Purpose:

Practice using density to investigate metals.

WARMUP :

Copy this equation and then practice punching this into your calculator:

$$3.14 \times \left(\frac{0.0380}{5}\right) \times \left(\frac{8}{3}\right) = \frac{0.0643}{0.06}$$

How Do We EXPAND A NUMBER THAT HAS TWO UNITS?

Thorium density is $11.7 \frac{g}{cm^3}$.

That's the same as $\frac{11.7 \text{ grams}}{1 \quad cm^3}$

#2 HOW WOULD YOU FIND THE MASS OF A 55mL THORIUM CHUNK?

① 55mL is "the lonely measurements"
② Mass is the ~~numberless~~ numberless measurement
③ The ratio we know is $\frac{11.7 \text{ grams}}{1 \text{ cm}^3}$

Lonely measurement	×	the ratio	=	numberless measurement

Two
three

$55 \text{ mL} \times \left(\frac{11.7 \text{ grams}}{1}\right) = 643.5 \text{ grams}$

640 grams

#3

3300000000 is 3.3×10^9
_____
eight

The decimal point must be after the first digit.

Use this for extremely small and large numbers.

43000000000000

is

4.3×10^{11}

Because I bounced the decimal 11 times.

IT'S NOT A SCIENTIFIC NOTATION UNLESS THE DECIMAL IS AFTER THE FIRST DIGIT

What are RATIOS good for?

EHS CΛ3мІѕ+гу

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Multiplication with units. Use a calculator. Your answer should have units written as one or more words. Round to correct sig figs

$$\frac{75 \ cm}{12.87 \ liters} * \frac{3.5 \ cm}{} = 20. \ \frac{cm^2}{L}$$

$$\frac{1.2 \ grams}{11.7 \ grams} * \frac{1 \ mL}{} = 0.1 \ mL$$

strategy top times top divided by bottom

$$\frac{91.2 \ grams}{594.4 \ grams} * \frac{117 \ pretzels}{} = 18.0 \ pretzels$$

$$\frac{1.2 \ grams}{1 \ mL} * \frac{11.7 \ grams}{} = 10 \ \frac{grams^2}{mL}$$

I. Numbers that are in a relationship (use your common sense)

a.	12 EGGS =	1 DOZENS	d.	1000 mL =	1 liters	
b.	2 EYES =	1 HUMAN	e.	1 kilometers =	1000000 millimeters	
c.	8 LEGS =	1 SPIDER	f.	100 yards =	1 football field	

II. Rewrite the six numbers-in-relationships from above as ratios there are two versions of each, one an upside down version of the other.

a. ratios for eggs and dozens could be $\left(\dfrac{1 \ dozen}{12 \ eggs}\right)$ or $\left(\dfrac{12 \ eggs}{1 \ dozen}\right)$.

b. ratios for eyes and humans could be $\left(\dfrac{2 \ eyes}{1 \ human}\right)$ or $\left(\dfrac{1 \ human}{2 \ eyes}\right)$

c. ratios for mL and liters could be $\left(\dfrac{1000 \ mL}{1 \ L}\right)$ or $\left(\dfrac{1 \ L}{1000 \ mL}\right)$

d. ratios for yards and fields could be $\left(\dfrac{100 \ yards}{1 \ field}\right)$ or $\left(\dfrac{1 \ field}{100 \ yards}\right)$

III. Insert one of your ratios from above into each equation below in a way that the units will cancel. Use a calculator to write an answer that has correct UNITS and sig figs.

a. 225 eggs $\times \left(\dfrac{1 \ dozen}{12 \ eggs}\right) = 18.75 \ dozen$

c. 9.90 liters $\times \left(\dfrac{1000 \ mL}{1 \ L}\right) = 9900 \ mL$

b. 13 humans $\times \left(\dfrac{2 \ eyes}{1 \ human}\right) = 26 \ eyes$

d. 55 football fields $\times \left(\dfrac{100 \ yard}{1 \ field}\right) = 5500. \ yards$

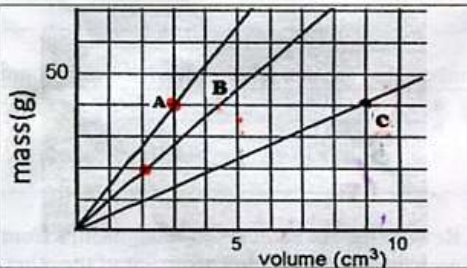15. Estimate the level of liquid in the four containers. Remember: read between the lines and add only ONE MORE digit

