ Lithosphere (Kerogens) (13,600,000 Gt)</li> <li>■ Fossil fuels (3,700 Gt)</li> <li>■ Atmosphere (650 Gt)</li> </ul>

The general distribution of carbon

Question		Answer										
The lithosphere	7 The lithosphere is a major source of carbon because:											
	8 Order the following by the size of carbon store.	<table border="1"> <thead> <tr> <th>Store</th> <th>Rank (1 = highest)</th> </tr> </thead> <tbody> <tr> <td>Fossil fuels</td> <td></td> </tr> <tr> <td>Peat</td> <td></td> </tr> <tr> <td>Marine sediment</td> <td></td> </tr> <tr> <td>Soil organic matter</td> <td></td> </tr> </tbody> </table>	Store	Rank (1 = highest)	Fossil fuels		Peat		Marine sediment		Soil organic matter	
	Store	Rank (1 = highest)										
	Fossil fuels											
	Peat											
Marine sediment												
Soil organic matter												
9 Distinguish between organic and inorganic sources of carbon in the lithosphere.												
10 Give an example of:	1. Organic carbon 2. Inorganic carbon											
The hydrosphere	11 It is estimated that up to:	Approximately _____ GtC is stored in ocean sediments, and up to _____ GtC is stored in the oceans themselves. NB figures may vary depending on the source used.										
	12 Carbon is sequestered on the seafloor because:											

Question		Answer
13	Which layer(s) of the ocean store(s) the most carbon - the surface layer (euphotic zone) or the intermediate layer (twilight zone) and deep ocean combined?	
14	Suggest two living sources of oceanic carbon.	1.
		2.
15	Suggest which ecosystem stores:	The most carbon
		The least carbon
16	Which other ecosystem holds a large amount of carbon found in the biosphere - around a fifth?	
17	Therefore, which two regions store the most carbon?	1.
		2.
19	Suggest two sources of carbon in living vegetation.	1.
		2.
19	Contrast plant litter and soil humus.	
20	Distinguish between the organic carbon and the inorganic carbon in soil.	



Question		Answer
21	Peat can exist because:	
22	The melting of permafrost is an example of a positive feedback cycle because:	
23	Animals are not significant stores of carbon, but they are important in:	
24	What is the unit that gas concentration is measured in?	
25	What is the current CO <sub>2</sub> concentration in the atmosphere?	
26	Has the concentration of atmospheric CO <sub>2</sub> remained fairly constant?	
27	In 1750, the concentration of CO <sub>2</sub> in the atmosphere was 280 ppm. How does this compare to modern levels?	
28	What was the cause of any change?	
The biosphere and cryosphere		
The atmosphere		

# Learning Grid 4b: The Carbon Cycle Part 1b

HOD: pp. 24–29  
 CAM: pp. 14–17, 25  
 ZZ-RP: pp. 27–32

Question		Answer
1	Distinguish between 'net carbon sinks' and 'net carbon sources'.	<p>The diagram illustrates the carbon cycle with the following components and processes:</p> <ul style="list-style-type: none"> <li><b>Atmosphere:</b> Labeled 'CARBON DIOXIDE IN EARTH'S ATMOSPHERE' with a <math>CO_2</math> molecule. Processes include 'Condensation' and 'Evaporation'.</li> <li><b>Land:</b> <ul style="list-style-type: none"> <li><b>Plants:</b> Perform 'Photosynthesis' (taking in <math>CO_2</math> and releasing <math>O_2</math>) and 'Respiration'.</li> <li><b>Animal:</b> A cow is shown performing 'Respiration'.</li> <li><b>Human:</b> A factory is shown performing 'Burning', which releases <math>CO_2</math> into the atmosphere.</li> <li><b>Soil:</b> Contains 'soil carbon' and 'soil organic matter'. Processes include 'microbial respiration and decomposition'.</li> <li><b>Sediments:</b> Labeled 'sediments' at the bottom of the land and 'marine biota' in the ocean.</li> </ul> </li> </ul>
2	Identify the sinks in the diagram:	

Question		Answer
<b>Factors</b>	3	Identify any transfers (fluxes) which are missing from the diagram in question 2.
	4	Two major types of organism that photosynthesise are: 1. 2.
	5	The purpose of photosynthesis is:
	6	The equation for photosynthesis is:
	7	The by-product of photosynthesis is:
	8	The energy for photosynthesis is provided by:
	9	Plants store carbohydrate – but how do plants (and other photosynthesising organisms) get their energy?
	10	Complete this sentence:  _____ is the reverse of photosynthesis because carbohydrate is converted into water and _____, and _____ is released in the process.

