my revision notes

OCR GCSE (9–1)

GEOGRAPHY B

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HODDER EDUCATION
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1 How can weather be hazardous?

The global circulation system

How does it work?

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There are three large-scale circular movements of air in each **hemisphere** of the Earth's surface. These circular movements, or 'cells', take air from the Equator and move it towards the poles. The cells have a role to play in creating the **climate zones** on Earth.

Hemisphere: one half of the Earth, usually divided into northern and southern halves by the Equator.

Climate zone: divisions of the Earth's climates into belts, or zones, according to average temperatures and average rainfall. The three major zones are polar, temperate and tropical.

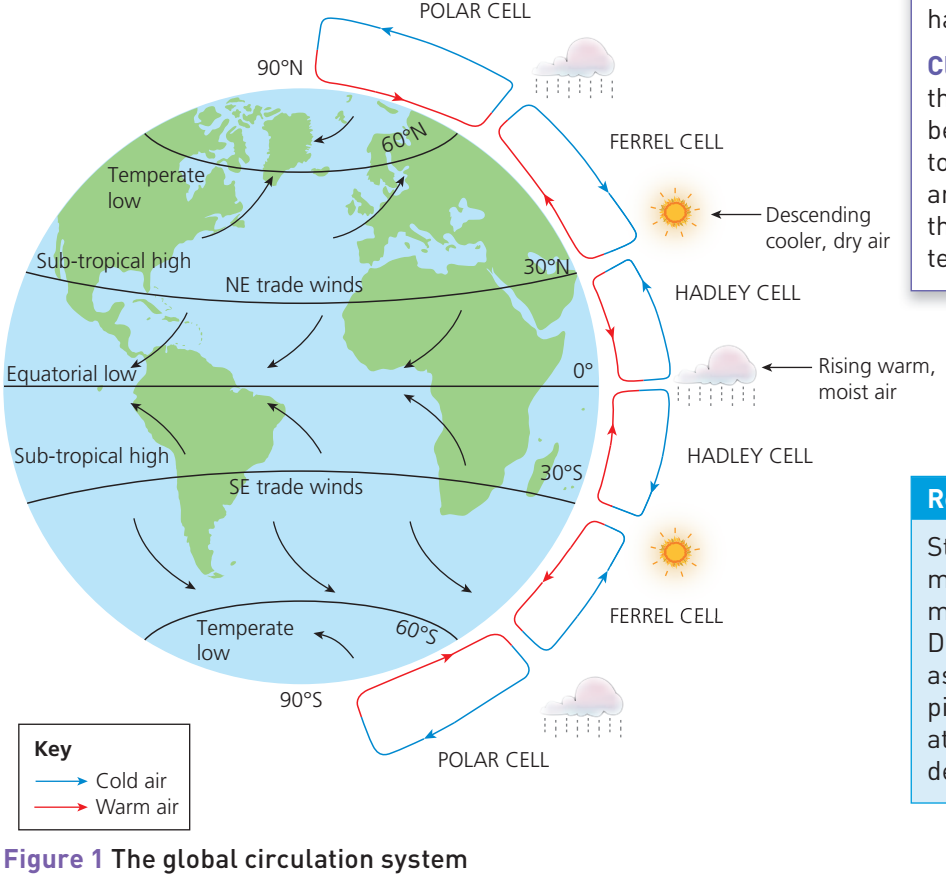

Figure 1 The global circulation system

Revision activity

Study Figure 1 for one minute, memorising as many details as possible. Draw as much of the model as you can remember on a piece of paper. Look back at Figure 1 to check which details you have missed.

Circulatory cells

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	Where is it?	What happens?
Hadley cell	The largest cell, which extends from the Equator to 30° in the north and south.	Winds meet near the Equator and the warm air rises causing thunderstorms. The drier air then flows out towards 30° before sinking over subtropical areas.
Ferrel cell	The middle cell, which generally occurs from the edge of the Hadley cell at 30° to 60° in the north and south.	Air in this cell joins the sinking air at the edge of the Hadley cell; it travels across these mid-latitude regions until the air rises along the border of cold air with the Polar cell.
Polar cell	The smallest and weakest cell, which occurs from the edge of the Ferrel cell to the poles at 90°.	The air sinks over the higher latitudes at the poles and flows towards the mid-latitudes where it meets the Ferrel cell and rises.

