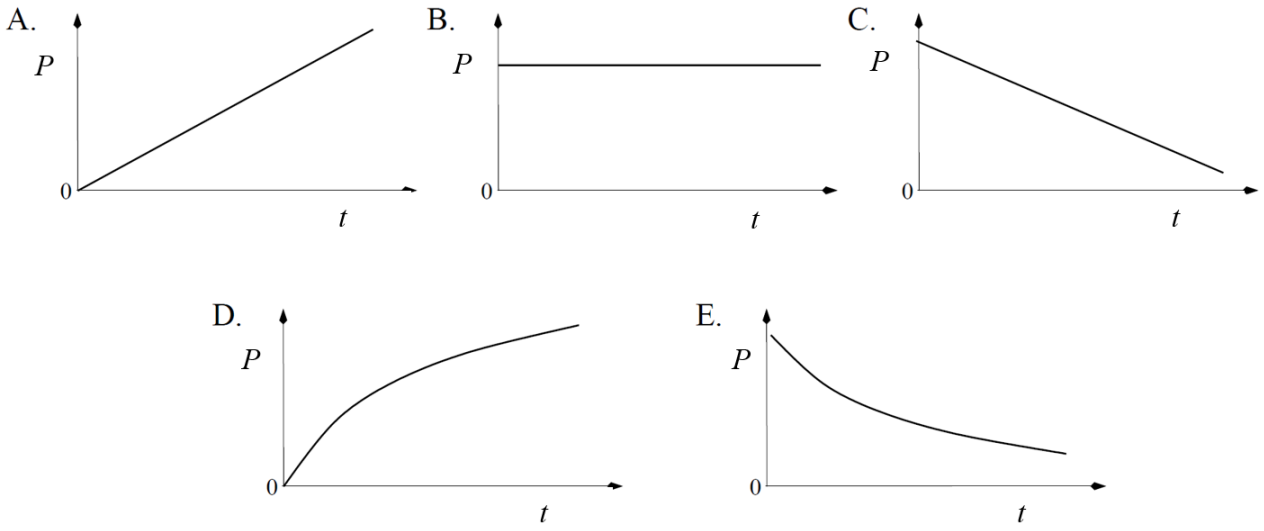
Problem 1.

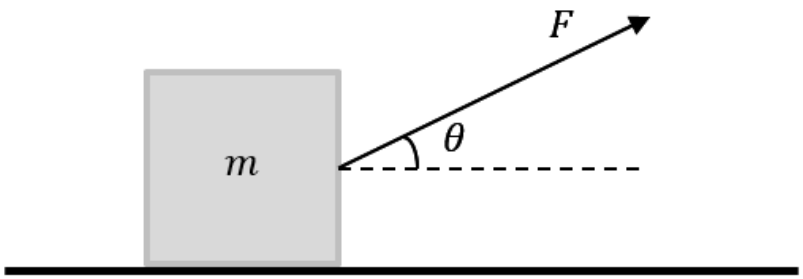
A block is situated on a horizontal smooth table. At time $t = 0$ the block is at rest. A constant horizontal force F is pushing the block forward. Which of the following figures represents the power P as a function of time, as the force F is acting on the block?



A) A
B) B
C) C
D) D
E) E
F) Don't know

Problem 2.

A block with mass m is placed on a smooth horizontal surface. The block is pulled with a constant force, F, forming the angle θ with horizontal. The block starts from rest.



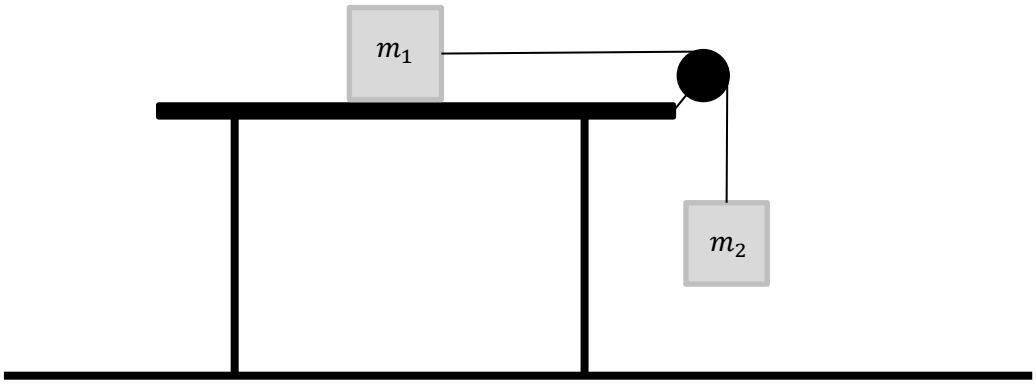
a) Determine the speed of the block when is has moved the horizontal distance L.

