## Unit Conversion Worksheet

**Directions:** Use the Factor-label method (or dimensional analysis) to convert between the following units. Remember to use unit equalities as conversion fractions to cancel out variables until ending with the desired new variable(s).

1. 1.2 kg = _____mg

$$1.2\ \text{kg} \left| \frac{1000\ \text{g}}{1\ \text{kg}} \right| \frac{1000\ \text{mg}}{1\ \text{g}} = 1.2 \times 10^{6}\ \text{mg}$$

2. $2.00 \times 10^{-5}$m = _____cm

$$2.00 \times 10^{-5}\ \text{m} \left| \frac{100\ \text{cm}}{1\ \text{m}} \right. = 2.00 \times 10^{-3}\ \text{cm}$$

3. 25.4 mm = _____cm

$$25.4\ \text{mm} \left| \frac{1\ \text{m}}{1000\ \text{mm}} \right| \frac{100\ \text{cm}}{1\ \text{m}} = 2.54\ \text{cm}$$

4. 1.2 m = _____km

$$1.2\ \text{m} \left| \frac{1\ \text{km}}{1000\ \text{m}} \right. = 1.2 \times 10^{-3}\ \text{km}$$

5. 15.47 g = _____ng

$$15.47\ \text{g} \left| \frac{1 \times 10^{9}\ \text{ng}}{1\ \text{g}} \right. = 1.547 \times 10^{10}\ \text{ng}$$

6. 45.1 mg = _____cg

$$45.1\ \text{mg} \left| \frac{1\ \text{g}}{1000\ \text{mg}} \right| \frac{100\ \text{cg}}{1\ \text{g}} = 4.51\ \text{cg}$$

7. 1.45 g = _____mg

$$1.45\ \text{g} \left| \frac{1000\ \text{mg}}{1\ \text{g}} \right. = 1.45 \times 10^{3}\ \text{mg}$$

8. 4.100 mL = _____L

$$4.100\ \text{mL} \left| \frac{1\ \text{L}}{1000\ \text{mL}} \right. = 4.100 \times 10^{-3}\ \text{L}$$

9. 1.2 kL = _____nL

$$\frac{1.2\,kL}{1\,kL}\left|\frac{1000\,L}{1\,L}\right|\frac{1\times10^{9}\,nL}{1\,L} = 1.2\times10^{12}\,nL$$

10. 145 mL = _____nL

$$\frac{145\,mL}{1000\,mL}\left|\frac{1\,L}{1\,L}\right|\frac{1\times10^{9}\,nL}{1\,L} = 1.45\times10^{8}\,nL$$

11. 6.51 L = _____cL

$$\frac{6.51\,L}{1\,L}\left|\frac{100\,cL}{1\,L}\right. = 6.51\times10^{2}\,cL$$

12. 17.0 m/s = _____mm/min

$$\frac{17.0\,m}{s}\left|\frac{1000\,mm}{1\,m}\right|\frac{60\,s}{1\,min} = 1.02\times10^{6}\,mm/min$$

13. 342 m/hr = _____km/s

$$\frac{342\,m}{hr}\left|\frac{1\,km}{1000\,m}\right|\frac{1\,hr}{3600\,s} = 9.50\times10^{-5}\,km/s$$

14. 2.00 m/s = _____cm/hour

$$\frac{2.00\,m}{s}\left|\frac{100\,cm}{1\,m}\right|\frac{3600\,s}{1\,hr} = 7.2\times10^{5}\,cm/hour$$

Name: _____

# Density Calculations Worksheet - Honors

| density = mass / volume | UNITS OF DENSITY<br>g/cm³ or g/mL |
|---|---|

1) Find the density of a wood block that has a ~~volume of 5.0 cm³~~ and a mass of 30.5 g.

$D = m/V = 30.5\,g / 5.0\,cm^3 = 6.1\,g/cm^3$

2) ~~Which has~~ the greater mass – 10 cm³ of copper or 5 cm³ of mercury?