Question		Answer	
11	'Plants are not the only organisms to respire.' True or false?		
12	'There is more oxygen than carbon dioxide in the atmosphere because not all organic carbon has been respired.' True or false?		
13	Match each type of decomposition to its description.	Biological	The addition of oxygen; for example, oxidation.
		Chemical	Reduction in size of material, e.g. by weathering processes, or the transport of material.
		Physical	Consumption and breakdown by living things; for example, digestion.
14	Organisms which break down dead organic matter are called:		
15	Suggest two forms of carbon that can be combusted.	1.	
		2.	
16	What factor allows the right-hand cycle shown in the diagram to work?	<p>Biological and physical pumps of carbon dioxide</p>	

Factors

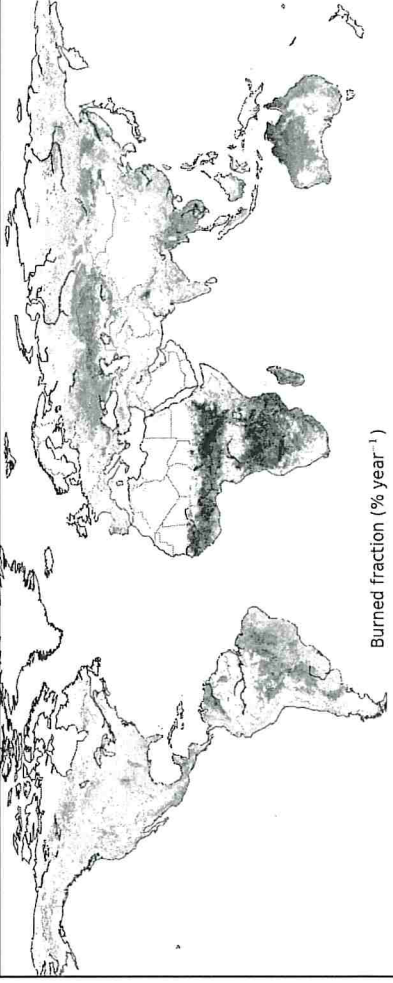


Question		Answer
17	The oceans are becoming more acidic because:	
18	Add two labels to the diagram (right) – tropics and polar regions – to show where water rises or sinks.	<p>Biological and physical pumps of carbon dioxide</p>
19	The movement of carbon to the seafloor can be called a biological pump because:	
20	The process whereby rock is broken down is called:	
21	Complete the sentence:	Weak carbonic acid in rainwater can _____ carbonate rocks. The carbon can precipitate out of the water, forming _____ – which is what stalactites are made from.

**Factors**

# Learning Grid 5: The Carbon Cycle Part 2

HOD: pp. 29–38  
 CAM: pp. 17–26  
 ZZ-RP: pp. 35–41

		Question	Answer
<b>Biomass burning</b>	1	<p>Study the map which shows worldwide biomass burning. The darker the shading, the larger the percentage of the area burned.</p> <p>Describe the distribution.</p>	 <p style="text-align: right; font-size: small;">Burned fraction (% year<sup>-1</sup>)</p>
	2	<p>Using the map, suggest which ecosystems are affected by biomass fires. Provide examples for each of your suggested ecosystems.</p>	
	3	<p>Fires can be caused by humans, or occur naturally. Complete the sentences:</p>	<p>Fires in tropical rainforests are likely to _____.</p> <p>Fires in savanna grassland are likely to _____.</p> <p>The number of fires are increasing due to human activity and _____, affecting the carbon balance.</p>

Question		Answer
Biomass burning	4 Forest fires don't release all carbon back into the atmosphere because:	
	5 Newer forests are a larger carbon sink than older forests. Circle the correct answer.	True  False
Volcanic activity	6 Complete the sentence:	Compared to that released by human activity, the amount of CO <sub>2</sub> released by volcanoes is _____, but in the past, is likely to have accounted for a _____ amount of the CO <sub>2</sub> in the atmosphere at the time.
	7 The warming effect of the CO <sub>2</sub> released by volcanoes is reduced because:	
Human activity	8 Unlike the burning of recently produced biomass, the burning of fossil fuels increases atmospheric CO <sub>2</sub> because:	
	9 Cement production generates CO <sub>2</sub> because:	1.
		2.
	10 The countries that produce the most CO <sub>2</sub> through cement demand and fossil fuel combustion are:	1.
		2.
3.		

