

GEOGRAPHY

LEAVING CERTIFICATE
HIGHER LEVEL

THE ROCK CYCLE



**THE DUBLIN
ACADEMY OF
EDUCATION**

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Chapter 7: The Rock Cycle

Learning Outcome: To explore the formation, composition and location of igneous rocks, sedimentary and metamorphic rocks. To examine human interaction with the rock cycle.

Keywords: Igneous rocks, intrusive/plutonic rocks, extrusive rocks, basalt, granite, sedimentary rocks, inorganic sedimentary rocks, organic sedimentary rocks, chemical sedimentary rocks, lithification, sandstone, conglomerates, limestone, calcium carbonate, permeable, soluble, chalk and dolomite, gypsum, rock salts, metamorphic rocks, contact metamorphism, regional metamorphism.

Essays

In this chapter, the following essays may be asked.

1. Examine the formation of two igneous rocks, with reference to Irish examples.
2. Examine the formation of sedimentary rocks, with reference to Irish examples.
3. Examine the formation of metamorphic rocks, with reference to Irish examples.
4. You may be asked to compare two rocks from different rock categories.
Previous combinations included
 - a. Plutonic igneous rock and metamorphic rock
 - b. Sedimentary and metamorphic rock
 - c. Igneous and metamorphic rock
5. Explain how different rock types produce distinctive landscapes in Ireland, with reference to examples.
6. Examine how humans interact with the rock cycle, with reference to one of the following – geothermal energy

7.1 Examine the formation of two igneous rocks, with reference to Irish examples (30m)

Marking scheme – 15 SRPs

- 2 SRPs for two igneous rocks named
- Rock 1: 1 SRP for Irish example and 6 SRPs for examination/explanation
- Rock 2: 1 SRP for Irish example and 5 SRPs for examination/explanation
- 1 SRP for optional diagram taken from either Rock 1 or Rock 2 examination/explanation

Igneous rocks

- **Igneous rocks** are formed due to volcanic activity. They are categorised by the location they cool and solidify – intrusive or extrusive.

- **Intrusive rocks** are also known as **plutonic rocks**. They are formed when magma forces its way into rock cavities. The magma cools and solidifies deep in the earth's crust. **Example: granite.**
- **Extrusive rocks** are also known as **volcanic rocks**. They are formed when lava erupts from volcanoes or sea-floor fissures. The lava cools and solidifies on the earth's surface. **Example: basalt.**

7.1.1 Basalt

- Basalt is an extrusive rock being formed on the earth's surface.
- Basalt makes up most of the ocean floor due to lava erupting from sea-floor fissures, making it the most common rock in the world.
- Basalt is formed at divergent plate boundaries, when plates separate, or anywhere volcanic activity occurs (such as volcanic cones or mid-ocean ridges).
- Basalt is dark in colour, varying from black to dark green (due to the olivine mineral).
- Basalt contains predominantly iron and magnesium.
- Basalt is fine-grained containing tiny crystals. The crystals are tiny due to the rapid cooling of lava on the earth's surface.
- Basalt is used for road chippings and is a hard rock, which is resistant to weathering and erosion.
- Example: Antrim-Derry Plateau (**for more SRPs look at Chapter 4 – Volcanoes, more specifically 4.8**).



7.1.2 Granite

- Granite is an intrusive/plutonic rock being formed within the depths of the earth's crust, ranging from small dikes to large batholiths.
- Granite is formed where an oceanic plate sinks below a continental plate (subduction). For example: South American/Nazca plates. Magma will rise upwards and cool and solidify within fissures and cracks in the rock.
- Granite can also be formed when two plates collide and buckle upwards, forming fold mountains. Magma cools and solidifies within folds and faults in the existing rock.
- Granite can be white, pink or grey in colour, depending on their mineralogy.

- Granite consists of silica-rich minerals such as feldspar, mica and quartz.
- Granite is coarse-grained containing large crystals. These crystals are large due to the slow cooling of magma within the earth's crust.
- Granite is used for construction as it is resistant to weathering and erosion.
- Example: Leinster Batholith (*for more SRPs look at Chapter 4 – Volcanoes, more specifically 4.8*).



