Chapter 4

Problems

47.

   a. A projectile is launched with speed v_0 and angle θ. Derive an expression for the projectile's maximum height h.

$$v_f = v_0(\Delta t) + \frac{1}{2}a(\Delta t^2)$$
$$v_y = v_0 \sin\theta, \quad a = -9.8\text{m/s}^2$$
$$\Delta t = -\frac{v_y}{a}$$

   b. A baseball is hit with a speed of 33.6 m/s. Calculate its height and the distance traveled if it is hit at angles of 30.0°, 35.0°, and 60.0°.

51. A tennis player hits a ball 2.0 m above the ground. The ball leaves his racquet with a speed of 20.0 m/s at an angle of 5.0° above the horizontal. The horizontal distance to the net is 7.0 m, and the net is 1.0 m high. Does the ball clear the net? If so, by how much? If not, by how much does it miss?

5(?). Fuck if I know

60. You are asked to consult for the city's research hospital, where a group of doctors is investigating the bombardment of cancer tumors with high-energy ions. As FIGURE P4.60 shows, ions are fired directly toward the center of the tumor at speeds of 5.0 x 10^6 m/s. To cover the entire tumor area, the ions are deflected sideways by passing them between two charged metal plates that accelerate the ions perpendicular to the direction of their initial motion. The acceleration region is 5.0 cm long, and the ends of the acceleration plates are 1.5 m from the target. What sideways acceleration is required to deflect an ion 2.0 cm to one side?

67. Communications satellites are placed in a circular orbit where they stay directly over a fixed point on the equator as the earth rotates. These are called geosynchronous orbits. The radius of the earth is 6.37 x 10^6 m, and the altitude of a geosynchronous orbit is 3.58 x 10^7 m (22,000 miles). What are (a) the speed and (b) the magnitude of the acceleration of a satellite in a geosynchronous orbit?

Chapter 5

Questions

14.