**Chapter 11: Rocks**

**Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Block:\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Rocks vs. Minerals**

A **rock** can be made of one or more \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, or can originate from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_(unlike a mineral). Compositions are listed on pg. \_\_\_\_\_\_\_\_\_\_\_ of the reference table

1.)Monomineralic rocks: made of \_\_\_\_\_\_\_mineral, *usually* from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Examples:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(mineral-\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (mineral-\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)

2.)Polymineralic rocks: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_minerals

Ex: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_-mixture of quartz, feldspar, micas, amphibole

3.) Biologic origin: Coal- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**How are Rocks Classified?**

* Three groups **according to how they formed**
	+ - 1.)Igneous- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		- 2.)Metamorphic -\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		- 3.)Sedimentary- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Rocks are further classified according to :

* + 1. *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_* (2) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**SEDIMENTARY ROCKS**

Always involve \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to form. Because they involve water, they are only found in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the earth’s crust (a thin “\_\_\_\_\_\_\_\_\_\_\_\_\_\_” covering the earth)

How do sedimentary rocks form according to pg. 6 of the ESRT?

1.
2.

**Clastic rock environment of formation🡪**

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**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_**

**Sedimentary Rock Types (Texture)**

**1.)Clastic (fragmental) Sedimentary Rocks:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

sediments in order of decreasing grain size: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Cements: dissolved minerals \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ out in the saturated water of pore spaces in sediment layers forming the “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_”

* ****Common cements in rock: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**2.) Crystalline Sedimentary Rocks**: Are made of mineral crystals from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_- can be microscopic to coarse (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) in size.

**Example 1:** Evaporation of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ leaves behind \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (halite crystals)

**Example 2:** Seawater becomes supersaturated with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(CaCO3) which comes from seashells of marine organisms, dropping mineral deposits of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ on the ocean floor =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_!

**3.) Bioclastic Sedimentary Rocks:**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Example 1:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from dying organisms deposit on the ocean floor. Over time they will compact and cement together to form \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(coquina version)

**Example 2:** dead \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ remains from marshy areas compact to form \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* **Sedimentary rocks are the only types of rocks which contain \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_!**

Which type of sedimentary rock do you think would preserve the imprint of an animal bone and/or leaf? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**IGNEOUS ROCKS (cooling and solidication of molten rock)**

Magma- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Lava- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Igneous rocks are classified according to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Extrusive- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Intrusive- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Igneous rocks are further classified according to\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

* Intrusive rocks- cool \_\_\_\_\_\_\_\_\_\_\_\_\_\_, thus will have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ grains or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Examples:

* Extrusive rocks- cool \_\_\_\_\_\_\_\_\_\_\_\_\_, thus will have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ grains or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and in some cases no crystals at all (non crystalline= \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)

Examples:

* Vesicular texture: When \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ molten rock contains volatiles (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) trapped inside
	+ When the gas releases, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ features are recorded in the rock

Examples:

**Igneous rocks are also classified by composition**

* + **(1)** Felsic- are rocks rich in \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_ minerals like \_\_\_\_\_\_\_\_\_\_\_\_\_\_and \_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_in color (pink, white, clear, light grey**)**

**Examples:**

* + **(2)** Mafic- are rocks rich in \_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_ minerals like pyroxene, olivine, & hornblende and are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_in color (black, green, dark grey)

**Examples:**

If a rock has roughly the same amount of felsic and mafic minerals it is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Examples:**

**Metamorphic Rocks (by heat and/or pressure)**

* Any existing rock can be metamorphosed with \_\_\_\_\_\_\_\_\_\_\_in\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_and/or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ex: Limestone🡪Marble

* The “parent rock” becomes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ \_\_\_\_\_\_\_\_\_ the size of crystals/grains
	+ and/or \_\_\_\_\_\_\_\_\_\_ minerals form

**Texture**:

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Have “layers” of crystals formed by recrystallization where minerals align themselves under \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Examples:

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Minerals are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_because they were not subject to high directional pressure

Examples:

1. BANDING/Extreme Foliation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The Two types of Metamorphism:

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: rocks come into contact with magma/lava of an intrusion/extrusion
	+ With this\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, rocks metamorphose
	+ \*These rocks show *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*as there is no directional pressure
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_:Sections of the crust \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_over long periods of time deep within earth

The rocks at these collision zones are under \_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_thus show \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The following rocks are in order of increasing metamorphic grade, according to the ESRT pg. 7

Shale (sedimentary)🡪 \_\_\_\_\_\_\_\_\_\_\_ 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_