Name: _____ NetID: _____

NYU Physics I—Term Exam 5

Problem 1: What is are the units of PV (that is, pressure times volume)? (From worksheet on the ideal gas.)

Problem 2: What is the kinematic relationship between acceleration a (in length per time-squared) and angular acceleration α (in angle per time-squared) for something that is rolling without slipping? (From lecture on 2017-11-07.)

Problem 3: A blimp has a volume of $7000\,\mathrm{m}^3$ 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: Compare a point 1 m below the surface of a lake at sea level to a point 5 m below the surface. What is the pressure difference between these points? Which one is at higher pressure? (From lecture on 2017-11-02.)

Problem 5: If the acceleration due to gravity at the surface of the Earth is $10\,\mathrm{m\,s^{-2}}$, the mass of the Earth is $6 \times 10^{24}\,\mathrm{kg}$, and the radius of the Earth is 6000 km, what would you compute to be the value of Newton's Constant G? Give your answer in SI units, with units. (From lecture on 2017-11-14.)

Problem 6: A figure skater spins in place on frictionless ice at angular speed w_i with her hands outstretched. She has a total moment of inertia I_i. As the skater draws her hands into her body, her moment of inertia decreases to $I_f = I_i/2$. Does her kinetic energy K increase, decrease, or stay the same? Assume that there are no torques acting. (From Problem Set 9.)