PERCENTAGE ERROR

Name ____________________

-centage error is a way for scientists to express how far off a laboratory value is from the commonly accepted value.

The formula is:

$$\% \text{ error} = \left| \frac{\text{Accepted Value} - \text{Experimental Value}}{\text{Accepted Value}} \right| \times 100$$

→ absolute value

Determine the percentage error in the following problems.

1. Experimental Value = 1.24 g
   Accepted Value = 1.30 g

   Answer: __________

2. Experimental Value = 1.24×10^{-2} g
   Accepted Value = 9.98×10^{-3} g

   Answer: __________

3. Experimental Value = 252 mL
   Accepted Value = 225 mL

   Answer: __________

4. Experimental Value = 22.2 L
   Accepted Value = 22.4 L

   Answer: __________

5. Experimental Value = 125.2 mg
   Accepted Value = 124.8 mg

   Answer: __________

ANSWER KEY

PERCENTAGE ERROR

Name ____________

Percentage error is a way for scientists to express how far off a laboratory value is from the commonly accepted value.

The formula is:

$$\% \text{ error} = \left| \frac{\text{Accepted Value} - \text{Experimental Value}}{\text{Accepted Value}} \right| \times 100$$

→ absolute value

Determine the percentage error in the following problems.

1. Experimental Value = 1.24 g
   Accepted Value = 1.30 g

   Answer: 4.62%

2. Experimental Value = 1.24×10^{7} g
   Accepted Value = 9.98×10^{6} g

   Answer: 24.2%

3. Experimental Value = 252 mL
   Accepted Value = 225 mL

   Answer: 12.0%

4. Experimental Value = 22.2 L
   Accepted Value = 22.4 L

   Answer: 0.893%

5. Experimental Value = 125.2 mg
   Accepted Value = 124.8 mg

   Answer: 0.3%

SIGNIFICANT FIGURES

Name ____________________

measurement can only be as accurate and precise as the instrument that produced it. scientist must be able to express the accuracy of a number, not just its numerical value. We can determine the accuracy of a number by the number of significant figures it contains.

1) All digits 1-9 inclusive are significant.
   Example: 129 has 3 significant figures.
2) Zeros between significant digits are always significant.
   Example: 5,007 has 4 significant figures.
3) Trailing zeros in a number are significant only if the number contains a decimal point.
   Example: 100.0 has 4 significant figures.
   100 has 1 significant figure.
4) Zeros in the beginning of a number whose only function is to place the decimal point are not significant.
   Example: 0.0025 has 2 significant figures.
5) Zeros following a decimal significant figure are significant.
   Example: 0.000470 has 3 significant figures.
   0.47000 has 5 significant figures.

Determine the number of significant figures in the following numbers.

1. 0.02 ______
2. 0.020 ______
3. 501 ______
4. 501.0 ______
5. 5,000 ______
6. 5,000. ______
7. 6,051.00 ______
8. 0.0005 ______
9. 0.1020 ______
10. 10,001 ______

Determine the location of the last significant place value by placing a bar over the digit. (Example: $1.70\bar{0}$)

1. 8040 ____________________
2. 0.0300 ____________________
3. 699.5 ____________________
4. 2.000×10^2 ____________________
5. 0.90100 ____________________
6. 90,100 ____________________
7. 4.7×10^{-8} ____________________
8. 10,800,000. ____________________
9. 3.01×10^{21} ____________________
10. 0.000410 ____________________

CALCULATIONS USING SIGNIFICANT FIGURES

Name ____________________

When multiplying and dividing, limit and round to the least number of significant figures in any of the factors.

> **Example 1:** 23.0 cm x 432 cm x 19 cm = 188,784 cm^3
> The answer is expressed as 190,000 cm^3 since 19 cm has only two significant figures.

When adding and subtracting, limit and round your answer to the least number of decim places in any of the numbers that make up your answer.

> **Example 2:** 123.25 mL + 46.0 mL + 86.257 mL = 255.507 mL
> The answer is expressed as 255.5 mL since 46.0 mL has only one decimal place.

Perform the following operations expressing the answer in the correct number of significa figures.

1. 1.35 m x 2.467 m = ____________
2. 1,035 m^2 ÷ 42 m = ____________
3. 12.01 mL + 35.2 mL + 6 mL = ____________
4. 55.46 g − 28.9 g = ____________
5. .021 cm x 3.2 cm x 100.1 cm = ____________
6. 0.15 cm + 1.15 cm + 2.051 cm = ____________
7. 150 L^3 ÷ 4 L = ____________
8. 505 kg − 450.25 kg = ____________
9. 1.252 mm x 0.115 mm x 0.012 mm = ____________
10. 1.278×10^3 m^2 ÷ 1.4267×10^2 m = ____________