Copper
$m = D \times V = (8.92\,g/cm^3)(10\,cm^3) = 89.2\,g \rightarrow 90\,g$

Mercury
$m = (13.5939\,g/cm^3)(5\,cm^3) = 67.97 \rightarrow 70\,g$

3) Calculate the mass of a wooden block that is 4 cm long, 2 cm wide, 6 cm high, and has a density of 0.5 g/cm³. (hint: find the volume of a block first)

Volume = (4cm)(2cm)(6cm)
= 48 cm³

$M = D \times V = (0.5\,g/cm^3)(48\,cm^3) = 24\,g \rightarrow 20\,g$

4) In the table below are the mass and volume of some mineral samples. Calculate the density of sample B.

| Sample | Mass (g) | Volume (mL) |
|---|---|---|
| A | 19.5 | 6.54 |
| B | 12.4 | 3.1 |
| C | 6.8 | 3.4 |

$D = m/V = (12.4\,g)/(3.1\,mL) = 4.0\,g/mL$

5) What volume would a rock occupy if it had a mass of 31.2 g and a density of 10.4 g/cm³?

$V \times D = \frac{m}{V} \times V \rightarrow \frac{V \times D}{D} = \frac{m}{D} \Rightarrow V = \frac{m}{D} = \frac{31.2\,g}{10.4\,g/cm^3} = 3.00\,cm^3$

6) The density of oak is 0.7 g/cm³, and the density of pine is 0.4 g/cm³. Compare the masses of a 30 cm³ block of each type of wood.

$M = D \times V$

Oak
$M = (0.7\,g/cm^3)(30\,cm^3)$
$M = 21\,g \rightarrow 20\,g$

Pine
$M = (0.4\,g/cm^3)(30\,cm^3)$
$= 12\,g \rightarrow 10\,g$

7) How large a container would you ~~need~~ to hold 195 g of a liquid that has a density of 1.3 g/mL?

≈ volume
$V = m/D = 195\,g / 1.3\,g/mL = 150\,mL$

8) A jeweler suspects that a piece of gold jewelry in his collection is fake. If the volume of the piece of jewelry is 6 cm³, and its mass is 109 g, is the piece fake? Why or why not?

$D = m/V = (109\,g)/(6\,cm^3) = 18.17\,g/cm^3 \rightarrow 19\,g/cm^3$

yes because density is an intensive property, so all gold should have the same density of $19.31\,g/cm^3$

9) Substances A and B have the same volume, but the mass of B is twice as great as the mass of A. How do the densities of the two substances compare?

Volume A+B = 1 mL
mass A = 1 g
mass B = 2 g

$D = 1\,g/1\,mL = 1\,g/mL$ (A)
$D = 2\,g/1\,mL = 2\,g/mL$ (B) ← density is twice as large

10) 28.5 g of metal is added to a graduated cylinder containing 45.50 mL of water. The water level rises to the 49.10 mL mark. From this information, calculate the density of this metal. Identify the metal.

