

Energy and Momentum Review

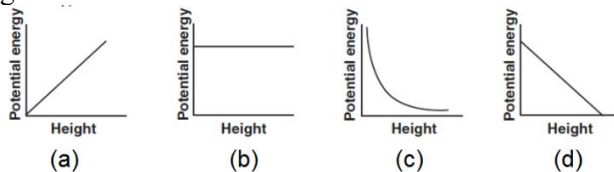
Honors Physics

Work and Power

- A 5.0 kg sled on a frictionless icy surface is pulled with a force of 60.0 N at an angle of 25° above the horizontal. If it is pulled a distance of 6.0 m, what is the work done on the sled?
 - 120 J
 - 294 J
 - 326 J
 - 360 J
- The work done in accelerating an object along a frictionless horizontal surface is equal to the change in the object's
 - momentum
 - velocity
 - potential energy
 - kinetic energy
- 1000 Joules of work are done to lift a 40 kg box up to a certain height. What is the gravitational potential energy of the box at this height?
 - 40,000 J
 - 1000 J
 - 250 J
 - 25 J
- Which of the following quantities is a measure of how quickly work is being done?
 - kinetic energy
 - power
 - potential energy
 - momentum
- Which of the following units is equivalent to Joules per second?
 - Newtons
 - Watts
 - kilogram meters per second
 - Newton seconds

Energy

- When a 1.53-kilogram mass is placed on a spring with a spring constant of 30.0 newtons per meter, the spring is compressed 0.500 meter. How much energy is stored in the spring?
 - 3.75 J
 - 7.50 J
 - 15.0 J
 - 30.0 J
- Which graph best represents the relationship between the gravitational potential energy of an object near the surface of Earth and its height above Earth's surface?



- How fast would a 70 kg student have to run in order to have a kinetic energy of 600 J?
 - 17 m/s
 - 8.6 m/s
 - 4.1 m/s
 - 2.9 m/s
- How far above the ground would a 70 kg boulder have to be in order to have a gravitational potential energy of 103,000 J?
 - 1470 m
 - 1000 m
 - 150 m
 - 103 m

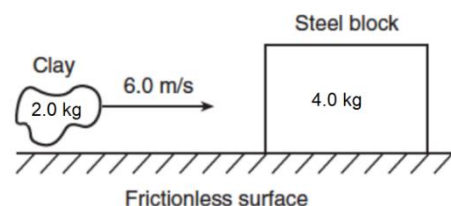
10. A car driving on the road has a kinetic energy of 100,000 J when the car is traveling at 10 m/s. If the same car is driving at 30 m/s, the kinetic energy of the car will be
- 3333 J
 - 300,000 J
 - 600,000 J
 - 900,000 J
11. As an object falls freely, its kinetic energy will _____ and its total mechanical energy will _____.
- increase, decrease
 - decrease, increase
 - increase, remain constant
 - decrease, remain constant
12. As a block slides across a table, its speed decreases while its temperature increases. Which two changes occur in the block's energy as it slides?
- a decrease in kinetic energy and an increase in internal energy
 - an increase in kinetic energy and a decrease in internal energy
 - a decrease in both kinetic energy and internal energy
 - an increase in both kinetic energy and internal energy

Momentum and Impulse

13. Cart A has a mass of 2 kilograms and a speed of 3 meters per second. Cart B has a mass of 3 kilograms and a speed of 2 meters per second. Compared to the inertia and magnitude of momentum of cart A, cart B has
- the same inertia and a smaller magnitude of momentum
 - the same inertia and the same magnitude of momentum
 - greater inertia and a smaller magnitude of momentum
 - greater inertia and the same magnitude of momentum
14. A car is rolling along a level surface has a momentum of 450 kg·m/s. If the car has a mass of 900 kg, the velocity of the car is
- 5.0×10^{-1} m/s
 - 2.0×10^0 m/s
 - 1.35×10^3 m/s
 - 4.0×10^5 m/s
15. Which pair of quantities can be expressed using the same units?
- impulse and kinetic energy
 - power and momentum
 - weight and potential energy
 - impulse and momentum
16. A 1,200-kilogram car traveling at 10 meters per second hits a tree and is brought to rest in 0.10 second. What is the magnitude of the average force acting on the car to bring it to rest?
- 1.2×10^2 N
 - 1.2×10^3 N
 - 1.2×10^4 N
 - 1.2×10^5 N
17. A force of 6.0 Newtons pushes on a 5.0 kg cart on a frictionless surface for 1.5 s. If the cart started from rest, what is the change in the momentum of the cart?
- 30 kg·m/s
 - 7.5 kg·m/s
 - 9.0 kg·m/s
 - 4.0 kg·m/s

