Name: \_\_\_\_\_\_\_\_\_\_\_\_\_ANSWER KEY\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_

Chemistry in Earth System: Quarter 1 Midterm Review

The midterm is on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. The purpose of the midterm is to measure retention of information we have learned so far in quarter 1.

This review packet is due on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Important midterm information:**

* The midterm will be multiple choice & cumulative—it will cover everything so far.
* You will *not* be able to retake the midterm, and it will *not* be curved.
* The midterm will account for 10% of your overall grade (for now, it will be averaged with the final at the end of the semester)
* You will get to use your Conversion (DA Reference) Cheat Sheet and a calculator on the test.
* You may make a notecard (3x5, both sides) of notes to use on the midterm. You may put whatever information you would like on this notecard, but it will be collected along with your test.

**LT 1.1: Identify standard units and use dimensional analysis to convert between them.**

1. How many liters are in 4.78 gallons? Show work, write your answer with units and correct significant figures.

|  |  |  |
| --- | --- | --- |
| 4.87 gal | 1 L | 18.4 L |
|  | 0.264 gal |  |

1. Convert 489.1 mg to kg. Write your answer in scientific notation. Show work, write your answer with units and correct significant figures.

|  |  |  |
| --- | --- | --- |
| 489.1 mg | 0.001 kg | 0.0004891 🡪 4.891 x 10-4 kg |
|  | 1000 mg |  |

1. How many inches are in 3.7 kilometers? Write your answer in scientific notation. Show work, write your answer with units and correct significant figures.

|  |  |  |  |
| --- | --- | --- | --- |
| 3.7 km | 100 cm | 1 inch | 145669 🡪 1.5 x 105 in |
|  | 0.001 km | 2.54 cm |  |

1. How many micrograms (μg) are in 3.5 grams? Show work, write your answer with units and correct significant figures.

|  |  |  |
| --- | --- | --- |
| 3.5 g | 106 µg | 3.5 x 106 µg |
|  | 1 g |  |

**LT 1.2: Calculate answers with the correct number of significant figures and units, using scientific notation as appropriate.**

1. Give the rules for counting significant figures.
2. All numbers (1-9) are significant.
3. Zeroes to the right of a decimal and a number are significant.
4. Zeroes sandwiched between significant figures are also significant.
5. Zeroes used to tell you how big or small the number is (placeholders) are not significant.
6. How many significant figures are in each of the following numbers? Underline all of the significant figures.
   1. 351 \_\_3\_\_
   2. 402 \_\_3\_\_
   3. 309000 \_\_3\_\_
   4. 0.0041 \_\_2\_\_
   5. 0.020900 \_5\_\_
   6. 5010.0 \_5\_\_
   7. 18900 \_\_3\_\_
   8. 60. \_\_2\_\_
   9. 4.5 x 103 \_2\_
   10. 3.10 x 10-1 \_\_3\_\_
7. When multiplying and dividing, how do you determine how many significant figures your answer should have?

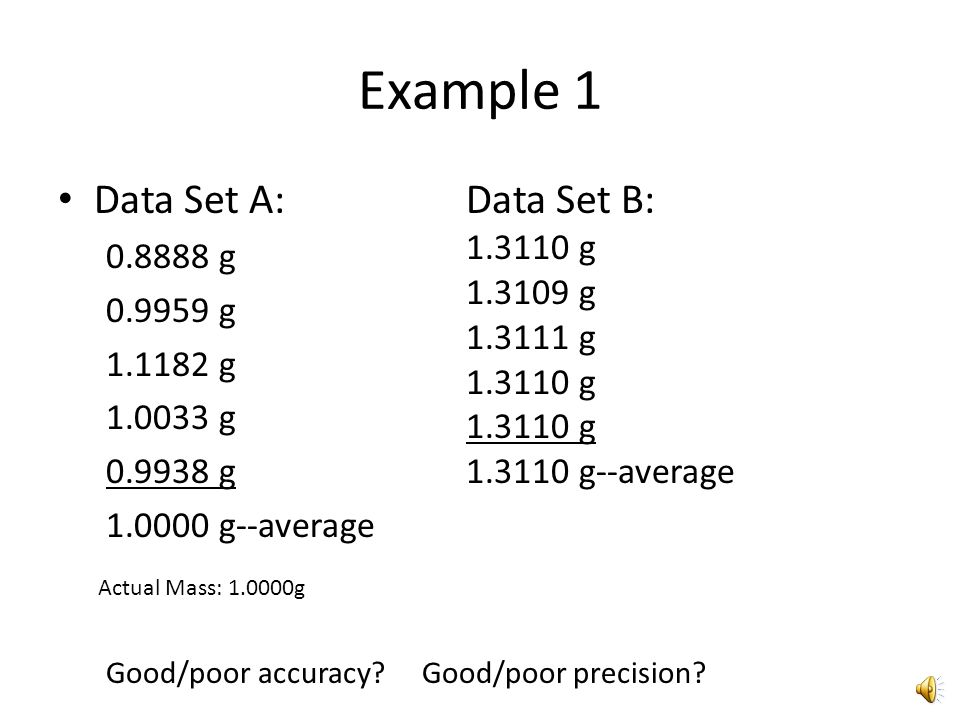
Look at all numbers in the problem, you round your answer to the fewest number of sig figs.

