THE GEOSPHERE

ASSESSMENT RUBRIC

Content	Assessment criteria	Learning outcomes	Key competences
The layers of the geosphere	1. Differentiating the layers of the Earth and their characteristics	1.1 Describe the general characteristics of the crust, the mantle and the core and the materials that form them, relating the mentioned characteristics to their location.	LC CMST LL SIE
Minerals Properties of minerals	2. Understanding the concept of mineral and apply it in order to recognise if certain substances are mineral or not.	2.1 Explains the concept of mineral.	MCST LL
		2.2 Applies the concept to recognise whether a substance is a mineral or not.	
	3. Differentiating minerals according to their properties.	3.1 Identifies minerals using criteria that allow their differentiation.	LC CMST SIE
Rocks Classification Types The rock cycle	4. Knowing the concept and classification of rocks.	4.1 Recognises the three types of rocks according to their origin and know the main characteristics of each type.	CMST DC LL
	5. Distinguishing the rocks according to their origin.	5.1 Identify rocks using criteria that allow their differentiation.	LC CMST SIE
The use of rocks	6. Describing the most frequent applications of rocks in daily life.	6.1 Describe some of the most frequent applications of rocks in daily life.	CMST SIE
The extraction of minerals and rocks	7. Valuating the importance of the responsible use and sustainable management in the extraction of minerals and rocks.	7.1 Recognises the importance of responsible use and sustainable management of mineral resources.	LC CMST SIE

LC: Linguistic communication; **DC**: Digital competence; **SIE**: Sense of initiative and entrepeneurship; **CMST**: Mathematical competence and basic competences in science and technology; **LL**: Learning to learn.

THE LAYERS OF THE GEOSPHERE

The geosphere is the solid layer of the Earth, which, in turn, is divided in three layers that are separated by areas known as **discontinuities.**

The deeper a layer is the more density and temperature it presents.

The crust

- **Continental crust**: it forms the continental platform, continents and is composed of rocks such as granite, clay and slate.
- **Oceanic crust**: it forms the seafloor and is composed mainly of basalt.

The mantle

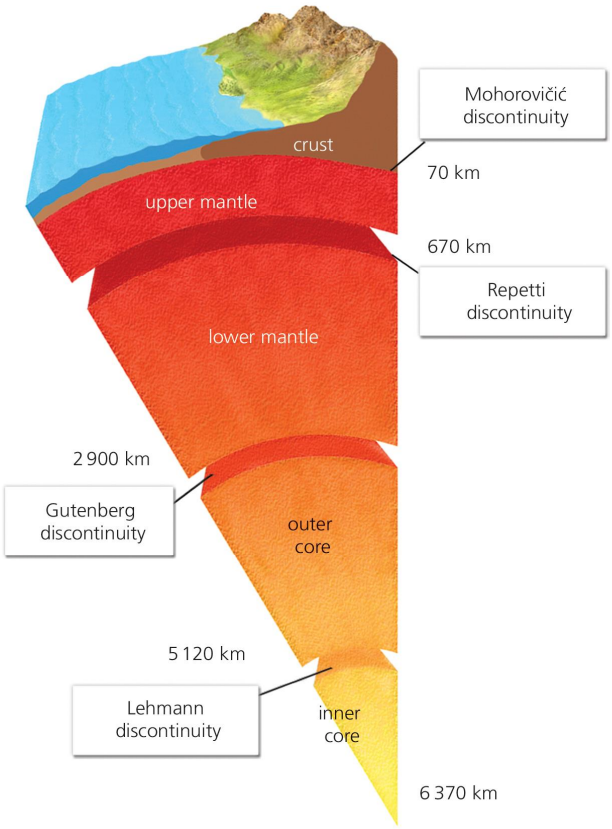
Mainly made up of a type of rock called peridot.

- **Upper mantle**: it is solid, though partially molten in some areas.
- **Lower mantle**: it contains materials in a solid state.

The core

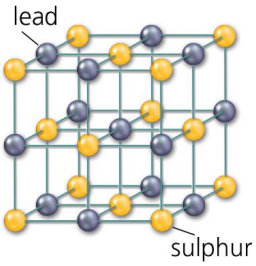
Mostly made of iron, although other metals such as nickel can be found.

- **Outer core**: formed of molten materials and it is constantly moving.
- **Inner core**: it contains the densest materials. Even being the hottest layer, the materials are in a solid state due to the immense pressure they are under.