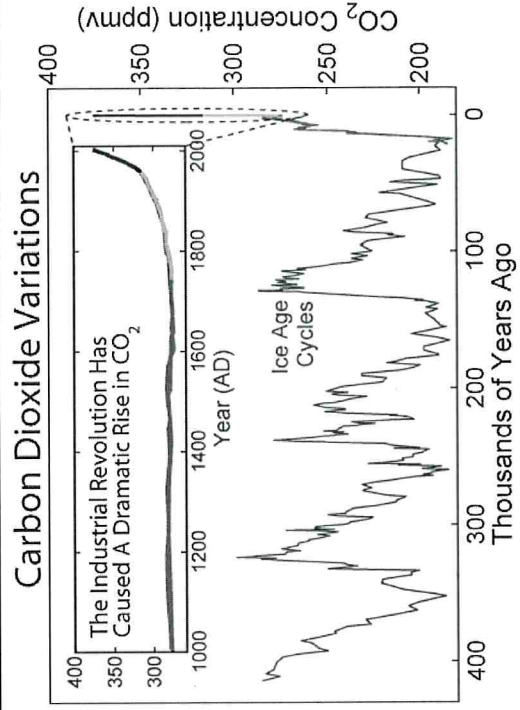
Question		Answer
11	Complete the sentence:	_____ is often seen as the 'dirtiest' fossil fuel because it is heavily polluting and has high CO <sub>2</sub> emissions.
12	Farmers' livestock produces the greenhouse gas:	Methane (CH <sub>4</sub> )
13	Complete the sentence:	The gas produced by livestock is _____ 'potent' than CO <sub>2</sub> , meaning that it has a _____ warming effect than the same amount of CO <sub>2</sub> .
14	Another source of this gas are:	
15	Ploughing produces CO <sub>2</sub> by:	
16	Two causes of deforestation in tropical rainforests are:	1.
		2.
17	Define (re)afforestation:	
Human activity		
Land use change		



Question		Answer
18	Using the graph, describe the trends in world, rural and urban population since 1960.	<p>World, rural and urban population</p> <p>Legend:  World (dotted line)  Rural (solid line)  Urban (hatched area)</p>
19	The trends shown on the graph will affect the land in the following ways:	<p>Agricultural land</p> <p>Urban areas</p>
20	CO <sub>2</sub> production will increase because:	

Land use change

Question		Answer
Land use change	21	CO <sub>2</sub> can be stored – this is a process called:
	22	Carbon can be naturally stored by:
	23	Weaknesses of this system include:
	24	Humans can capture CO <sub>2</sub> from:
	25	Humans can store this CO <sub>2</sub> in the following locations:
Carbon budgets	26	The graph shows us that:



Question		Answer				
27	Fill in the gaps to complete the paragraph, using the words provided below the text.	Carbon _____ is a natural process. Plants use carbon dioxide as an _____ source, and to produce tissue. The carbon is stored in trunks, branches/twigs, leaves and _____. Some carbon is released back into the _____ as the plant itself _____, and _____ break down dead plant material and soil carbon, also through respiration. Fallen debris from the plant and dead roots add _____ to the soil. On the soil surface, a layer of leaf _____ can also build up; for example, within a forest.				
28	Name two positive impacts and two negative impacts of increased CO <sub>2</sub> concentration on terrestrial ecosystems.	sequestration decomposers	roots energy	organic carbon respires	atmosphere litter	
		Advantages	1.			
			2.			
		Disadvantages	1.			
	2.					
29	Coral reefs are likely to be affected by an increase in dissolved ocean-water CO <sub>2</sub> because:					
30	Sea creatures with carbonate shells will be affected because:					
31	Ocean warming can have a positive feedback cycle because:					

Carbon budgets

Question		Answer
32	Due to increased fresh water entering oceans from melting ice, salinity in some areas has:	
33	This can have a knock-on effect on climate because of:	
34	Ocean levels are rising due to:	1.
		2.

Carbon budgets



# Learning Grid 6: Life on Earth

HOD: pp. 38-44  
 CAM: pp. 21-30  
 ZZ-RP: pp. 44-49

Question		Answer					
Climate change	1	Match the keywords to the definitions:	<table border="1"> <tr> <td>Radiative forcing</td> <td>Incoming radiation minus outgoing radiation</td> </tr> <tr> <td>Enhanced greenhouse effect</td> <td>Human modification of the atmospheric concentration of gases, causing the planet to warm</td> </tr> </table>	Radiative forcing	Incoming radiation minus outgoing radiation	Enhanced greenhouse effect	Human modification of the atmospheric concentration of gases, causing the planet to warm
	Radiative forcing	Incoming radiation minus outgoing radiation					
	Enhanced greenhouse effect	Human modification of the atmospheric concentration of gases, causing the planet to warm					
	2	Greenhouse gases include:	<table border="1"> <tr> <td>1.</td> <td></td> </tr> <tr> <td>2.</td> <td></td> </tr> </table>	1.		2.	
	1.						
	2.						
	3	Life on Earth is possible due to greenhouse gases because:					
4	Greenhouse gases warm the planet because:						
5	Even if we stopped producing greenhouse gases today, there would still be warming in the future – why?						
6	If the energy balance of Earth is not zero:						
7	Radiative forcing has increased since 1750 due to:	<table border="1"> <tr> <td>1.</td> <td></td> </tr> <tr> <td>2.</td> <td></td> </tr> </table>	1.		2.		
1.							
2.							

