

# Leaving Certificate

# Geography

## The Rock Cycle

Please see *Teachers' Notes* for explanations, additional activities, and tips and suggestions.

<b>Levels</b>	Students' English-language skills should be developed to <b>Level B1</b> during funded Language Support. Mainstream subject learning will require the development of skills at <b>Level B2</b> if students are to cope with public examinations.	
<b>Language focus</b>	Key vocabulary, word identification, sentence structure, extracting information from text, writing text, grammar.	
<b>Learning focus</b>	Using Geography textbooks and accessing curriculum content and learning activities.	
<b>Acknowledgement</b>	The <i>English Language Support Programme</i> gratefully acknowledges the permission of Gill and Macmillan to reproduce excerpts from <i>Dynamic Human Geography</i> by Patrick O'Dwyer, Barry Brunt and Charles Hayes.	
<b>Contents of this Unit</b>	Keywords Vocabulary file Activating students' knowledge Focus on vocabulary Focus on grammar <i>(sentence order, irregular verbs, the passive form, adjectives)</i> Focus on reading Focus on writing <i>(writing sentences from prompts)</i> Answer Key	<b>Page</b> 3 4,5 6 7,8 9,10  11,12,13,14 15  16,17,18,19

## Using this unit

### Language support and mainstream subject class

The sections **Activating students' knowledge**, **Focus on vocabulary**, and **Focus on grammar** have been designed, in particular, for Language Support classes.

**Focus on reading** and **Focus on writing** are suitable for use in either Language Support or subject classes.

### Answer Key

Answers are provided at the end of the unit for all activities except those based on free writing.

### Textbooks

This unit focuses on the section *The Rock Cycle* of the Leaving Certificate Geography curriculum. Students will need to use their textbooks if they are to gain the most benefit from the activities.

### Learning Record

The Learning Record is intended to help students monitor their progress. This can be downloaded or printed from the website in the section *Advising Students and Record of Learning for the Leaving Certificate*. A copy of the Learning Record should be distributed to each student for each Unit studied.

Students should:

1. Write the subject and topic on the record.
2. Tick off/date the different statements as they complete activities.
3. Keep the record in their files along with the work produced for this unit.
4. Use this material to support mainstream subject learning.

### Symbols

Symbols are used throughout the unit to encourage students to develop their own learning and support materials.



prompts students to file the sheet when they have completed the activity. This is used for activities which can be used as a reference in the future e.g. for subject classroom, revision, homework etc.



prompts students to add vocabulary, definitions, or examples of vocabulary in use to their own personal glossary for the topic. A personal glossary makes study and revision more efficient.

**Nouns**

acid  
 appearance  
 area  
 basalt  
 billion  
 cave  
 cavern  
 change  
 channels  
 column  
 compression  
 crack  
 crystals  
 denudation  
 desert  
 environment  
 erosion  
 features  
 feldspar  
 formation  
 frost  
 granite  
 gravel  
 igneous activity  
 karst  
 land  
 landform  
 lava  
 limestone  
 liquid  
 location  
 magma  
 make-up  
 metamorphism  
 million  
 mineral  
 molten rock  
 mountain regions  
 mud  
 openings  
 particles  
 passages  
 pillar  
 plate tectonics  
 plutonic rock

**Keywords**

presence  
 rain  
 rainfall  
 rainwater  
 region  
 ridges  
 rock  
 rock particles  
 sandstone  
 scree  
 season  
 setting  
 sky/skies  
 stalactite  
 stalagmite  
 sun  
 surface  
 temperature  
 weather  
 weathering  
 wind

**Verbs**

to affect  
 to build up  
 to buckle  
 to change  
 to compose  
 to compress  
 to cool  
 to create  
 to deposit  
 to destroy  
 to develop  
 to disappear  
 to dissolve  
 to drip  
 to erode  
 to evaporate  
 to fall  
 to form  
 to freeze  
 to heat  
 to locate  
 to make

to protect  
 to push  
 to quarry  
 to react  
 to trail  
 to wear away

**Adjectives**

active  
 bare  
 changed  
 cold  
 deep  
 dry  
 few  
 igneous  
 important  
 metamorphic  
 narrow  
 natural  
 negative  
 passive  
 positive  
 sedimentary  
 sparse  
 special  
 tectonic  
 trailing  
 tropical  
 underground  
 weak

