1. (1 point) The display of a high precision electronic balance shows 0.03050 g.

(a) What should a researcher record in his or her lab notebook? 0.03050 g

(b) The number on the display has ____ significant digits.
   (A) 2      (B) 3      (C) 4      (D) 5      (E) 6

2. (2 points) Below are the fragments of two graduated cylinders: a 50-milliter one (on the left) and a 10-milliliter one (on the right). A student recorded the volumes of the liquid in the cylinders. However, he made a few mistakes. Correct his mistakes by crossing the incorrect result and writing the correct one above.

   ![Graduated Cylinders]

3. (4 points) Do the following unit conversions. Write the final result either in decimal or in scientific notation which ever seems to be most appropriate way of presenting the final result.

   \[3.80 \times 10^3 \text{ nL} = 3.80 \times 10^{-5} \text{ dL}\]

   \[7.45 \times 10^{-17} \text{ \mu m}^3 = 74.5 \text{ pm}^3\]

   \[7.0 \times 10^{22} \text{ mm}^2 = 7.0 \times 10^{40} \text{ pm}^2\]

   \[1.00 \mu \text{L} = 1.00 \text{ mm}^3\]
4. (4 points) Zero on both the Kelvin and Rankine scales is absolute zero (it is exactly zero on both scales), but the unit on Rankine scale is defined as equal to one degree Fahrenheit, rather than the one degree Celsius used by the Kelvin scale. What is the boiling point of water on Rankine scale? Show work.

Boiling point of water = 100°C = (100 + 273) K = 373 K =

= (373×1.8)°R = 671°R

5. (4 points) A piece of capillary tubing was calibrated in the following manner. A clean sample of the tubing weighed 3.247 g. A thread of mercury, drawn into the tubing, occupied a length of 23.75 mm, as observed under the microscope. The weight of the tubing with the mercury was 3.489 g. Assuming that capillary bore is a uniform cylinder, find the diameter of the bore.

mass of mercury = 3.489 g  -  3.247 g = 0.242 g

volume of mercury = 0.242 g / (13.6 g/cm$^3$) = 0.01779 cm$^3$

$V_{cylinder} = \pi R^2 H = \frac{\pi D^2 H}{4}$

$D = \sqrt{\frac{4 \times V}{\pi \times H}} = \sqrt{\frac{4 \times 0.01779 \text{ cm}^3}{\pi \times 2.375 \text{ cm}}} = 0.0977 \text{ cm} = 0.977 \text{ mm}$