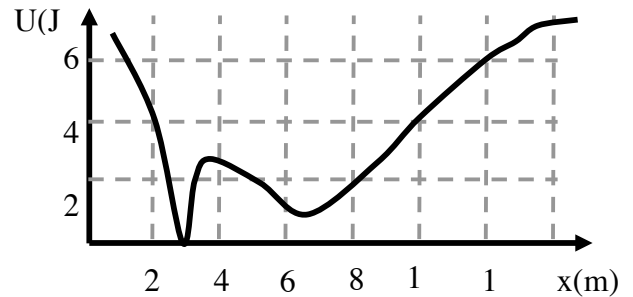


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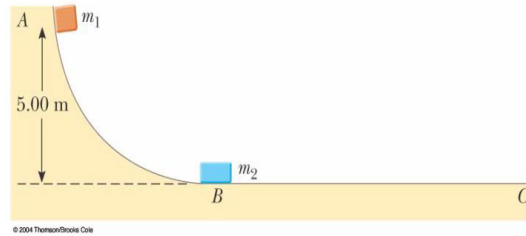
ASSIGNMENT 3 Due: Mon Feb 27 6:00PM

1 A 1kg particle moves under influence of conservative force whose potential energy is shown in the diagram. At $t=0$ particle has $K=4\text{J}$ at $x=8\text{m}$.



- a) What is the kinetic energy of the particle at $x=3\text{m}$?
- b) What is the direction of the force at $x=2\text{m}$?
- c) What is the right turning point?
- d) What is the left turning point?

2 Two blocks are free to slide along the frictionless wooden track ABC shown. A block of mass $m_1 = 5.00\text{ kg}$ is released from A. Protruding from its front end is the north pole of a strong magnet, repelling the north pole of an identical magnet embedded in the back end of the block of mass $m_2 = 10.0\text{ kg}$, initially at rest. The two blocks never touch. Calculate the maximum height to which m_1 rises after the elastic collision.



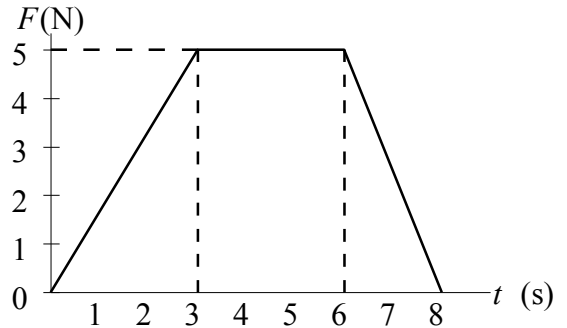
3A A 4.1 kg rifle is suspended by strings and fires a 0.0030 kg bullet at a speed of 1500 m/s. What is its recoil speed in m/s?

3B An explosion in a rigid pipe shoots out three pieces. A 6 g piece comes out the right end. A 4 g piece comes out the left end with twice the speed of the 6 g piece. From which end does the third piece emerge?

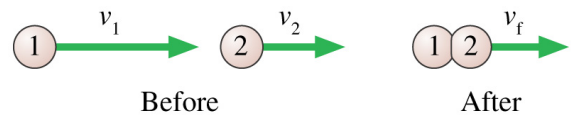
- A. Right end
- B. Left end
- C. Not enough information to answer this question

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- 4 A 2.5 kg body moving horizontally with speed $v = 1\text{ m/s}$ is acted on by a horizontal force as shown in the graph. What is the body speed at $x = 3\text{ s}$?
- a) 1 m/s
 - b) 2 m/s
 - c) 3 m/s
 - d) 4 m/s
 - e) 5 m/s



- 5 The two particles are both moving to the right. Particle 1 catches up with particle 2 and collides with it. The particles stick together and continue on with velocity v_f . Which of these statements is true?

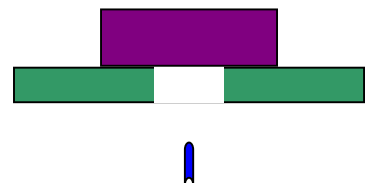


- A. $v_f = v_2$.
- B. v_f is less than v_2 .
- C. v_f is greater than v_2 , but less than v_1 .
- D. $v_f = v_1$.
- E. v_f is greater than v_1 .

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- 6 A 12-g bullet moving horizontally strikes and remains in a 3.0-kg block initially at rest on the edge of a table. The block, which is initially 80 cm above the floor, strikes the floor a horizontal distance of 120 cm from its initial position. What was the initial speed of the bullet?

- 7 A 10-g bullet moving 1000 m/s strikes and passes through a 2.0-kg block initially at rest, as shown. The bullet emerges from the block with a speed of 400 m/s. To what maximum height will the block rise above its initial position?

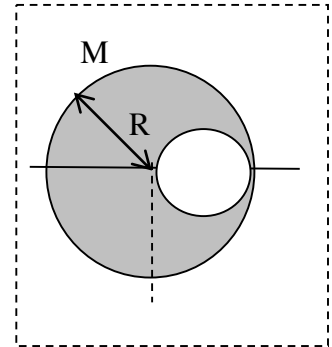


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8a. A 4.0-kg particle is moving horizontally with a speed of 5.0 m/s when it strikes a vertical wall. The particle rebounds with a speed of 3.0 m/s. What is the magnitude of the impulse delivered to the particle?

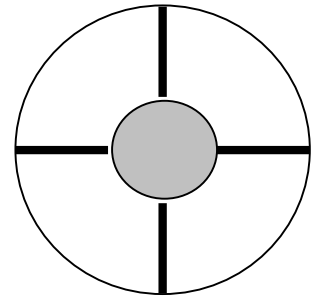
8b. A 2.0-kg object moving 5.0 m/s collides with and sticks to an 8.0-kg object initially at rest. Determine the kinetic energy lost by the system as a result of this collision.

9. A sphere of radius R and mass M uniformly distributed over its whole volume, has a smaller sphere of radius $R/2$ removed from it as shown on the cross section diagram. Find the x coordinate of the CM of the sphere.



10. The wheel shown on diagram has a central hub of radius 2m and a mass of 4kg, outside rim of radius 6m and a mass 1kg. Each of the four spokes is 4 m long and has a mass of 2kg.

- a) Find the moment of inertia about an axis through the centre. Treat the hub as a disk.
- b) find the moment of inertia about the axis through the point where the spoke is attached to the outer rim. Both axes are perpendicular to the plane of the wheel.



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11 A potter's wheel—a thick stone disk of radius 0.500 m and mass 100 kg—is freely rotating at 50.0 rev/min. The potter can stop the wheel in 6.00 s by pressing a wet rag against the rim and exerting a radially inward force of 70.0 N. Find the effective coefficient of kinetic friction between wheel and rag.

12 An explosion in a rigid pipe shoots out three pieces. A 6 g piece comes out the right end. A 4 g piece comes out the left end with twice the speed of the 6 g piece. From which end does the third piece emerge?

- A. Right end
- B. Left end
- C. Not enough information to answer this question