Acceleration (pages 320–325)

What Is Acceleration? (pages 320–321)

Key Concept: In science, acceleration refers to increasing speed, decreasing speed, or changing direction.

- Remember that velocity is speed and direction. **Acceleration** is the rate at which velocity changes.
- Objects accelerate when they speed up. A car that goes faster is accelerating.
- Objects accelerate when they slow down. A rolling ball that slows down is accelerating.
- Objects accelerate when they change direction. A bus that turns a corner is accelerating.

Answer the following questions. Use your textbook and the ideas above.

1. The rate at which velocity changes is ____________________.

2. Circle the letter of each example of acceleration.
   - a. A ball speeds up as it rolls down a hill.
   - b. A car slows down as it comes to a stop sign.
   - c. A biker goes around a curved track without changing speed.

3. Is the following sentence true or false? A bus stopped at a red light is accelerating. _________
Calculating Acceleration  (pages 322–323)

**Key Concept:** To determine the acceleration of an object moving in a straight line, you must calculate the change in speed per unit of time.

- You can find the acceleration of an object moving in a straight line.
- To find acceleration, you need to know three things:
  1. You need to know the starting speed.
  2. You need to know the ending speed.
  3. You need to know how long it took for the object to change speeds.
- The formula for acceleration is:

\[
\text{Acceleration} = \frac{\text{Final speed} - \text{Initial speed}}{\text{Time}}
\]

- The unit for acceleration is meters per second per second, or m/s\(^2\).

Answer the following questions. Use your textbook and the ideas above.

4. Read the words in the box. Use the words to fill in the blanks in the formula for acceleration.

   \[
   \text{Acceleration} = \frac{\text{Final speed} - \text{Initial speed}}{\text{Time}}
   \]

   - a. \underline{Final speed} – Initial speed
   - b. Distance

5. Is the following sentence true or false? Acceleration is measured in meters per second per second.

   [ ] True
   [ ] False
6. A student used this formula to find the acceleration of an object:

\[
\frac{8 \text{ m/s} - 2 \text{ m/s}}{3 \text{ s}} = \frac{6 \text{ m/s}}{3 \text{ s}} = 2 \text{ m/s}^2
\]

a. What is the final speed of the object?

b. What is the initial speed of the object?

c. How long did it take the object to change speeds?

Graphing Acceleration (pages 324–325)

Key Concept: You can use both a speed-versus-time graph and a distance-versus-time graph to analyze the motion of an accelerating object.

- Acceleration can be shown on a line graph.

- A speed-versus-time graph shows time on the bottom, or \(x\)-axis. It shows speed on the side, or \(y\)-axis. A straight, slanted line on this kind of graph shows acceleration.

- A distance-versus-time graph shows time on the \(x\)-axis. It shows distance on the \(y\)-axis. A curved line on this kind of graph shows acceleration.

Answer the following questions. Use your textbook and the ideas above.

7. Circle the letter of the kind of graph that can be used to show acceleration.

a. circle graph

b. bar graph

c. line graph
8. Fill in blanks in the table about acceleration graphs.

<table>
<thead>
<tr>
<th>Type of Graph</th>
<th>Acceleration Is Shown as</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>straight, slanted line</td>
</tr>
<tr>
<td>b.</td>
<td>curved line</td>
</tr>
</tbody>
</table>

9. Use the graphs to answer the questions.

a. Which graph shows an object that is moving at a steady speed? ________________

b. Which graph shows an object with a changing speed? ________________

c. Which graph shows acceleration? ________________