Volume: 49.10 mL − 45.50 mL = 3.60 mL

$D = m/V = \frac{28.5\,g}{3.60\,mL} = 7.92\,g/mL$ Iron

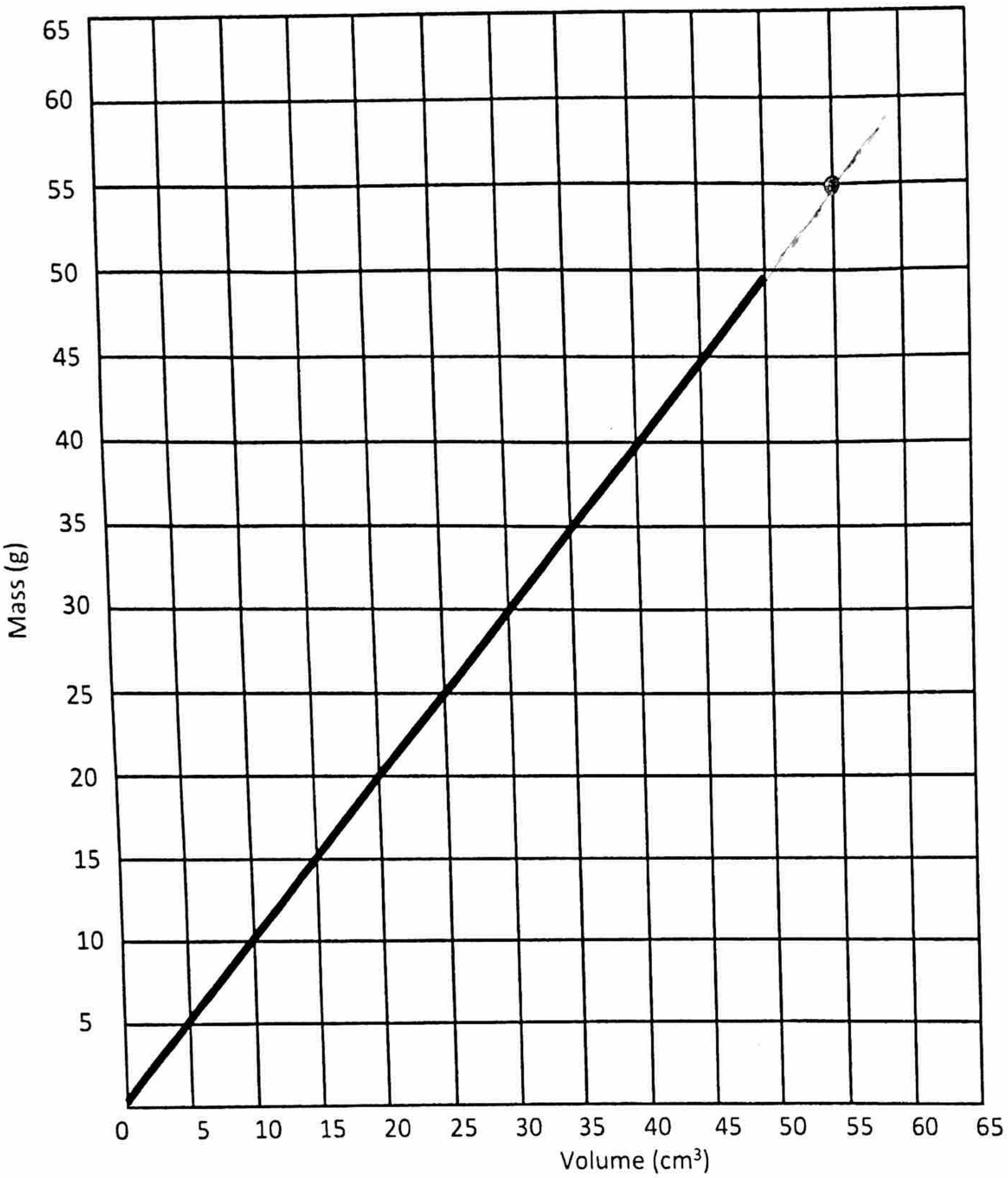
11) Calculate the density of a metal that has a mass of 36.457 g and a volume of 13.5 cm³. Identify the metal.

$D = \frac{36.457\,g}{13.5\,cm^3} = 2.70\,g/cm^3$ aluminum

# Interpreting Mass vs. Volume Graphs

Name: _____

**Graphing is a very important tool in science since it enables us** to see trends that are not always obvious. Graph the following data and answer the questions below.




1. Using the graph and data chart try to figure out f you increased the substance to 55 mL, how many grams would the substance have..

2. How much space would 65 g of the substance take up?

Data Chart

| Mass of substance (g) | Volume of Substance |
|---|---|
| 5 g | 5 $cm^3$ |
| 25 g | 25 $cm^3$ |
| 50 g | 50 $cm^3$ |
| 55 g | 55 $cm^3$ |
| 65 g | 65 $cm^3$ |

3.. As the volume of a sample increases from 20. mL to 30. mL, does the mass increase or decrease?

it increases because we have a positive slope

4. Calculate the Density of the substance. Show your work!

$D = m/v = 5g/5cm^3 = 1\ g/cm^3$

5. According to your calculation of density which substance is graphed?

| Substance | Density |
|---|---|
| Hydrogen | 0.00009 g/mL |
| Mercury | 13.5 g/mL |
| Carbon | 2.3 g/mL |
| Water | 1.00 g/mL |
| Sucrose | 1.6 g/mL |

