Date: _____

Your Name: _____

New England Common Assessment Program

Released Science Inquiry Task

Density

2013

Grade 8

Student Answer Booklet

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Directions:

You will work on your own to organize and present your data, analyze and use your results, and evaluate your investigation. You may use the Word Bank below during this session.

Word Bank

Average (mean)	a typical number for a data set; a value that is found by dividing the sum of a set of terms by the number of terms **Example:** The average of 4, 5, and 9 is $\frac{(4 + 5 + 9)}{3} = 6$.
Density	a ratio of mass over volume $\left(D = \frac{m}{V} \right)$
Fulcrum	the support, or point of rest, on which a lever turns when moving an object
Mass	the amount of matter in an object
Trial	each time you repeat the same step of an investigation
Volume	the amount of space that an object takes up
Water displacement	a method of measuring volume where a solid object is added to water in a cylinder and the increase in the height of the water in the cylinder is measured **Example:** If a cylinder contains 30 mL of water and adding an object causes the water to rise to 40 mL, the object has a volume of 10 mL. The volume of the object (10 mL) has displaced an equal volume of water (10 mL).

Organizing and Presenting Your Data

Directions: Answer questions 1 through 8.

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1. Explain why it was important to conduct multiple trials and to use the average of those trials to calculate the average density.

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Copy the average mass, volume, and density data for each object from the data table on page 5 of your Inquiry Booklet to Data Table 1 below. **Be sure to double-check that you have copied the data correctly.**

Data Table 1: Average Mass, Volume, and Density of Found Objects

Object	Average Mass (g)	Average Volume (mL)	Average Density (g/cm³)
Coin			
Nugget			

Note: 1 cm³ = 1 mL

Jennifer's science teacher helped her research the densities of various substances. Data Table 2, below, shows the results of their research.

Data Table 2: Densities of Various Substances

Substance	Density (g/cm³)
Aluminum	2.7
Brass	8.4–8.7
Copper	8.9
Gold	19.3
Pyrite	5.0
Silver	10.5

2. Compare the average densities of the coin and nugget from your investigation (Data Table 1) with the densities of substances listed in Data Table 2. Identify the substances that **most likely** make up the coin and nugget. Support your answer with data from both tables.

3. Copy your prediction from page 3 of your Inquiry Booklet into the box below.

a. Is your prediction supported by the evidence from your investigation and Jennifer's research?

b. Use specific evidence from your investigation and Jennifer's research to explain your answer.

Analyzing Your Results

Jennifer's history teacher helped her research information about the types of metals and objects that may have been on the *Gaspee* before the ship was burned. Data Table 3, below, shows the results of their research.

Data Table 3: Types of Metals and Objects Likely Found on the Ship

Type of Metal	Objects Commonly Made from the Metal
Brass	locks, keys, hinges, lamps
Copper	pots, pans
Gold	coins, nuggets
Silver	coins, spoons, knives, and forks

4. A student in the science class said that his density investigation of the coin "**proved**" that the coin came from the shipwreck. Do you agree or disagree with the student's statement? Explain the reasoning for your answer.

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Jennifer allowed a scientist from the Historical Society to borrow the coin and the nugget for further testing. The scientist performed her own measurements of the mass and volume of the objects and calculated the densities.

5. Explain why it is important for scientists to retest other scientists' experiments.

6. The scientist's results were slightly different from Jennifer's results. Explain why the scientist's results may have been slightly different from Jennifer's results.

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Applying What You've Learned

Jennifer's science teacher had the class do another investigation with nonmetal objects. They measured the mass and volume of samples that were all made out of the same nonmetal material but had different masses. The average measurements of the samples are shown in Data Table 4, below.

Data Table 4: Average Mass and Volume of Four Samples Made of the Same Nonmetal

Sample	Mass (g)	Volume (cm³)	Density (g/cm³)
W	2.2	1.1	2.0
X	5.1	2.3	2.2
Y	11.3	5.4	2.1
Z	14.2	7.1	2.0

7. Describe the pattern shown by the mass, volume, and density of the samples listed in Data Table 4.

8. Explain how the pattern you described in question 7 supports the idea that the composition of each object found on the beach could be identified from its density.

STOP