1. For each of the following calculations, give your unrounded answer, then a rounded answer with appropriate units.

|  |  |  |
| --- | --- | --- |
| **Calculation** | **Unrounded Answer** | **Rounded Answer** |
| 43 g x 0.06 g | 2.58 | 3 g2 |
| 3056 m3 ÷ 410 m2 | 7.453658537 | 7.5 m |
| 0.0051 mL2 x 5.67 mL2 | 0.028917 | 0.029 mL4 |
| 35.10 cm x 0.44 cm x 5.111 cm | 78.934284 | 79 cm3 |
| 400 g3 ÷ 35 g | 11.42857143 | 10 g2 |
| 16.789 kg ÷ 7.1 kg x 2.10 kg | 4.965760563 | 5.0 kg |
| 1400 m2 ÷ 650 m | 2.153846154 | 2.2 m |

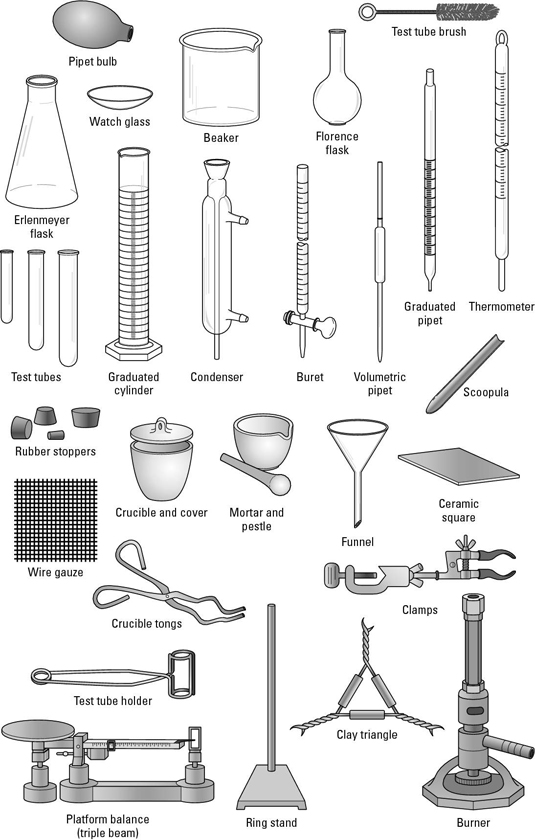
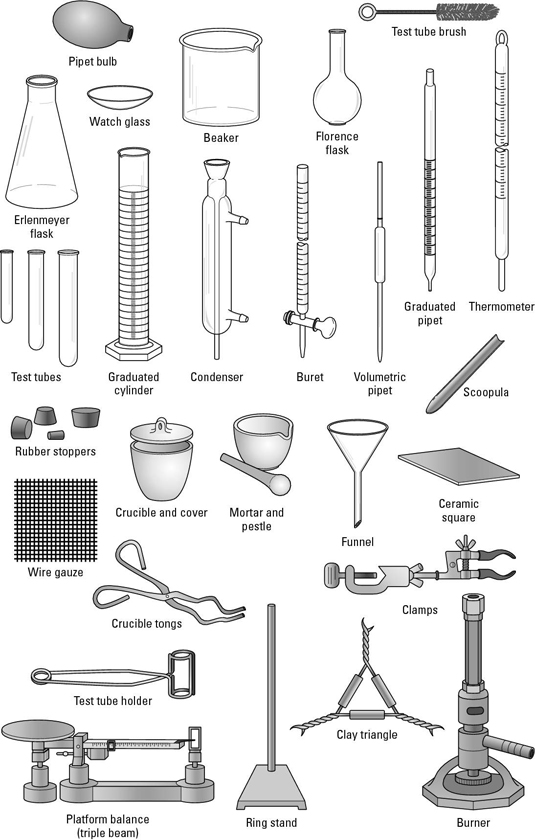
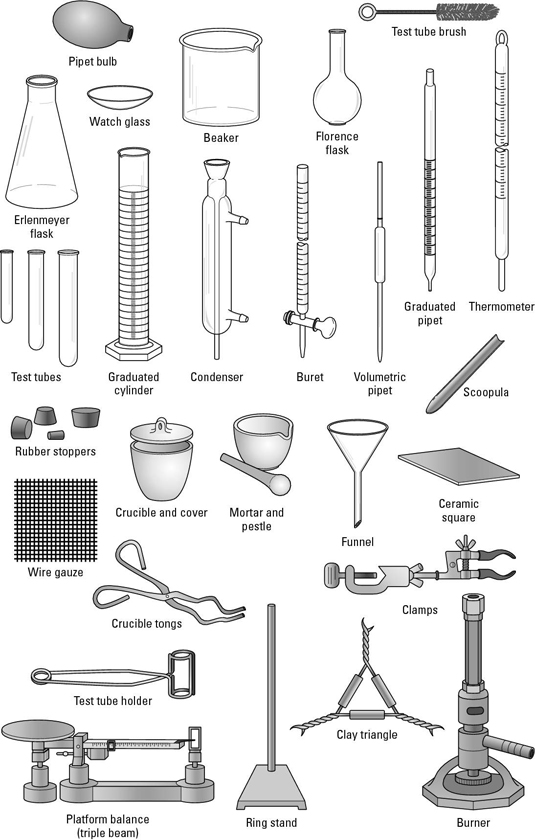
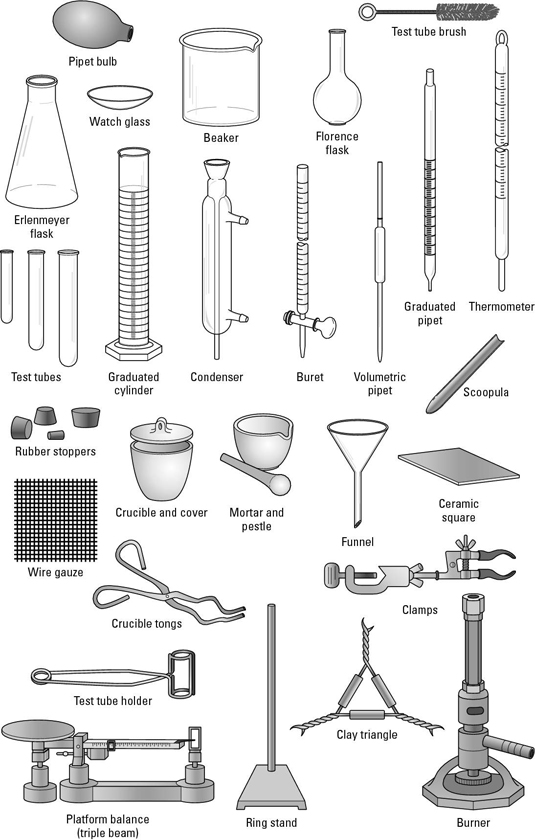
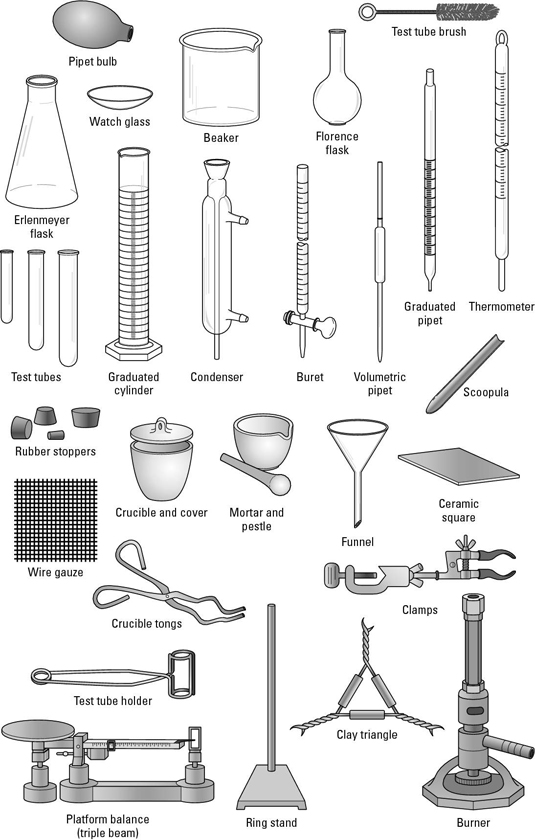
1. In scientific notation, how many numbers should be before the decimal point?
2. In scientific notation, what does a positive exponent mean? A negative exponent?
3. Convert the following numbers into scientific notation:
   1. 3,400 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. 0.000023 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. 101,000 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   4. 0.010 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Convert the following numbers into standard form:
   1. 2.30 x 104 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. 1.76 x 10-3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. 1.901 x 10-7 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   4. 8.65 x 10-1 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   5. 9.11 x 103 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**LT 1.3: Analyze the accuracy and precision of experimental data and analyze experimental error.**

