

ES202 Lab 3 - Sedimentary Rock Analysis and Classification

Part 1. Sedimentary Rock Video Exercise (Earth Revealed: Sedimentary Rocks)

Watch the video in the lab and answer the questions below.

1. Who first explored the geology of the Grand Canyon? How did the Grand Canyon form?
2. How many years of Earth history are contained in the sedimentary rocks of the Grand Canyon?
3. What is the general goal of sedimentary geology?
4. What is sediment? How is it formed?
5. List and describe 3 examples of loose sediment at the Earth's surface.
6. How is loose sediment transformed into hard sedimentary rock?
7. True or False: sedimentary rocks most commonly occur inside the Earth, while igneous rocks are common at the Earth's surface. Explain your answer.
8. Define the term "clastic".
9. What is the smallest size of sediment particle called? What is the largest size of sediment particle called?
10. List and briefly describe 2 examples of how sediment may be transported at the Earth's surface.
11. List and describe 3 places at the Earth's where you would likely find sediment deposits. Why do you find deposits in these places?
12. Define the term "lithification". What are 2 processes that result in lithification of sediment?
13. List and describe 2 environments where chemical sediments may form.
14. What is the name of a sedimentary rock that forms from the skeletons and hard parts of dead sea animals?
15. Where does coal form? What is coal composed of?
16. What is the motto for the "principle of uniformitarianism"? What is the principle of uniformity and how is it used to interpret Earth history?

End Video at Uniformitarianism.

Part 2. Recognition of Sedimentary Process (refer to 8th Edition of AGI Lab Manual)

1-1. Based on your pre-lab questions and p. 128 of your lab manual, match the sedimentary process term on the right with the sedimentary rock on the left.

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| _____ 1. Sandstone | A. Detrital Origin (weathering / fragmental) |
| _____ 2. Conglomerate | B. Biochemical (biologically-derived rock) |
| _____ 3. Shale | C. Chemical (Physical-Chemical Process) |
| _____ 4. Rock Gypsum | |
| _____ 5. Coral Reef Deposits | |
| _____ 6. Sand on the beach | |
| _____ 7. Bonneville Salt Flats of Utah | |
| _____ 8. Shells on the beach | |
| _____ 9. Coal | |
| _____ 10. Breccia | |

Part 3. General Questions on Sedimentary Texture

2-1. Using the attached grain size chart and the Wentworth scale, determine the grainsize of the following detrital sedimentary rock samples (derive the grainsize to the level of fine sand, medium sand, etc.), and determine the sorting (well sorted, moderately sorted, poorly sorted).

Sample No.	Grainsize (list ~diameter and term)	Sorting
11	_____	_____
9B	_____	_____
15	_____	_____
4	_____	_____
6	_____	_____
14	_____	_____
Sample Jar S2-1	_____	_____
Sample Jar S2-7	_____	_____

2-2. Compare and contrast the sedimentary texture of sample 11 and sample 4. Which one do you think has sediment that was more greatly transported during it's formation?

2-3. Observe the characteristics of sample 35. Is this detrital or biochemical? What is this specimen?

2-4. Examine the deposit in the beaker labeled "2-4". Explain how this deposit formed. Is it chemical or detrital?

Part 4. Sedimentary Rock Identification

Using the sedimentary rock analysis and identification key on p. 111-112 and p. 116 of the lab manual, complete the table on the following page.

Sample Number	Detrital, Chem., or Biochem?	Composition: choose all that apply: quartz, feldspar, clay, plant frags., calcite, halite, gypsum, iron minerals	Grain Size (for detrital) / Crystal Size (for chemical / biochemical)	Other Characteristics (e.g. fossils, grain shape, fizzes with HCl, scratchable, taste, etc.)	Rock Name
30					
1B					
14					
9B					
11					
8					
3					
13					
31					
32					
20					
16					
2					
7					
15					
12					
10					
6					
37					
4					

TABLE 5.2 Methods of measuring sediment grain size

Type of sample	Sample grade	Method of analysis
Unconsolidated sediment	Boulders Cobbles Pebbles	Manual measurement of individual clasts
	Granules Sand Silt Clay	Sieving or settling tube analysis
		Pipette analysis, photohydrometer, Coulter counter
Lithified sedimentary rock	Boulders Cobbles Pebbles	Manual measurement of individual clasts
	Granules Sand Silt Clay	Thin-section measurement
		Electron microscope

TABLE 5.1 Grain-size scale for sediments, showing Wentworth size classes, equivalent phi (ϕ) units, and sieve numbers of U.S. Standard Sieves corresponding to various millimeter and ϕ sizes