**Adverbs**

directly  
 gradually  
 naturally  
 rapidly  
 slowly  
 together

**Proper nouns**

Carboniferous Period  
 The Equator

NAME: \_\_\_\_\_ DATE: \_\_\_\_\_  
Leaving Certificate GEOGRAPHY: The Rock Cycle

Vocabulary file for the topic  
**The Rock Cycle**

Word	Meaning	Page(s) in my textbook	Note
igneous			
sedimentary			
metamorphic			
plate margins			
quarrying			
landforms			
weathering			
freeze-thaw			
granite			
limestone			
feldspar			

NAME: \_\_\_\_\_ DATE: \_\_\_\_\_  
Leaving Certificate GEOGRAPHY: The Rock Cycle

Word	Meaning	Page(s) in my textbook	Note
sandstone			
quartzite			
basalt			
shale			
karst			
caverns			
folding			
batholiths			
sinkholes			
crystals			
aggregates			



## Introduction

### Activating students' existing knowledge

Use a spidergram to activate students' ideas and knowledge on the key points in this chapter. See **Teachers' Notes** for suggestions.

Possible key terms for the spidergram:

## Rocks and landscapes

### The uses of rock

- Invite students to provide key words in their own languages.
- Encourage dictionary use.
- Encourage students to organise their vocabulary into relevant categories (e.g. meaning, nouns, keywords, verbs etc.).



Students should record vocabulary and terms from the spidergram in their personal dictionaries.

Level: B1  
 Individual / pair

## Focus on vocabulary

### 1. Missing words

The following sentences are taken from your textbooks. They describe different types of rocks. The key words are missing. First, check that you understand the meanings of the key words in the box below, then read the sentences and fill in the gaps.

- a) \_\_\_\_\_ rocks are formed of hot, molten rock matter which cools.
- b) Rocks which were once igneous or sedimentary and have been changed by great pressure are \_\_\_\_\_.
- c) Rocks formed from crushed remains of animals, plants and other rocks are \_\_\_\_\_.
- d) \_\_\_\_\_ is made from large crystals of mica, feldspar and quartz.
- e) \_\_\_\_\_ is a volcanic rock that cooled quickly on or near the surface.
- f) \_\_\_\_\_ is made up of many thin layers of sediment.
- g) \_\_\_\_\_ is formed from calcium carbonate or calcite.

metamorphic   basalt   granite   igneous   limestone   sedimentary   shale

### 2. Matching

Match each term in Column A with a definition in Column B. Draw a line between them. Look at your text book if you need help.



Column A	Column B
carboniferous period	When a rock or rock part is rubbed away over time by the action of weather and water.
plug and feather method	Blocks or broken masses of stone that are quarried for use in construction.
aggregate products	These minerals form granite.
erosion	Holes are drilled in rock and wedges and steel rods are used to split rock into thin slabs for use in construction.
crystals of mica, feldspar and quartz	The period of time when a lot of coal was formed in limestone.

### 3. Completing sentences

Choose the best word or phrase to complete the sentences below. Put a), b) or c) in the space. Check your textbook if you are not sure.

- 1) Rocks are destroyed by \_\_\_\_\_.  
 a) sunshine                      b) people                      c) weathering
- 2) Granite, basalt and lava are \_\_\_\_\_ rocks.  
 a) igneous                      b) limestone                      c) compressed
- 3) A \_\_\_\_\_ is a large pit where stone is extracted from the earth.  
 a) quarry                      b) cavern                      c) bed
- 4) \_\_\_\_\_ changes rocks through heat or pressure or both.  
 a) sagging                      b) extraction                      c) metamorphism
- 5) The \_\_\_\_\_ method is used to break off huge masses of rock in a quarry.  
 a) cutting                      b) explosive                      c) heating

