Chapter 3

Review

Summary

3-1: Motion and Speed

1. Motion is a change in position of a body. Speed is the rate at which a body changes position.
2. Average speed is the ratio of distance traveled to time and describes motion, even if speed varies.

3-2: Velocity and Acceleration

1. Velocity describes the speed and direction of a moving body.
2. Acceleration is the rate of change in velocity.

3-3: Science and Society: A Crash Course in Safety

1. Seat belts reduce injuries by limiting impacts and spreading out the force over more of the body.
2. Some people believe that seat belts should be required by law; others don't.

3-4: Connecting Motion with Forces

1. A force is a push or a pull one body exerts on another. Balanced forces acting on a body do not change the motion of the body. Unbalanced forces result in a net force, which always changes the motion of a body.
2. Inertia explains why a massive, fast-moving bowling ball is more difficult to stop than a table-tennis ball at the same speed.
3. Newton's first law says an object's motion will not change unless a net force acts on it.

3-5: Gravity—A Familiar Force

1. Gravity causes planets to orbit the sun and people to remain on Earth's surface.
2. The gravitational force between two objects depends on their masses and the distance between them.
3. Mass is the amount of matter in an object. Weight is the force of gravity on that mass.

Key Science Words

a. acceleration
b. average speed
c. balanced forces
d. constant speed
e. force
f. friction
g. gravity
h. inertia
i. instantaneous speed
j. net force
k. speed
l. velocity
m. weight

Reviewing Vocabulary

Match each phrase with the correct term from the list of Key Science Words.

1. rate of change in position
2. speed that does not change
3. rate of change in velocity
4. a push or pull exerted on an object
5. type of force that changes the motion of an object
6. tendency of an object to resist change in motion
7. a force that opposes motion between surfaces
8. force exerted by every object in the universe on every other object
9. measure of the force of gravity on an object
10. rate of motion at a given point in time

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Checking Concepts

Choose the word or phrase that completes the sentence or answers the question.

1. The best way to describe the rate of motion of an object that changes speed several times is to calculate the object's _____.
   a. average speed c. instantaneous speed
   b. constant speed d. variable speed
2. Which of the following is a force?
   a. inertia c. acceleration
   b. friction d. velocity
3. The unit for _____ is m/s^2.
   a. weight c. inertia
   b. acceleration d. velocity
4. Which of the following is not used in calculating acceleration?
   a. initial velocity c. time interval
   b. average speed d. final velocity
5. A body accelerates if it _____.
   a. speeds up c. changes direction
   b. slows down d. all of these
6. The gravitational force between two objects depends on their _____.
   a. masses c. shapes
   b. velocities d. volumes
7. _____ acts only between surfaces that are in contact.
   a. Inertia c. Gravity
   b. Friction d. A net force
8. An object's weight is directly related to its _____.
   a. volume c. mass
   b. velocity d. shape
9. An object of large mass has _____ than an object of small mass.
   a. less inertia c. less weight
   b. more inertia d. greater acceleration
10. A constant velocity means acceleration is _____.
    a. positive c. increasing
    b. negative d. zero

Understanding Concepts

Answer the following questions in your Science Journal using complete sentences.

11. Can you tell an object has moved if you do not see it move? What information would you need to calculate the object's speed? Its velocity?
12. Explain how it is possible for an automobile traveling at constant speed to be accelerating.
13. Friction and gravity are both forces. Describe at least two differences between them.
14. Compare and contrast mass and weight.
15. Describe some common effects of inertia.

Thinking Critically

16. Explain why a fast-moving freight train cannot be stopped quickly.
17. A cyclist must travel 800 km. How many days will the trip take if the cyclist travels 8 h per day at an average speed of 16 km/h?
18. A satellite's original velocity is 10 000 m/s. After one minute, it is 5000 m/s. What is the satellite's acceleration?
19. A cyclist leaves home and rides due east for a distance of 45 km. She returns home on the same bike path. If the entire trip takes 4 h, what is her average speed?
20. The return trip of the cyclist in question 19 took 30 min longer than her trip east, although her total time was still 4 h. What was her velocity in each direction?

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Developing Skills

If you need help, refer to the **Skill Handbook.**

21. **Measuring in SI:** Which of the following represents the greatest speed: 20 m/s, 200 cm/s, or 0.2 km/s? HINT: Express all three in meters/second and then compare them.
22. **Observing and Inferring:** A car sits motionless on a hill. What forces are acting on the car? Are the forces balanced or unbalanced? Explain how you inferred your answers.
23. **Making and Using Tables:** The four cars shown in the table were traveling at the same speed, and the brakes were applied in all four cars at the same instant.

Car	Mass	Stopping Distance
A	1000 kg	80 m
B	1250 kg	100 m
C	1500 kg	120 m
D	2000 kg	160 m

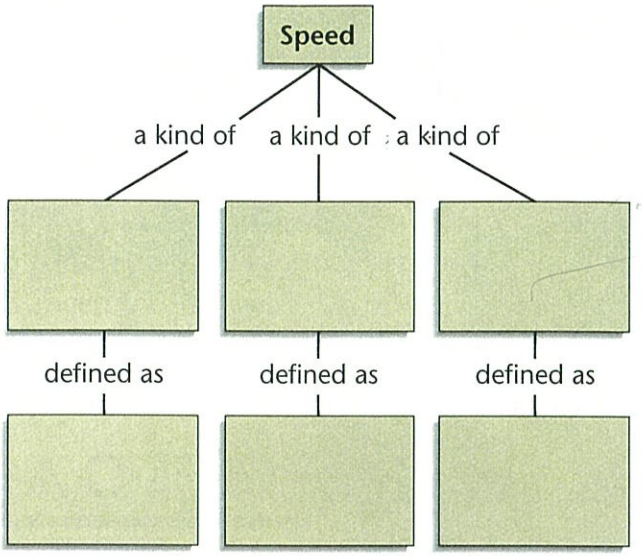
What is the relationship between the mass of a car and its stopping distance? How do you account for this relationship?

24. **Making and Using Graphs:** The following data were obtained for two runners.

	Sally	Alonzo
Time	Distance	Distance
1 s	2 m	1 m
2 s	4 m	2 m
3 s	6 m	2 m
4 s	8 m	4 m

Make a distance-time graph that shows the motion of both runners. What is the average speed of each runner? What is the instantaneous speed of each runner 1 s after he or she starts? Which runner stops briefly? During what time interval do Sally and Alonzo run at the same speed?

25. **Concept Mapping:** Make a network tree concept map that defines the three kinds of speed described in this chapter.



Performance Assessment

1. **Making Observations and Inferences:** In Activity 3-1 on page 70, you designed an experiment to find out how slowly you could make a glider fly. After observing the glider flights, you can make inferences about how glider design relates to glider speed. Redesign your glider to see how fast you can make it fly. What changes would you make? Try it and calculate your glider's speed.
2. **Data Table:** Use the procedure in Activity 3-2 on page 87 to test the shear strength of other materials such as aluminum foil, waxed paper, or human hair. Report your findings in a table.
3. **Formulating a Hypothesis:** Oils and waxes are lubricants, materials that are used to reduce the friction between surfaces. Form a hypothesis about which lubricant would work best on (a) a squeaky hinge and (b) a sticking dresser drawer.