

Chapter 1 - Patterns of Motion and Equilibrium

Reading Check Questions:

1. What did Aristotle believe about the relative speeds of fall for heavy and light objects?
4. Which dominated Galileo's way of extending knowledge: philosophical discussion or experiment?
5. What name is given to the property by which objects resist changes in motion?
6. Which depends on location, weight or mass?
7. Where is your weight greater, on earth or on the moon? How about your mass?
8. What are the units of measurement for weight and for mass?
9. A 1 kilogram weighs nearly 10 N on earth. Would it weigh more or less on the moon?
11. What two quantities are necessary for a vector quantity?
12. Name the support force that occurs in a rope when both ends are pulled in the opposite directions?
15. Why is the support force on an object often called the normal force?
22. Distinguish between speed and velocity.
24. Does the speedometer on a vehicle show average speed or instantaneous speed?
25. How can you be at rest and moving at 100,000 km/h at the same time?

Think and Solve:

40. Find the net force produced by a 30 N force and a 20 N force in each of the following cases:
 - a) Both forces act in the same direction.
 - b) The two act in the opposite directions.
45. A horizontal force of 120 N is required to push a piece of furniture across a floor at a constant velocity.
 - a) What is the net force acting on the furniture?
 - b) How much friction acts on the furniture when it is at rest on a horizontal surface?
 - c) How much friction (f) acts on the bookcase when it is at rest on a horizontal surface without being pushed?
48. a) Show that the average speed of a tennis ball is 48 m/s when it travels the full length of the court, 24 m, in 0.5 s.
 - b) How would air resistance affect the travel time?
49. a) Show that the average speed of Leslie is 10 km/h when she runs to the store 5 km away in 30 min.
 - b) How fast is this in m/s?
50. Show that the acceleration is 7.5 m/s^2 for a ball that starts from rest and rolls down a ramp and gains a speed of 30 m/s in 4 s.
53. A race car races on a circular track of radius (r).
 - a) Write an equation for the car's average speed when it travels a complete lap in time (t).
 - b) The radius of the track is 100 m and the time to complete a lap is 14 s. Show that the average speed around the track is 45 m/s.

Exercises:

63. A bowling ball rolling along a lane gradually slows as it rolls. How would Aristotle likely interpret this observation? How would Galileo interpret it?
67. What physical quantity is a measure of how much inertia an object has?
81. An empty jug of weight (W) rests on a table. What is the support force exerted on the jug by the table? What is the support force when water of weight (W) is poured into the jug?
87. Suppose that a freely falling object were somehow equipped with a speedometer. By how much would its speed readings increase with each second of fall?
90. What is the acceleration of a car that moves at a steady velocity of 100 km/h for 100 s? Why is this question an exercise in careful reading as well as in physics?

Chapter 2 - Newton's Laws of Motion

Reading Check Questions:

5. What kind of path would the planets follow if suddenly their attraction to the sun no longer existed?
11. Why doesn't a heavy object accelerate more than a light object when both are falling freely?
22. Consider hitting a baseball with a bat. If we call the force on the bat against the ball the action force, identify the reaction force.
28. How does a helicopter get its lifting force?

Think and Solve:

38. A Honda Civic Hybrid weighs about 2,900 lb. Calculate the weight of the car in Newtons, and its mass in kilograms. [Note: 1 N = 2.2 lb; 1 kg on earth's surface has a weight of about 10 N.]

Chapter 3 - Momentum and Energy

Reading Check Questions:

1. Which has a greater momentum, an automobile at rest or a moving skateboard?
2. When a ball is hit with a given force, why does contact over a long time impart more speed to the ball?
5. In karate, why is a force that is applied for a short time more effective?
6. In boxing, why is advantageous to roll with the punch?
16. A car is raised a certain distance on a service-station lift and therefore has potential energy relative to the floor. If it were raised twice as high, how much potential energy would it have?
19. Compared with some original speed, how much work must the brakes of a car supply to stop a car that is moving four times as fast? How does the stopping distance compare?

Exercises:

64. Show that 480 W of power is expended by a weightlifter when lifting a 60 kg barbell a vertical distance of 1.2 m in a time interval of 1.5 s?
75. In terms of impulse and momentum, why do airbags in cars reduce the chances of injury in accidents?
4. A car crashes into a wall at 25 m/s and is brought to rest in 0.1 s. Show that the average force exerted on a 75 kg test dummy by the seat belt is more than 18,000 N.

Chapter 4 - Gravity, Projectiles, and Satellites

Reading Check Questions:

5. What is the magnitude of gravitational force between the earth and a 1 kg body at its surface?
7. How does the force of gravity between two bodies change when the distance between them is tripled?
10. Explain why occupants of the International Space Station have no weight, yet are firmly in the grip of earth's gravity.
28. At what part of an elliptical orbit does a satellite have the highest speed? The lowest speed?
29. What happens to a satellite close to earth's surface if it is given a speed exceeding 11.2 km/s?

Chapter 5 - Fluid Mechanics

Review Questions:

1. Give two examples of a fluid.
2. What happens to the volume of a loaf of bread that is squeezed? What happens to the mass? What happens to the density?
9. Why does a buoyant force act upward on an object submerged in water?
21. How does the downward pressure of the 76 cm column of mercury in a barometer compare with the air pressure at the bottom of the atmosphere?