

PHY 250: Midterm Retake

November 11th, 2020

Name: _____

Part 1: Test Your Understanding (30 p)

Q1

If there were a great migration of people toward the Earth's equator, would the length of the day (a) get longer because of conservation of angular momentum; (b) get shorter because of conservation of angular momentum; (c) get shorter because of conservation of energy; (d) get longer because of conservation of energy; or (e) remain unaffected?

Q2

If the net force on a system is zero, is the net torque also zero? If the net torque on a system is zero, is the net force zero? Give examples.

Q3

A tall Styrofoam cup is filled with water. Two holes are punched in the cup near the bottom, and water begins rushing out. If the cup is dropped so it falls freely, will the water continue to flow from the holes? Explain.

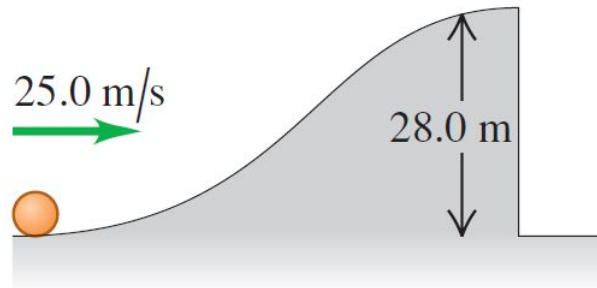
Q4



The three containers in the figure are filled with water to the same height and have the same surface area at the base. How is the pressure on the base? the same for all the containers, or different? And the total force?

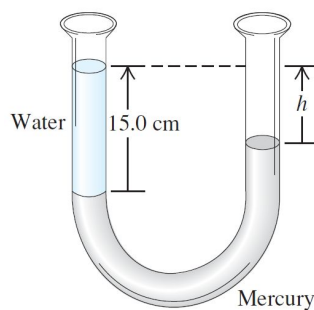
Part 2: Solve exercises (70 p)

Exercise 1



A solid uniform ball rolls without slipping up a hill. At the top of the hill, it is moving horizontally, and then it goes over the vertical cliff. (a) How far from the foot of the cliff does the ball land, and how fast is it moving just before it lands? (b) Notice that when the ball lands, it has a greater translational speed than when it was at the bottom of the hill. Does this mean that the ball somehow gained energy? Explain!

Exercise 2



A U-shaped tube open to the air at both ends contains some mercury. A quantity of water is carefully poured into the left arm of the U-shaped tube until the vertical height of the water column is 15.0 cm . (a) What is the gauge pressure at the water–mercury interface? (b) Calculate the vertical distance h from the top of the mercury in the righthand arm of the tube to the top of the water in the left-hand arm.

Exercise 3

You drill a small hole in the side of a vertical cylindrical water tank that is standing on the ground with its top open to the air. (a) If the water level has a height H , at what height above the base should you drill the hole for the water to reach its greatest distance

from the base of the cylinder when it hits the ground? (b) What is the greatest distance the water will reach?

Exercise 1

Exercise 2

Exercise 3