

4. Base your answer to the following question on the information below.

A method used by ancient Egyptians to obtain copper metal from copper(I) sulfide ore was heating the ore in the presence of air. Later, copper was mixed with tin to produce a useful alloy called bronze.

Calculate the density of a 129.5-gram sample of bronze that has a volume of 14.8 cubic centimeters. Your response must include a correct numerical setup and the calculated result.

5. Based on data collected during a laboratory investigation, a student determined an experimental value of 322 joules per gram for the heat of fusion of H₂O. Calculate the student's percent error. Your response must include a correct numerical setup and the calculated result.

6. Base your answer to the following question on the information below.

Archimedes (287–212 BC), a Greek inventor and mathematician, made several discoveries important to science today. According to legend, Hiero, the king of Syracuse, commanded Archimedes to find out if the royal crown was made of gold, only. The king suspected that the crown consisted of a mixture of gold, tin and copper.

Archimedes measured the mass of the crown and the total amount of water displaced by the crown when it was completely submerged. He repeated the procedure using individual samples, one of gold, one of tin, and one of copper. Archimedes was able to determine that the crown was not made entirely of gold without damaging it.

Identify *one* physical property that Archimedes used in his comparison of the metal samples.

7. A student used a balance and a graduated cylinder to collect the following data:

Sample mass	10.23 g
Volume of water	20.0 mL
Volume of water and sample	21.5 mL

a Calculate the density of the element. Show your work. Include the appropriate number of significant figures and proper units.

b If the accepted value is 6.93 grams per milliliter, calculate the percent error.

c What error is introduced if the volume of the sample is determined first?

8. Base your answer to the following question on the following information.

Carbon and oxygen are examples of elements that exist in more than one form in the same phase.

Graphite and diamond are two crystalline arrangements for carbon. The crystal structure of graphite is organized in layers. The bonds between carbon atoms within each layer of graphite are strong. The bonds between carbon atoms that connect different layers of graphite are weak because the shared electrons in these bonds are loosely held by carbon atoms. The crystal structure of diamond is a strong network of atoms in which the shared electrons are strongly held by the carbon atoms. Graphite is an electrical conductor, but diamond is not. At 25°C, graphite has a density of 2.2 g/cm³ and diamond a density of 3.51 g/cm³.

The element oxygen can exist as diatomic molecules, O₂, and as ozone, O₃. At standard pressure the boiling point of ozone is 161 K.

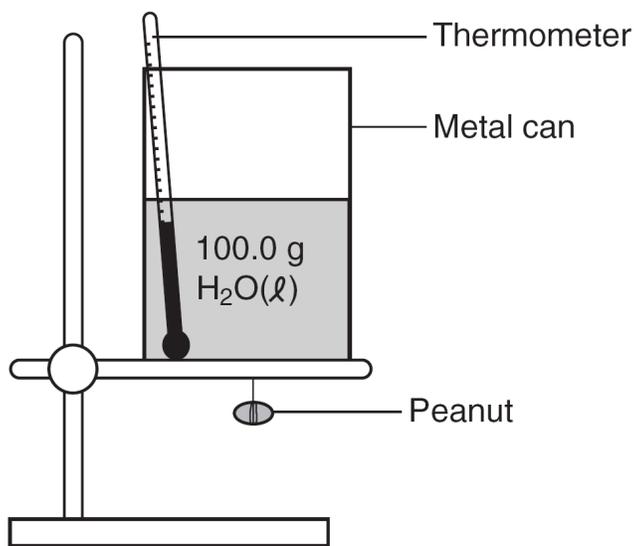
Calculate the volume, in cm³, of a diamond at 25°C that has a mass of 0.200 gram. Your response must include both a correct numerical setup and the calculated result.

9. Describe *one* appropriate laboratory test that can be used to determine the malleability of a solid sample of an element at room temperature.

10. Base your answer to the following question on the information below.

A student performed an experiment to determine the total amount of energy stored in a peanut. The accepted value for the energy content of a peanut is 30.2 kilojoules per gram. The student measured 100.0 grams of water into a metal can and placed the can on a ring stand, as shown in the diagram below. The peanut was attached to a wire suspended under the can.

The initial temperature of the water was recorded as 22.0° C. The peanut was ignited and allowed to burn. When the peanut finished burning, the final water temperature was recorded as 57.0° C. The student's experimental value for the energy content of this peanut was 25.9 kilojoules per gram.



Determine the student's percent error for the energy content of this peanut.

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