

Physics 9A Section A Discussion Questions: Week 6

Question 1: Playing Pinball

A spring with spring constant 100 N/m is compressed 4 cm with a .08 kg ball placed at the end. The pinball table is sloped at an angle of 15° . Assume that when the ball travels up the table, its motion is frictionless.

i: What is the maximum speed reached by the ball upon releasing the spring? Where does this occur? What is the speed of the ball at the end of the spring?

ii: How far will the pinball go from its initial position before coming to a stop, using energy conservation?

iii: Verify your answer, using the speed of the pinball at the end of the spring, with $\Sigma F = ma$

Question 2: Power produced by a dam

6.86 •• The Grand Coulee Dam is 1270 m long and 170 m high. The electrical power output from generators at its base is approximately 2000 MW. How many cubic meters of water must flow from the top of the dam per second to produce this amount of power if 92% of the work done on the water by gravity is converted to electrical energy? (Each cubic meter of water has a mass of 1000 kg.)

Question 3: Picking up a bag of concrete

At a construction site, a heavy 65.0 kg bucket is suspended vertically by a cable which loops over a frictionless pulley, and connects to an 80.0 kg box that sits on a flat roof. Assume both the pulley and cable are massless. The coefficients of static and kinetic friction respectively between the box and the rooftop are given as $\mu_s = .6$, $\mu_k = .4$.

i: Assume the box is carrying a 50.0 kg bag of gravel, which has the same coefficients of friction with the box as the box does with the rooftop. What is the force of friction exerted by the box on the bag of gravel?

ii: If half of the gravel is emptied out, will the bag of gravel start to slide off the box?

iii: If the entire bag of gravel is lifted off, the bucket how fast will the bucket be travelling when it has moved 2m?