SCIENTIFIC SKILLS

Aim 1: What is a measurement?

HW From textbook "CHEMISTRY a Contemporary Approach"

- **Read "Uncertainty in Measurement" p542-545**

A measurement has three parts

Part 1: A number read off an instrument such as a scale or ruler

Part 2: A unit for the number that is particular to each measurement

Part 3: A statement of the measurement's accuracy expressed in significant figures

The significant figures rules are:

Rule #1: All non-zero digits are significant.

Rule #2: Zeros in front of a number are not significant.

Rule #3: Zeros between non-zero digits are significant.

Rule #4: Zeros at the end of a number are significant if there is a decimal point in the number.

Ex:
0.0203 has 3 significant figures
2.50 has 3 significant figures
2500 has 2 significant figures
3.7×10^9 has 2 significant figures
45009 has 5 significant figures
100. has 3 significant figures

Significant figures in additions and subtractions

Decimal places are overwriting the significant figure rule. The answer should have the same number of decimal places as the quantity with the least decimal places.

Ex:
3.7 m + 9.40 m = 13.1 m
2.35 L + 1.2 L = 3.6 L
3.67 kg + 12.498 kg = 16.17 kg

Significant figures in multiplications and divisions

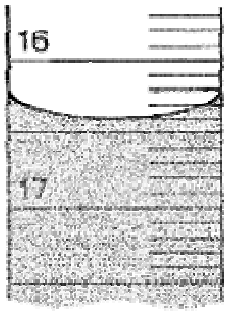
The product or quotient should have the same number of significant digits as the quantity with least significant figures.

Ex:
(0.023 m) x (3.42 m) = 0.079 m^2
56.90 s / 2.45 s = 23.2

Test your understanding

1. Which measurement contains a total of three significant figures?
   (1) 0.12 (2) 012 (3) 120 (4) 120.
2. What is the product of (2.324 cm x 1.11 cm) expressed to the correct number of significant figures?
   (1) 2.58 cm^2 (2) 2.5780 cm^2 (3) 2.5796 cm^2 (4) 2.57964 cm^2
3. Which quantity expresses the sum of the given masses to the correct number of significant figures?
   22.1 g + 375.66 g + 5400.132 g
   1. 5800 g 2. 5798 g 3. 5797.9 g 4. 5797.892 g
4. Which mass measurement contains a total of three significant figures?
   1. 22.0 g 2. 22.00 g 3. 220 g 4. 2200 g

5. The diagram shows a portion of a burette. What is the meniscus reading in milliliters?



1. 16.00 2. 16.40 3. 17.00 4. 17.60

6. Which measurement contains three significant figures?

1. 0.08 cm 2. 0.080 cm 3. 800 cm 4. 8.08 cm

7. Given: (52.6 cm)(1.214 cm). What is the product expressed to the correct number of significant figures?

1. 64 cm^2 2. 63.9 cm^2 3. 63.86 cm^2 4. 63.8564 cm^2

6/02

4. Which mass measurement contains four significant figures?

(1) 0.086 g (2) 0.431 g (3) 1003 g (4) 3870 g

8/04

50 A student calculates the density of an unknown solid. The mass is 10.04 grams, and the volume is 8.21 cubic centimeters. How many significant figures should appear in the final answer?

(1)1 (2) 2 (3) 3 (4) 4