Name _____

SEDIMENTARY ROCK LAB

Question: What methods can we use to identify sedimentary rocks?

Background Information:

- **Sedimentary** rocks are formed from weathered rock particles
- There are 3 types of sedimentary rocks: **detrital**, **organic**, and **chemical**.
- First, you need to determine the **texture** of the rock before you can determine its **origin**.

Sedimentary Rock Textures:

- **Grain size** plays an important part in determining the texture

Sizes can be:

Coarse--particles larger than pebble size > 2 mm
Medium--sand sized like granulated sugar 1/16 to 2 mm
Fine--individual grains are too small to be visible < 1/16 mm

- Sedimentary rocks that contain the mineral calcite will fizz or **effervesce** in the presence of hydrochloric acid (HCl)
- Rocks can be **clastic** or non-**clastic**
- Non-clastic rocks are usually crystalline
- Clastic rocks are made of individual particles of sediments but most of the time, are too small to be seen with the naked eye.
- Clastic simply means broken rock

Sedimentary rock types:

- ~~Detrital~~ clastic
  - Made of individual particles, skeletal remains or broken fragments of previously existing rocks
  - Particles are cemented together by other minerals
- **Organic**
  - Formed directly or indirectly from once – living materials
- **Chemical**
  - Formed when a sea or lake dries up

- Large amounts of minerals are left behind when the water evaporates

Materials: 10 sedimentary rocks in tray
Hand lens

Procedures: examine each of the rocks, observe their properties, and determine the type of sedimentary rock.

Data:

Rock #	Grain Size: Coarse Medium Fine Crystalline	Texture: Clastic Non-Clastic?	Fizzes in Hydrochloric acid	Type of Rock Organic? Chemical? Detrital?	Name of Rock
1			NO		
2			Yes		
3			NO		
4			NO		
5			NO		
6			NO		
7			Yes		
8			NO		

Conclusions: Use notebook paper, and write in complete sentences.

1. Which rocks seem to be created by the cementation process? (3 clastic rocks)

2. Which rocks seem to be organic in nature?
(1 clastic /1 nonclastic)

3. Which rocks seem to be created by the compaction process?
(3 clastic)

4. Which rock would you expect to be used as a fuel source or source of energy? (1 nonclastic)

5. Which rocks can you really see the strata or layers easily?
(1 clastic/1 nonclastic)

6. Which rocks seem to be made by chemical means? (either precipitation or evaporation) hint: which ones have not been used yet?

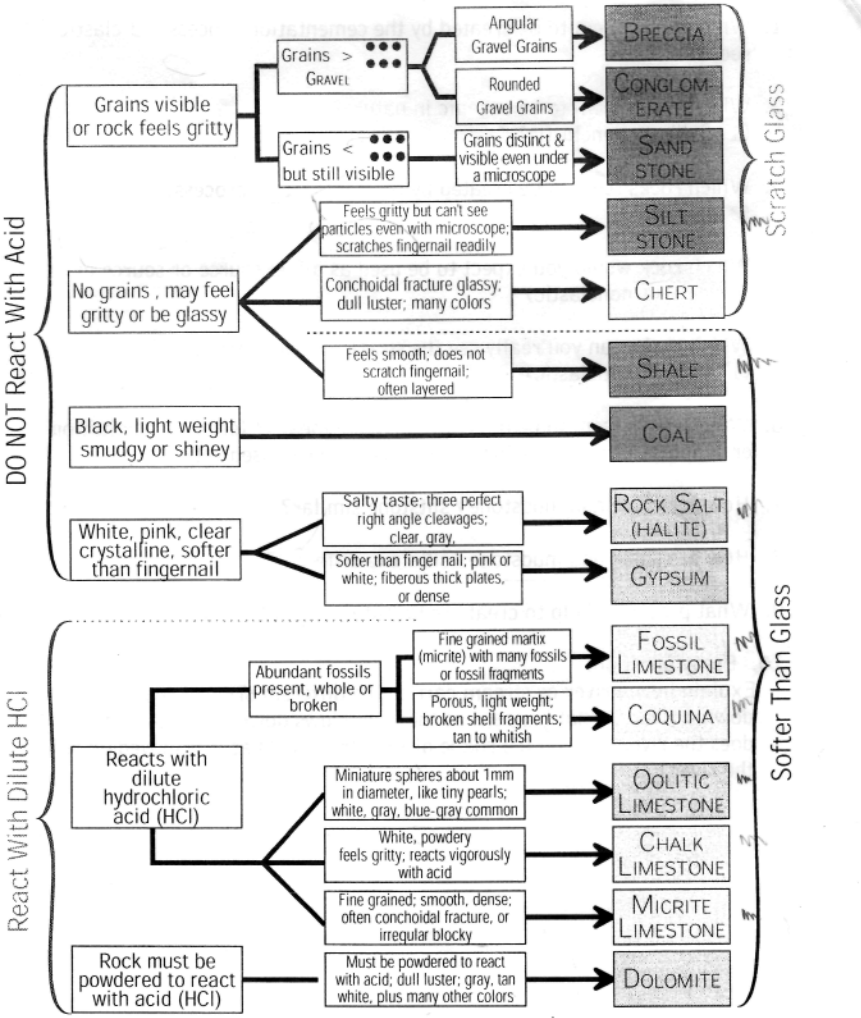
7. How are shale and mudstone / siltstone similar?