### 4. Vocabulary in use

Write a short sentence using each of the following words/phrases. Check your text book for information.

building materials \_\_\_\_\_

magma \_\_\_\_\_

six-sided columns \_\_\_\_\_

shells and skeletons \_\_\_\_\_

gravel \_\_\_\_\_

### 5. Identifying vocabulary



Circle the words or terms in the box that relate to the rock cycle. Look through your textbook if you are not sure.

crystals	tourism	sediments	suburban	marble
weathering	valley	quartz	maps	erosion
bog	aggregates	quarries	drainage	shale
batholith	traffic	feldspar	periphery	
	snow			



Level: B1  
 Individual / pair

## Focus on grammar

### 6. Sentence order

Put the words in the correct order to form sentences. These are the type of statements that you use when writing answers.  
 Don't forget your punctuation! You should also check your textbook to find the information.

a) and doming compression are folding caused by

\_\_\_\_\_

b) landforms creates faulting such valleys block as and rift mountains

\_\_\_\_\_

c) is the rocks of weathering decay on near earth's the or surface

\_\_\_\_\_

d) water and solutions chemical cause water weathering

\_\_\_\_\_

e) some rock weathered types when they are distinctive produce landscapes

\_\_\_\_\_

f) a cavern a landform is subsurface

\_\_\_\_\_

### 7. Verbs

Some of the verbs used in this topic are irregular. This means that they do not make the past tense by adding - ed. Put the sentences below into the past tense.

Rainwater joins with carbon dioxide as it falls.	
The rocks wear away.	
Some rocks break up into large blocks.	
They quarry stone for building.	
Rift valleys drop down between faults.	
Some blocks fall from the ceiling of underground passages.	
Water drips from cavern ceilings.	
Calcite builds up to form a cone.	

## 8. The passive form

One of the reasons for learning about irregular verbs is so that you can make the **passive form** correctly. This form is often used in textbooks, particularly to describe **a process**. It is important to use the passive when you are writing.

The passive form is made by using the verb **to be** with the past participle of the active verb.

Example: Rocks **are eroded** by weather and water.

However, be careful! The past participle is **not always** the same as the past tense.

For example: the verb **to break** **Past tense: broke** **Past participle: broken**

Put these sentences into the passive form.

The rocks wear away. ( <i>Be careful!</i> )	
Some rocks break up into large blocks.	
They quarry stone for building.	
Rift valleys drop down between faults.	
Calcite builds up to form a cone.	

## 9. Adjectives

(*Adjective: a word that describes a noun or a pronoun. Example: big, happy*)

Check that you understand the adjectives below which are all taken from your textbook. Then draw a line between the adjective and its meaning.

One has been done as an example.

You can use your textbook or dictionary if you need help.

Adjective	Meaning
narrow	a small number, not many
sparse	not acting to influence or control a situation
weak	a small distance from one side to the other
natural	not covered by anything
passive	not strong
few	not made or done by people
bare	small in numbers or amount

Level: B1 / B2  
 Individual / pair



## Focus on reading

**10. Read the text and indicate with a tick (✓) whether the statements below are True or False.**

### Limestone pavement

Limestone pavement forms in regions of medium to heavy rainfall with a warm to temperate climate. It also forms because limestone is composed of one mineral, calcium carbonate, which creates even weathering of the rock surface. It reacts to rainwater which dissolves the rock. It has regular joints which are the result of unloading of the overlying rock through erosion and it is pervious. This means that rainwater can pass freely through the vertical joints and horizontal bedding planes.

Rainwater is a weak acid, called carbonic acid. This acid forms as rain falls through the air and absorbs carbon dioxide. When the rainwater lands on bare limestone rock, it creates a chemical reaction. The hydrogen in the carbonic acid separates the calcium carbonate of the limestone rock into separate calcium and bicarbonate atoms, which are both soluble in groundwater. In this way the limestone is dissolved and removed, so the rock is worn away.