7.2 Examine the formation of two sedimentary rocks, with reference to Irish examples (30m)

Marking scheme – 15 SRPs

- 2 SRPs for two sedimentary rocks named
- Rock 1: 1 SRP for Irish example and 6 SRPs for examination/explanation
- Rock 2: 1 SRP for Irish example and 5 SRPs for examination/explanation

Sedimentary rocks

- **Sedimentary rocks** are formed on land, lake beds or beneath the sea. They are developed in layers called strata because sediment is deposited over time and at different rates. **Lithification** is the process that converts sediments into solid rock due to compaction and cementation.
- **Inorganic sedimentary rocks** are formed by the weathering and erosion of pre-existing rocks. *Example: sandstone and conglomerates.*
- **Organic sedimentary rocks** are formed by sediments that once came from living organisms. *Example: limestone and coal.*
- **Chemical sedimentary rocks** are materials that are carried in solution in lakes and seas. *Example: gypsum and rock salt.*

7.2.1 Inorganic sedimentary rocks

Sandstone

- Sandstone is the second most common rock type in Ireland.
- Sandstone is a build-up of sand that have been deposited on land or shallow seas and later lithification.

- Sandstone is a stratified rock separated with bedding planes. *Bedding planes* are surfaces that separate each layer of the rock.
- Sandstone is red/brown in colour (known as old red sandstone).
- *Example: Munster Ridge and Valley Region & MacGillycuddy Reeks, Co. Kerry*
 - Formed 350 million years ago.
 - At this time, Ireland was 30° south of the equator and experienced a desert climate.



Conglomerates

- Conglomerates are found in association with limestone.
- These boulders and pebbles were deposited by flood water.
- Pores within the rock were filled with sand and mud and became compacted and cemented.
- Pebbles may be rounded or angular and found in a variety of colours.

7.2.2 Organic sedimentary rocks

Limestone

- Limestone is the most common rock in Ireland.
- Limestone is formed by skeletal remains (teeth, bones and shells) of marine creatures such as sea urchins, fish and coral. These marine creatures were made up of *calcium carbonate*.
- These remains have been lithified on the beds of warm, clear and shallow seas with calcite, which came from the bones and shells of marine remains.
- Limestone is a stratified rock which can be found in white, but sometimes grey or black.
- Limestone is a *permeable* rock, meaning that water can pass through it, and *soluble*, meaning that it can dissolve.
- Limestone was formed in Ireland around 350 million years ago when Ireland was located south of the equator.
- Limestone can be used as a building material with the production of cement by heating powdered limestone with clay.
- *Example: The Burren, Co. Clare*



Chalk and Dolomite

- Chalk is pure, soft and white-coloured. It was laid down far away from sediments that originated on land. Chalk once covered Ireland but has been weathered and eroded, except under the Antrim-Derry Plateau.
- Dolomite is limestone that has undergone a chemical change. Some of the calcium has been replaced by magnesium. It can be found in white, grey or pink.

7.2.3 Chemical sedimentary rocks

Gypsum

- Soft white mineral.
- Found as an ingredient in plaster, plasterboard and cement industries.
- Mined at Kingscourt, Co. Cavan.

Rock Salt

- Used for de-icing roads and much of it is exported.
- Mined at Carrickfergus, Co. Antrim.

