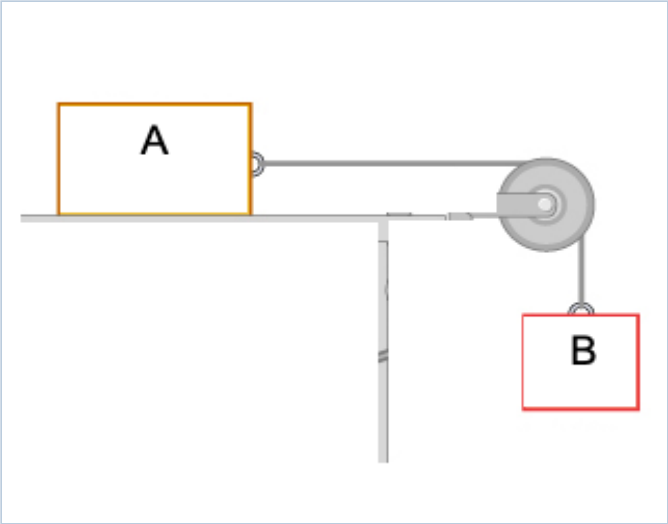
Problem 1

Consider the system of two blocks shown in the Figure. The blocks are released from rest. While the two blocks are moving, the tension in the light rope that connects them is



$30\ \mathrm{N}$. Suppose the mass of the block A is 8.8 kg and the mass of the block B is 6.8 kg .

During a 0.700 m downward displacement of the block B answer the following questions.

Part A

How much work has been done on block B by gravity?

Express your answer with the appropriate units.

ANSWER:

W_{w} =

Part B

How much work has been done on block B by tension T?

Express your answer with the appropriate units.

ANSWER:

W_T =

Part C

Find the speed of the block B after it has descended 0.700 m.

Express your answer with the appropriate units.

ANSWER:

v =

Part D

What is the total work done on the block A?

Express your answer with the appropriate units.

ANSWER:

W_{tot} =

Part E

How much work was done on the block A by the tension T in the cord?

Express your answer with the appropriate units

ANSWER:

W_T =

Part F

How much work was done on the block A by the friction force exerted on it?

Express your answer with the appropriate units.

ANSWER:

W_f =

Part G

Find the net work done on the system of two blocks.

Express your answer with the appropriate units.

ANSWER:

W_{tot} =

Part H

How much work was done on the system of two blocks by gravity?

Express your answer with the appropriate units.

ANSWER:

W_{w} =

Part I

How much work was done on the system of two blocks by friction?

Express your answer with the appropriate units.

ANSWER:

W_f =

Part J

How much work was done on the system of two blocks by tension?

Express your answer with the appropriate units.

ANSWER:

W_T =

Problem 2

A block with mass 1.50 kg is placed against an ideal spring that is compressed 0.28 m . The spring's other end is attached to a wall, and its spring constant is k = 45.0 $\mathrm{N/m}$.

The spring and block are released from rest, and the block moves on a horizontal surface whose coefficient of kinetic friction with the block is 0.3.

When the block has moved 0.28 m and the spring has reached its equilibrium length, the block loses contact with the spring.

Part A

What is the speed of the block at the instant when it leaves the spring?

Express your answer with the appropriate units.

ANSWER:

v =

Part B

What is the maximum speed of the block during its motion?

(Your answer must be within 1% of the right answer to be accepted as correct!)

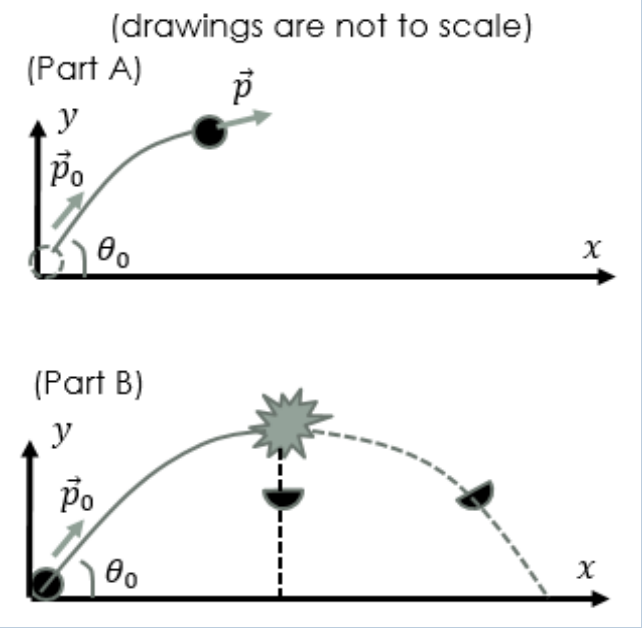
Express your answer with the appropriate units.