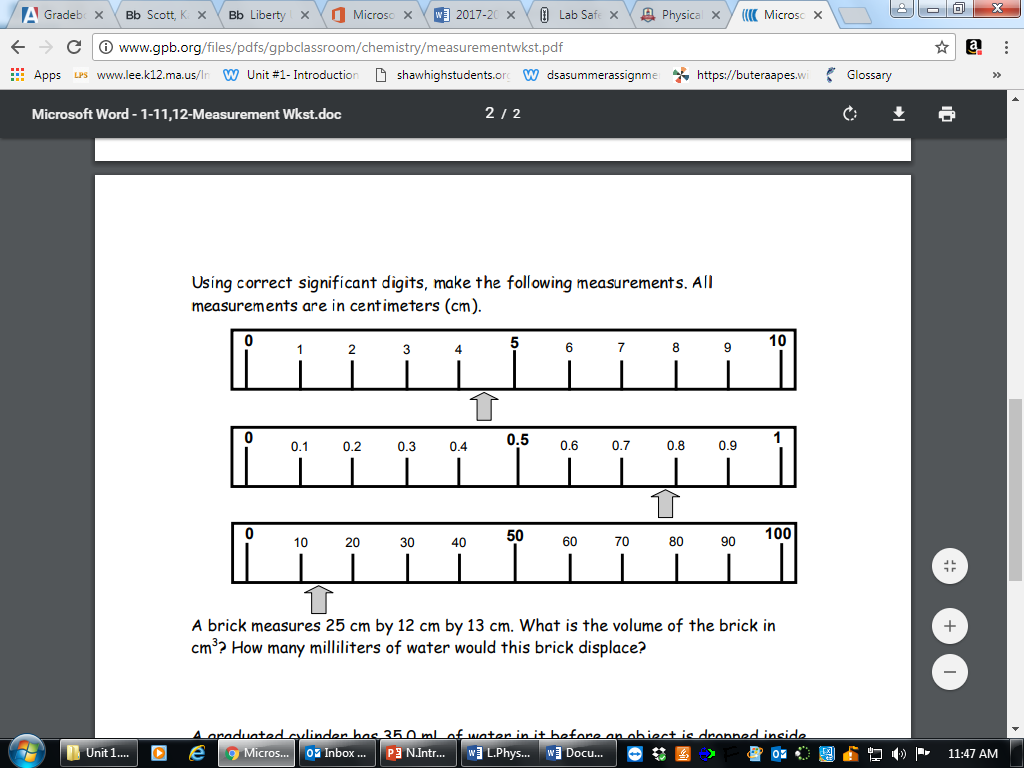
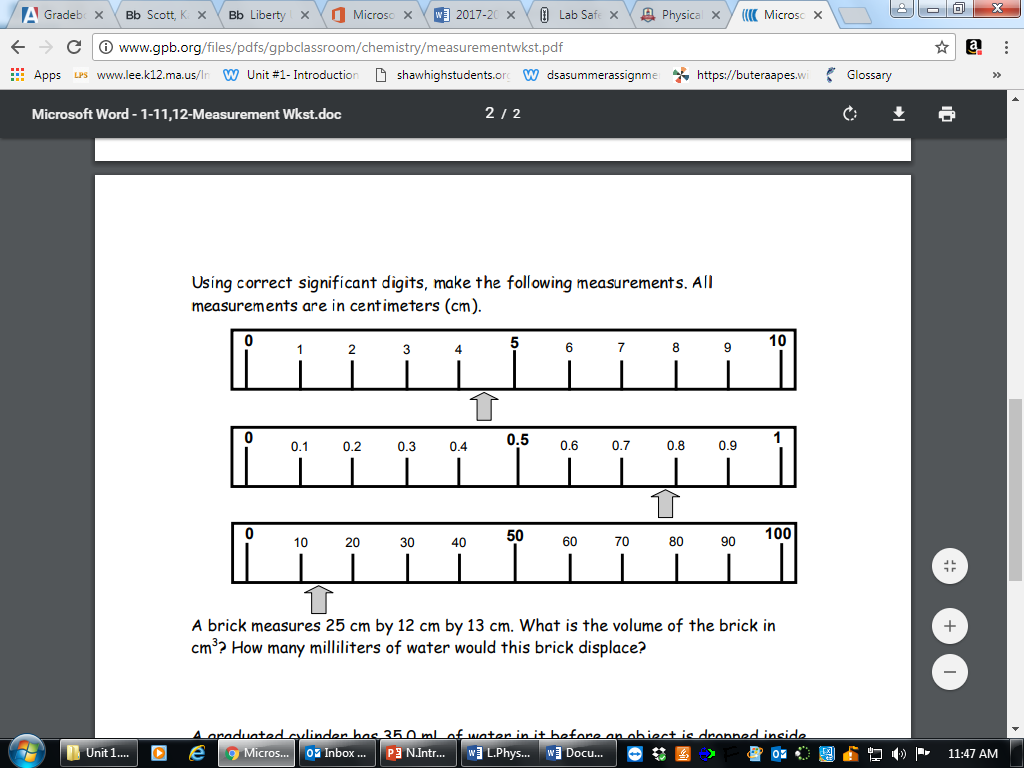
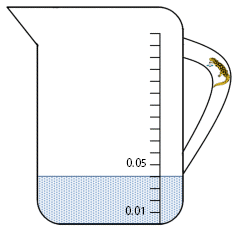
1. What is the difference between accuracy and precision?
2. The data sets to the right are each measuring a substance that has an actual mass of 1.0001 grams.
   1. Which data set is more precise? How can you tell?
   2. Which data set is more accurate? How can you tell?
3. What is the formula for percent error?
4. If the actual mass of is 1.0001 grams,
   1. Calculate the percent error for data set A.
   2. Calculate the percent error for data set B.
5. In the same experiment where they were determining the mass above, one of the scales used was not zeroed before the experiment, so it read “-0.0201 g” before the mass was placed on the scale. How would this affect the measured mass?