7.3 Examine the formation of two metamorphic rocks, with reference to Irish examples (30m)

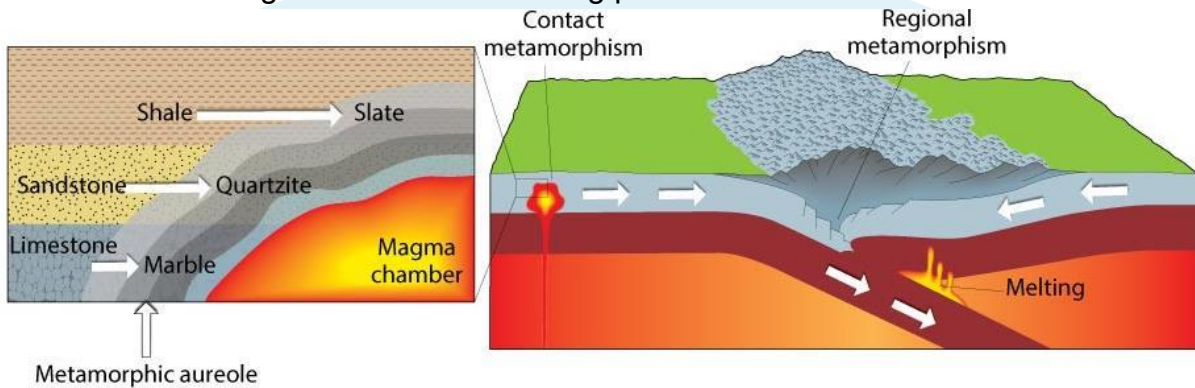
Marking scheme – 15 SRPs

- 2 SRPs for two metamorphic rocks named
- Rock 1: 1 SRP for Irish example and 6 SRPs for examination/explanation
- Rock 2: 1 SRP for Irish example and 5 SRPs for examination/explanation
- 1 SRP for optional diagram taken from either Rock 1 or Rock 2 examination/explanation

Metamorphic rocks

- **Metamorphic rocks** were once igneous and sedimentary rocks but have undergone great heat or pressure changes. These changes can be physical in appearance or chemical.
- **Contact metamorphism** is caused by heat alone. Magma intrudes into the crust and heats the rocks around the magma.

- An aureole is the zone surrounding an intrusion, which is a mass of igneous rock that solidifies between other rocks located within the earth.
- **Regional metamorphism** is caused by heat and pressure. It occurs during periods of folding when one tectonic plate is subducted.
 - Rocks are subjected to extreme pressure by colliding plates and high temperatures as magma rises into the rock.
 - These metamorphic rocks were formed in Ireland around 400 MYA during the Caledonian folding period.



7.3.1 Marble

- Marble is a coarse-grained rock, whose parent rock was either limestone or chalk.
- It was formed as a result of regional metamorphism – heat and pressure.
- Fossils within the limestone are destroyed in the process and marble develops large crystals.
- Pure marble is white in colour. However, marble can be found in other colours with the presence of different minerals. For example, red (iron oxide) and green (serpentine).
- Marble is used for ornamental purposes, sculptures and buildings.
- Marble can be found in Connemara, Co. Galway (green marble), Co. Cork (red marble) and Rathlin Island, Co. Antrim (white).



7.3.2 Quartzite

- Sandstone was the parent rock of quartzite. Sandstone came into contact with deeply buried magma.
- Quartzite varies in colour from white, grey to pink.
- Spaces between the grains were filled with silica which help bind quartz to the quartzite.
- Quartzite may sometimes contain a mineral called fuchsite which would give the rock a green colour.
- Quartzite is much harder than the parent rock, sandstone, and extremely resistant to erosion.
- Quartzite can be found in Croagh Patrick, Co. Mayo, Errigal, Co. Donegal and Sugar Loaf, Co. Wicklow.



7.4 Rock Cycle

All rocks can be:

- Weathered and eroded into sediments to form sedimentary rocks.
- Turned into molten magma by melting. Molten magma will cool and solidify to form igneous rocks.
- Igneous and sedimentary rocks under great heat and pressure will turn into metamorphic rocks.

7.5 Examine how humans interact with the rock cycle, with reference to one of the following – geothermal energy (30m)

Marking scheme – 15 SRPs

- 1 SRP for example
- 1 SRP for interaction identified
- 13 SRPs for examination/explanation (1 SRP for optional diagram)

Human interaction with the rock cycle

- Metals: ferrous (iron), base (copper and lead), precious (gold and silver).
- Construction: sand and gravel, crushed rock, ornamental stone, gypsum salts.
- Tourism and leisure: The Burren, Co. Clare, Giant's Causeway, Co. Antrim, hill walking and rock climbing.

- Agriculture: soil – alluvium, loess (silt-size grains of quartz, feldspar and mica) and volcanic soils.
- Energy: oil, coal, peat, natural gas, uranium and geothermal energy.
- ***For this essay, you can use the same information in Chapter – 4 Volcanoes (more specifically section 4.7 – Geothermal energy in Iceland).***

7.6 Explain how different rock types produce distinctive landscapes, with reference to examples (30m)

In this essay, you should talk about the formation of each rock and how it produces distinct landscapes.

