Study Guide

Interactive Textbook

- Complete student edition
- Section and chapter self-assessment
- Assessment reports for teachers

Help Students Read

Building Vocabulary

Paraphrasing Have students rewrite, in their own words, the paragraphs under the headings Average Speed and Instantaneous Speed. Students should rewrite the paragraphs to be more concise while still covering all of the main points. Students should be sure to define the key terms found in the sections in their own words.

Word/Part Analysis Explain that the word part *veloc-* is a Latin root meaning swift or quick. Have students relate this to the meaning of the key term *velocity*. Ask: **What can you infer about the type of dinosaur named the velociraptor?** *(It could move quickly.)*

Connecting Concepts

Help students develop ways to show how the information in this chapter is related. The motion of an object can be described by measuring its speed, velocity, and acceleration and is measured using SI units; some objects move quickly, others, like Earth's plates, move very slowly. Have students brainstorm to identify the key concepts, key terms, details, and examples, then write each one on a self-sticking note and attach it at random on chart paper or on the board.

Tell students that this concept map will be organized in hierarchical order and to begin at the top with the key concepts. Ask students these questions to guide them to categorize the information on the self-sticking notes: **How is motion described and measured? How can the motion of Earth's plates be described? What is acceleration, and how is it calculated?**

Chapter Study Guide

1 Describing and Measuring Motion

Key Concepts

- An object is in motion if it changes position relative to a reference point.
- If you know the distance an object travels in a certain amount of time, you can calculate the speed of the object.
- $\text{Speed} = \frac{\text{Distance}}{\text{Time}}$
- When you know both the speed and direction of an object's motion, you know the velocity of the object.
- You can show the motion of an object on a line graph in which you plot distance versus time.
- $\text{Slope} = \frac{\text{Rise}}{\text{Run}}$

Key Terms

motion
reference point
International System of Units
meter
speed
average speed
instantaneous speed
velocity
slope

2 Slow Motion on Planet Earth

Key Concepts

- According to the theory of plate tectonics, Earth's landmasses have changed position over time because they are part of plates that are slowly moving.
- Some plates move at a rate of several centimeters each year. Others move only a few millimeters per year.

Key Terms

plate
theory of plate tectonics

3 Acceleration

Key Concepts

- In science, acceleration refers to increasing speed, decreasing speed, or changing direction.
- To determine the acceleration of an object moving in a straight line, you must calculate the change in speed per unit of time.
- $\text{Acceleration} = \frac{\text{Final speed} - \text{Initial speed}}{\text{Time}}$
- You can use both a speed-versus-time graph and a distance-versus-time graph to analyze the motion of an accelerating object.

Key Term

acceleration

Prompt students by using connecting words or phrases, such as "is described by", and "is measured using" to indicate the basis for the organization of the map. The phrases should form a sentence between or among a set of concepts.

Answer

Accept logical presentations by students.

All in One Teaching Resources

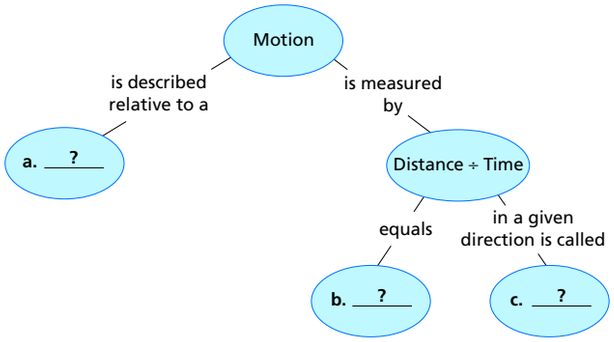
- Key Terms Review: *Motion*
- Connecting Concepts: *Motion*

Review and Assessment

Go Online PHSchool.com
For: Self-Assessment
Visit: PHSchool.com
Web Code: cga-3010

Organizing Information

Concept Mapping Copy the concept map about motion onto a separate sheet of paper. Then complete it and add a title. (For more information on Concept Mapping, see the Skills Handbook.)



Reviewing Key Terms

Choose the letter of the best answer.

1. A change in position with respect to a reference point is
   a. acceleration.
   b. velocity.
   c. direction.
   d. motion.
2. You do not know an object's velocity until you know its
   a. speed.
   b. reference point.
   c. speed and direction.
   d. acceleration.
3. If you know a car travels 30 km in 20 minutes, you can find its
   a. acceleration.
   b. average speed.
   c. direction.
   d. instantaneous speed.
4. The parts of Earth's outer layer that move are called
   a. reference points.
   b. slopes.
   c. plates.
   d. boundaries.
5. The rate at which velocity changes is called
   a. acceleration. **b.** constant speed.
   c. average speed. **d.** velocity.

