

Baseline Check

Name _____ Date _____ Total: 64 points

Read this first. This is **not a graded test** and it is not meant to be easy. It is a snapshot of what you already know so we can spend our study time where it actually helps — and so you can see how far you moved when you take the real exam.

Calculator: yes. Notes: no. Aim for about 45 minutes. If you don't know something, write “*not sure*” and move on — that is genuinely more useful to us than a blank or a guess. Show your work; partial credit is real. Watch your units and your significant figures.

Part A — Concepts and Models

1. Mass and volume

5 points

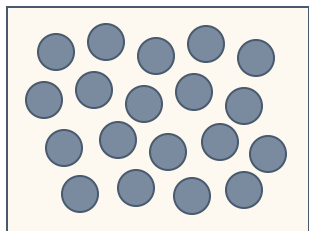
a) What is the difference between the **mass** of an object and its **volume**? Give an appropriate unit for each.

b) Is mass the same thing as weight? Explain.

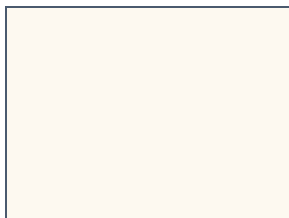
2. Particle diagram: liquid to solid

3 points

The box at left contains atoms of aluminum in the **liquid** phase. In the box at right, represent the **same atoms** in the **solid** phase.



LIQUID (given)

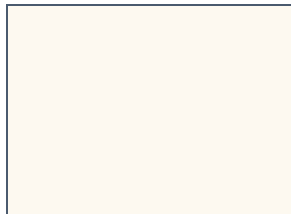


SOLID (draw)

3. Particle diagram: the gas phase

2 points

How would you represent the atoms of aluminum in the **gaseous** phase? Draw it, and describe in one sentence what is different.

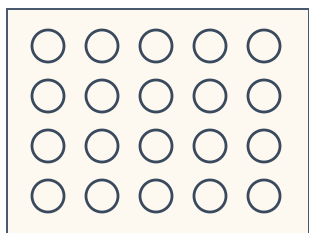


GAS (draw)

4. Burning steel wool

4 points

The box at left contains atoms of iron in a piece of steel wool. A student records its mass as **9.40 g**, heats it strongly in open air, and finds the mass afterward is **11.85 g**.



BEFORE (given)



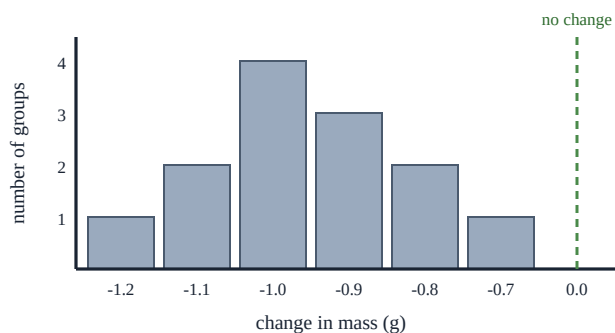
AFTER (draw)

Explain how the increase in mass is consistent with the law of conservation of mass.

5. Reading a histogram

4 points

A chemistry class dropped an antacid tablet into a cup of water sitting **open** on a balance, and each group recorded the **change in mass**. The class data are below.



a) Did the mass of the system really change, or is this measurement error? How can you tell?

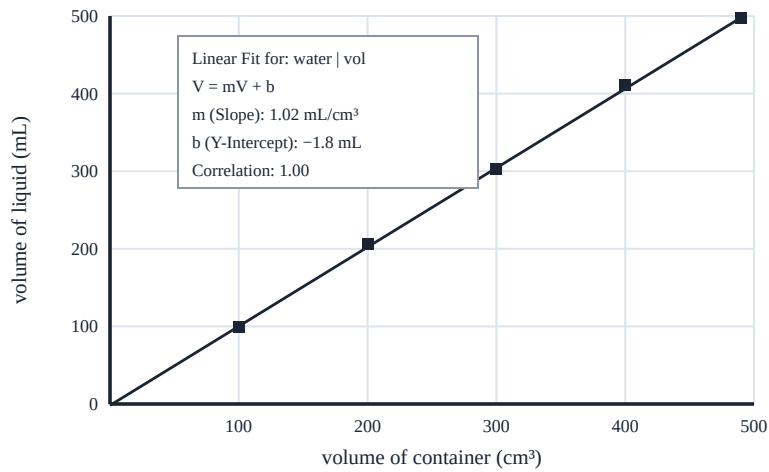
b) Explain what happened, at the level of particles.

c) What would the histogram look like if the same experiment were run in a **sealed** container? Why?

