

MCG 2108: MECHANICS II
HOMEWORK 2

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Policy

The homework has to be submitted in paper copy. Unreadable submissions will not be graded. **Late submissions will not be considered.**

Problem 1

The 10 kg sphere in Fig. 1 is suspended from the 15 kg frame which slides down the 30° incline. If the coefficient of kinetic friction between the frame and the incline is $\mu = 0.2$

1. Determine the tension in each of the supporting wires.

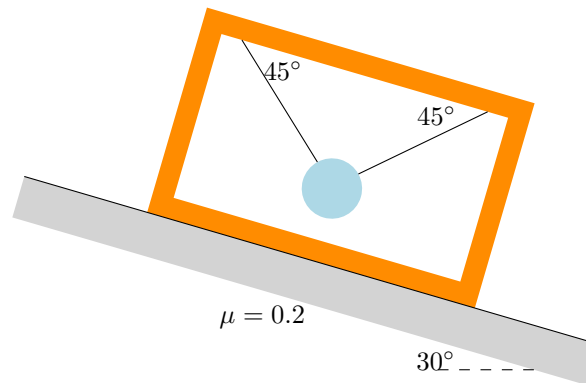


Fig. 1: Problem 1

Problem 2

For the system in Fig. 2, neglect all friction and the masses of the pulleys. Blocks A and B have respectively masses $m_A = 30$ kg and $m_B = 10$ kg.

1. Determine the accelerations of the two bodies upon release from rest for $\alpha = 20^\circ$.

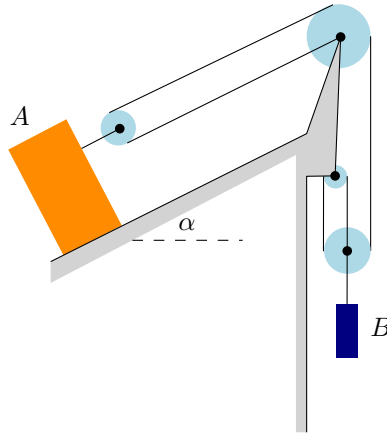


Fig. 2: Problem 2

Problem 3

Solve sample problem 13.10 by using Newton's second law.

Problem 4

The solid sphere in Fig. 3(a) is released from position A with initial speed $v_0 = 3 \text{ m s}^{-1}$ and swings in a vertical plane. At the bottom position, the cord strikes the fixed bar B , and the ball continues to swing along the dashed arc.

1. Calculate the velocity of the ball as it passes through C by neglecting the resistance of the air.

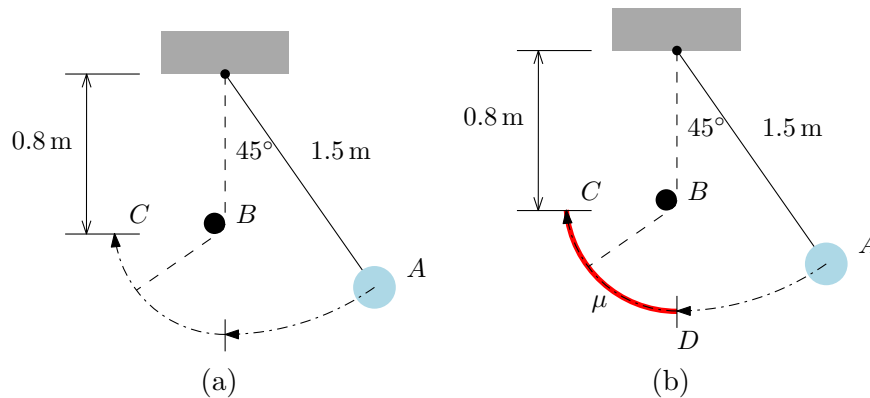


Fig. 3: (a) Problem 4; (b) Problem 5

Problem 5 (5% bonus)

Consider the system in Fig. 3(b), in which the same ball as in Problem 4 swings on the rough surface DC after striking the fixed bar B .

1. Determine the friction coefficient μ such that the ball reaches point C with zero speed.

Problem 6

The 0.7 kg sphere in Fig. 4 moves in a horizontal plane and is controlled by a cord which is reeled in and out below the table in such a way that the center of the sphere is constrained to the path

$$\frac{x^2}{2.25} + \frac{y^2}{1.44} = 1$$

where x and y are in meters. The speed of the sphere as it passes through point A is $v_A = 2 \text{ m s}^{-1}$, and friction is negligible.

1. Determine the tension T_B as the sphere passes through point B .

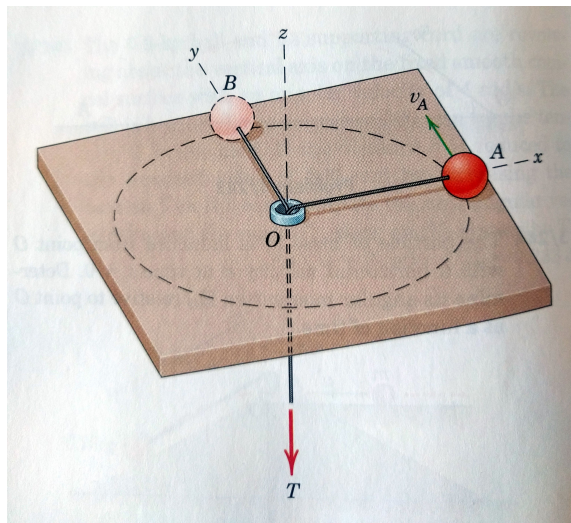


Fig. 4: Problem 6