		U.S. Standard sieve mesh	Millimeters	Phi (ϕ) units	Wentworth size class
GRAVEL			4096	- 12	
			1024	- 10	Boulder
			256	- 8	
			64	- 6	Cobble
			16	- 4	
		5	4	- 2	Pebble
		6	3.36	- 1.75	
		7	2.83	- 1.5	Granule
		8	2.38	- 1.25	
		10	2.00	- 1.0	
SAND		12	1.68	- 0.75	
		14	1.41	- 0.5	Very coarse sand
		16	1.19	- 0.25	
		18	1.00	0.0	
		20	0.84	0.25	
		25	0.71	0.5	Coarse sand
		30	0.59	0.75	
		35	0.50	1.0	
		40	0.42	1.25	
		45	0.35	1.5	Medium sand
		50	0.30	1.75	
		60	0.25	2.0	
		70	0.210	2.25	
		80	0.177	2.5	Fine sand
		100	0.149	2.75	
		120	0.125	3.0	
		140	0.105	3.25	
		170	0.088	3.5	Very fine sand
		200	0.074	3.75	
		230	0.0625	4.0	
MUD	SILT	270	0.053	4.25	
		325	0.044	4.5	Coarse silt
			0.037	4.75	
			0.031	5.0	
			0.0156	6.0	Medium silt
	CLAY		0.0078	7.0	Fine silt
			0.0039	8.0	Very fine silt
			0.0020	9.0	
			0.00098	10.0	Clay
			0.00049	11.0	
	0.00024	12.0			
	0.00012	13.0			
	0.00006	14.0			

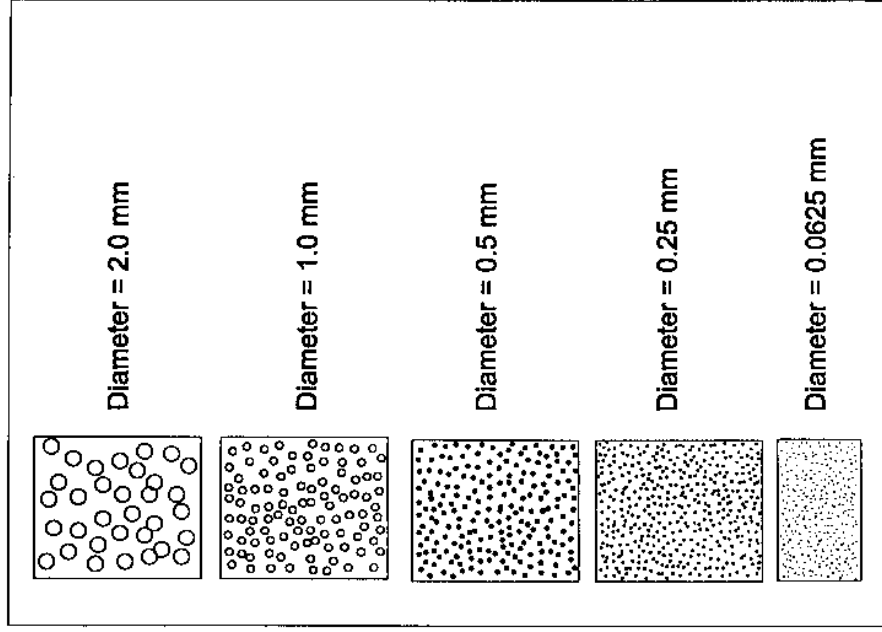
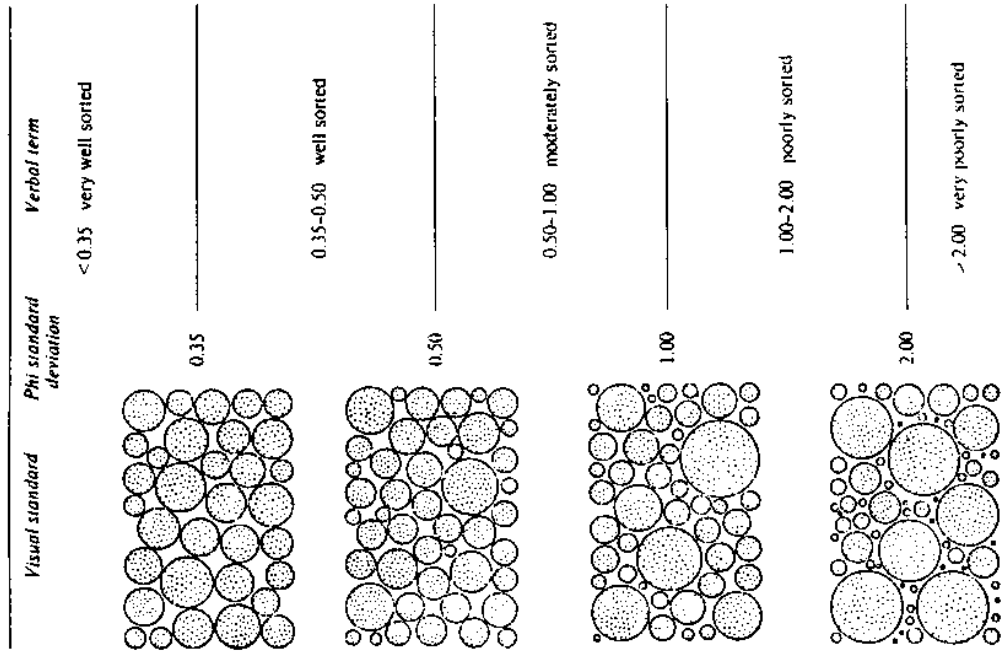


Figure 6.4 Chart for the field estimation of sorting (modified from Folk 1968).