Additional Problems

Chapter 1 The Science of Physics

1. Mt. Waialeale in Hawaii gets 1.168×10^3 cm of rainfall per year. Express this quantity in meters.
2. An acre is equal to about 4.0469×10^3 m^2. Express this area in square kilometers.
3. A group drinks about 6.4×10^4 cm^3 of water per person per year. Express this in cubic meters.
4. The largest stone jar on the Plain of Jars in Laos has a mass of 6.0×10^3 kg. Express this mass in milligrams.
5. Half of a sample of the radioactive isotope beryllium-8 decays in 6.7×10^{-17} s. Express this time in picoseconds.

Chapter 2 Motion in One Dimension

6. The fastest airplane is the Lockheed SR-71. If an SR-71 flies 15.0 km west in 15.3 s, what is its average velocity in kilometers per hour?
7. Except for a 22.0 min rest stop, Emily drives with a constant velocity of 89.5 km/h, north. How long does the trip take if Emily's average velocity is 77.8 km/h, north?
8. A spaceship accelerates uniformly for 1220 km. How much time is required for the spaceship to increase its speed from 11.1 km/s to 11.7 km/s?
9. A polar bear initially running at 4.0 m/s accelerates uniformly for 18 s. If the bear travels 135 m in this time, what is its maximum speed?
10. A walrus accelerates from 7.0 km/h to 34.5 km/h over a distance of 95 m. What is the magnitude of the walrus's acceleration?
11. A snail can move about 4.0 m in 5.0 min. What is the average speed of the snail?
12. A crate is accelerated at 0.035 m/s^2 for 28.0 s along a conveyor belt. If the crate's initial speed is 0.76 m/s, what is its final speed?
13. A person throws a ball vertically and catches it after 5.10 s. What is the ball's initial velocity?
14. A bicyclist accelerates –0.870 m/s^2 during a 3.80 s interval. What is the change in the velocity of the bicyclist and bicycle?
15. A hockey puck slides 55.0 m in 1.25 s with a uniform acceleration. If the puck's final speed is 43.2 m/s, what was its initial speed?
16. A small rocket launched from rest travels 12.4 m upward in 2.0 s. What is the rocket's net acceleration?
17. A jet slows uniformly from 153 km/h to 0 km/h over 42.0 m. What is the jet's acceleration?
18. A softball thrown straight up at 17.5 m/s is caught 3.60 s later. How high does the ball rise?
19. A child, starting from rest, sleds down a snow-covered slope in 5.50 s. If the child's final speed is 14.0 m/s, what the length of the slope?
20. A sky diver opens her parachute and drifts down for 34.0 s with a constant velocity of 6.50 m/s. What is the sky diver's displacement?
21. In a race, a tortoise runs at 10.0 cm/s and a hare runs at 200.0 cm/s. Both start at the same time, but the hare stops to rest for 2.00 min. The tortoise wins by 20.0 cm. At what time does the tortoise cross the finish line?
22. What is the length of the race in problem 21?
23. The cable pulling an elevator upward at 12.5 m/s breaks. How long does it take for the elevator to come to rest?
24. A disk is uniformly accelerated from rest for 0.910 s over 7.19 km. What is its final speed?
25. A tiger accelerates 3.0 m/s^2 for 4.1 s to reach a final speed of 55.0 km/h. What was its initial speed in kilometers per hour?
26. A shark accelerates uniformly from 2.8 km/h to 32.0 km/h in 1.5 s. How large is its acceleration?
27. The 1903 Wright flyer was accelerated at 4.88 m/s^2 along a track that was 18.3 m long. How long did it take to accelerate the flyer from rest?
28. A drag racer starts at rest and reaches a speed of 386.0 km/h with an average acceleration of 16.5 m/s^2. How long does this acceleration take?
29. A hummingbird accelerates at –9.20 m/s^2 such that its velocity changes from +50.0 km/h to 0 km/h. What is its displacement?
30. A train backs up from an initial velocity of –4.0 m/s and an average acceleration of –0.27 m/s^2. What is the train's velocity after 17 s?
31. A cross-country skier skiing with an initial velocity of +4.42 m/s slows uniformly at –0.75 m/s^2. How long does it take the skier to stop?