If the statement is true, write *true*. If it is false, change the underlined word or words to make the statement true.

6. The distance an object travels per unit of time is called acceleration.
7. The basic SI unit of length is the meter.
8. The theory of plate tectonics explains how Earth's landmasses have changed position over time.
9. The slope of a speed-versus-time graph represents acceleration.
10. Both speed and acceleration include the direction of an object's motion.

Writing in Science

News Report Two trucks have competed in a race. Write an article describing the race and who won. Explain the role the average speed of the trucks played. Tell how average speed can be calculated.

Discovery Channel SCHOOL
Motion
Video Preview
Video Field Trip
Video Assessment

Go Online PHSchool.com
For: Self-Assessment
Visit: PHSchool.com
Web Code: cga-3010
Students can take a practice test online that is automatically scored.

All in One Teaching Resources

- Transparency M10
- Chapter Test
- Performance Assessment Teacher Notes
- Performance Assessment Student Worksheet
- Performance Assessment Scoring Rubric

ExamView® Computer Test Bank CD-ROM

Review and Assessment

Organizing Information

a. Reference point
b. Speed
c. Velocity

Reviewing Key Terms

1. d **2.** c **3.** b **4.** c **5.** a
6. speed
7. true
8. true
9. true
10. velocity

Discovery Channel SCHOOL Video Assessment

Motion

Show the Video Assessment to review chapter content and as a prompt for the writing assignment. Discussion questions: **How do you calculate acceleration?** *(Subtract the starting speed from the maximum speed and divide by the amount of time it took to reach that speed.)* **What unit of measurement do you use for acceleration?** *(Meters per second squared)*

Writing in Science

Writing Mode Description

Scoring Rubric

4 Exceeds criteria; is well written and includes a thorough discussion of the calculation of average speed
3 Meets criteria
2 The news report is brief, lacks detail, and/or includes some incorrect information
1 The news report is poorly written and/or includes numerous errors

Checking Concepts

11. The passenger would appear to be moving backwards from a reference point on the train. From the ground, she would appear to be moving forward, because the train moves forward faster than she is walking backwards.

12. The duck, at 12 m/s, has a greater speed than the heron, which travels at 10 m/s.

13. The greater the slope, the greater the speed.

14. Sample answer: You could make a mark of where the object is today (a reference point), then come back after a certain period of time and make a mark to show where the object is at that time. If the object is still at the same reference point, the object is not moving.

15. The insect is accelerating because the direction of its motion is always changing.

Thinking Critically

16. The car is moving for the first 4 seconds, it stops for the next 4 seconds, and moves again for the last 4 seconds. It is moving fastest from 0–4 seconds, when it moves at 10 cm/s. It moves at 5 cm/s during the last 4 seconds, and not at all from seconds 4–8.

17. Because the first driver drove the same distance in less time, the first driver had the greater average speed.

18. The family traveled 160 km in 3 hours, so their average speed is about 53 km/h.

Math Practice

19. 119 cm = 1.19 m

20. 22.4 km = 22,400 m

21. (35 m/s – 0 m/s) ÷ 0.5 s = 70 m/s^2

Applying Skills

22. Starting line to line B = 2.0 cm; line B to the finish line = 5.0 cm

23. 2 cm/s

24. 1.0 cm/s^2

Review and Assessment

Checking Concepts

11. A passenger walks toward the rear of a moving train. Describe her motion as seen from a reference point on the train. Then describe it from a reference point on the ground.

12. Which has a greater speed, a heron that travels 600 m in 60 seconds or a duck that travels 60 m in 5 seconds? Explain.

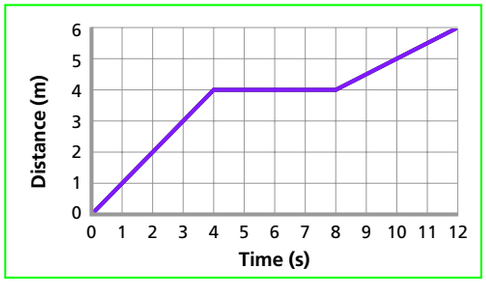
13. You have a motion graph for an object that shows distance and time. How does the slope of the graph relate to the object's speed?

14. How can you tell if an object is moving when its motion is too slow to see?

15. An insect lands on a compact disc that is put into a player. If the insect spins with the disc, is the insect accelerating? Why or why not?

Thinking Critically

16. **Interpreting Graphs** The graph below shows the motion of a remote-control car. During which segment is the car moving the fastest? The slowest? How do you know?



