PHYS 121 2021-2022 Fall
Second Midterm-Makeup
90 Minutes

1	2	3	4	5	Total

Name: …… **Student No:** ……..... **Department:**
Lecturer…….

You can use calculator during the exam but exchanging is not allowed.
Unless stated otherwise, take g = 9,80 m/s^2 if necessary. Each question worth 20 points. **Good luck.**

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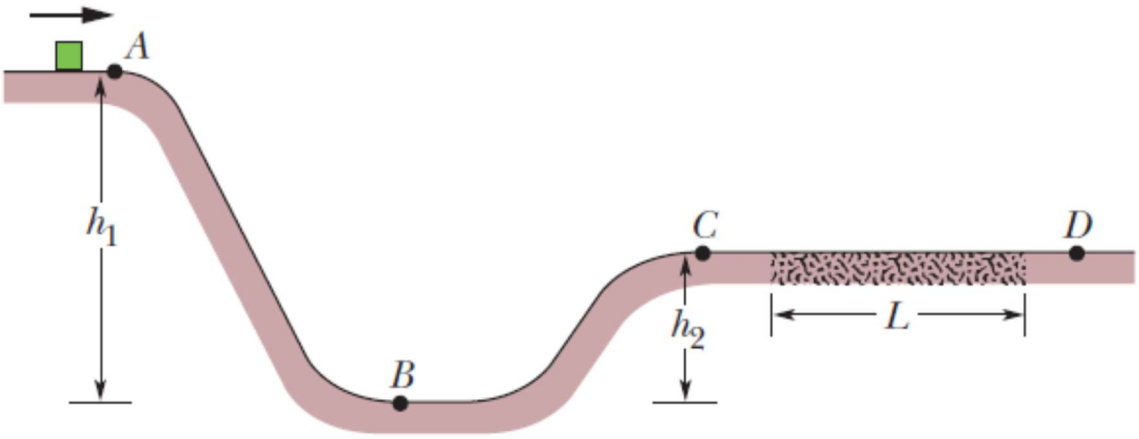
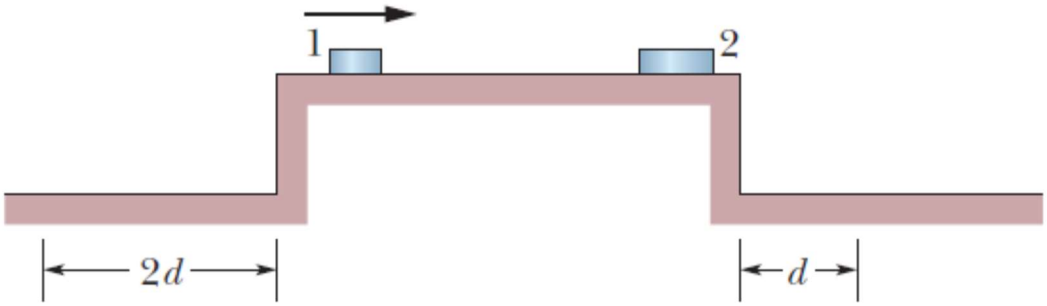
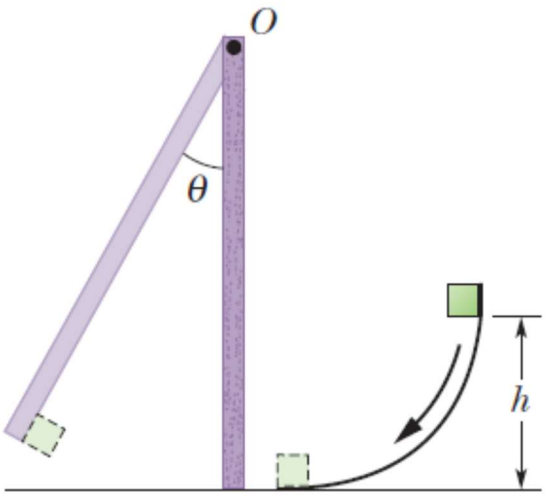
1 A small block is sent through point *A* with a speed of 7.0 m/s. Its path is without friction until it reaches the section of length *L*=12 m, where the coefficient of friction is 0.70. The indicated heights are h_1=6.0 and h_2=2.0 m. What are the speeds of the blocks at (a) point *B* and (b) point *C*? (c) Does the block reach point *D*? If so, what is the speed there; if not, how far through the section of friction does it travel?



2. Puck 1 of mass m_1=0.20 kg is sent sliding across a frictionless lab bench, to undergo a one-dimensional elastic collision with stationary puck 2. Puck 2 then slides of the bench and land a distance d from the base of the bench. Puck 1 rebounds from the collision and slides off the opposite edge of the bench, landing a distance $2d$ from the base of the bench. What is the mass of the puck 2?





3. A small 50 g block slides down a frictionless surface through height h=20 cm and then sticks to a uniform rod of mass 100 g and length 40 cm. The rod pivots about point O through angle θ before momentarily stopping. Find θ.

(The moment of inertia of a rod with length L and mass M about an axis going through its center of mass (CM) is given by $I_{CM} = \frac{1}{12}ML^2$)

4. A pulley, with a rotational inertia of 1.0×10^{-3} kg·m^2 about its axle and a radius of 10 cm, is acted on by a force applied tangentially at its rim. The force magnitude varies in time as $F = 0.50t + 0.30\,t^2$, with F in newtons and t in seconds. The pulley is initially at rest. At $t = 3.0$ s what are its (a) angular momentum and (b) kinetic energy?

5. The figure represents an insect caught at the midpoint of a spider-web thread. The thread breaks under a stress of 8.20×10^{8} N/m^2 and a strain of 2. Initially, it was horizontal and had a length of 2.00 cm and a cross-sectional area of 8.00×10^{-12} m^2. As the thread was stretched under the weight of the insect, its volume remained constant. If the weight of the insect puts the thread on the verge of breaking, what is the insect's mass?