

# ANSWER KEY

## G202 Lab 3 - Sedimentary Rock Analysis and Classification

### Part 1. Recognition of Sedimentary Process

1-1. Based on your pre-lab questions and reading assignments, match the sedimentary process term on the right with the sedimentary rock on the left.

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

### Part 2. 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<br>(list ~diameter and term)     | Sorting                   |
|-----------------|--------------------------------------------|---------------------------|
| 11              | > 2 mm - PEBBLES<br>1-2 mm COARSE SAND     | POORLY-VERY POORLY SORTED |
| 9B              | 1-2 mm - <sup>VERY</sup> COARSE SAND       | MODERATELY                |
| 15              | ~ 0.0625 mm - SILT                         | WELL-VERY WELL            |
| 4               | > 2 mm Pebbles                             | POORLY                    |
| 6               | 0.25-0.5 mm <sup>MEDIUM-</sup> COARSE SAND | WELL SORTED               |
| 14              | < 0.0625 mm                                | VERY WELL SORTED          |
| Sample Jar S2-1 | > 2 mm Pebbles                             | POORLY-MODERATELY         |
| Sample Jar S2-7 | 0.25-0.5 mm <sup>FINE</sup> SAND           | VERY WELL SORTED          |

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?

11: PEBBLES ARE ROUNDED  
4: PEBBLES ARE ANGULAR

1 H = GREATER TRANSPORT =  
MORE "TUMBLING" AND  
ROUNDED

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

BIOCHEMICAL - CORAL

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

CHEMICAL - EVAPORATION OF LIQUID

### Part 3. Sedimentary Rock Identification

Using the sedimentary rock analysis and identification key on p. 91 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            | DETRITAL                      | CLAY                                                                                                             | CLAY < 0.0625 mm                                                      | FISSILE - BREAKS INTO SHEETS                                                                 | SHALE                                |
| 1B            | BIOCHEM.                      | SHELL FRAGMENTS                                                                                                  | 1-2 mm VERY COARSE SAND                                               | FIZZES / SHELS                                                                               | COQUINA                              |
| 14            | DETRITAL                      | CLAY + OTHERS                                                                                                    | < 0.0625 mm                                                           | NO FIZZ                                                                                      | MUDSTONE                             |
| 9B            | DETRITAL                      | QUARTZ + FELDSPAR                                                                                                | 0.25 mm - FINE SAND                                                   | WELL SORTED                                                                                  | FINE-GRAINED SANDSTONE               |
| 11            | DETRITAL                      | ROCK FRAGMENTS                                                                                                   | > 2 mm PEBBLES                                                        | POORLY SORTED, ROUNDED GRAVEL + SAND                                                         | SANDY CONGLOMERATE                   |
| 8             | CHEMICAL                      | (CALCITE) CALCIUM CARBONATE                                                                                      | FINELY CRYSTALLINE                                                    | FIZZES                                                                                       | MICRITE (MICROCRYSTALLINE LIMESTONE) |
| 3             | CHEMICAL                      | QUARTZ - SiO <sub>2</sub>                                                                                        | FINELY CRYSTALLINE                                                    | VERY HARD - CONGLOMERATE FRAGMENTS                                                           | CHERT                                |
| 13            | DETRITAL                      | QUARTZ + PINK FELDSPAR                                                                                           | 0.25 - 0.5 mm                                                         | WELL SORTED                                                                                  | ARKOSIC SANDSTONE                    |
| 31            | DETRITAL                      | CLAY / CARBON                                                                                                    | < 0.0625 mm                                                           | PLANT FOSSILS COARSE, FISSILE IRON CRYSTALS                                                  | BLACK SHALE                          |
| 32            | CHEMICAL                      | IRON                                                                                                             | FINELY CRYSTALLINE                                                    | IRON CRYSTALS                                                                                | IRONSTONE                            |
| 20            | BIOCHEM.                      | PLANT FRAGS.                                                                                                     | 1-3 mm                                                                | BROWN PLANTS                                                                                 | PEAT                                 |
| 16            | BIOCHEM.                      | MICRO FOSSILS CALCITE                                                                                            | < 0.0625 mm                                                           | FIZZES w/ HCL WRITES ON BOARD                                                                | CHALK                                |
| 2             | DETRITAL                      |                                                                                                                  |                                                                       |                                                                                              |                                      |
| 7             | BIOCHEM.                      | CALCIUM CARBONATE FOSSIL PARTS                                                                                   | FOSSILS > 2 mm                                                        | FOSSILS + FIZZES                                                                             | CALCAREOUS FOSSILIFEROUS LIMESTONE   |
| 15            | DETRITAL                      | HARD TO TELL TOO FINE                                                                                            | < 0.0625 mm SILT                                                      | NO FIZZ.                                                                                     | SILTSTONE                            |
| 12            | CHEMICAL                      | CALCIUM CARBONATE                                                                                                | 0.5 - 1 mm                                                            | FIZZES / HCL SMALL BEADS                                                                     | ODOLITIC LIMESTONE                   |
| 10            | CHEMICAL                      | GYP SUM                                                                                                          | FINELY CRYSTALLINE                                                    | NO FIZZ SOFT < 2.5                                                                           | ROCK GYPSUM                          |
| 6             | DETRITAL                      | ROCK FRAGMENTS, QUARTZ, FELDSPAR                                                                                 | 0.25 - 0.5 mm MEDIUM-COARSE                                           | GRAINED                                                                                      | LITHIC SANDSTONE                     |
| 4             | DETRITAL                      | CHERT AND LIMESTONE                                                                                              | > 2 mm                                                                | ANGULAR PEBBLES                                                                              | BRECCIA                              |