MINERALS

- Minerals are **solid substances**. They cannot be liquid or gaseous.
- They are **inorganic.** They have not been produced by living things.
- They are **natural**, not made by humans.
- They have a **definite chemical composition**; they are composed of chemical elements that are always combined in the same proportion to create the same mineral.
- They have a **crystalline structure**. Their particles are arranged to form geometric structures such as cubes or prisms that are repeated constantly. If these shapes are visible to the naked eye, we call this a **crystal**.



The importance of minerals		
Metal ores Minerals from which metals are extracted	**Raw material for the industry**	**Gems or precious stones** Due to its scarceness and beauty

PROPERTIES OF MINERALS

These characteristics allow us to differentiate them from each other. The main ones are:

- **Streak**: the colour of the powder produced when a mineral is scratched.
- **Colour**: the characteristic colour of some minerals.
- **Habit**: characteristic shape of some minerals that reflect their crystalline structure.
- **Lustre**: how the mineral reflects light.
- **Tenacity**: how easily a mineral breaks.
- **Hardness**: a mineral's resistance to scratching. It is measured by the **Mohs scale**.

Mohs scale		
Hardness	**Mineral**	**Characteristics**
1	Talc	Very soft, can be scratched by another mineral.
2	Gypsum	
3	Calcite	Soft minerals that can be scratched by the point of a knife.
4	Fluorite	
5	Apatite	
6	Orthoclase	Hard minerals that can be scratched with sandpaper and quartz scratches glass.
7	Quartz	
8	Topaz	Very hard, cannot be scratched by any other mineral
9	Corundum	
10	Diamond	

CLASSIFICATION AND TYPES OF ROCKS

Rocks are natural aggregates made up of one or various minerals. We can identify them thanks to their composition and texture.

- **Composition**: the minerals that make up the rock. **Simple** or **homogeneous rocks** are made up of one mineral. **Complex** or **heterogeneous rocks** are made up of a variety of minerals.
- **Texture** refers to the size and arrangement of the minerals in the rock.

Types of rock

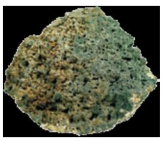
Igneous or magmatic

These originate when magma from the Earth's interior cools and solidifies.

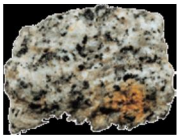
Volcanic: formed outside the Earth's crust as **lava** from volcanoes cools down.


Obsidian


Pumice stone


Basalt

Plutonic: formed when rising magma cools slowly inside the Earth's crust.


Granite


Syenite


Gabbro

Sedimentary

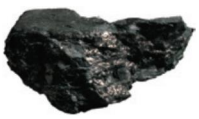
Formed when sediments (fragments of other rocks, minerals and organic remains) consolidate through **diagenesis** or **lithification**.


Conglomerate


Sandstone


Clay


Limestone


Coal


Oil

Metamorphic

Formed by the transformation of other rocks subjected to high pressure conditions and/or temperatures, without reaching a melting state.