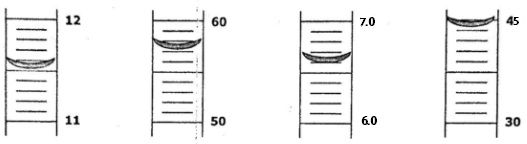
**LT 1.4: Choose appropriate measurement tools and use them to report measurements with the correct number of significant figures.**

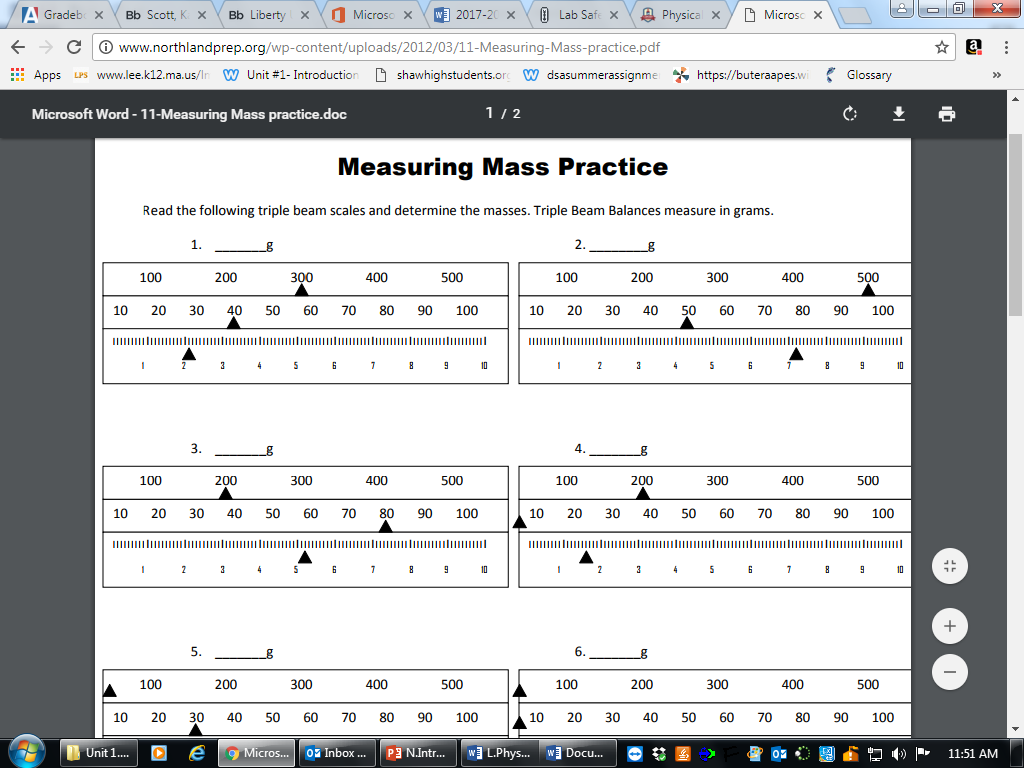
1. Name the following measurement tools:

1. State whether each of the following tools measures mass, volume, length, or temperature.
   1. \_\_\_\_\_\_\_\_\_\_\_\_ thermometer
   2. \_\_\_\_\_\_\_\_\_\_\_\_ triple beam balance
   3. \_\_\_\_\_\_\_\_\_\_\_\_ ruler
   4. \_\_\_\_\_\_\_\_\_\_\_\_ graduated cylinder
   5. \_\_\_\_\_\_\_\_\_\_\_\_ beaker
   6. \_\_\_\_\_\_\_\_\_\_\_\_ meter stick
   7. \_\_\_\_\_\_\_\_\_\_\_\_ electronic scale
2. What is the most accurate piece of glassware for measuring *exactly* 50.0 mL of water—a beaker, graduated cylinder, or Erlenmeyer flask? Explain.
3. For each of the following, write the measurement with the correct units and significant figures.

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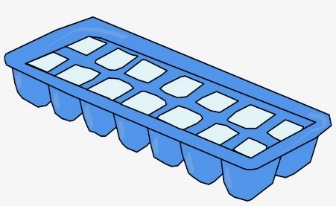


342.12 g 11.52 mL 57.3 mL

**LT 1.5: Identify types of matter and determine chemical and physical properties in matter.**

1. Define the following terms:
   1. Matter anything with mass and volume
   2. Pure substance one type of particle
   3. Mixture 2+ particles together, but not connected
   4. Element one type of atom
   5. Compound 2+ elements connected
   6. Chemical property how it reacts
   7. Physical property what it is
2. Identify whether each of the following are elements, compounds, or mixtures:
   1. \_\_C\_ water (H2O)
   2. \_M\_ chocolate (C6H12O6 & NaCl & …)
   3. \_\_E\_\_ nickel (Ni)
   4. \_\_C\_\_ potassium fluoride (KF)
   5. \_E\_ tungsten (W)
   6. \_M\_ glass (SiO2 & Na2CO3 & …)
3. Identify whether each of the following are chemical or physical properties:
   1. \_\_\_PP\_\_\_ melting point
   2. \_\_CP\_\_ combustibility
   3. \_PP\_\_\_ malleability
   4. \_\_PP\_\_ color
   5. \_\_CP\_\_ reaction with metal
   6. \_\_PP\_ density
   7. \_PP\_\_ solubility (dissolving)

