Unit 2 Test: Matter & Energy

Name: _____ Block _____

On my honor, I have neither given nor received help on this test. _____ (sign)

$V_{sphere} = 4\pi r^3/3$ $V_{cylinder} = \pi r^2 h$ 1 gallon = 231 in^3 = 3.7854 L 2.54 cm = 1 inch 1609 m = 1 mi
1 cal = 4.184 J Specific Heat Capacity for Water: 1 cal/g·°C or 4.184 J/g°C 1 lb = 454 g 1 fl oz = 28 g

II. Short Answer – Show all work for each problem below. Use dimensional analysis for all unit conversions. Record all answers to the appropriate number of significant figures and include units.

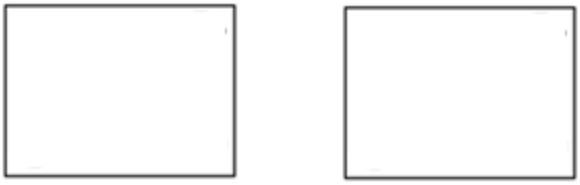
1. How many kJ of heat are needed to raise the temperature of 2.50 kg of liquid water from 22.6 °C to 89.2 °C?

2. Dry ice is stored in a freezer at -100 °C. A 1.0 kg sample is placed on the lab bench in a room that is 20 °C. After observing the phase change, the students were asked to do the following:

   a. A student was asked to identify the phase change but accidently claimed that the dry ice "evaporated" into the air. Explain why this is incorrect.

   b. Another student claimed that the dry ice "changed into water vapors" as moved away from the block of ice. Use the Law of Mass Conservation to explain why this is incorrect.

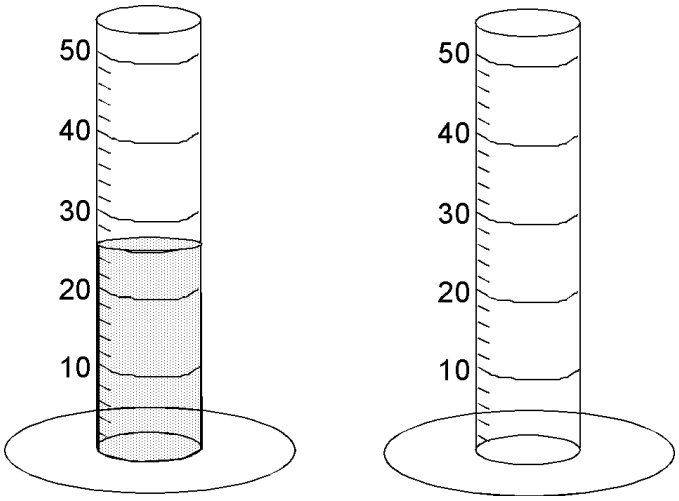
   c. Draw a particle diagram of dry ice at -100 °C and another at 20° C. Use this particle to represent the CO_2: 



-100 °C 20 °C

3. A gold cylinder has a diameter of 2.80 cm and is 7.5 cm long. The density gold is 19.3 g/mL, and the metal has a heat capacity of 0.129 J/g˚C. If the cylinder is heated with 1.20 kJ of energy, how much will it change temperature?

4. Below left is a cylinder containing water. An object with a mass of 21g and a volume of 15 cm3 is lowered into the water. Sketch the object and the new water level in the cylinder on the right.



5. Round off to the indicated number of significant figures.

a) 808.57 to 4 SF's 808.6

b) 808.57 to 3 SF's 809

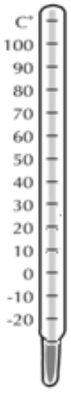
c) 808.57 to 2 SF's 810 (or 8.1×10^2)

d) 0.06372 to 3 SF's 0.0637

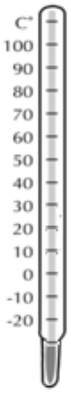
e) 0.06372 to 2 SF's 0.064

f) 9999999 to 2 SF 1.0×10^7

6. A thermometer is placed in a beaker of warm water. Explain what is going on at the molecular level as the reading on the thermometer rises from 25°C to 40°C. Use a diagram to aid your answer.



25°C



40 °C