Examples of rock types producing distinctive landscapes are:

Basalt – Antrim-Derry Plateau Granite – Leinster Batholith

Limestone – The Burren

As we have already examined the Antrim-Derry Plateau and Leinster Batholith in Chapter 4 – Volcanoes. We used these examples in intrusive and extrusive volcanic features in the Irish landscape. To make it easier for you, you should double up on this information and use it in this essay.

Marking scheme – 15 SRPs

- 2 SRPs for rock one named and example provided
- 2 SRPs for rock two named and example provided
- 11 SRPs for examination/explanation (1 SRP for optional diagram)

Basalt – Antrim-Derry Plateau

This section may also be found in Chapter 4 – Volcanoes (more specifically 4.8)

- A basalt plateau is a flat-topped upland area made of basalt rock. These form due to fissure eruptions, where basic lava spews out of the lithosphere when separating at constructive plate boundaries or hot spots.
- Basic lava is very runny and can reach temperatures of 1000°C.
- Basalt plateaux can range from 3 sided to 12 sided polygonal structures.
- The Antrim-Derry Plateau was formed 65 million years ago when the Eurasian and American plates were separating, creating a constructive plate boundary.
- This created the Atlantic Ocean, with volcanic activity lasting for 15 million years.
- Lava flows, ranging in thickness from 5m to 40m, cooled to form basalt on the surface.
- The plateau is 4000km² with a peak height of 350m.

- The Giant's Causeway is a distinct part of this landscape with 60,000 hexagonal columns of slowly formed basalt due to being trapped in a river valley.
- Lower columns of basalt are exposed to coastal erosion.

Granite – Leinster Batholith

This section may also be found in Chapter 4 – Volcanoes (more specifically 4.8)

- Largest intrusive feature in Ireland and Great Britain.
- 1500km² of landscape, including the Dublin, Wicklow and Blackstairs Mountains.
- The plutonic rock was formed during the convergent/destructive plate boundary at the North American and Eurasian plates. This happened 400-450 MYA during the Caledonian period.
- Magma intruded into the fractures in the rock and slowly cooled and solidified to form granite.
- Batholiths are usually surrounded by a zone or aureole of metamorphic rocks. Intense heat and pressure turned the surrounding sedimentary rocks into metamorphic rocks, such as quartzite and schist.
- The batholith is visible today because the processes of weathering and erosion removed the overlying quartzite and schist and exposed the once deeply buried granite.
- This exposed the gently sloping dome-shaped mountains, such as Table Mountain and Kippure, Co. Wicklow. Some of the mountains are topped by tors, which are large blocks of granite with joints that have been enlarged by weathering.
- Lugnaquilla is the highest peak of Wicklow Mountains at 925m. The schist capstone has protected the underlying granite from erosion.

Limestone – The Burren, Co. Clare.

- Limestone plateau that covers 360km² of Co. Clare.
- Formed during the Carboniferous period – 300-350 million years ago.
- Some rocks have been slightly folded as a result of earth movements. For example: Mullaghmore.
- Slieve Elva is 344m high, making it the highest point of the Burren.
- There is a cap of shale and sandstone on Slieve Elva. Most of them have been eroded, exposing the limestone.
- The limestone at the Burren, Co. Clare has been chemically weathered by the process of carbonation → ***This will be studied in Chapter 8 – Weathering (more specifically 8.3).***

7.6 Exam Questions

Part 1 – Short Questions

- This chapter appears in Part 1 of the Leaving Cert Geography exam (short questions).
- You are required to answer 10 out of 12 short questions.
- Each question is worth 8 marks – total 80 marks awarded – 20% of your exam.
- You should spend between 20 to 25 minutes on this section.
- **Tip: Answer all 12 short questions to maximise your chances of receiving full marks.**

Part 2 – Structured and Essay Style Questions

- This chapter may appear as Part A of Q1, 2 or 3.
- This question is worth 20 marks or 5% of your exam.
- This question should take you 5 minutes.
- It will provide a source (image, diagram or map) and ask you a series of questions related to it.
- Some questions might relate to your theoretical knowledge of the content.
- Keywords from this chapter might be used in Part A to answer questions.