6. Volume of a container vs. volume of liquid

3 points

A class measured the inside volume of several containers with a ruler (in cm^3) and then measured how much water each one held (in mL). Their graph and best-fit line are below.

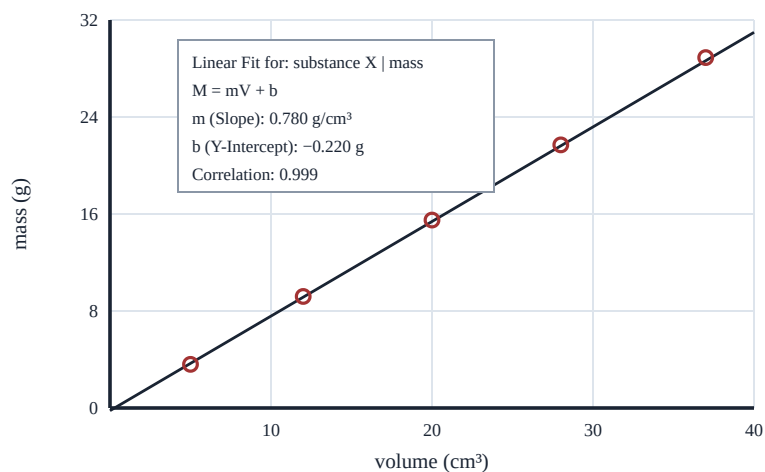


a) What does the slope tell you? b) What value would you expect the slope to have, and why?

7. Mass vs. volume graph

8 points

A class measured the mass and volume of several samples of one substance. Their graph and best-fit line are below.



a) Write the equation for the line. _____

b) What information is given by the slope of the graph?

c) Would this substance sink or float if placed in water? Defend your answer with a number.

d) What mass would you expect a **50.0 cm³** piece of this substance to have? Show your work.

8. Density problem

3 points

Chloroform has a density of 1.49 g/mL. What volume is occupied by **85.0 g** of chloroform?

9. Is it pure?

4 points

A ring of silver-colored metal has a volume of 3.50 cm³ and a mass of 33.0 g. The density of pure silver is 10.5 g/cm³. Is this ring pure silver? Show the number that decides it, then answer in a sentence.

Part B — Measurement and Calculation

10. Reading a graduated cylinder

3 points

A graduated cylinder is marked every 1 mL. The bottom of the meniscus sits between the 37 and 38 marks, about six-tenths of the way up toward 38.

- a) Record the volume: _____ b) How many significant figures does your answer have? _____
c) Which digit in your answer is uncertain, and why is it there at all?
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-

11. Comparing two instruments

3 points

Two thermometers are used on the same beaker of water. Thermometer C reads **24.3 °C**. Thermometer D reads **24.28 °C**.

- a) Which one is more precise? _____
b) Which one has the greater uncertainty? Explain how you know.
-
-

12. Counting significant figures

5 points

How many significant figures does each measurement have?

- a) 0.00450 g _____ b) 60.07 mL _____ c) 5000 km _____ d) 2.100 s _____
e) 8.0×10^5 L _____

13. Rounding

3 points

- a) 0.08346 to 2 sig figs _____ b) 47.98 to 3 sig figs _____ c) 1.0649 to 3 sig figs _____
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14. Calculating with significant figures

4 points

- a) $8.7 \text{ g} + 12.34 \text{ g} =$ _____ b) $205.6 \text{ mL} - 12.98 \text{ mL} =$ _____
c) $6.02 \text{ cm} \times 3.1 \text{ cm} =$ _____ d) $88.4 \text{ g} \div 12.0 \text{ mL} =$ _____
-

15. Volume units

2 points

A rectangular box measures 4.00 cm by 3.00 cm by 2.00 cm on the inside.

- a) What is its volume in cm^3 ? _____ b) How many mL of water will it hold? _____
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16. Identifying an unknown metal

4 points

A student places a piece of metal on a balance and records **71.3 g**. She fills a graduated cylinder to **15.0 mL**, drops the metal in, and the water rises to **25.0 mL**.

Densities (g/mL): aluminum 2.70 • zinc 7.13 • iron 7.87 • copper 8.96 • silver 10.50 • lead 11.35

What is the metal? Show your work.

17. Thickness of aluminum foil

4 points

A rectangular piece of aluminum foil measures 20.0 cm by 12.0 cm and has a mass of **1.30 g**. The density of aluminum is 2.70 g/cm³. Find the **thickness** of the foil.

Unit 1 Baseline Check — modeled on the class Unit 1 Review, extended to cover all ten Unit 1 learning targets.