

Name: _____ NetID: _____

NYU Physics I—Term Exam 5

Problem 1: What is the difference in pressure (in Pa) between a point 1 m below the surface of the ocean and a point 3 m below the surface? (From Lecture on 2016-11-03.)

Problem 2: If rolled (without slipping) down a plane, with a fair start (at rest), which would win a gravity-driven race, a solid, uniform sphere of mass 0.9 kg and radius 0.05 m or a solid, uniform cylinder of mass 0.4 kg and radius 0.01 m? No calculation required, but say *why, in less than 30 words*. Box your answer. (From Lecture on 2016-11-10.)

Problem 3: A blimp has a volume of 7000 m^3 of He (atomic mass 4) at STP, floating in air (atomic mass around 28) at STP. How much mass in *kg* can the blimp carry, roughly? That mass will include the skin, the cabin, the motors, the crew and cargo! (From Problem Set 9.)

Problem 4: A spinning figure skater (subject to no net external torque) reduces her moment of inertia by a factor of 1.5 (that is $I_{\text{new}} = I_{\text{old}}/1.5$). By what factor does her kinetic energy change? Does it increase or decrease or stay the same? (From Problem Set 10.)

Problem 5: Imagine that the rate at which particles hit a wall is Γ (number per unit time). Imagine that each of these particles has mass m and hits the wall with a normal velocity of v (that is, the component of the velocity perpendicular to the wall is v). What is the mean force on the wall? Collisions are elastic. (From the recitation on the ideal gas.)

Problem 6: The truck is accelerating to the right at acceleration a , and the pipe is not tied down. Draw a free body diagram for the pipe, assuming static friction. Imagine (despite how the figure is drawn) that the pipe is not touching the cab of the truck, it is only touching the bed (floor) of the truck. (From the recitation on rolling.)