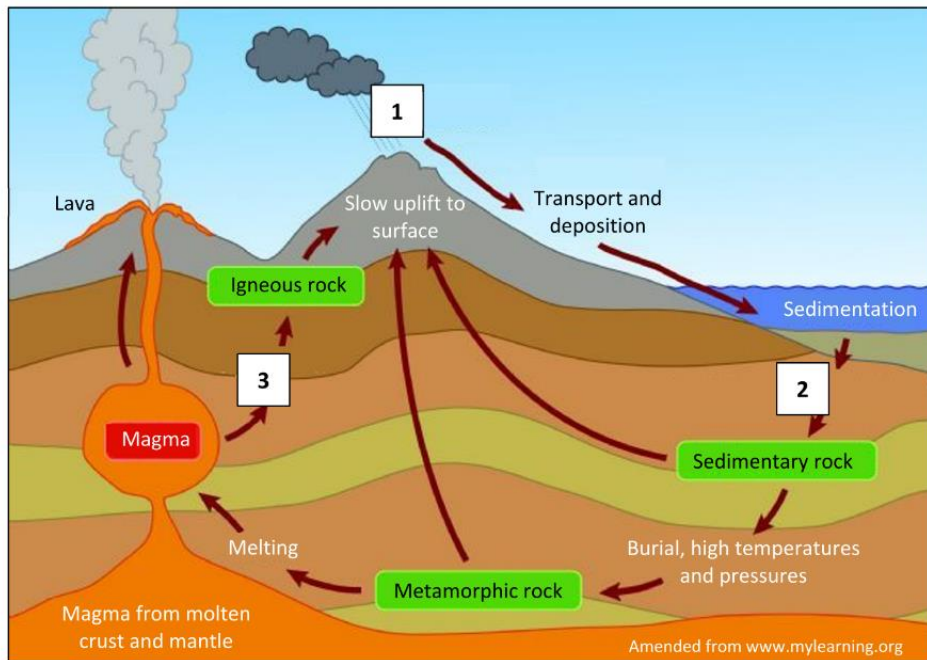
Essays

- Examine the formation of two igneous rocks, with reference to Irish examples – 30m
2023, 2021, 2014, 2011
- Examine the formation of sedimentary rocks, with reference to Irish examples – 30m
2024, 2022 Deferred, 2015, 2009
- Examine the formation of metamorphic rocks, with reference to Irish examples – 30m
2022, 2013, 2010
- You may be asked to compare two rocks from different rock categories.
Previous combinations included – 30m
 - Plutonic igneous rock and metamorphic rock **2020**
 - Sedimentary and metamorphic rock **2019, 2012**
 - Igneous and metamorphic rock **2016**
- Explain how different rock types produce distinctive landscapes in Ireland, with reference to examples – 30m
2019, 2016, 2014, 2008, 2006

- Examine how humans interact with the rock cycle, with reference to one of the following – geothermal energy – 30m
2023 Deferred, 2023, 2022, 2020, 2018, 2015, 2013, 2011, 2010, 2009, 2007, 2006
- ***You only have 15 minutes in the exam to write an essay worth 30 marks.***



2023 – Part 1 – Question 4



Examine the diagram of the rock cycle above and answer each of the following questions.

- (i) Match each of the numbers on the diagram with the process that best matches it in the table below.

Process	Number
Crystallisation of magma	
Weathering and erosion	
Compaction and cementation	

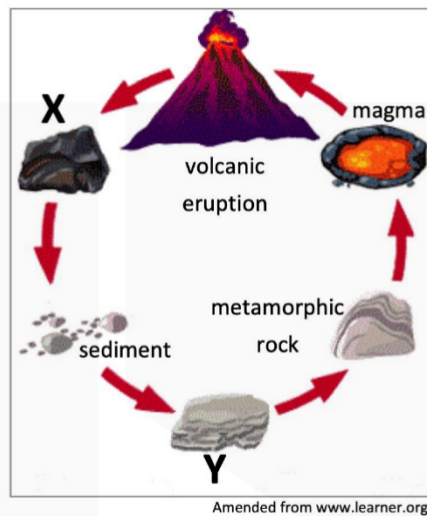
- (ii) Name **one** example of a sedimentary rock **and one** example of a metamorphic rock.