Question		Answer
Climate change	8	The effects of radiative forcing can be reduced by small particles in the atmosphere called:
	9	Order the following gases by their contribution to the greenhouse effect (1 = greatest effect).
	10	The most important greenhouse gas is:
	11	This is because:
	12	The amount of CO <sub>2</sub> that the oceans can absorb is based on:
	13	The removal of CO <sub>2</sub> from combustion gases, and later sequestration in geological formations is called:
	14	The process works by:
	15	The process is expensive because:
	16	Some of the high cost can be recovered by:
	17	Disadvantages of the process include:
Climate change - mitigation		Methane and other trace gases / some aerosols
		Water vapour
		Carbon dioxide
		Clouds
		1.
		2.

Question		Answer
<p style="text-align: center;"><b>Climate change - mitigation</b></p> <p style="text-align: center;"><b>18</b></p> <p>For each of the following examples, give a reason why it helps to manage the extent of climate change.</p>	Increased use of renewable energy	
	Reafforestation	
	Reduction in ploughing	
	Aviation (fuel) efficiency improvements	
	Increased use/thickness of building insulation	
	Increased recycling	
	Increased capture of landfill gas	
	Increased use of nuclear energy	
	Fuel-efficient cars	
	Sustainable transport in urban areas	

Question		Answer
<b>Climate change - mitigation</b>		
19	Complete the paragraphs, using the words underneath:	<p>In _____, improvements can be made to increase the storage of carbon – both as _____ and as soil carbon. In croplands, soil carbon can be increased by _____, using organic fertilisers to add matter to the soil. Adding fertilisers (either organic or chemical) also increases crop growth. Storage of carbon is also improved by crop _____; by planting different varieties.</p> <p>Fertilisation of _____ can also increase soil carbon in similar ways. This can also be achieved by planting _____ plants, which add nitrogen to the soil – important for plant growth. _____ can also reduce biomass and soil carbon (and can lead to a process called desertification).</p> <p>Planting _____ increases the biomass store of the land – the roots protect the soil from erosion, and a thick layer of _____ can build. Soils in forests are often dark in colour because of the high level of _____. Trees can also benefit farmers – many _____ can be grown in _____.</p> <p style="text-align: center;"> overgrazing      leguminous      fruits and nuts      mulching  grasslands      rural areas      rotation      trees  soil organic carbon      leaf litter      orchards      biomass </p>
20	Efficiency savings are important within the aviation industry because:	
21	Aircraft can be designed to be:	1. 2. 3. 4.
22	Aircraft management is predicted to be more efficient using techniques such as:	1. 2. 3.



# Learning Grid 7: Case Studies

HOD: pp. 44–49  
 CAM: pp. 31–36  
 ZZ-RP: pp. 53–55

Question		Answer
1	Name the tropical rainforest that you have studied.	
2	Why are rainforests a very large sink for carbon?	
3	Much of the biomass is later respired – why are rainforests still sinks?	
4	What is the climate like in your chosen rainforest?	
5	Describe the river(s) in your chosen rainforest.	
6	Why does around 50% of the rainfall in tropical rainforests not reach the ground?	
7	How is rainforest often cleared?	
8	What are the uses of rainforests after the trees have been cleared?	

Tropical rainforests

Question		Answer
Tropical rainforests	9	How does deforestation affect the water cycle?
	10	How does deforestation affect the carbon cycle?
	11	How is climate change affecting your chosen rainforest?
River catchments	12	You will have studied a river in the UK. Name the river, and give its location.
	13	Where is the source of your chosen river?
		River:
	Location:	
14	Describe the geology of the catchment.	
15	Describe the land uses in the catchment.	

Question		Answer
16	How do the natural and human factors affect the river's regime (or hydrograph).	
17	How have humans modified the catchment?	
18	Do humans abstract or add water to the river?	
19	Have humans directly modified the river?	
20	How has human activity affected the flood risk of the river?	
<b>River catchments</b>		