

**Mathematics & Physics** (p. 3 – 10)**I. What Is Physics?**

## 1. Define the term physics.

Physics – branch of science that involves the study of the physical world  
(energy, matter, motion, electricity, magnetism)

## 2. List four careers that people who study physics pursue.

1. Engineers 2. Computer Science 3. Teachers 4. Construction

Plans  
after  
H.S.?

**II. Mathematics & Physics**

## 1. Why are mathematical models needed for physical science experiments &amp; observations?

- To support conclusions. (Neptune discovery)

## 2. What is an easy way to double-check mathematical solutions?

- Does it make sense (Based on estimation + experience.)

p.5

**III. SI Units**

## 1. Define the term SI units.

SI Units – standards that are universally accepted + understood by scientists throughout the world

## 2. Match the SI base unit with the correct quantity measured.

- |                                    |                  |
|------------------------------------|------------------|
| 1. <u>E.</u> - Temperature         | A. Kilogram (kg) |
| 2. <u>A.</u> - Mass                | B. Mole (mol)    |
| 3. <u>G.</u> - Luminous Intensity  | C. Ampere (A)    |
| 4. <u>D.</u> - Length              | D. Meter (m)     |
| 5. <u>B.</u> - Amount Of Substance | E. Kelvin (K)    |
| 6. <u>F.</u> - Time                | F. Second (s)    |
| 7. <u>C.</u> - Electric Current    | G. Candela (cd)  |

Derived Units

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

$$\text{Newton} = \text{kg} \cdot \text{m/s}^2$$

$$\text{Weight} = mg$$

$$\text{Momentum} = \text{kg} \cdot \text{m/s}$$

3. Conversions between SI units are based on the appropriate power of 10. (p.6)**IV. Dimensional Analysis**

## 1. Define the term dimensional analysis.

Dimensional Analysis – method of treating units as algebraic quantities (which can be cancelled)

## 2. One mile is equal to 1.61 kilometers. What is the speed of a car traveling 55 miles / hour in the units of kilometers / hour?

$$\frac{1 \text{ mile}}{1.61 \text{ km}} = \frac{55 \text{ miles}}{(x) \text{ km}}$$

$$1x = (55)(1.61)$$

$$x = 88.5 \text{ km/hr.}$$

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**V. Significant Digits**

1. Define the term significant digits.

(Reduces experimental uncertainty)

Significant Digits - valid digits in a measurement  
 (last digit given in a measurement is uncertain)

2. List the four rules for determining significant digits. (See page 834.)

1. Nonzero digits are significant.
2. Final zeros after a decimal point are significant.
3. Zeros between two significant digits are significant.
4. Zeros used only as placeholders are not significant.

Examples:  
p. 834

3. Identify the number of significant digits in each measurement.

	<u>Significant Digits</u>		<u>Significant Digits</u>
1. 1,405 m	<u>4</u>	4. 12.007 kg	<u>5</u>
2. 2.50 km	<u>3</u>	5. $5.8 \times 10^6$ kg	<u>2</u>
3. 0.0034 m	<u>2</u>	6. $3.03 \times 10^5$ mL	<u>3</u>

4. The result of an arithmetic operation can never be more precise than the least-precise measurement.

Circle One: True False

5. How are significant digits determined when adding or subtracting values?

1. Perform operation 2. Round off result to least-precise value.

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6. How are significant digits determined when multiplying or dividing values?

1. Perform calculation 2. Round off result to least-precise value.

7. Solve the following equations using the correct number of significant digits.

1.  $5.012 \text{ km} + 3.4 \text{ km} + 2.33 \text{ km} = \underline{10.7 \text{ km}}$
2.  $45 \text{ g} - 8.3 \text{ g} = \underline{37 \text{ g}}$
3.  $3.40 \text{ cm} \times 7.125 \text{ cm} = \underline{24.2 \text{ cm}}$
4.  $54 \text{ m} / 6.5 \text{ s} = \underline{8.3 \text{ m/sec.}}$

**VI. Scientific Methods**

p. 8-9

1. Match the following terms with the correct definitions.

- Scientific Method
1. State Problem
  2. Gather Information
  3. Form Hypothesis
  4. Test Hypothesis
  5. Analyze Results
  6. Draw Conclusions

1. D. - Scientific Method    A. Educated guess about how variables are related.
2. A. - Hypothesis    B. Explanation based on observations supporting results.
3. E. - Model    C. Rule of nature that describes a pattern in nature.  
(Big Bang Theory, Theory of Evolution)
4. C. - Scientific Law    D. Method of observing, experimenting, and analyzing.  
(Law of Gravitation, Newtonian Laws)
5. B. - Scientific Theory    E. Concept created as an idea, equation, structure, or system  
(Solar System, Geologic Time Scale, Atom, DNA)