Sedimentary rock:
Metamorphic rock:

[8m]

2022 Deferred – Part 1 – Question 4

4. Rock Cycle



Examine the diagram of the rock cycle above and answer each of the following questions.

- (i) Name the category of rock at **X** and name a location in Ireland where this rock is found.

Category
Irish Location

- (ii) Name the category of rock at **Y** and name a location in Ireland where this rock is found.

Category
Irish Location

- (iii) Name **two** factors that result in metamorphism.

1.
2.

- (iv) Explain briefly the term *lithification*.

[8m]

2016 – Part 1 – Question 4

4. Rocks

- (i) The list below contains a number of source materials from which rocks are formed and a number of metamorphic rocks.

Sand	Marble
Shells and fish bones	Gneiss
Magma	Quartzite

Complete the table below by inserting the correct terms from the list, to match each of the rocks named in the table with:

- (a) the source material most associated with it and
(b) the metamorphic rock most associated with it.

Rock Name	(a) Source Material	(b) Metamorphic Rock
Sandstone		
Limestone		
Granite		

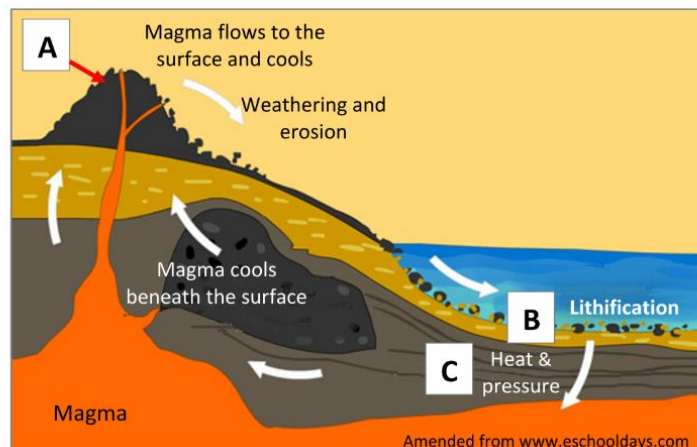
- (ii) Name the rocks most associated with each of the following Irish locations.

(a) The Antrim Plateau _____

(b) The Burren _____

[8m]

2017 – Part 2 – Question 3A



Examine the diagram of the rock cycle above and answer each of the following questions.

- (i) Name the category of rock formed at **A** and the category of rock formed at **B**.
- (ii) Name the category of rock formed at **C** and name **one** specific Irish location where this rock can be found.
- (iii) Explain briefly what is meant by the term *lithification*.
- (iv) Explain briefly what is meant by the term *plutonic rock*.
- (v) Explain briefly how rocks are changed by either *thermal metamorphism* or *regional metamorphism*.

[20m]



7.8 Sample essays

Explain the formation of two igneous rocks, with reference to Irish examples

Marking scheme – 15 SRPs

- 2 SRPs for two igneous rocks named
- 7 SRPs for rock one (1 SRP allowed to be an Irish location)
- 6 SRPs for rock two (1 SRP allowed to be an Irish location)

An example of an intrusive/plutonic rock is granite [SRP]. Intrusive rocks are formed when magma cools and solidifies within the Earth's crust [SRP]. The surrounding layers of rock act as insulation and the magma cools very slowly. Granite is formed where an oceanic plate sinks under a continental plate. This is known as subduction [SRP]. For example, the South American and Nazca plates. Granite can also be formed where two plates collide and buckle upwards to form fold mountains [SRP].

Granite can be found in white, pink or grey in colour, depending on the mineralogy present [SRP]. Granite contains silica-rich minerals, such as feldspar, mica and quartz. Granite is coarse-grained in texture and contains large crystals due to the slow cooling of magma within the depths of the Earth's crust [SRP]. Granite can be used for the exterior of buildings, monuments and gravestones. It must be highly polished to prevent weathering.

In Ireland, granite can be found in the Leinster Batholith [SRP]. It was formed over 400 million years ago due to the collision of the North American and Eurasian continental plates. Magma intruded into the folds of rock and cooled and solidified slowly to form masses of granite [SRP]. The Leinster Batholith is 1,500 km² of an intrusive igneous formation running from Killiney, Co. Dublin to Thomastown, Co. Kilkenny, including the Dublin/Wicklow and Blackstairs mountains.