The parallel vertical joints in the limestone allow the water to trickle through the rock. These cracks are widened and deepened through solution. These widened cracks are called grikes. The wider the grikes become, the faster the water is able to sink through the limestone. The parallel grikes create flat ridges of rock between them called clints.

	True	False
Limestone pavement is only found in dry cold regions.		
Limestone is formed of a single mineral.		
Limestone weathers evenly.		
Rainwater has little effect on limestone.		
Limestone is impervious to rainwater.		
Rainwater is a weak acid.		
Grikes are wide cracks in limestone.		
Between the grikes you find clints.		

## 11. Reading for the main idea

It is not always necessary to read through every sentence and paragraph of text. Nor do you have to understand every single word. However, It is important to read with a purpose.

1. In this exercise you must read each paragraph (taken from your textbook) to decide on the main idea of that paragraph.
2. Then write **a phrase** on the blank line which **summarises** the topic of the paragraph.

You should **try** to read quickly, without stopping to check every word. However, sometimes it is necessary to read with more focus when the topic is not immediately clear.

a) Topic: \_\_\_\_\_

Granite was formed from masses of magma deep within fold mountains. These are destructive boundaries where the ocean crust is subducted into the mantle. Large masses of magma rise from the sinking plate into the buckled and folded rock to form batholiths. The magma cools very slowly over millions of years and creates large crystals of mica, feldspar and quartz. These three minerals form granite.

b) Topic: \_\_\_\_\_

Conglomerate was formed from gravel in alluvial fans or river channels at the foot of steep slopes within the Caledonian mountains. The large particles, or clasts, were not eroded much because they were not carried far from their source in the mountains.

c) Topic: \_\_\_\_\_

Quarrying can have a negative effect on the landscape. Some impacts include airborne dust that can affect nearby homes and farmland. Silt is generated in rivers and this affects water quality and fish spawning grounds. There is noise and vibration from machinery as well as damage to nearby roads. Disused quarries scar the landscape and have often been used as rubbish pits.

d) Topic: \_\_\_\_\_

Folding is caused by compression. It is associated with the closing of the ocean. On the ocean floor, thousands of metres of sediment are compressed by their own weight into solid rock. Once the ocean closes, these sedimentary rocks are crushed between the colliding continents. The layers of sediments are compressed, folded and pushed up (and sometimes down) to form fold mountains.

e) Topic: \_\_\_\_\_

Some minerals absorb water. When they do, they expand. If a rock contains these kinds of mineral, the wet, expanding materials create stresses within the rock and over time shatter the rock. 'Tiny' freeze-thaw within wet minerals also helps shatter rock particles, leading them to breaking up.

## 12. Words from the texts

These are words that appeared in four of the texts in Exercise 11. The same word can have a different meaning in different contexts. Here the context is the *Rock Cycle*.

Read the texts again and, for each word, suggest another word with a similar meaning which is suitable for this context.

	Word from text	Alternative word/expression in this context
Text a)	to form	
Text a)	masses	
Text b)	foot	
Text c)	pit	
Text e)	minerals	

### Be careful!

When using your dictionary, you should always check that the word you choose is the correct word for a particular context.

### 13. Reading for specific information

Read the following extract from your textbook. Don't read slowly though every word and sentence.

Read the questions first

Read the text in order to find the answers.

Underline the key sentences when you have found the answers.

**Tip:** It's a good idea to time yourself so that you learn how to find important information quickly.

#### Questions:

1. Where does cavern formation take place?
2. Give an example of limestone caverns in Ireland.
3. Where does rainwater collect?
4. Why is the underground water acidic?
5. How does limestone rock become soluble?
6. How do the caverns become enlarged?

### The Formation of Caverns

The formation of most caverns takes place in the zone of saturation, at or below the water table in limestone regions. Some caverns, such as Marble Arch Caves, were formed by flowing water that came from the surface rivers.

When rain falls on the ground, it trickles through the soil and bedrock until it meets an impermeable rock layer. It cannot go down, so its level rises and it saturates the porous, or pervious, rock above so that all pore spaces between the rock grains and joints and bedding planes are filled with water.