The block is now placed at a horizontal, rough surface. The coefficient of kinematic friction between the block and the surface is μ_k. Else, the situation is as described before.

a) Determine the speed of the block when the block has moved the horizontal distance L.

Problem 3.

A block is placed on a horizontal table. The surface is rough. Another block is hanging in a string attached to the block on the table through a massless pully. The blocks has the masses m_1 and m_2.

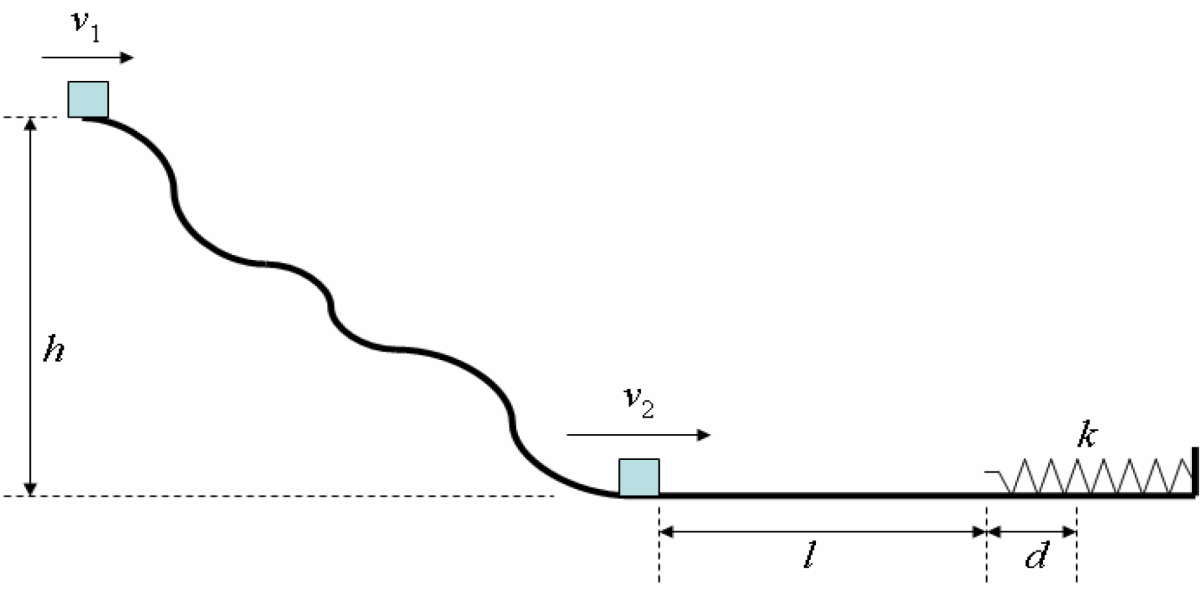


The system is set in motion and moves with a constant speed. The system is observed from when it is set in motion, till it has moved the distance d.

a) Determine the work done on the block placed on the table by the friction force f and the tension T.
b) Determine the work the tension T and gravity has done on the hanging block.

Problem 4.

