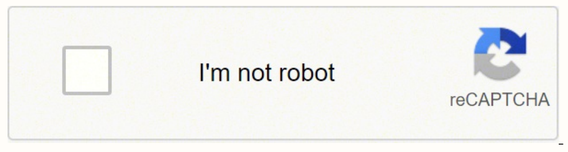


Open

Density lab high school chemistry answers

Name: Per: Date:

Density Worksheet

Chemistry in Context 2008-9

Perhaps someone has tried to trick you with this question: "Which is heavier, a pound of lead or a pound of feathers?" Many people would incorrectly answer "lead." When they give this incorrect answer, these people are really thinking of density. If a piece of lead and a feather of the same volume are weighed, the lead would have a greater mass than the feather. It would take a much larger volume of feathers to equal the mass of a given volume of lead.

Density is the relationship of the mass of an object to its volume. Density is usually reported in units of grams per cubic centimeter (g/cm^3). For example, water has a density of 1.00 g cm^{-3}. Since a cubic centimeter contains the same volume as a milliliter, in some cases you may see density expressed as g/mL. Density = $\frac{\text{mass}}{\text{volume}}$ or $D = \frac{M}{V}$

To solve density problems, list the known and unknown values, then use one of the following.

- When a problem requires you to calculate density, use the density equation, $\boxed{D = \frac{M}{V}}$
- You can solve for mass by multiplying both sides of the density equation by volume:
  $D V = \frac{M}{V} V$ or $\boxed{M = D V}$
- You can solve for volume by dividing both sides of the equation above by density.
  $\frac{M}{D} = \frac{D V}{D}$ or $\boxed{V = \frac{M}{D}}$

Example: What is the mass of an object that has a density of 8 g/cm^3 and a volume of 64 cm^3?

Known: $D = 8$ g/cm^3
$V = 64$ cm^3

Unknown: $M = ?$

Equation to use: $M = D V$

"Plug and chug": $M = (8 \text{ g/cm}^3)(64 \text{ cm}^3) = 512$ g

PROBLEMS List the known and unknown values; try to derive the equation without looking above.

1. A piece of tin has a mass of 16.52 g and a volume of 2.26 cm^3. What is the density of tin?
   Known: mass = 16.52g volume = 2.26 cm^3 $D = \frac{M}{V}$ 7.3097345133
   Unknown: Density (D) $\frac{16.52\text{g}}{2.26\text{cm}^3} = \boxed{7.31 \text{ g/cm}^3}$
2. A man has a 50.0 cm^3 bottle completely filled with 163 g of a briny green liquid. What is the density of the liquid?
   Known: volume = 50.0cm^3 mass = 163g $D = \frac{M}{V}$
   Unknown: Density (D)
   $\frac{163\text{g}}{50.0\text{cm}^3} = \boxed{3.26 \frac{\text{g}}{\text{cm}^3}}$

5-5-3-3_Density Worksheet and KEY

Name _____ Date _____

ANSWER KEY

Density Worksheet

Directions: Solve each problem below. Show your work and circle your answers.

Example: A student has a sample of aluminum that has a mass of 27 g and a volume of 10 cm^3. What is the density of aluminum?

Density = mass/volume

Density = 27 g / 10 cm^3

Density = 2.7 g/cm^3

1. A loaf of bread has a mass of 500 g and volume of 2500 cm^3. What is the density of the bread?

   Density = mass/volume

   Density = 500g / 2500cm^3

   Density = 0.2 g/cm^3

2. A block of wood has a mass of 6.0 g and a volume of 12.0 cm3. What is the density of the block of wood?

   Density = mass/volume

   Density = 6.0g / 12.0cm3

   Density = 0.5 g/cm3

3. The density of a substance is 4.0 g/cm3. If a sample of the substance has a volume of 25 cm3, then what is its mass? (Hint: Use the equation: mass = density × volume.)

   Mass = density × volume

   Mass = 4.0 g/cm3 × 25 cm3

   Mass = 100 g

4. You have a lead ball with a mass of 420 g. The density of lead is 10.5 g/cm3. What is the volume of the ball? (Hint: Use the equation: volume = mass/density.)

   Volume = mass/density

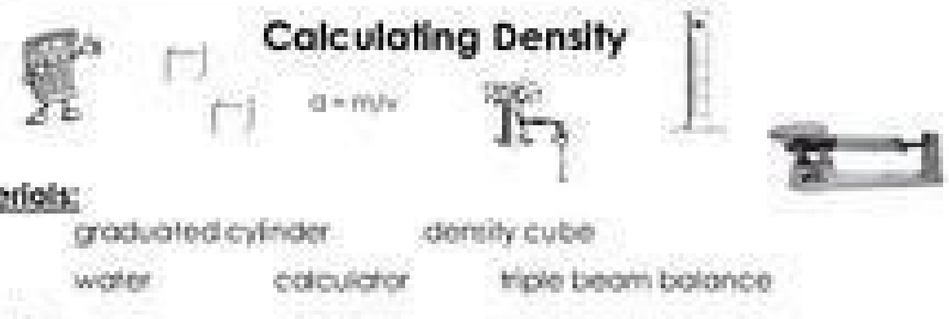
   Volume = 420 g / 10.5 g/cm3

   Volume = 40 cm3

Name: _____ Date: _____

Calculating Density

d = m/v



Materials:

graduated cylinder density cube
water calculator triple beam balance

Directions:

