Laboratory #3 - ROCK IDENTIFICATION – Sedimentary Rocks

Your Name _____
Lab Section _____

This week we will study examples of the final third of the predominant rock types of the earth's crust in hand specimen, those that are *sedimentary.*

Sedimentary Rocks.

Formed by the consolidation of sediment, and/or by the precipitation of ions out of solution, sedimentary rocks lie as a veneer of variable thickness across many parts of the earth's crust. We can consider them in two categories, *clastic* or *chemical*, although some overlap exists because clastic rocks may be held together by chemical cement. Clasts of sediment may be transported to the deposition site by water, wind, glaciers, or landslides. Chemical sedimentary rocks are produced when dissolved constituents in fresh or marine waters are precipitated by chemical changes, biological activity, or evaporation. They tend to be more or less chemically pure and can be identified by their mineral components.

Many features of sedimentary rocks visible in hand specimen are distinctive and provide evidence of the origin and environment of deposition: stratification (beds or layers); fossils (bone, shell, imprints, or organic materials replaced by silica or other chemicals); particle size (larger clasts indicate higher-energy transporting agent). Most colors are due to iron compounds (red, brown, ochre, green, purple) and depend on the extent of oxidation; black usually indicates organic matter; white indicates salt, clay, calcite, or silica. Cements may be calcite, silica or iron oxides.

Record observations for all seven samples on the worksheet (refer Montgomery, p.35, Table C.2), materials from previous labs and other noted lab resources e.g. "Essentials of Geology").

A. First consider only the five sedimentary samples that contain no obvious clasts. Four of these five are *chemical*:

1. Find the one that resembles volcanic glass. This is coal. How is it different from glass?
   _____
2. Compare hardness and other mineral properties to identify the limestone.
3. Do the same to identify the chert sample.
4. You should be left with one remaining chemical sample…. one seen in previous labs. Can you work out what it is?

B. There are three samples which are *clastic* (synonymous with *detrital*) even though one of them contains no visible clasts. Use a ruler in millimeters to estimate sizes of visible clasts (sand-sized and larger). Refer to the Wentworth Scale

C. Elaborate on your deemed 'Environment of Deposition' by writing a short paragraph (for each rock) about how each rock was likely formed in that environment. Remember to include information relating to sediment sources and the cycle until lithification occurs. Include also in this paragraph a likely rock those sedimentary rocks will become following metamorphism. This should be completed on a separate sheet/s and attached to your lab.

Sedimentary Structures

These are physical structures preserved in sedimentary rocks that were once produced by some combination of physical, chemical, and biological processes during deposition. Sedimentary structures are often the most informative aspect of sedimentary rocks for interpreting past depositional environments. Look (very carefully!) at some of the structures provided and answer the following questions.

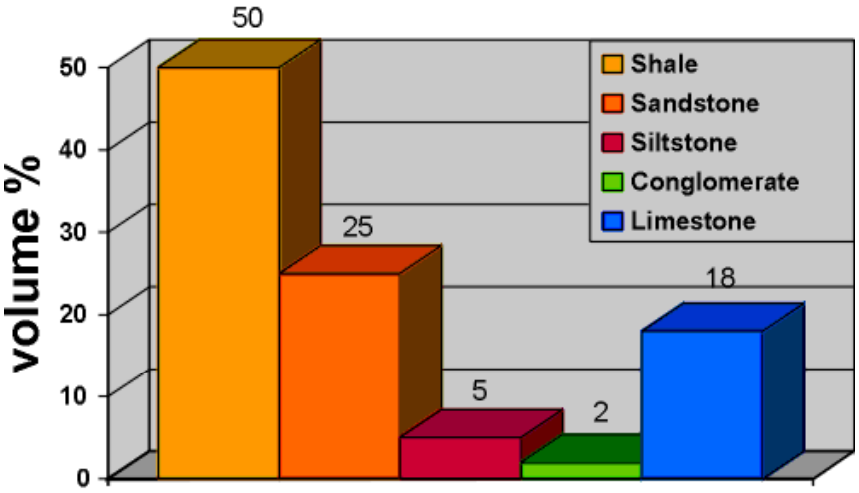
D. Examine the rock example that you think is a slab of mudstone. What sort of features indicate that this mudstone was deposited in an evaporate basin? Make a small sketch to show the dominant features.

E. One of the most useful aspects of sedimentary structures is to decipher current direction. Given these ripple marks in the sample labeled 'E', how can you tell which direction the current was flowing when this rock was deposited? What types of environment could this have formed in? Make a small sketch of the ripples (in profile and from above) and annotate the sketch with presumed current direction.

F. Compare and contrast the two coquina slabs. Focus on the fine grained matrix, what differences do you note? What sort of different deposition environments may have led to these two samples?

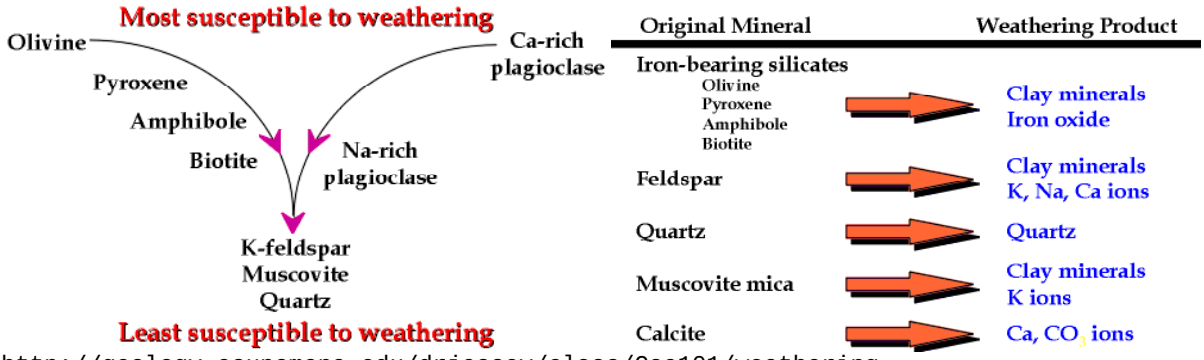
G. Identify and sketch a profile of the Squantum "tillite" or other "conglomerate" and annotate which direction is up. What evidence do you have for the orientation? What do you suppose is the depositional environment of this sample?

Homework! – Chose <u>one</u> of the sedimentary rocks we have covered and design a one page fact sheet about it. Give information about how it may be identified. Also include information about the processes by which that rock may be formed and in what environments. Remember to talk about the whole cycle beginning with the origin of the sedimentary particles and ending with lithification. Finally discuss briefly an issue that would be of interest to an Environmental Geologist that relates to your chosen rock and environment. E.g. coal and its impact on energy production and climate



Sedimentary rock abundances

Bowens Reaction Series – relationship to Sedimentary rock formation



http://geology.csupomona.edu/drjessey/class/Gsc101/weathering

WENTWORTH SCALE

Boulder	>256 mm	Conglomerate
Cobble	64-256 mm	
Pebble	2-64 mm	
Sand	1/16-2 mm	Sandstone
Silt	1/256-1/16 mm	Siltstone
Clay	<1/256 mm	Shale

Rock Identification Worksheet: Sedimentary Rocks Name:_____

ROCK NAME	COLOR	HARDNESS	CLAST SIZE (mm)	MINERAL(S)	ENVIRONMENT OF DEPOSITION
Coal			N/A	N/A	
Limestone			N/A		
Chert			N/A		
			N/A		

A page for C (elaborations) .... Use the back for your Homework – Fact sheet