26.   26.4   26:42   43.4
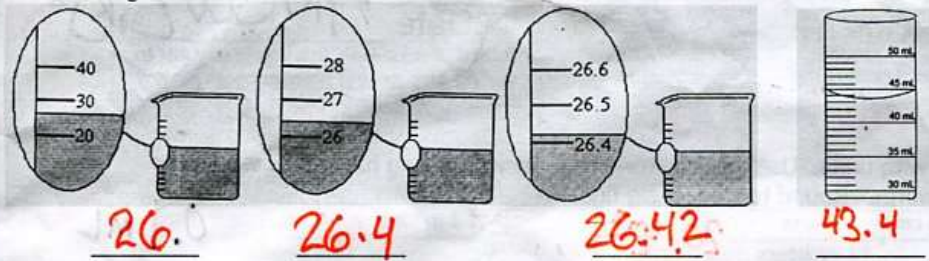
V.   Equalities based on metric system and on the graph shown here:

a.   Slope of A
$$\frac{\Delta y}{\Delta x} = \frac{40 g}{3 cm^3} = \frac{40 \, grams}{3 \, cm^3}$$

b.   Slope of B
$$\frac{\Delta y}{\Delta x} = \frac{20 \, grams}{2 \, cm^3}$$

V.   Use your two slopes from the graph to write ratios
a.   Two ways to write a ratio based on the Slope of Line A are
$$\left(\frac{40 \, grams}{3 \, cm^3}\right) \text{ or } \left(\frac{3 \, cm^3}{40 \, grams}\right)$$

b.   Two ways to write a ratio based on the Slope of Line B are
$$\left(\frac{20 \, g}{2 \, cm^3}\right) \text{ or } \left(\frac{2 \, cm^3}{20 \, g}\right)$$

c.   Two ways to write a ratio based on the Slope of Line C are
$$\left(\frac{40 \, g}{9 \, cm^3}\right) \text{ or } \left(\frac{9 \, cm^3}{40 \, g}\right)$$

VI Insert one of your ratios from above into each equation below in a way that the units will cancel.   Use a calculator to write an answer that has correct UNITS and sig figs.

a.   225 cm³ of "A" $\times \left(\frac{40 \, grams}{3 cm^3}\right) = $ 3000 grams

c.   0.48 g of "B" $\times \left(\frac{2 cm^3}{20 \, gram}\right) = 0.048 \approx 0.05 \, cm^3$

d.   1.65 cm³of "B" $\times \left(\frac{20 \, grams}{2 \, cm^3}\right) = 16.5 \approx 20 \, grams$

b.   4.50 g of "A" $\times \left(\frac{3 cm^3}{40 g}\right) = 0.3375 \approx 0.3 \frac{cm^3}{gram}$ answer

What are slopes good for 2?

EHS CΛ3ᴍIs+ry

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Write each number in standard format.

1) 1.152×10^{7} = __11520000.__

2) 7.043×10^{-5} = 0.00007043

3) 7.5777×10^{-9} = 0.0000000075777
     <u>EIGHT ZEROES</u>

4) 8.0217×10^{-3}

5) 7.1378×10^{4}

6) 4.326×10^{-1}

7) 8.36×10^{4}

8) 3.92×10^{-2}

9) 5.67×10^{-8}

10) 1.1318×10^{5}

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1) What is the of water in container 1?
   Volume: __25.2__ mL

2]

3]

1.   2.   3.

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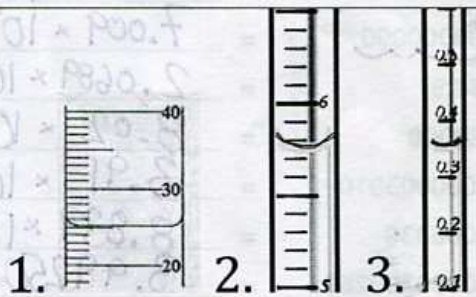
4) Calculate the volume of a block that has the dimensions:
    L = 6.20 cm,   W = 5.25 cm, H = 1.00 cm

Show your calculations and present your answer to the proper precision (number of significant digits).
Remember to show the units on your answer.

$V = L \cdot W \cdot H$

$V =$

$V =$

5) If the density of a substance is $6.505 \frac{g}{cm^3}$ and the volume of a sample of this substance is $13.1cm^3$, what is the mass of this sample?

$\boxed{\text{onely number}} \times \boxed{\text{RATIO}} = \boxed{\text{numberless measurement}}$ ⟹ $13.1 cm^3 \times \left(\frac{6.505 \text{ gram}}{1 \cdot cm^3}\right)$

oops TYPO

6) A piece of paper is known to have an area of 30.2 cm^2 and has a volume of 0.0052 cm^3. What is the thickness of this paper?

SHOULD SAY 0.0052

Strategy: $\frac{cm^3}{cm^2} = cm$

Write each number in scientific notation.

11)   529000000   = 5.29×10^8

12)   5.29   = 5.29×10^0

13)   982.05   = 9.82×10^2

14)   7009000000

15)   2068.9

16)   8020000

17)   0.0000003910

18)   0.0008839

19)   0.00000399250

20)   0.0002867