1. Mass the density cube.
2. Record the mass of the density cube on the chart below.
3. Fill the graduated cylinder to _____.
   - Be sure to check the water level in the cylinder by looking at it eye-level.
4. Record the water level (volume) in the chart.
5. Place the density cube in the graduated cylinder.
6. Once the water has stopped "moving" in the cylinder, record the water level (volume) with the density cube.
   - Be sure to check the water level in the cylinder by looking at it eye-level.
7. Subtract the first volume from the second volume.

Mass of density cube	grams
Volume **w/out** density cube (1st volume)	mL
Volume **with** density cube (2nd volume)	mL

Name: _____

Date: _____ Per. _____

Density Makes Cents!

As you have already learned, density is a physical property of a substance which relates the amount of matter in a defined volume. Density is often reported in g/ml, or g/cm³. The density of a pure substance never changes (as long as temperature is constant) and can therefore be used to help identify the composition of a substance.

In this lab, we will be using pennies from various time periods in United States history and hopefully verifying its composition!

Pre-lab Questions

1. What element do you think is used to make pennies?

2. Look up the density of that element in a chart or table. This is what you expect to find as the density of pennies in the lab.

3. How many pennies should you use at one time?

4. The formula for a line is y = mx+b. List every variable and what is represents. How might this formula be used to calculate density (hint: how can the equation for density be rewritten to look like the formula for a line).

Purpose

To write a procedure for determining the density of pennies, to determine the pennies' density, and to verify the pennies' composition.

Procedure

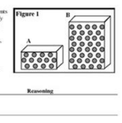
In your lab groups, create and write down a procedure for determining the density of pennies in three categories: **Before 1980, 1982-1983, and After 1982.** Each of you should write this procedure on a separate sheet of paper. Next, construct a data table you will need for this lab. *ALL DATA TABLES SHOULD BE CREATED BEFORE BEGINNING LAB.* Then on a sheet of graph paper create two different Mass Vs Volume graphs for the two different age pennies. After clearing your procedure and data tables with the instructor you may begin. Remember to concentrate on safe lab techniques, and precision counts!

Chemistry I Name _____
Unit 1 WS 2 – Mass, Volume, and Density

1. Study the matter shown in Figure 1. Each dot represents a particle of matter. [*Assume the particles are uniformly distributed throughout each object, and particles of the same size have the same mass.*]

a. In the table below, show how the masses, volumes, and densities of A and B compare by adding the symbol <, >, or = to the statement in the second column.
b. Explain your reasoning for each answer in the last column.

Figure 1

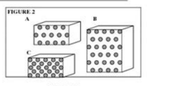


Property	Relationship	Reasoning
Mass	A ____ B	
Volume	A ____ B	
Density	A ____ B	

2. Study the matter in Figure 2. [*Assume the particles are uniformly distributed throughout each object, and particles of the same size have the same mass.*]

a. In the table below show how the masses, volumes, and densities compare by adding the symbol <, >, or = to the statement in the second column.
b. Explain your reasoning for each answer in the last column.

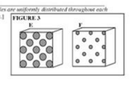
FIGURE 2



Property	Relationship	Reasoning
Mass	A ____ B	
	A ____ C	
Volume	A ____ B	
	A ____ C	
Density	A ____ B	
	A ____ C	

3. Is object E or object F more dense? [*Assume the particles are uniformly distributed throughout each object, and particles with a larger size have a larger mass.*] Explain your reasoning.