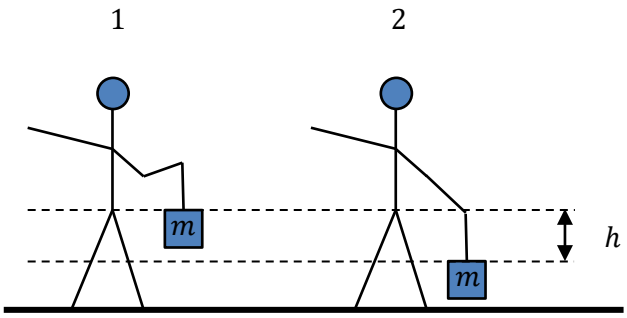
A block with mass $m = 5.00$ kg moves in a hilly terrain, from one horizontal surface to another. The difference in height between the two horizontal surfaces are $h = 12.0$ m. The block leaves position 1, the first horizontal surface, with speed $v_1 = 5.00$ m/s. The block arrives in position 2, the beginning of the second horizontal surface, with speed $v_2 = 10.0$ m/s. From here, the block travels a distance $l = 9.50$ m before it, in situation 3, hits a spring which is compressed a distance d. The spring constant is $k = 1000$ N/m and the coefficient of kinematic friction between the block and the surface is $\mu_k = 0.350$.



a) Determine the work done by the friction force from 1 to 2.
b) Determine the speed of the block, v_3, immediately before the block hits the spring.
c) Determine the max compression of the spring d.

Problem 5.

A person is holding a block at rest attached to a string (situation 1). The block has mass m. The person now lowers the block vertically at a constant acceleration $a = \frac{g}{4}$. In total, the block is lowered a distance h. Notice, the speed of the block in situation 2 is not zero.



a) What is the magnitude of the tension T?

A) $T = mg$
B) $T = \frac{1}{3}mg$
C) $T = \frac{2}{3}mg$
D) $T = \frac{1}{4}mg$
E) $T = \frac{1}{2}mg$
F) $T = \frac{3}{4}mg$
G) Don't know

b) What is the magnitude of the work W, the person has done on the block from 1 to 2?

A) $W = \frac{1}{4}mgh$
B) $W = -\frac{1}{4}mgh$
C) $W = \frac{3}{4}mgh$
D) $W = -\frac{3}{4}mgh$
E) $W = \frac{4}{3}mgh$
F) $W = -\frac{4}{3}mgh$
G) Don't know

c) What is the speed of the block when it is in situation 2?

Problem 6.

A block with mass $m = 20.0$ kg is moving over a horizontal surface. The coefficient of kinematic friction between the block and the surface is $\mu_k = 0.200$. The initial speed of the block is $v = 8.00$ m/s.

a) What is the average power the friction force is delivering to the block?

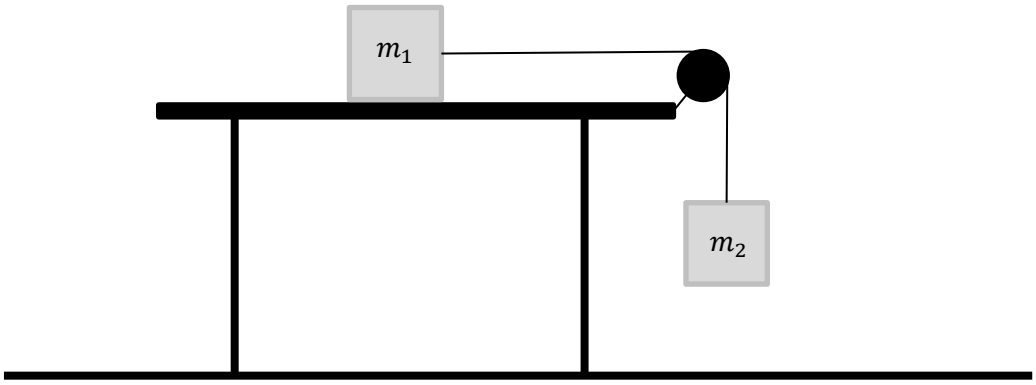
Problem 7.

A ball with mass $m = 7.0$ kg is at rest on the ground. A shot putter picks up the ball and shoots it. The ball lands $L = 20$ m away from where it is shot. The point from where the ball is shot is $h = 2.2$ m above ground. The ball is shot at an angle $\theta = 43^o$ with respect to horizontal.

a) Determine the speed of the ball in the moment it is shot.
b) Determine the magnitude of the work done on the ball by the shot putter.

Problem 8.

A block is situated on a horizontal table. The surface is rough. The coefficient of kinematic friction between the block and the table is μ_k. Another block hangs in a string, which goes over a massless frictionless pully and is attached to the block on the table. The blocks has masses m_1 and m_2



The system is released from rest and the blocks starts accelerating.

a) Determine the speed of the blocks when they have traveled the distance l