An example of an extrusive/volcanic rock is basalt [SRP]. Extrusive rocks are formed due to lava cooling and solidifying on the Earth's surface [SRP]. It is formed at divergent plate boundaries, where plates separate or where volcanic activity occurs, such as volcanic cones and mid-ocean ridges [SRP]. This makes basalt the most common rock in the world.

Basalt ranges from black to dark green in colour depending on its mineral content. For example, specs of green in basalt could be due to the mineral olivine present [SRP]. However, basalt predominantly consists of iron and magnesium. Basalt is fine grained containing tiny crystals, which are too small to be seen with the eye, due to the rapid cooling of lava on the Earth's surface. This does not give adequate time for crystals to form [SRP].

In Ireland, basalt can be found at the Antrim-Derry Plateau [SRP]. The plateau is 4,000 km² in area with a peak height of 350 metres. The Giant's Causeway is a distinct part

of the landscape with 60,000 hexagonal columns of slowly formed basalt due to being trapped in a river valley. The lower hexagonal columns are exposed to coastal erosion [SRP].

15 SRPs x 2 marks = 30 marks – H1



Examine the formation of two metamorphic rocks, with reference to Irish examples (30m)

Marking scheme – 15 SRPs

- 2 SRPs for two metamorphic rocks named
- Rock 1: 1 SRP for Irish example and 6 SRPs for examination/explanation
- Rock 2: 1 SRP for Irish example and 5 SRPs for examination/explanation
- 1 SRP for optional diagram taken from either Rock 1 or Rock 2 examination/explanation

Metamorphism is the changing of rock by the action of great heat and/or pressure. Metamorphism of rocks occur at temperatures higher than 200°C and pressures higher than 300 megapascals (3,000 times normal atmospheric pressure) [SRP].

An example of a metamorphic rock is marble [SRP]. Marble is a coarse-grained rock, whose parent rock was either limestone or chalk [SRP]. It was formed as a result of regional metamorphism. This is where rocks have changed due to heat and pressure [SRP]. The fossils present within the limestone are destroyed in the process and marble develops large crystals [SRP]. Pure marble is white in colour. However, marble can be found in other colours with the presence of different minerals. For example, red (iron oxide) and green (serpentine) [SRP]. Marble is much harder than the parent rock, limestone, and extremely resistant to erosion. Marble is used for ornamental purposes, sculptures and buildings [SRP]. Marble can be found in Connemara, Co. Galway, which contains serpentine giving the rock a green colour [SRP].

Another example of a metamorphic rock is quartzite [SRP]. Quartzite is a coarse-grained rock, whose parent rock was sandstone [SRP]. Quartzite was formed due to thermal metamorphism. This occurs when rocks are affected by the great heat supplied by magma [SRP]. Quartzite varies in colour from white, grey to pink [SRP]. Spaces between the grains were filled with silica which help bind quartz to the quartzite [SRP]. Quartzite may sometimes contain a mineral called fuchsite which would give the rock a green colour. Quartzite is much harder than the parent rock, sandstone, and extremely resistant to erosion [SRP]. Quartzite can be found in Croagh Patrick, Co. Mayo [SRP].

15 SRPs x 2 marks = 30 marks – H1

Examine how humans interact with the rock cycle, with reference to one of the following – geothermal energy

Marking scheme – 15 SRPs

- 1 SRP for example
- 1 SRP for interaction identified
- 13 SRPs for examination/explanation (1 SRP for optional diagram)

Geothermal energy production uses heat from hot igneous rocks to heat water and generate steam which can be used to make electricity [SRP]. Iceland is found on the Mid-Atlantic Ridge and formed due to the separation of the North American and Eurasian plates. This makes Iceland a hot spot for volcanic activity and a producer of geothermal energy [SRP].

Groundwater absorbs heat from the rocks and becomes hot. As the water is heated, its temperature rises above the boiling point to become superheated, reaching 200°C [SRP]. Wells are drilled into the rock and hot water is pumped out of the ground. If there is a shortage of groundwater, cold water is pumped into the rock via another series of wells [SRP]. When the hot water reaches the earth's surface, it decompresses to steam. This steam is used to drive turbines and generate electricity [SRP].