ANSWER:

v_{max} =

Phys101F20Mt2Q3upd

A projectile is launched with initial momentum of magnitude $p_0 = 40$ $\mathrm{kgm/s}$ on a flat ground. The launch angle is $\theta_0 = 65^{\circ}$. The gravitational acceleration is $g = 9.81 m/s^2$. Answer the following (parts A and B are unrelated).



Part A - Calculate the total impulse acted on the projectile after the launch until its momentum decreases to 2/3 of its initial value. Enter the x- and y-components of the impulse in order, separated by comma (DO NOT type the unit vectors, pay attention to the sign of components)

ANSWER:

$J_x, J_y =$ _____ $\mathrm{kgm/s}$

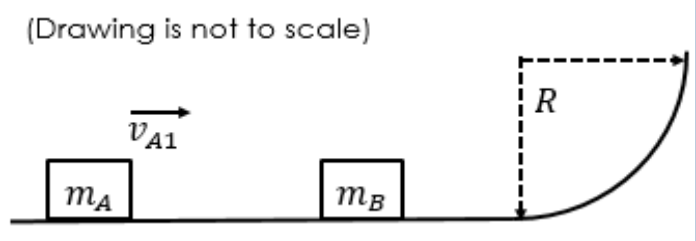
Part B - When the projectile has reached its maximum height, it splits to two equal pieces each of mass 0.5 kg. It is observed that one piece makes a vertical free fall and that both pieces land on the ground simultaneously. Find the distance between the pieces.

ANSWER:

$d =$ _____ m

Phys101F20Mt2Q4

The shows block A and B on a frictionless track with respective masses m_A =6 kg and m_B =1.4 kg . Block B was initially at rest. The blocks first make an elastic collision and block B slides up to a height R =10 cm . Take $g = 9.81 m/s^2$.



Part A - Calculate the speed of block A before the collision.

ANSWER:

v_{A1} = m/s

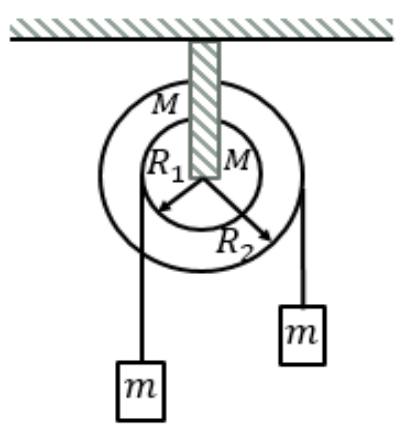
Part B - After block B comes back, blocks make a completely inelastic collision on the horizontal track. Calculate the speed of the blocks after the collision.

ANSWER:

v_{final} = m/s

Phys101F20Mt2Q5

Two concentric disks each of mass M =1.5 kg and radii R_1 =10 cm and R_2 =50 cm form a rigid body that is free to rotate about the center axis. Two blocks each of mass m =2 kg are suspended by ropes that are respectively wound around the rim of each disk. The system is released from rest and the block attached to the larger disk has moved by an amount h =40 cm Assume that the ropes move without slipping and the blocks move only vertically. Take gravitational acceleration $g = 9.81\mathrm{m/s^2}$.



Part A - Calculate the speed of the block attached to the smaller disk when the block attached to the larger disk moved by an amount h after the system was released from rest.

ANSWER:

$v =$ = m/s

Part B - Calculate the ratio of the rotational kinetic energy of larger disk to that of the smaller disk.

ANSWER:

$\frac{K_{rot2}}{K_{rot1}} =$ =