Chapter 1 Test Review (PreIB) Name: _____

Experimental Design

Billy was building a volcano for science class. Inside the volcano, he mixed baking soda and vinegar. He noticed heat was created. He wanted to see if he changed the amounts of baking soda, if the temperature would change as well. In three beakers, Billy measured 15 g of baking soda. In three more beakers, Billy measured 10 g of baking soda. Next, Billy measured 5 g of baking soda into three more beakers. Finally, Billy left three beakers with no baking soda. He ensured that the beakers were all the same size and that the vinegar he planned to use started at room temperature. He was concerned that the age and brand of the baking soda could affect his results, so he bought a very large container from the store the day he started his experiment. To run his test, Billy added 50 mL of vinegar to all of the beakers. He measured the change in temperature in all of the beakers. Billy's results showed that the beakers containing 15 g of baking soda showed the largest increase in temperature.

Independent Variable: amount of baking soda

Levels of IV *(label the control)*	0g (control)	5g	10g	15g
# of Trials	3 trials	3 trials	3 trials	3 trials

Dependent Variable: change in temperature

Constants: 50 mL vinegar; same size beaker; start vinegar at room temp.; age and brand of baking soda

Measurement

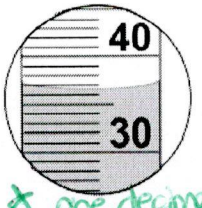
1) What is the purpose of multiple trials in an experiment? to see if your results are repeatable or consistent

2) Circle the estimated digit in each measurement: 54.39 g 31.571 mL 70.0 °C

3) Measure the following using the correct number of significant figures.

A) 2.67 cm B) 36.7 mL C) 6.39 mL

* two decimal places



* one decimal place

* two decimal places

Put in scientific notation:

4) 504,000 5.04×10^5

5) 0.003079 3.079×10^{-3}

6) 0.040 4×10^{-2}

7) 1,405,000,000 1.405×10^9

Take out of scientific notation:

8) 5.12×10^{-3} 0.00512

9) 4.20×10^4 42000

10) 8.6×10^5 860000

11) 3.0×10^{-4} 0.00030

Significant Figures

How many significant figures are in the following?

12) 70.0 g 3

13) 0.0069 mg 2

14) 5.60×10^4 km 3

15) 0.0400 mL 3

16) 6200 cm 2

17) 200 mi 1

18) 2.0×10^{-3} kL 2

19) 403.00 g 5

20) 0.24 mm 2

Solve each problem using the correct number of significant figures in your answer.

21) The reaction times for three trials of an experiment are 90.3, 90.2, and 90.5 seconds. What the average reaction time expressed using the correct number of significant figures? 90.3 sec

22) An experiment is conducted to find the mass and volume of a sample of beryllium nitride (see the chart given). What is the density of beryllium nitride expressed using the correct number of significant figures? 2.71 $\frac{g}{mL}$

Experimentally Determined Data for Be_3N_2

Mass (g)	Volume (mL)
39.30	14.5

23) *Round* the following measurement to 3 significant figures: 0.000379120 m 0.000379

24) *Round* the following measurement to 4 significant figures: 31,254,942 mi 31,250,000

25) 40.50 m x 2.250 m = 91.13

26) 83.70 g – 15.6021 g = 68.10

Unit Conversions *Solve the following using dimensional analysis.*

27) Convert 5.100 years to hours

44676 hr ← your answer might be slightly different depending on the equalities you used

28) A rock was found to weigh 3.4 kg. What would its mass be in milligrams?

3400000 mg

29) Convert 893,000 inches to meters

22682.2 m

30) Convert 7.9 L to mL

7900 mL

Accuracy, Precision, & Percent Error

31) White gold is an alloy of gold and nickel or palladium. A jeweler tested the density of a piece of white gold jewelry in an experiment using water displacement in four trials. The data collected is given below. The theoretical density of white gold is **14.0 g/mL**.

	Mass	Starting Volume	Final Volume	Density (g/mL)
Trial 1	22.85 g	54.3 mL	55.9 mL	14.28
Trial 2	28.21 g	59.2 mL	61.2 mL	14.11
Trial 3	36.99 g	52.9 mL	55.5 mL	14.23
Trial 4	41.64 g	49.8 mL	52.8 mL	13.88

A) Is the jeweler's data accurate, precise, neither, or both? *Explain your answer using complete sentences.*

The data is fairly precise (Trial 4 is the least precise). The data is accurate because the average density is close to the true value and has only 0.89% error.

B) What is the percent error of the jeweler's average? *Show your work for the percent error calculation.*

average density = 14.125 $\frac{g}{mL}$

0.89%