Figure 2 Characteristics of the circulatory cells

High and low pressure

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Atmospheric air pressure ranges from low pressure of approximately 980 millibars to high pressure of approximately 1050 millibars. **Low pressure** is created where the two Hadley cells meet and air rises. Where Hadley and Ferrel cells meet, air descends creating **high pressure**.

High pressure

- When air cools it becomes denser and falls towards the ground, leading to high pressure.
- Cool air warms as it reaches the Earth's surface, causing any clouds to evaporate.
- Heavy rain at the Equator means that most of the moisture has gone by the time the air reaches the subtropics.
- High-pressure systems are usually associated with clear skies and dry, hot weather.

Low pressure

- Low pressure causes warm air to rise, after which it cools and condenses to form clouds.
- Moisture falls from the atmosphere as rain, sleet, snow or hail (collectively known as **precipitation**).
- Differences in temperature between day and night are unlikely to be large as the cloud cover reflects solar radiation during the day and traps it at night.

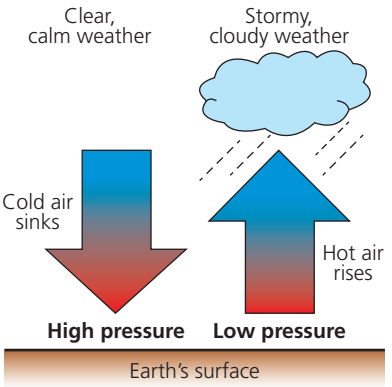

Figure 3 High and low pressure

Atmospheric air pressure: the force exerted on the Earth's surface by the weight of the air, measured in millibars.

Low pressure: occurs when the air is rising, so less air is pressing down on the ground; air rises as it warms, leading to low pressure at the surface.

High pressure occurs when there is more air pressing down on the ground caused by air sinking; air descends as it cools, leading to high pressure at the surface.

Precipitation: the collective term for moisture that falls from the atmosphere; it could be in the form of rain, sleet, snow or hail.

Now test yourself

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1 At which line of latitude do the Polar and Ferrel cell meet?
2 Would an air pressure of 1036 millibars be high or low pressure?
3 Which circulatory air cell is the smallest?
4 Which circulatory cells meet at the Equator?
5 Why might the climatic conditions be unsettled around 60° latitude in the northern and southern hemisphere?

Climate zones

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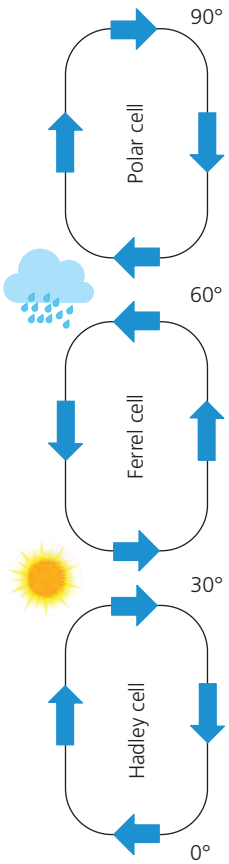
Exam tip

The specification requires you to be able to describe the relationship between the global circulation system and the climate zones. Make sure you refer to precise details such as the cells, places, air pressure and latitude.



Climate zone	Latitude	Characteristics of the climate
Polar	At the poles 90° north and south of the Equator	Cold air from the Polar cell sinks producing high pressure. The spin of the Earth creates dry, icy winds. In some parts of Antarctica, the average wind speed is 50 mph.
Temperate	Mid-latitudes 50° to 60° north and south of the Equator	Two air cells meet, one warm from the Ferrel cell and one cold from the Polar cell. Low pressure is created as the warm air from the Equator meets the cold air from the poles along a weather front. This brings frequent rainfall and is typical of the UK.
Subtropical	30° north and south of the Equator	High pressure as a result of sinking air where Hadley and Ferrel cells meet. This creates a belt of deserts including the Sahara in northern Africa and the Namib in southern Africa. Daytime temperatures can exceed 40 °C.
Tropical	At the Equator, 0° line of latitude	A belt of low pressure where the Hadley cells meet and air rises rapidly. This results in regular heavy rainfall and thunderstorms in places such as Malaysia in South East Asia and northern Brazil in South America.

Figure 4 Climate zones

Now test yourself

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1 Which climate zone is found where Hadley and Ferrel cells meet?
2 Brazil and Malaysia are examples of which climate zone?
3 Why do deserts form at 30° north and south of the Equator?