This underground water is not stationary, as it constantly seeps and flows through the bedrock. This water is acidic because it dissolved carbon dioxide from the air and from organic matter as it trickled down through the soil. It is carbonic acid and it creates a chemical reaction with limestone. The hydrogen in the carbonic acid separates the calcium carbonate of the limestone rock into separate calcium and bicarbonate atoms, which are both soluble in groundwater. In this way, the limestone is dissolved and removed, so the rock is worn away.

This process creates huge cavities that become enlarged by other processes over time. Sediment in flowing groundwater erodes the rock by abrasion. Collapsing limestone blocks from small cavern ceilings increase the height of the caverns.

Level: B1 / B2  
Individual / pair

### Focus on writing

#### 14. Writing statements of fact

In the Leaving Certificate exam, many answers are written as simple sentences. This exercise will give you practice in writing these sentences.

Read the question or instruction first, then write the statement using the main points. You may have to write two sentences in some cases.

Check your textbook to make sure that your facts are correct.

a) What is freeze-thaw action?

water trapped/ water freezes and thaws/forces joint open/ shatters rock

---

b) What is a sinkhole?

opening in bed of river/ river disappears underground / limestone region

---

c) What are speleothems and where are they formed?

stalactites, stalagmites pillars and curtains/ calcite / dry, nearly dry caverns

---

d) How are igneous rocks formed? Give two examples of igneous rocks.

molten rock matter / cools / solid / examples?

---

e) What is basalt and where can you see basalt columns in Ireland?

volcanic / dark / heavy / rusty spots / iron

---

f) When was Ireland's limestone formed, what is it composed of and what does it contain?

near Equator / 300-350 million years / compressed shells / fossils

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## Answer Key

### Focus on vocabulary

#### 1. Missing words

- a) **Igneous** rocks are formed of hot, molten rock matter which cools.
- b) Rocks which were once igneous or sedimentary and have been changed by great pressure are **metamorphic**.
- c) Rocks formed from crushed remains of animals, plants and other rocks are **sedimentary**.
- d) **Granite** is made from large crystals of mica, feldspar and quartz.
- e) **Basalt** is a volcanic rock that cooled quickly on or near the surface.
- f) **Shale** is made up of many thin layers of sediment.
- g) **Limestone** is formed from calcium carbonate or calcite.

#### 2. Matching

Column A	Column B
carboniferous period	The period of time when a lot of coal was formed in limestone.
plug and feather method	Holes are drilled in rock and wedges and steel rods are used to split rock into thin slabs for use in construction.
aggregate products	Blocks or broken masses of stone that are quarried for use in construction.
erosion	When a rock or rock part is rubbed away over time by the action of weather and water.
crystals of mica, feldspar and quartz	These minerals form granite.

#### 3. Completing sentences

1. c) .
2. a)
3. a)
4. c)
5. b)

#### 4. Vocabulary in use

Suggested main points for sentences:

**building materials** - quarrying / rock compounds /

**magma** - formation of basalt

**six-sided columns** - basalt cracks to form columns

**shells and skeletons** - one of the ways of forming limestone

**gravel** - conglomerate was formed from gravel in river channels



**5. Identifying vocabulary**

crystals	tourism	sediments	suburban	marble
weathering	valley	quartz	maps	erosion
bog	aggregates	quarries	drainage	shale
batholith	traffic	snow	feldspar	periphery

**Focus on grammar**

**6. Sentence order**

- Folding and doming are caused by compression.
- Faulting creates landforms such as block mountains and rift valleys.
- Weathering is the decay of rocks on or near the earth's surface.
- Water and water solutions cause chemical weathering.
- When some rock types are weathered, they produce distinctive landscapes.
- A cavern is a subsurface landform.