PEBBLES

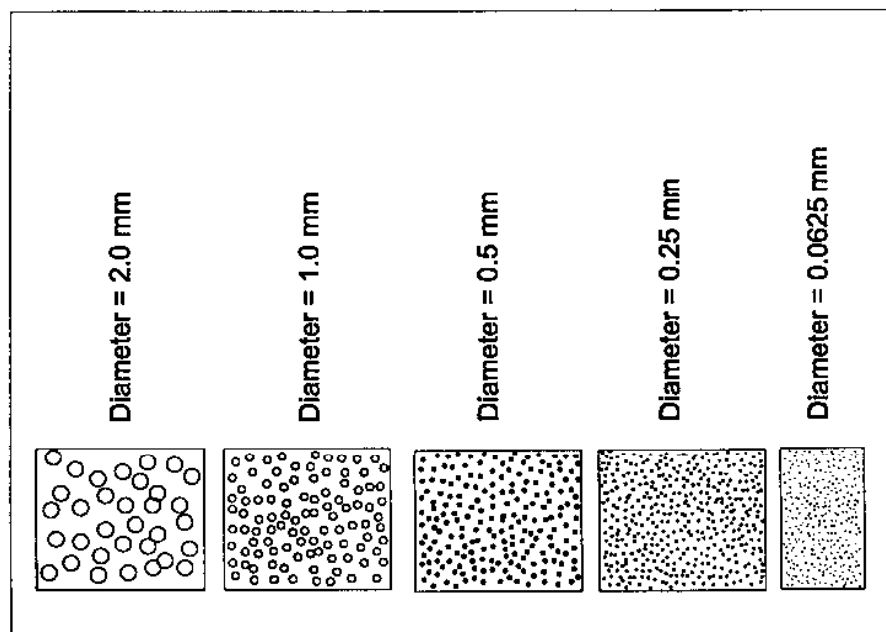
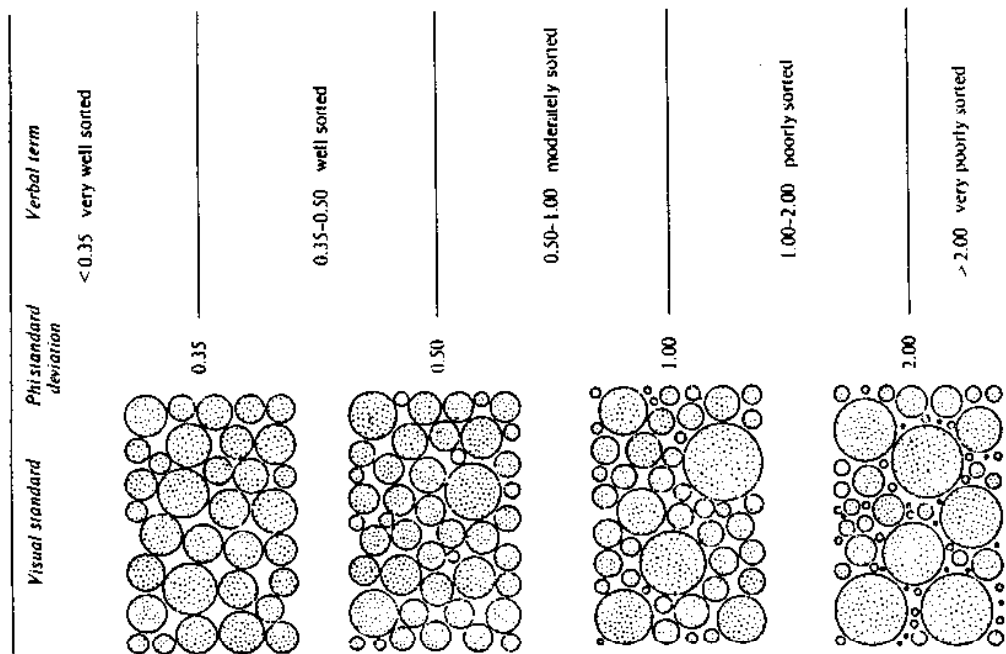


Figure 6.4 Chart for the field estimation of sorting (modified from Folk 1968).

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

|        |      | U.S. Standard<br>sieve mesh | Millimeters | Phi ( $\phi$ )<br>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                    |                      |
| MUD    | SILT | 230                         | 0.0625      | 4.0                     |                      |
|        |      | 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          |
|        |      |                             | 0.0078      | 7.0                     | Fine silt            |
|        | CLAY |                             | 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                    |                      |