8. How are shale and mudstone / siltstone different?

9. What processes help to create sedimentary rocks? (6 ways)

10. Essay question:
Explain how a river or stream carries the different sizes of sediments down a river. What happens as the river slows down? What effect does the river have on the shape of rock fragments as it is moved down the river?

Key to the Identification of Basic Sedimentary Rocks



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http://geollab.jmu.edu/Fichter/SedRx/index.html

Table 5.1: Clastic sedimentary rock classification key.

Texture	Grain Size	Composition	Other Texture	Rock Name
Clastic	Gravel (particles larger than 2 mm)	Gravel-sized clasts mostly rock fragments	Rounded grains	Conglomerate
		Gravel-sized clasts mostly rock fragments	Angular grains	Breccia
	Sand (particles visible, but less than 2 mm)	Commonly quartz, feldspar, rock fragments		Sandstone
		Predominately feldspar		Arkosic sandstone
		Calcite	Very well rounded and spherical grains	Oolitic limestone
	Silt (particles not visible, feels gritty and cannot be scratched by fingernail)	Most often quartz, some feldspar		Siltstone
	Clay (particles not visible, feels smooth and is easily scratched by fingernail)	Clay minerals and quartz		Mudstone or shale
		Silica	Pure white, no reaction to acid	Diatomite

Chemical Sedimentary Rocks

Chemical sedimentary rocks are formed by the precipitation of compounds from aqueous solutions. For example, limestone forms from the precipitation of calcium carbonate (calcite) from seawater. Often, biology plays a key role in the formation of **limestones** as the calcite comes from the shells of sea creatures. Another example of a chemical sedimentary rock is an **evaporite,** a rock that forms when water is evaporated from closed basins in arid climates. As evaporation continues, the remaining waters can become highly saline and eventually the water will become supersaturated with respect to a variety of dissolved constituents, eventually leading to their precipitation from solution. Common evaporite minerals include **gypsum** and **halite**.

Silica is undersaturated in sea water so we would not expect to find it as a direct precipitate from sea water, and indeed we do not. However, small siliceous organisms like diatoms, radiolarians, and some sponges are highly efficient in removing silica from sea water to form their skeletons. After these organisms die they sink and accumulate on the sea floor. Many **cherts** are formed by lithification and recrystallization of these deposits. These recrystallized deposits are often classified as chemical sedimentary rocks.

Organic sedimentary rocks

Rocks formed by organisms or their remains are called **organic** sedimentary rocks. One special type of organic sedimentary rock is **coal**, a carbon-rich rock that forms when the organic matter (like trees) in swampy peat bogs gets buried and compressed. **Coprolites** are fossilized fecal matter. **Paleosols** are old soil layers that are found in the sedimentary rock record.

Table 5.2: Key to chemical and organic sedimentary rocks.

Texture	Composition	Other Properties	Rock Name
Chemical (crystalline)	Microcrystalline quartz	Scratches glass	Chert
	Halite	Three perfect cleavages at 90°, tastes salty	Rock Salt
	Gypsum	Softer than fingernail, cleavages not at 90°	Rock Gypsum
	Calcite	Readily reacts with dilute hydrochloric acid	Limestone
	Dolomite	Powdered rock reacts with dilute hydrochloric acid (much less reactive than calcite)	Dolostone
Organic	plant material (carbon)	brown to black, low specific gravity	Coal

Figure 5.2: Guide to grain size

Name of particle	Range limits of diameter (mm)	Names of loose sediment	Name of consolidated rock
Boulder	> 256	boulder gravel	boulder conglomerate
Cobble	64 to 256	cobble gravel	cobble conglomerate
Pebble	2 to 64	pebble gravel	pebble conglomerate
Sand*	1/16 to 2	sand	sandstone
Silt	1/256 to 1/16	silt	siltstone
Clay**	< 1/256	clay	mudstone and shale

*Note: Sand can be further divided into fine sand (1/16 to about 1/8 mm), medium sand (1/8 to 1 mm) and coarse sand (1 to 2 mm).

**The term "clay" can refer both to a grain size (< 1/256 mm) and to a family of sheet silicate minerals known as clay minerals.

Figure 5.3: Guide to grain sorting.