**LT 1.6: Explain and model energy transfers between systems and surroundings.**

1. Identify the system and the surroundings in the following scenarios:
   1. Two liquids are mixed in a beaker and the temperature changes. Liquids are the system, beaker is the surroundings.
   2. An ice cube melts on the counter. Ice cube in the system, counter/air is the surroundings.
2. Define open, closed, and isolated systems and give an example of each. Open means matter/energy is exchanged. Closed means matter not exchanged. Insulated means energy not exchanged.
3. You put an ice cube tray full of water into the freezer. On the image to the right, show the energy transfer—is energy entering or exiting the water as it becomes ice? Energy is exiting the water as it becomes ice.
4. Label each of the following as potential or kinetic energy:
   1. \_\_PE\_\_ energy in food
   2. \_\_KE\_ energy from fire
   3. \_PE\_\_ a chandelier hanging from the ceiling
   4. \_\_KE\_ a rock rolling down a hill

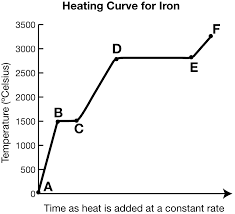
**LT 2.1: Describe the effects of energy on particle motion of solids, liquids, and gases.**

1. Define temperature. Explain how it relates to molecular motion. Temperature is the average kinetic energy of the molecules in a substance. The higher the temperature, the faster the molecules are moving.
2. Which molecules have more kinetic energy—water at 100°C or water at 45°C? How do you know? Water at 100C because the higher temperature. Temp is KE, so more temp = more KE.
3. Draw a particle model of solids, liquids, and gases. For each one, label whether they have definite volume, definite shape, both, or neither.

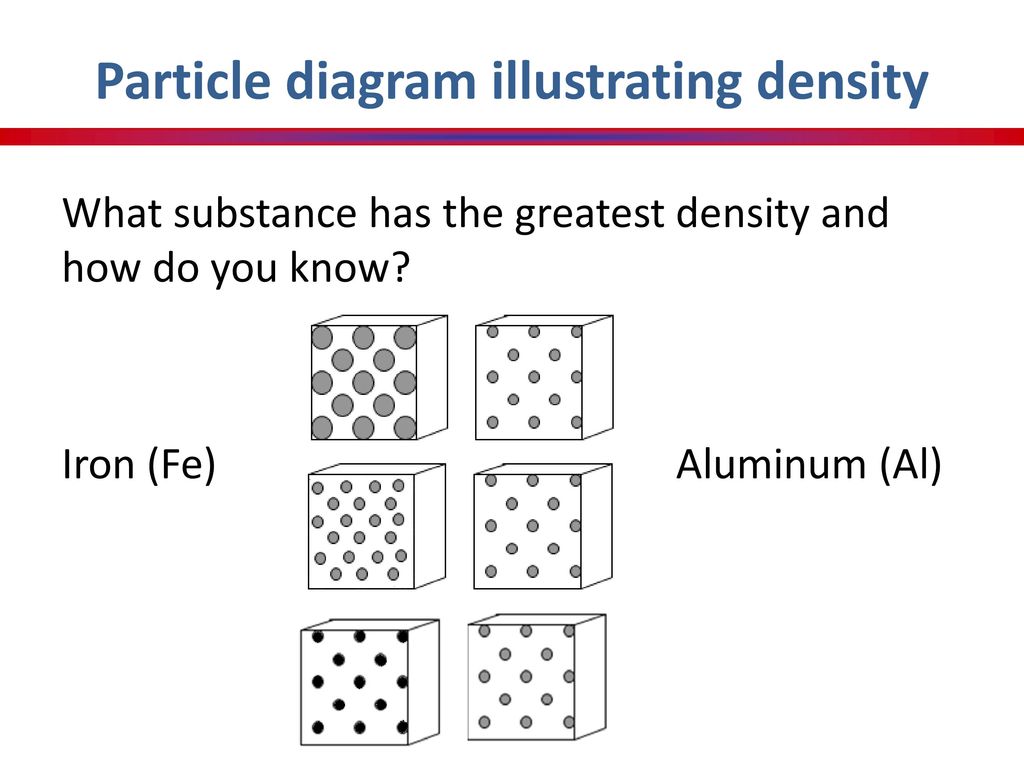
**LT 2.2: Use heating and cooling curves to model changes in potential and kinetic energy as a substance goes through phase changes.**