**7. Verbs**

Rainwater joins with carbon dioxide as it falls.	Rainwater joined with carbon dioxide as it fell.
the rocks wear away	the rocks wore away
Some rocks break up into large blocks.	Some rocks broke up into large blocks.
They quarry stone for building.	They quarried stone for building.
Rift valleys drop down between faults.	Rift valleys dropped down between faults.
Some blocks fall from the ceiling of underground passages.	Some blocks fell from the ceiling of underground passages.
Water drips from cavern ceilings	Water dripped from cavern ceilings.
Calcite builds up to form a cone.	Calcite built up to form a cone.

**8. The passive form**

The rocks wear away. (be careful!)	The rocks are worn away
Some rocks break up into large blocks.	Some rocks are broken into large blocks.
They quarry stone for building.	Stone is quarried for building.
Rift valleys drop down between faults.	Rift valleys are dropped down between faults.
Calcite builds up to form a cone.	Calcite is built up to form a cone.

**9. Adjectives – meaning of adjectives**

Adjective	Meaning
narrow	a small distance from one side to the other
sparse	small in numbers or amount
weak	not strong
natural	not made or done by people
passive	not acting to influence or control a situation
few	a small number, not many
bare	not covered by anything

**Focus on reading**

**10. Limestone pavement**

	True	False
Limestone pavement is only found in dry cold regions.		√
Limestone is formed of a single mineral.	√	
Limestone weathers evenly.	√	
Rainwater has little effect on limestone.		√
Limestone is impervious to rainwater.		√
Rainwater is a weak acid.	√	
Grikes are wide cracks in limestone.	√	
Between the grikes you find clints.	√	

**11. Reading for the main idea**

Suggested answers:

- a) How granite is formed from batholiths
- b) How conglomerate is formed in alluvial fans or river channels
- c) The negative effects of quarrying on the landscape / environment
- d) The process of folding / how fold mountains are created
- e) The action of water in chemical weathering / the freeze-thaw weathering process

**12. Words from the texts**

	Word from text	Alternative word/expression in this context
Text a)	to form	to make to create
Text a)	masses	large amounts
Text b)	foot	base, bottom
Text c)	pit	dump
Text e)	minerals	chemical substances

**13. Reading for specific information**

**. The Formation of Caverns**

The formation of most caverns takes place <sup>1</sup>in the zone of saturation, at or below the water table in limestone regions. Some caverns, such as <sup>2</sup>Marble Arch Caves, were formed by flowing water that came from the surface rivers.

When rain falls on the ground, it trickles through the soil and bedrock until it meets an <sup>3</sup>impermeable rock layer. It cannot go down, so its level rises and it saturates the porous, or pervious, rock above so that all pore spaces between the rock grains and joints and bedding planes are filled with water.

This underground water is not stationary, as it constantly seeps and flows through the bedrock. This water is acidic because <sup>4</sup>it dissolved carbon dioxide from the air and from organic matter as it trickled down through the soil. It is carbonic acid and it creates a chemical reaction with limestone. <sup>5</sup>The hydrogen in the carbonic acid separates the calcium carbonate of the limestone rock into separate calcium and bicarbonate atoms, which are both soluble in groundwater. In this way, the limestone is dissolved and removed, so the rock is worn away.

This process creates huge cavities that become enlarged by other processes over time. <sup>6</sup>Sediment in flowing groundwater erodes the rock by abrasion. Collapsing limestone blocks from small cavern ceilings increase the height of the caverns.

**Focus on writing**

**14. Writing statements of fact**

- a) Water is trapped in a joint which then freezes and forces the joint open. As the water freezes and thaws it shatters the rock.
- b) A sinkhole is an opening in the bed of a river through which a river disappears underground in a limestone region.
- c) Examples of speleothems are stalactites, stalagmites, pillars and curtains which are made of calcite and are found in dry or nearly dry caverns.
- d) Igneous rocks are formed when hot molten rock matter cools and becomes solid. Examples of igneous rocks are granite and basalt.
- e) Basalt is a volcanic rock which is dark and heavy and may have rusty spots due to a high iron content. Basalt is found in the Giant's Causeway in Co. Antrim.
- f) Ireland's limestone was formed when Ireland was near the Equator 300-350 million years ago. It is composed of compressed shells and contains many fossils.