Exam practice

1 Describe two features of the global circulation system. [2]
2 Describe the climatic conditions in a high-pressure belt. [2]
3 Outline the link between Hadley cells and tropical climates. [2]

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5 What influences the landscapes of the UK?

Geomorphic processes

Geomorphic processes are responsible for shaping landscapes. They include weathering, mass movement, erosion, transportation and deposition.

Geomorphic processes: processes that result in a change in the shape of the Earth.

Weathering

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Weathering involves the decomposition or disintegration of rock in its original place at or close to the ground surface. There are two main types of weathering: **chemical weathering** and **mechanical (physical) weathering**.

Chemical weathering	Mechanical weathering
Carbonation: carbon dioxide dissolved in rainwater forms a weak carbonic acid; this reacts with calcium carbonate (limestone and chalk) to form calcium bicarbonate, which is soluble and can be carried away by water **Hydrolysis**: acidic rainwater reacts with feldspar in granite turning it into clay and causing granite to crumble **Oxidation**: oxygen dissolved in water reacts with iron-rich minerals, causing rocks to crumble	**Freeze–thaw**: repeated cycles of freezing and thawing causing water trapped in rocks to expand and contract, eventually causing rock fragments to break away (Figure 2) **Salt weathering**: crystals of salt, often evaporated from seawater, grow in cracks and holes, expanding to cause rock fragments to flake away

Figure 1 Processes of chemical and mechanical weathering

A third type, **biological weathering**, involves living organisms such as nesting birds, burrowing rabbits and plant roots. Plants roots may expand in cracks, slowly prising rocks apart. Acids that promote chemical weathering may be active beneath soils and rotting vegetation.

Chemical weathering: the decomposition of rocks involving a chemical change, usually resulting from acidic water.

Mechanical (physical) weathering: the disintegration or break up of rocks without any chemical change.

Biological weathering: weathering that results from the action of living organisms, such as plants or animals.

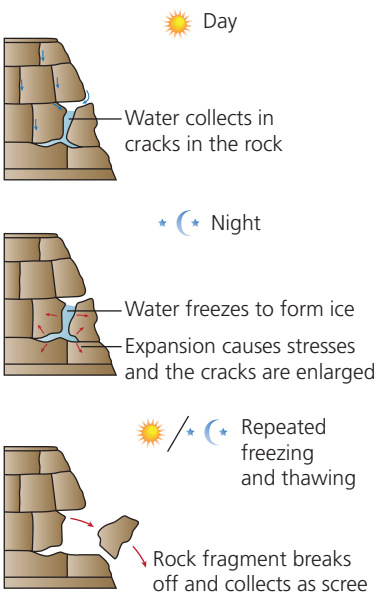

Figure 2 Freeze–thaw weathering

Now test yourself

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1 What is the difference between mechanical and chemical weathering?
2 Outline the process of freeze–thaw weathering.
3 How does the action of plant roots cause weathering to rocks?

Mass movement

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Mass movement is active at the coast, particularly where cliffs are undercut by the sea making them unstable. It includes sliding and slumping, as well as falls (rockfalls) and flows (mudflows).

- **Sliding**: this involves rock or loose material sliding downhill along a slip plane, such as a bedding plane. Slides are often triggered by ground shaking (for example, an earthquake) or heavy rain.
- **Slumping**: this commonly involves the collapse of weak rock, such as sands and clays, often found at the coast. Slumping often results from heavy rainfall when the sediments become saturated and heavy.

Common forms of mass movement at the coast include:

- Rockfall: individual fragments or chunks of rock falling off a cliff face, often resulting from freeze–thaw weathering.
- Landslide: blocks of rock sliding rapidly downslope along a linear shear-plane, usually lubricated by water (Figure 3).
- Mudflow: saturated material (usually clay) flowing downhill, which may involve elements of sliding or slumping as well as flow.
- Rotational slip/slump: slumping of loose material often along a curved shear-plane lubricated by water (Figure 4).

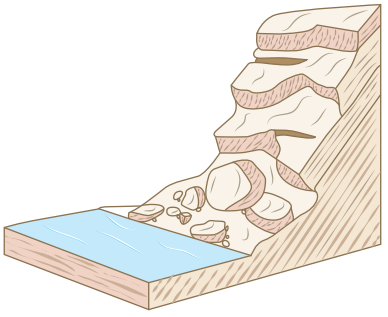

Figure 3 Landslide

Mass movement: movement of surface material caused by gravity.