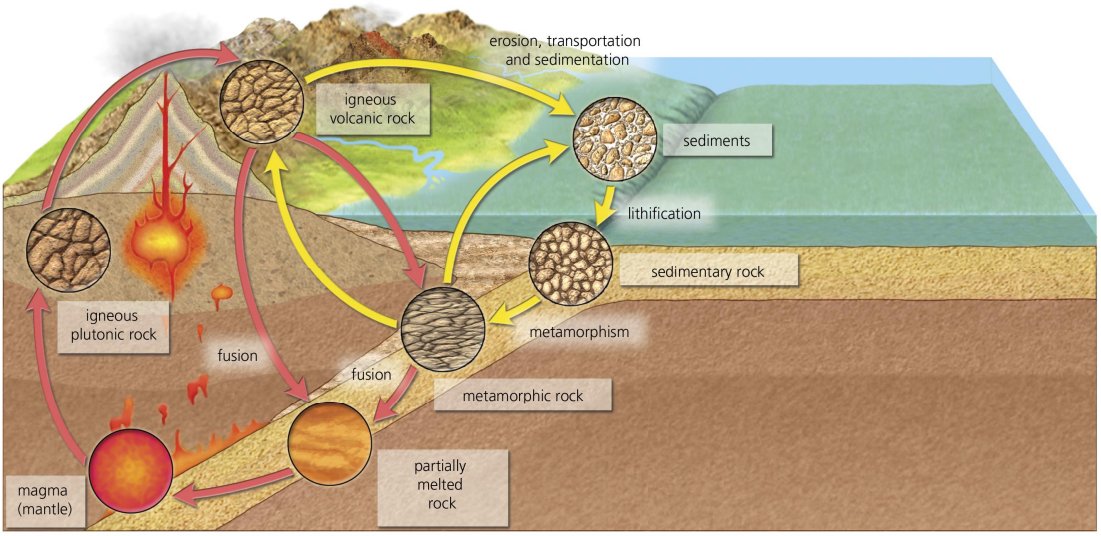

Slate


Gneiss


Marble

THE ROCK CYCLE

The rock cycle is a series of processes that a rock goes through to transform into another type of rock. It is the group of processes that a rock can undergo until it becomes one of a different type.



THE USE OF ROCKS

The evolution of humans has been linked to the use of rocks since the beginning. Nowadays, the main applications of rocks are construction, ornamentation and as source of fuels and technological materials.

<table>
<tr><th colspan="3">Building materials</th></tr>
<tr>
<td> 
Cement is obtained by grinding and heating limestone and clay.</td>
<td> 
Concrete is created by mixing cement, water, sand and gravel.</td>
<td> 
Ceramics are made with clay and water and are used to make bricks.</td>
<td> 
Glass is created from quartz present in sand.</td>
</tr>
<tr><th>Ornamental rocks</th><th>Source of fossil fuels</th><th>Source of minerals for technological use</th></tr>
<tr><td>Rocks such as marble or granite are used to decoration sculptures or building floors.</td><td>When burnt, coal and oil produce a lot of energy.</td><td>Rocks rich in quartz are a source of silicon, which is used to make computer processors or photovoltaic solar panels.</td></tr>
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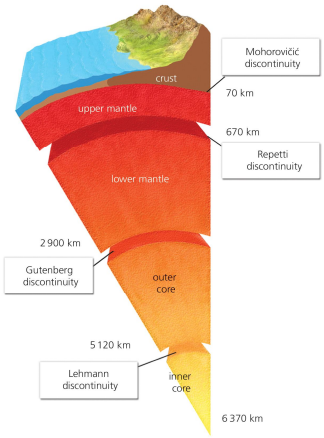
THE EXTRACTION OF MINERALS AND ROCKS

A deposit is the place where minerals or rocks are extracted from. The minerals that are extracted in sufficient amounts called **ore deposit**. The other rocks and minerals are referred to as **gangue**.

Superficial extractions	Underground extractions
Rocks and minerals are extracted from the surface or not very deep under the surface. This type of extraction has a great impact on the environment. They are, for example, **opencast mines** and **quarries.**	Minerals and rocks are located deep within the crust and are extracted using **underground mines**. Vertical tunnels called **shafts** are constructed and horizontal tunnels or galleries called **adits** are constructed.

EVALUATION (ANSWER KEY)

1. Complete the diagram of the Earth's crust with the following terms: continental crust, upper mantle, inner core, discontinuity of Mohorovičić, oceanic crust, outer core, lower mantle, discontinuity of Gutenberg.



2. Relaciona las características que definen a un mineral con su significado:

They are solid substances	Their particles are arranged forming geometric structures
They are inorganic	They are always formed by the same chemical elements
They have a natural origin	They are not human-made
The have a definite chemical composition	They have not been produces by any living thing
They present a crystalline structure	They are not liquid or gas.

3. Completa la tabla indicando en cada caso el tipo de roca y su utilidad principal:

Rock	Type of rock	Main use
Clay	**sedimentary**	**construction**
Limestone	**sedimentary**	**construction**
Oil	**sedimentary**	**fossil fuel**
Granite	**igneous**	**ornamental**
Marble	**metamorphic**	**ornamental**
Coal	**sedimentary**	**fossil fuel**

4. Write 'I' next to the sentences referred to igneous rocks, 'S' next to the ones related to sedimentary rocks and 'M' next to the metamorphic ones.

a) Formed when magma is cooled down. **I**

b) Formed from sediments. **S**

c) Classified into two big groups: plutonic and volcanic. **I**

d) Resulting from rocks exposed to high pressures and/or temperatures, without melting. **M**

e) Coal and oil belong to this group. **S**

f) Slate is a clear example of this group. **M**

5. Say whether the following sentences are true or false. Correct the false ones.

   a) A deposit is the place where rocks and minerals are extracted from. **True**

   b) Minerals that contain useful materials in sufficient quantity are called ore. **True**

   d) The rest of rocks and minerals in the deposit are called metals. **False. They are called gangue.**