1.2 Scientific Notation and Significant Digits

Please do these problems in your notes to review.

1. Give the SI base unit of measurement for each of the following quantities.
   a. mass  
   b. length  
   c. time  
   d. temperature
   kg    m    s    K

2. Convert the following numbers into scientific notation.
   a. 85,000,000
   b. 0.00019

   8.5 \times 10^7
   1.9 \times 10^{-4}

3. Put the following into decimal notation.
   a. 8.72 \times 10^{-8}
   b. 3 \times 10^4

   0.0000000872
   30,000

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Precision vs. Accuracy

Precision refers to the closeness of two or more measurements to each other.

Accuracy refers to the closeness of a measured value to a standard or known value.

The precision of a measurement is 1/2 the smallest division of the instrument.
**Parallax**

Parallax is the apparent shift in the position of an object when it is viewed from different angles.

**WHY SIGNIFICANT DIGITS?**

"A measurement without any knowledge of its uncertainty is meaningless!"

- Walter Lewin, MIT

**SIGNIFICANT DIGITS**

Two athletes are trying to decide who has a faster time in the 100 m dash. One runner states that his time was 11 s and the other runner’s time was 11.0 s. What is the difference between their times?

\[ 10.6 - 11.0 \]

\[ 0.4 = 11.04 \]
1.2 Scientific Notation and Significant Digits

**SIGNIFICANT DIGITS**

How many significant digits are there in each number?

1) 0.0860 m
2) 172,000 g
3) $1.7200 \times 10^5$ g

**SIGNIFICANT DIGITS**

All non-zero numbers are significant?

**SIGNIFICANT DIGITS**

Are all zeros significant?

- Leading? No
- Tweeners? Yes
- Trailing? Sometimes
  - After Decimal $\Rightarrow$ Yes
  - Before $\Rightarrow$ No

**SIGNIFICANT DIGITS**

How many significant digits?

- a.) 0.0860 m
- b.) 172,000 g
- c.) $1.7200 \times 10^5$ g

3.2539456

**SIGNIFICANT DIGITS**

Adding / Subtracting

The number of decimal places after addition or subtraction is equal to the smallest number of decimal places in any of the individual terms.

Solve the following problem using significant digits.

$\hat{\circ} \ 1 \checkmark$

$3.86 \text{ m} + 2.4 \text{ m} = 6.26 \text{ m}$
SIGNIFICANT DIGITS

Multiplying / Dividing

The number of significant figures after multiplication or division is equal to the number of significant figures in the least accurately known quantity.

Solve the following problem using significant digits.

\[ \frac{409.2 \text{ km}}{11.4 \text{ s}} = \frac{35.9}{\ \text{s}} \]

\[ \text{35.9 } \frac{\text{km}}{\text{s}} \]

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HOMEWORK

Unit 1 Problems (6-7)