Revision activity

Make a copy of Figure 3 and add labels to describe the causes and characteristics of sliding.

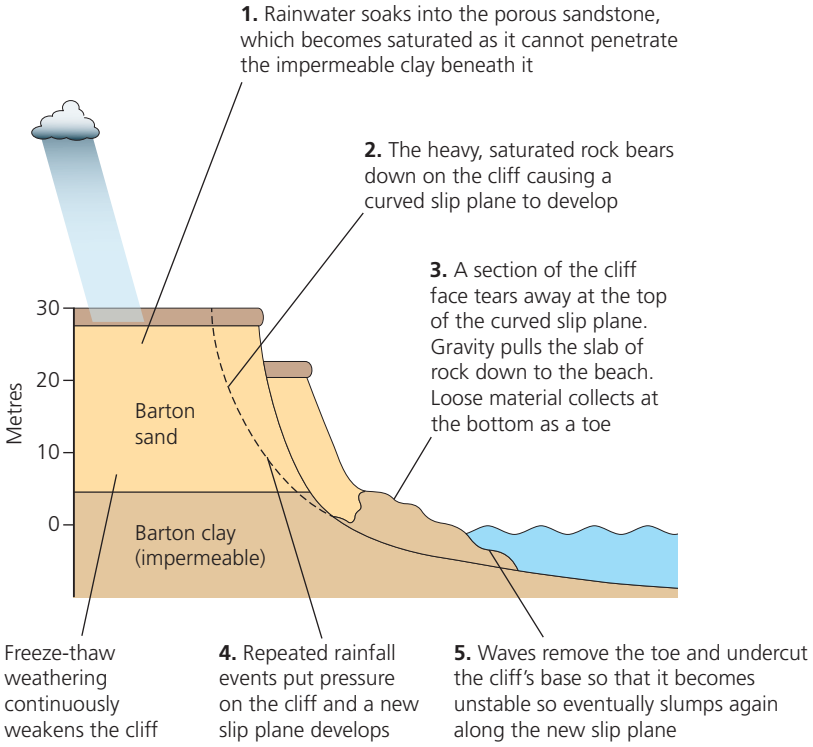

Figure 4 Slumping at Barton on Sea, Hampshire

Now test yourself

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1 Use Figure 4 to describe the causes and characteristics of slumping.

Erosion

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Erosion involves the wearing away and removal of material by a moving force, such as a breaking wave. The main processes of erosion are abrasion, hydraulic action, attrition and solution.

- **Abrasion**: this is the 'sandpapering' effect as loose rock particles carried by the water scrape against solid bedrock. It can also involve loose particles being flung against a sea cliff or river bank by the water – a process sometimes referred to as corrasion.
- **Hydraulic action**: this involves the sheer power of the water, often compressing air into cracks in sea cliffs or river banks causing rocks to break away.
- **Attrition**: erosion caused when rocks and boulders transported by waves bump into each other and break up into smaller pieces. Over time the rocks become smaller and more rounded.
- **Solution**: the dissolving of soluble rocks, such as chalk and limestone.

Erosion: the wearing away and removal of material by a moving force.

You also need to know what is meant by the key terms **abrasion**, **hydraulic action**, **attrition** and **solution**.

Transportation

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Transportation involves the movement of eroded sediment from one place to another. It commonly involves the following processes:

- **Traction**: large particles rolling along the seabed.
- **Saltation**: a bouncing or hopping motion by pebbles too heavy to be suspended.
- **Suspension**: particles suspended within the water.
- **Solution**: chemicals dissolved in the water.

Transportation: the movement of eroded sediment from one place to another.

You also need to know what is meant by the key terms **traction**, **saltation**, **suspension** and **solution**.

Revision activity

Draw a simple diagram to show the four processes of transportation. Set your diagram in a river or at the coast.

Deposition

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Deposition occurs when material being transported is dropped due to a reduction in energy. This typically occurs in areas of low energy, where velocity is reduced and sediment can no longer be transported. At the coast, deposition is common in bays or in areas sheltered by bars and spits. In rivers, deposition is common close to the river banks, in estuaries and at the inside bend of meanders.

Deposition: when material being transported is dropped due to a reduction in energy.

Exam practice

1 Describe the process of mechanical weathering. [2]

2 Explain the conditions under which hydraulic action will be an important process of coastal erosion? [4]

3 Explain where and why sediment is deposited in rivers and at the coast? [6]

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