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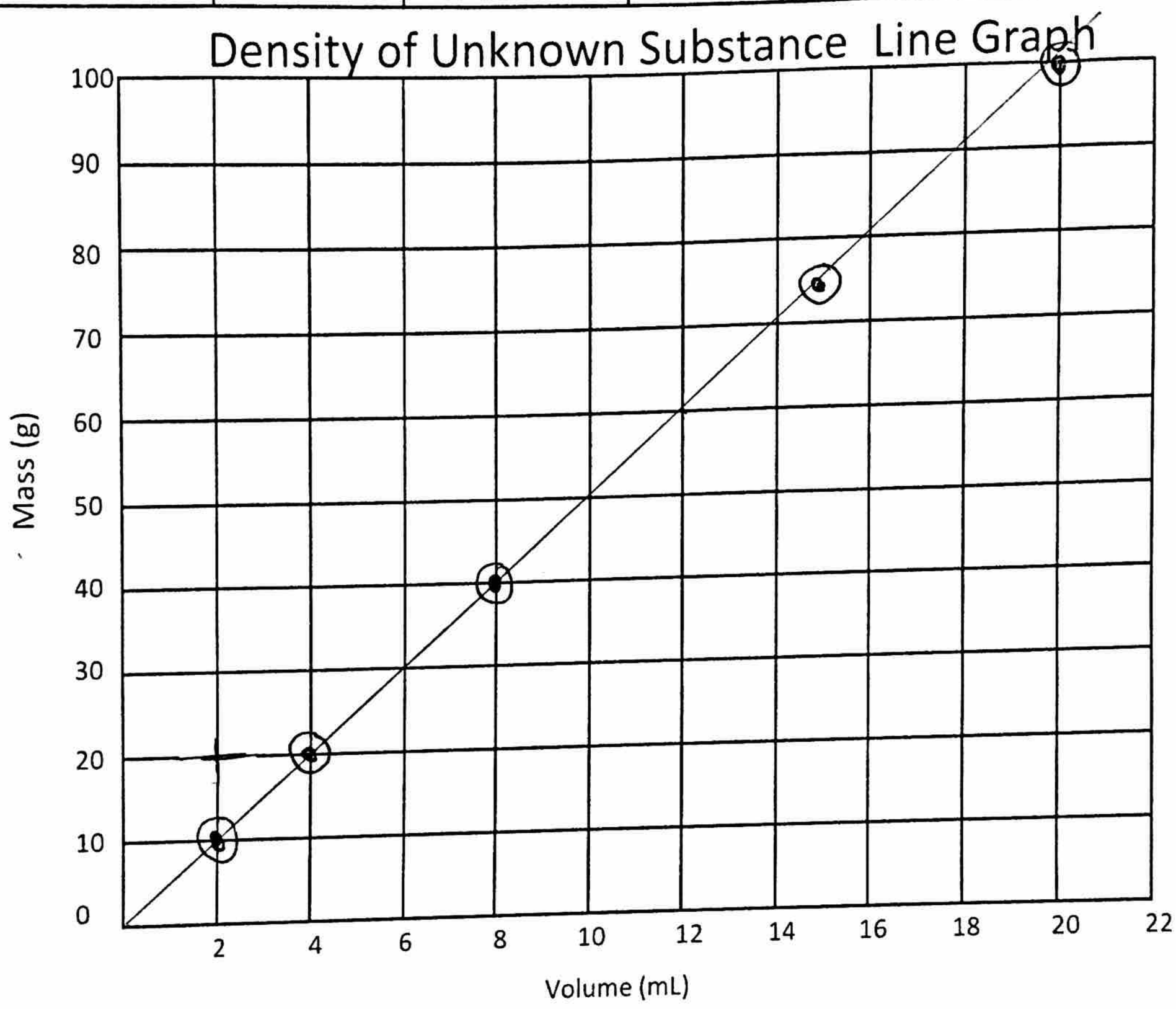
6. Graph the following mass and volume numbers on the graph below. This graph is a line graph and will look like the graph on the other side of the homework.

| Mass of liquid (g) | 20 | 100 | 75 | 40 | 10 |
|---|---|---|---|---|---|
| Volume of liquid ($cm^3$) | 4 | 20 | 15 | 8 | 2 |




7. As mass increases, what happens to the volume?

it increases

8. As volume increases, what happens to the mass?

it increase

9. Find 12 mL on the volume line. Follow that line until it touches the line you drew. How many grams would it be?

60g

10. What volume would 90 g occupy?

18mL

11. What is the density of the liquid? Calculate using the data table.

$D = m/V = 20\,g/4\,cm^3 = 5\,g/cm^3$