FIGURE 3



Answers do not need to be in full sentences, as long as you do not include the question in this case. (Source) Archimedes needed to determine whether a holdsmith had diverted gold during the manufacture of the royal crown to King Hiero I of Syracuse. Record the volume of Water. Most people do not keep a cylinder graduated in their homes. If your chart is created in a graphical analysis, copy and paste your chart into this section of the lab ³ ³. If you haven't done a hip³thesis, tell me if the data you supported or refuted. Add the object, taking care to eliminate air bubbles. Some ³ are not prone to a ³. This does not give new information µ. Procedure: Give a brief summary of the steps taken to collect data. The volume of your object A© PI (Ã¬, ~ 3.14) multiplied by the square of the radius multiplied by the difference in the fluid levels (Ã∞ R2H). Partially fill a rectangular box or container with liquid.mark the initial liquid level on the outside of the container with a marker.Add the object.mark the new liquid level. Measure the difference between the original and final liquid levels. All virtual ³ and ³ in the home should follow these guidelines. Do not discuss human error because it is always present. How can ³ be improved so there is less error? There is another way to calculate the volume using the whole Archimede displacement m. You can't have one of these or both in a ³. ³ For a small object, in the laboratory, the easiest way to do this is to partially fill a graduated cylinder large enough to hold the object with Water (or some liquid in which the object does not dissolve). How would you not know if the crown was a base metal with a gold exterior? There are two types of data - quantitative (in a ©rich) and qualitative (observed with the senses, not in a ©rich). How is a ³ report ³ appropriate? eS eS .oir³Ätarobal od etnematerid setse raloc e raipoc edop The container was rectangular or square, the volume of the object The internal width of the container multiplied by the internal length of the container (both numbers are the same in a cube), multiplied by the distance that the liquid was shifted (length x width x height = volume). Melting the crown down to throw it into a cube or sphere would do for a Easy Circle and an angry king. Archimedes could use scales to find the mass of the crown, but how would he find the volume? Technically, he did not even need to weigh the crown if he had access to the royal treasury, since he could simply compare the displacement of Water by the crown with the displacement of Water by an equal volume of gold that the blacksmith was given to wear. Purpose/³: re-write the ³ of the ³ ³ that is given Some laboratories are ³ for you to give a hip³ µthesis or to guess with knowledge the conclusions Remember to record only notes µ µ here and not inferences, or conclusions based on µ observations. Conclusion: answer the ³ in this case. The parts of the report ³ be described with some examples. The radius of the cylinder is 1/2 of the meter. For example, if your hip³thesis was that burning was a humic change, in conclusion, you wouldn't write Á Â ³ A hipÃâA Gold is a very heavy metal (even heavier than lead, although lead has a higher atomic weight), so one way to test the crown would be to determine its density (mass per unit volume). Remember to always use meaningful digits and units when recording measurements. Remember to use meaningful digits and appropriate units! If the same Calculation is repeated with different data sets, you cannot show the steps in the Calculation the atief essof aoroc amu es airirbocsed ªÃcov omoC .lepap od opot on ohla§Ãebac mu omoc oir³Ätarobal od olutÃt o avercse erpmeS :olutÃT .anamuh omoc edaditnedi aus emrifnoc ªÃcov euq somidep ,etis osson od odnaturfsed raunitnoc araP .oir³Ätarobal on satsiv sacimÃuq e sacisÃf sa§Ãnadum ed solpmexe ªÃd ,sacimÃuq e sacisÃf sa§Ãnadum ravresbo ©Ã ovitejbo o eS .o£Ã§Ães atsen oinÃmula od edadisned a arap latnemirepxe rolav o ©Ã lauq agid o£Ãtne ,oinÃmula ed edadisned a rartnocne ©Á oir³Ätarobal mu ed otis³Ãporp o eS .etneipicer od ortned olucrÃc od ortem¢Ãid o a§Ãem ,ordnilic mu araP .siev¡Ãirav sa ertne o£Ã§Ãaler amu ajev e sodad so etolp ªÃcov euq megixe soir³Ätarobal snuglA :sodatluseR / ocif¡ÃrG .o£Ã§Ães atse elup ,oir¡Ässecen rof ocif¡Ãrg muhnen eS .uocolsed aoroc a aug¡Ã atnauq me esab moc emulov o raluclac airedop ele euq sedemiuqrA a uerroco ,amelborp o rarednop ed siopeD .iuqa sal-ªÃdnopser ,oir³Ätarobal od etrap merof satnugrep sa eS :satnugreP .otaf iof otejbo od osep o rebuos ªÃcov es ,edadisned aus e otejbo mu ed emulov o raluclac arap sedemiuqrA ed aiedi a sam ,oÉÃ§ÃcIf res edop ossid etraP "!akeruE !akeruE" :odnatirg saur salep uerroc e un ,arof arap uidolpxe ele ,amelborp ues o arap o£Ã§Ãulos a uignita sedemiuqrA zev amu ,air³Ätsih a moc odroca eD ?orre oa ravel airedop oir³Ätarobal on odasu otnemapiuqe uo otnemidecorp euq :orre ed siatnemirepxe setnoF .meb o£Ãtse euq setnerefid oir³Ätarobal ed soir³Ätaler zed me ramrofsnart medop setnerefid setnadutse zeD .oir³Ätarobal o ratelpmoc arap soir¡Ässecen soluc|¡Ãc reuqsiauq arap iuqa sohlabart rartsoM :soluc|¡ÃC .etnemlaicnenopxe sadanoicaler etnematerid ,etnematerid sadanoicaler etnemasrevni ,©Ã otsi ,sartuo s Ã samu sadanoicaler o£Ãtseâå siev¡Ãirav sa omoc ramrofni e raenil rof ocif¡Ãrg o es acifingis ahnil ad o£Ã§Ãanilcni a euq o euqilpxE .oir³Ätaler mu revercse euq revit euq erpmes aiug omoc o£Ã§Ãil atse esU .emulov ues rop adidivid assam a ©Ã edadisned aus ,otejbo od assim a revit ªÃcov eS .sanepa sodad ed otnujnoc gold or a cheaper league? This lesson will teach you a method to write a laboratory report. The nearest thing would be a liquid liquid Cup, which will carry out the same task, but with much less need. Ã, do not write Ã ¢ â € œFored physical and chemical alterations â € œB The object volume is the initial volume in the subtracted cylinder of the final volume. Data: ã, this is what you collected in the laboratory. Thank you very much for your cooperation. cooperation.

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