17. **Problem Solving** Two drivers make a 100-km trip. Driver 1 completes the trip in 2 hours. Driver 2 takes 3 hours but stops for an hour halfway. Which driver had a greater average speed? Explain.

18. **Applying Concepts** A family takes a car trip. They travel for an hour at 80 km/h and then for 2 hours at 40 km/h. Find their average speed during the trip.

Math Practice

19. **Converting Units** Convert 119 cm to meters.

20. **Converting Units** Convert 22.4 km to meters.

21. **Calculating Acceleration** During a slap shot, a hockey puck takes 0.5 seconds to reach the goal. It started from rest and reached a final speed of 35 m/s. What is the puck's average acceleration?

Applying Skills

Use the illustration of the motion of a ladybug to answer Questions 22–24.

22. **Measuring** Measure the distance from the starting line to line B, and from line B to the finish line. Measure to the nearest tenth of a centimeter.

23. **Calculating** Starting at rest, the ladybug accelerated to line B and then moved at a constant speed until it reached the finish line. If the ladybug took 2.5 seconds to move from line B to the finish line, calculate its constant speed during that time.

24. **Interpreting Data** The speed you calculated in Question 21 is also the speed the ladybug had at the end of its acceleration at line B. If it took 2 seconds for the ladybug to accelerate from the start line to line B, what is its average acceleration during that time?

Lab zone Chapter Project

Perfomance Assessment Organize your display cards so that they are easy to follow. Remember to put a title on each card stating the speed that you measured. Place the cards in order from the slowest speed to the fastest. Then display them to your class. Compare your results with those of other students.

Lab zone Chapter Project L3

Performance Assessment Have students review each other's display cards. Prepare a table on which students can record and compare their different values.

Have individual students present their methods for calculating speed. Students should indicate how many trials they ran and whether or not they used average data. Students probably got slightly different answers when they measured the same speed more than once. Remind students that accurately measuring motion involves accurately measuring both time and distance.

Standardized Test Prep

Test-Taking Tip

Converting Units

A test question may ask you to change one unit of measurement to another. You do this by using a conversion factor, a fraction that represents the relationship between the units. For example, to convert meters to centimeters, you need to remember that a meter equals 100 centimeters: 1 m = 100 cm. To figure out the answer, you would multiply by the conversion factor $\frac{100\text{ cm}}{1\text{ m}}$.

Sample Question

A garden measures 3.12 meters wide. How many centimeters wide is the garden?

A 0.312 cm
B 31.2 cm
C 312 cm
D 3,120 cm

Answer

The correct answer is **C.** When you multiply 3.12 m by 100 cm, you get 312 cm.

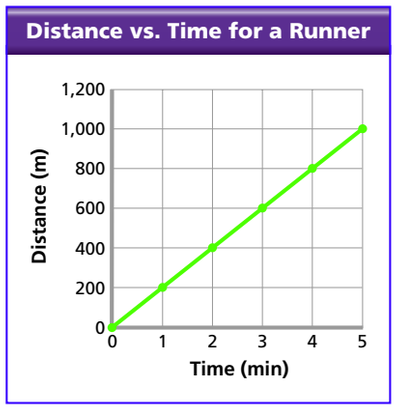
Choose the letter of the best answer.

1. Members of the Fairview Track Club are running a 1.5 km race. What is the distance of the race in meters?
A 0.15 m
B 15 m
C 150 m
D 1,500 m

2. Your father is driving to the beach. He drives at one speed for two hours. He drives at a different speed for another two hours and a third speed for the final hour. How would you find his average speed for all five hours?
F Divide the total driving time by the total distance.
G Multiply the total driving time by the total distance.
H Divide the total distance by the total driving time.
J Subtract the total driving time from the total distance.

3. Two objects traveling at the same speed have different velocities if they
A start at different times.
B travel different distances.
C have different masses.
D move in different directions.

4. The graph below shows the distance versus time for a runner moving at a constant 200 m/min. What could the runner do to make the slope of the line rise?



F stop running
G decrease speed
H maintain the same speed
J increase speed

5. An object used as a reference point to determine motion should be
A accelerating.
B stationary.
C decelerating.
D changing direction.

Constructed Response

6. Explain how speed, velocity, and acceleration are related.

Standardized Test Prep

1. D **2.** H **3.** D **4.** J **5.** B

6. Speed, velocity, and acceleration all are measures of motion. Speed measures how far an object moves in a given amount of time. Velocity not only measures an object's speed, but also the direction in which the object moves. Acceleration measures the rate at which velocity changes by considering an increase in speed, a decrease in speed, or a change in direction.