Name _____ Date _____

Using Density Data to Predict Which Objects Float or Sink

Directions: Read the lab report and study the data table. Each calculation question gives the formula you need. Type only the number; the unit is shown next to the answer box.

Ana's Sink-or-Float Lab

Use the lab report and the data table to answer these questions.

Sink or Float? Notes from Ana's Lab

Ana's class wanted to find out why some objects float in water and others sink. They tested six small objects. First, they found the mass of each object in grams on a balance. Next, they found each object's volume in cubic centimeters. To do this, they pushed the object completely underwater in a container marked in cubic centimeters and read how much the water level rose. Last, they set each object in a tank of tap water and watched what happened.

The cork stopper, the pine block and the candle floated. The rubber eraser, the granite rock and the steel bolt sank to the bottom.

Density tells how much mass is packed into each cubic centimeter of an object. To find it, divide the mass by the volume. Tap water has a density of about 1 gram per cubic centimeter. For solid objects like these, an object that is less dense than water floats, and an object that is denser than water sinks. The same rule works in other liquids: compare the object's density with the liquid's density.

Floating objects do not all float the same way. An object that is only a little less dense than water floats low, with most of it underwater. An object that is much less dense than water floats high.

Mass and volume of the six objects in Ana's lab

Object	Mass (g)	Volume (cm^3)
Candle	36	40
Steel bolt	40	5
Cork stopper	2	10
Granite rock	135	50
Pine block	60	120
Rubber eraser	12	10

1. Density = mass ÷ volume. Using the data table, what is the density of the steel bolt?

_____ g/cm^3

2. Density = mass ÷ volume. Find the density of the pine block. Your answer will be a decimal.

_____ g/cm^3

3. The pine block has more mass than the steel bolt, yet the lab report says the block floated and the bolt sank. Which statement explains this?

A. The block spreads its mass through a large volume, so it is less dense than water, while the bolt packs its mass into a small volume and is denser than water.

B. Small objects always sink, and the bolt is the smallest object in the table.

C. The lab report must be wrong, because an object with more mass always sinks.

D. Large objects always float, and the block is the largest object in the table.

4. The lab report says floating objects do not all float the same way. Which of the three floating objects most likely floated lowest, with the largest fraction of its volume underwater?

A. The cork stopper

B. The pine block

C. The candle

D. All three floated with the same fraction of their volume underwater

5. Ana cuts the candle into two equal halves and sets one half in the tank of water. Which prediction and reason are correct?

A. It will sink, because cutting the wax makes each piece denser.

B. It will float, because each half has half the mass and half the volume, so its density stays the same.

C. It will float, but only because it has less mass than the whole candle.

D. It will sink, because smaller objects sink more easily than larger ones.

6. Ana's class repeats the test in a thick syrup with a density of 1.4 g/cm^3. Which object that sank in water would most likely float in the syrup?

A. The granite rock

B. None of them, because an object that sinks in water sinks in every liquid

C. The steel bolt

D. The rubber eraser

7. Mass = density × volume. A larger piece of the same granite has the same density as the rock in the table and a volume of 200 cm^3. What is its mass?

_____ g

8. The steel bolt sank, but a huge ship with a steel hull floats in the ocean. Which statement explains how the ship floats?

A. Ship steel is a special kind of steel that is less dense than water.

B. Ocean water is dense enough to hold up solid steel.

C. The hull is shaped to hold a lot of air, so the ship as a whole, steel plus the air inside, is less dense than the water.

D. Large objects float no matter what they are made of.