Iceland has five geothermal energy plants and these produce over 75% of the country's electricity requirements. The main demand for energy comes from households [SRP]. Apart from domestic uses, this source of clean, cheap energy has attracted energy-hungry industries such as aluminium smelting. Three smelters consume 70% of the geothermal electricity produced each year [SRP]. The country also plans to export the geothermal electricity to Europe through undersea cables measuring 1,170km in length, which will be connected to Galway [SRP].

This energy is piped and sent to nearby urban centres for central heating in homes, offices and industries. At present, 26% of electricity in Iceland is generated using geothermal energy [SRP]. Over 90% of homes in Iceland are heated with geothermal energy. This has made Reykjavik one of the cleanest and sustainable cities with the use of renewable energy [SRP]. The water, when it cools, is pumped through pipes that have been installed under the soil of greenhouses, enabling flowers and vegetables to be grown throughout the year. It has also replaced oil as the energy source by growers [SRP].

Tourism is the fastest-growing section of the Icelandic economy. Most tourists are attracted by features that are related to volcanic activity, including volcanoes, geysers and hot pools [SRP]. Over 500,000 people visit Iceland's geothermal attractions each year. The Blue Lagoon is one of the best-known hot pools or spas in Iceland [SRP]. Water heated by geothermal energy is pumped from 1,600m below

the surface. Excess water, separate to that used for heat and electricity, is pumped into the lagoon [SRP].

+ [SRP] for valid diagram

15 SRPs x 2 marks = 30 marks – H1



Explain how different rock types produce distinctive landscapes, with reference to examples (30m)

Marking scheme – 15 SRPs

- 2 SRPs for rock one named and example provided
- 2 SRPs for rock two named and example provided
- 11 SRPs for examination/explanation (1 SRP for optional diagram)

Granite is an intrusive igneous rock, that forms when magma slowly cools and solidifies within the earth's crust. Therefore, minerals such as mica, quartz and feldspar have time to grow [SRP].

An example of a distinctive landscape produced by granite is the Leinster Batholith [SRP]. A batholith is the largest of all plutons, with a surface area greater than 100 km² [SRP]. Batholiths formed as magma intruded into the crust forcing its way into the bedding planes of sedimentary rock. It pushed the sedimentary rocks out of the way and occupied the great arched folds that it created. The magma cooled very slowly to form the granite batholith [SRP]. As hot molten magma came into contact with the surrounding sedimentary rocks, the intense heat and pressure changed them to metamorphic rocks, such as quartzite and schist [SRP]. Weathering and erosion have removed much of the overlying rock, exposing the gently-sloping, dome-shaped mountains [SRP]. Lugnaquilla, at 925 metres, is the highest peak in the Wicklow Mountains. It still has its capstone of resistant schist. This protected the underlying granite from erosion and has given it a steeper slope than the surrounding landscape [SRP]. The Leinster Batholith occupies over 1,500 km² of the landscape including the Dublin Mountains, Wicklow Mountains and Blackstairs Mountains [SRP].

Basalt is an extrusive igneous rock, that forms on the earth's surface after volcanic activity [SRP]. Basalt is formed after lava quickly cools and solidifies. Therefore, minerals such as mica, quartz and feldspar do not have time to grow visible to the eye [SRP].

Basalt forms a distinctive landscape known as the Antrim-Derry Plateau [SRP]. A basalt plateau is a flat-topped upland area made of basalt rock. They form during fissure eruptions of basic lava that occurs at constructive plate boundaries or hot spot [SRP]. Basic lava is very runny, and 1000°C, which allows for the creation of a plateau. The Antrim-Derry Plateau was formed 65 million years ago when the Eurasian and American plates were separating, creating a constructive plate boundary [SRP]. Lava flows, ranging in thickness from 5m to 40m, cooled to form basalt on the surface. The plateau is 4000km² with a peak height of 350m [SRP]. The Giant's Causeway is a distinct part of this landscape with 60,000 hexagonal columns of slowly formed basalt due to being trapped in a river valley. The lower columns of basalt are exposed to coastal erosion [SRP].

15 SRPs x 2 marks = 30 marks – H1