CHM 4, PAL – Significant figures Student name:

Part A: Significant figures rules when multiplying and dividing measurements

We must follow different rules depending on whether we are adding/subtracting or multiplying/dividing our measurements. Let's start by looking at a calculation involving just multiplication and division.

1) Perform the following calculation and *write down everything your calculator gives you*.

$$\frac{(105.982\,\text{mm})(3.6\,\text{mm})}{16.030\,\text{mm}} =$$

- When multiplying and dividing measurements, our answer can only have as many **significant figures** as the measurement we used with the least number of significant figures.
- In the above example, go back and label the number of significant figures in each of the 3 measurements used in the calculation.
- Based on the smallest number of significant figures, go back to the answer your calculator gave you and round off your calculation to the correct number of significant figures. Show your answer below.
- Check with someone in your PAL team if you need help with rounding.

Final answer rounded to correct significant figures =

Report the answers to the following calculations using the correct significant figures. Be sure to use scientific notation as needed to avoid "ambiguous zeros". Check your answers with your PAL team.

2) (105 in)(56 in) =

3) $\dfrac{\left(1.5 \times 10^{5}\ \text{mm}^2\right)}{\left(2.056 \times 10^{-6}\ \text{mm}\right)} =$

4) (400 m)(4.8 m)(8.560 m) =

Part B: Significant figures rules when adding and subtracting measurements

5) Perform the following calculation and *write down everything your calculator gives you*.

(1.7 mm) + (915.49 mm) + (89 mm) =

- When adding and subtracting measurements, the correct number of significant figures in our answer is determined by looking at the number of **decimal places** in the measurements used in our calculation.
- Our answer can only have as many **decimal places** as the measurement we used with the least number of decimal places.
- In the above calculation, label the number of decimal places in each of the 3 measurements.
- Based on the smallest number of decimal places, go back to the answer your calculator gave you and round off your calculation to the correct number of decimal places. Show your answer below.

Final answer rounded to correct significant figures =

Report the answers to the following calculations using the correct significant figures. Be sure to use scientific notation as needed to avoid "ambiguous zeros". Check your answers with your PAL team.

6) 45.9 s + 87 s – 32.5 s =

7) 56.976 g + 0.320 g + 268.2406 g =

8) What is the formula mass (in amu) of $ZnCO_3$?

Part C: Additional problems if your PAL team has time

Here is a checklist that you might want to consider for each problem below:

- Does your answer have the right significant figures (if doing x/÷) or decimal places (if doing +/-)?
- Does your answer have correct units?
- Does your answer have "ambiguous zeros"? If so, how should you rewrite your answer?
- Is your answer rounded off correctly?

9) Although we have not seen the formate ion (CO_2H^-) yet in class, the acid that is made from it is found in nature, primarily in the venom of bee and ant stings.

   a) What is the name and formula for the acid made from the formate ion? **Note:** The name/formula follow the rules for acids that we've learned in class.

   b) What is the formula mass of the acid made from the formate ion?

10) Report the answer to this calculation with the correct significant figures: (16 mm) (201 mm) (3.1 mm)

11) A large fish tank is found to measure 72 inches long by 24 inches deep by 26 inches tall. What is the volume of the fish tank?

12) Determine the formula mass (in amu) of lead(IV) hydrogen carbonate.