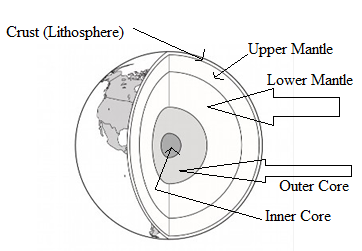
1. Name the following phase changes:
   1. Solid to liquid - melting
   2. Liquid to gas – evaporation (vaporizing)
   3. Gas to liquid - condensation
   4. Liquid to solid - freezing

For the following questions, refer to the heating curve to iron to the right:

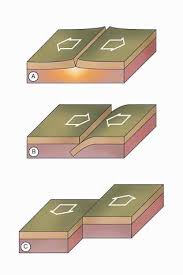
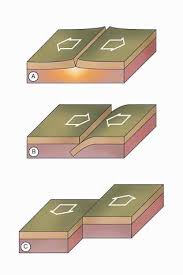
1. What segment shows solid iron? \_AB\_\_
2. What segment shows liquid iron? \_CD\_\_
3. What segment shows gaseous iron? \_\_EF\_\_
4. What segment shows melting? \_\_BC\_\_
5. What segment shows vaporization? \_\_DE\_
6. What is the melting point of iron? \_\_1500C\_
7. What is the boiling point of iron? \_\_2750C\_
8. Which sections show a change in kinetic energy? Explain. AB/CD/EF show KE increasing (as temperature is KE)
9. Which sections show a change in potential energy? Explain. BC/DE show increase in PE as the molecules are moving farther apart.

**LT 2.3: Calculate a substance’s density and use density to predict whether it will float or sink in relation to another substance.**

1. Give the formula for density. What are the units? D = m/V, usually g/mL
2. If I have a substance with a mass of 1.5 g and a volume of 2.75 mL, what is the density? 1.5/2.75 = 0.55 g/mL
3. If I have 45.9 grams of a substance with a density of 0.124 g/cm3, what is the volume? V = m/D = 45.9/0.124 = 370. cm3
4. If I have 278.0 mL of a substance with a density of 14.5 g/mL, what is the mass? m = D \* V = 278.0 x 14.5 = 4030 g
5. Which of the diagrams to the right is denser? Why? The picture to the left because there are more particles (mass) per unit volume.
6. If I pour alcohol (density 0.78 g/mL) and water (density 1.0 g/mL) into a test tube together, which one will float on top? Why? Alcohol will float on top because it’s density is less than water.

**LT 2.4: Energy from the Earth’s core drives convection currents in the mantle which results in plate tectonics in the crust.**

1. On the diagram to the right, label the following:
   1. Inner core
   2. Outer core
   3. Upper mantle
   4. Lower mantle
   5. Crust
2. Why do the layers separate out this way? Density – the more dense layers go towards the middle and the less dense towards the outside.
3. Which layer is the densest? The hottest? The core is the densest and hottest.
4. Name the three reasons the earth’s core is so hot. Skip!
5. Draw convection currents into the mantle. See below.
6. How do convection currents happen? Explain using temperature and density. As the mantle gets closer to the core, it heats up and molecules spread out, becoming less dense, so it rises. Then as it approaches the crust it cools and the molecules get closer together becoming more dense, so it sinks.
7. In the diagram below, label the type of boundary, then draw convection currents below each showing how this plate boundary would be formed.



**LT 2.5 The relationship between pressure, temperature, and volume of gases can be explained and modeled using a particulate view of matter and the gas laws.** Answers will vary – see your teacher to check.

1. Draw a model to explain what happens to pressure in a ball as the volume of the ball is increased.
2. Draw a model to explain why your tires are always a little “flatter” in the morning when it’s colder outside.
3. Draw a model to explain why as you go up in an airplane, your bag of chips expands.
4. Draw a model to explain why a warmer sample of CO2 would have a higher pressure reading.