1. Figure 1 shows three uniform spherical planets that are identical in size and mass. The periods of rotation T for the planets are given, and six lettered points are indicated—three points are on the equators of the planets and three points are on the north poles. Rank the points according to the value of the free-fall acceleration g at them, greatest first. Then explain why.

12h   20h   48h
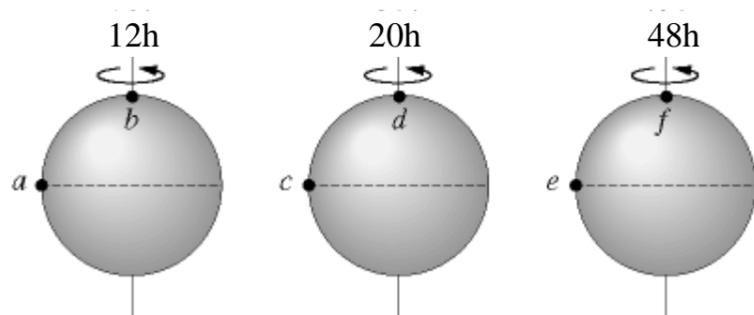
Fig. 1

2. A conservative force F(x) acts on a 2.0 kg particle that moves along the x axis. The potential energy U(x) associated with F(x) is graphed in Fig. 2. When the particle is at x = 4.0 m, its velocity is -1.5 m/s. (a) What are the magnitude and direction of F(x) at this position? (b) Between what limits of x does the particle move? (c) What is its speed at x = 14.0 m?
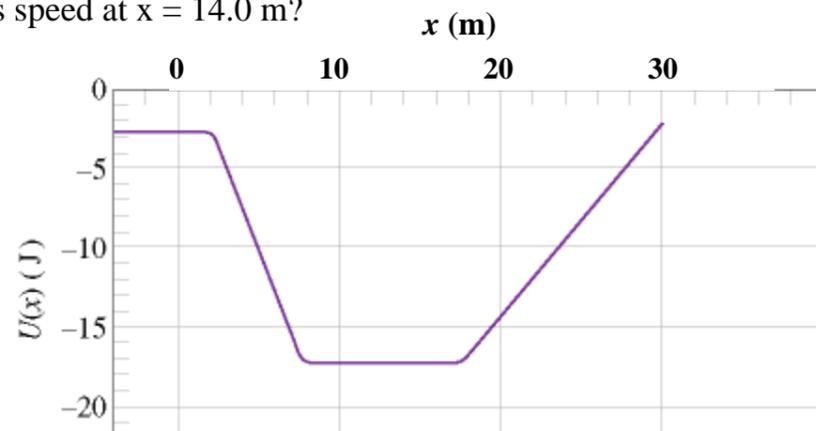
3. An 8.00 g bullet is fired into a 2.50 kg block initially at rest at the edge of a frictionless table of height 1.00 m, as shown in Fig. 3. The bullet remains in the block, and after impact the block lands 2.00 m from the bottom of the table. Determine the initial speed of the bullet.
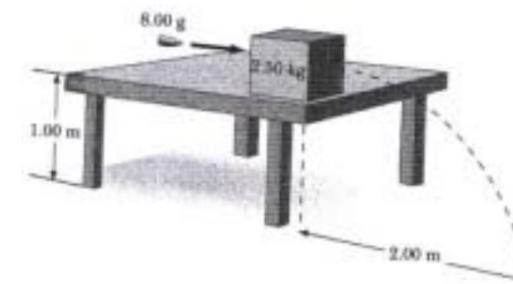
Fig. 3

4. Wharves are made with pilings that permit the free passage of water. Why would a solid-walled wharf be disadvantageous to ships attempting to pull alongside? (See Fig. 4)

Fig. 4

5   20
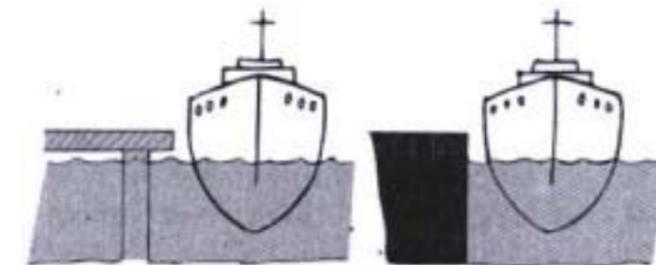
1. Physical pendulum

2. Hall effect

3. Photoelectric effect

4. Alpha particle (α-particle)