Earth Science
with
Mr. Dolphin

Name___________________
sheet no.______

The Journey's End

Background: Weathered material (**sediment**) travels down slope in water. The river or stream carrying the sediment eventually enters a large body of water. When this happens, the velocity of the river slows to a stop and its capacity to transport material ceases. The sand, silt, clay and other sediments begin to settle out of the water and form layers at the bottom of the body of water. This process is called **deposition**. Not all grains of sediment settle out at the same rate, however. The resultant force (gravity vs. friction) on the grain determines rate of settling. Smaller is bigger, in that the smaller the grain, the bigger the surface area **per mass**. With a bigger surface area per mass, there is more friction and therefore a slower settling rate. In this exercise you will explore how the size, shape, and density of different sediment grains affect their settling rate.

Objectives: By the end of this exercise, the student will be able to:

1. describe how size, shape and density of sediment grains affects their rate of settling,

2. describe the vertical arrangement of mixed material after being dumped in water, and

3. predict the distribution of sediment sizes as the distance from the mouth of a river is increased.

Procedure:

1. Fill the settling tube with water to a level above the "START" line.
2. Drop a small pinch of **fine** sediment into the water and measure how long it takes the sand to travel between the "START" and the "STOP" line.
3. Record this value as trial 1 in **Table I**.
4. Repeat steps 2 and 3 for trial 2 and trial 3 and record in the appropriate spaces in **Table I**.
5. Repeat the above steps for the **medium** and **coarse** grain sediments.
6. Repeat the above procedures for the **flat** and **round** sediments, and record times in **Table II**.

7. Repeat the above procedures for the **low**, **medium**, and **high density** sediments, and record times in **Table III.**
8. Empty the settling tube into sieve the collect all sediment. Dry the sediment and separate pieces into their original containers.
9. Calculate average times and record in the appropriate spaces of the appropriate table.
10. Graph grain size vs. average time from **Table I** on **Graph I**, grain shape vs. average time from **Table II** on **Graph II**, and grain density vs. average time from **Table III** on **Graph III**.
11. Answer all questions in **Full** and **Complete** sentences.

Table I - Grain Size

Size	Trial 1 (seconds)	Trial 2 (seconds)	Trial 3 (seconds)	Average (seconds)
fine				
medium				
coarse				

Table II - Grain Shape

Shape	Trial 1 (seconds)	Trial 2 (seconds)	Trial 3 (seconds)	Average (seconds)
round				
flat				

Table III - Grain Density

Density	Trial 1 (seconds)	Trial 2 (seconds)	Trial 3 (seconds)	Average (seconds)
low				
medium				
high				

Graph I - Settling Time vs. Grain Size

Graph II - Settling Time vs. Grain Shape

Graph III - Settling Time vs. Grain Density

<u>Questions</u>: Answer the following questions in **full** and **complete** sentences.

1. What is the general relationship between settling time and grain size?

2. What is the general relationship between settling time and grain shape?

3. What is the general relationship between settling time and grain density?

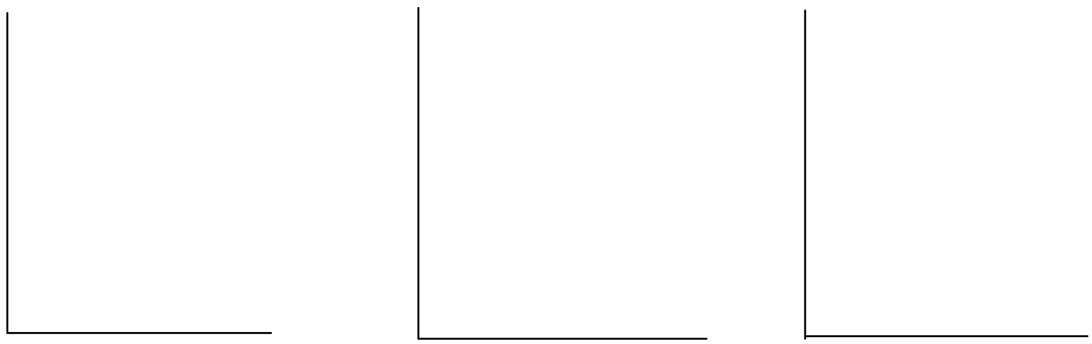
4. What two forces control the speed at which sediment settles out of water? In what direction do they each act?

5. In terms of grain surface area and friction versus gravity, describe how
   a. grain size affects settling rate,

   b. grain shape affects settling rate, and

   c. grain density affects settling rate.

6. On the axes below draw graphs which represent the relationship between grain size and settling rate, grain shape and settling rate, and grain density and settling rate.



7. If a large amount of mixed-size sediment is dumped into a still body of water, what will the resulting deposit look like after settling is allowed to occur? You may draw a diagram to illustrate your answer. (hint: use the settling tube if you need help)

8. The diagram below is a simple, so not to scale cross-section or a river entering the ocean. The river is eroding material of different sizes. As the river enters the ocean, the velocity slows. Use the diagram below to describe the distribution of sediments as they settle out onto the seafloor. (Hint: arrow length is directly proportional to current velocity)