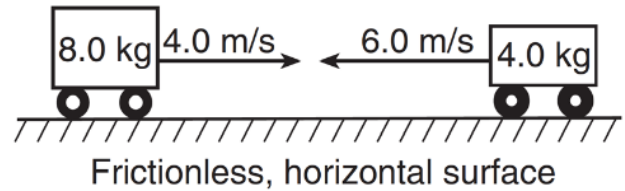
Conservation of Momentum

18. A 4.0-kilogram steel block is at rest on a frictionless horizontal surface. A 2.0-kilogram lump of clay is propelled horizontally at 6.0 meters per second toward the block as shown in the diagram and they stick together. What will be the momentum of the system after the collision?



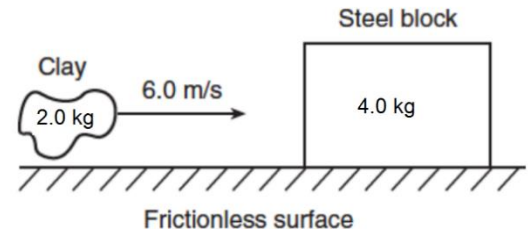
- 2 kgm/s
- 3 kgm/s
- 12 kgm/s
- 24 kgm/s

19. The diagram shows an 8.0-kilogram cart moving to the right at 4.0 meters per second about to make a head-on collision with a 4.0-kilogram cart moving to the left at 6.0 meters per second. After the collision, the 4.0-kilogram cart moves to the right at 3.0 meters per second. What is the momentum of the system before the collision?



- a) 32 kg·m/s
- b) 24 kg·m/s
- c) 60 kg·m/s
- d) 8 kg·m/s

20. A 4.0-kilogram steel block is at rest on a frictionless horizontal surface. A 2.0-kilogram lump of clay is propelled horizontally at 6.0 meters per second toward the block as shown in the diagram and they stick together. What will be the velocity of the system after the collision?



- a) 2 m/s
- b) 3 m/s
- c) 12 m/s
- d) 24 m/s

Work and Power

1. An elevator motor lifts a 2500 kg elevator up at a constant speed. The elevator is lifted 20.0 meters in 30 seconds.
 - a) What is the work done by the motor?

 - b) What is the power output of the motor?

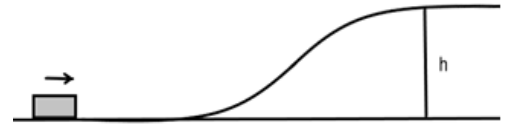
2. The tow rope on the back of a boat exerts a force of 150 N on a 55 kg water skier. If the skier started from rest, and if there is no friction, what is the skier's kinetic energy at the end of 60.0 meters?

3. A 0.5 hp engine is equivalent to 373 Watts. How much energy does the engine use if it runs for 15 minutes?

Conservation of Energy

4. An 8.0 kg bowling ball is tied to a rope and brought up to a height of 1.0 meter above the bottom of its swing. If the bowling ball is released from rest, how fast will it be traveling at the bottom of its swing?

5. A 0.170 kg hockey puck is sliding on frictionless ice on a ground-level lake at 7.0 m/s as shown in the diagram. Determine the following information about the puck as it slides up the frictionless slope.

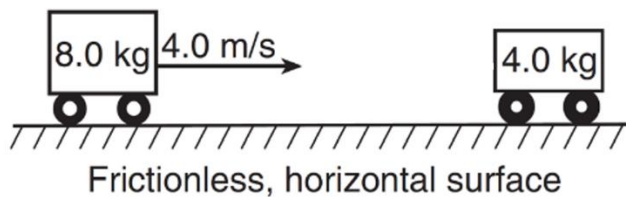


Bottom of the slope	Halfway up the slope	Top of the slope ($v = 0$)
PE = _____	PE = _____	PE = _____
KE = _____	KE = _____	KE = _____
Total energy = _____	Total energy = _____	Total energy = _____
	Velocity = _____	Height = _____

Momentum

6. At the circus, a 100-kilogram clown is fired at 15 meters per second from a 500-kilogram cannon that is initially at rest. What is the recoil speed of the cannon?

7. The diagram shows an 8.0-kilogram cart moving to the right at 4.0 meters per second about to make a head-on collision with a 4.0-kilogram cart that is at rest. After the collision, the 4.0-kilogram cart moves to the right at 3.0 meters per second. What is the velocity of the 8.0 kg cart after the collision? Which way is it moving?



8. The diagram below shows a 4 kg cart moving 4 m/s. The 4 kg cart collides with an 8 kg cart that's at rest. If the two carts lock together, what is the velocity of the locked carts after the collision?

