

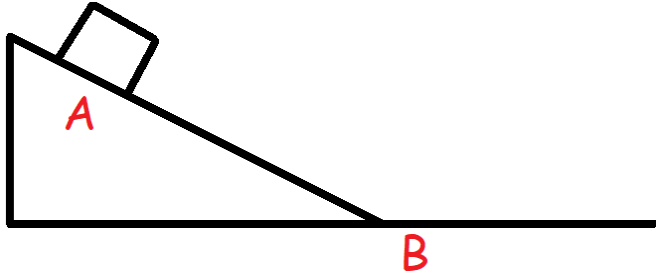
Conservation of Energy

Worksheet

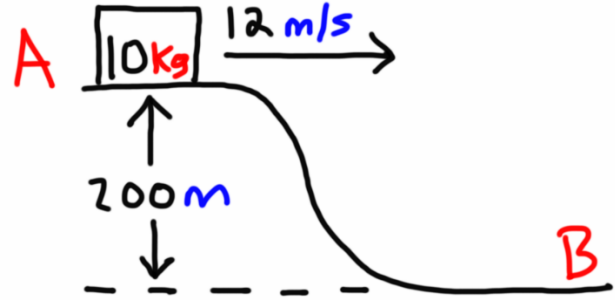
15 Practice Questions

Organic Chemistry Tutor

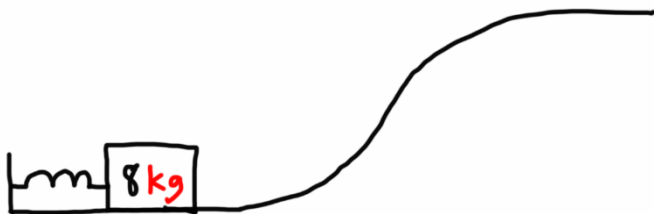
1. A block slides down a 150 m inclined plane as shown in the picture below starting from rest. What is the speed of the block when it reaches the bottom of the incline.



3. A 10 kg block slides down a hill that is 200 m tall as shown in the figure below with an initial speed of 12 m/s. (a) What is the speed of the block when it reaches the bottom of the hill at position B assuming no friction? (b) What is the final speed of the block at position B after traveling a total horizontal distance of 500 m (at the bottom of the incline) given a coefficient of kinetic friction of 0.21 between the block and the surface?



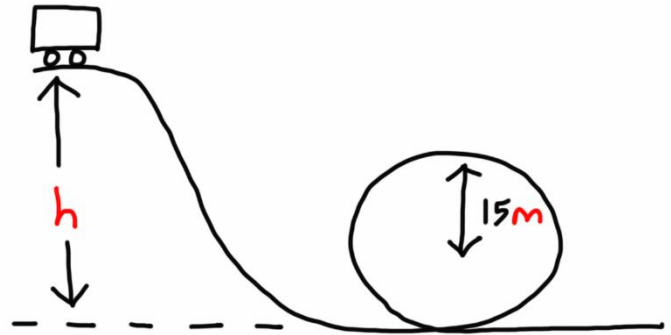
2. An 8 kg block compresses a horizontal spring ($K = 300 \text{ N/m}$) by 2.5 m beyond its natural length as shown in the figure below. (a) What is the speed of the block as soon as it's released from the spring? (b) How high up the hill will the block go?



4. A 12 kg block moving at a speed of 15 m/s crashes into a wall and comes to a complete stop. How much thermal energy was produced during the collision?

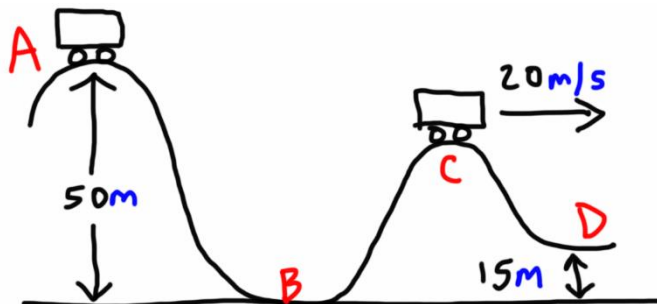
5. A 1500 kg car moving east at 35 m/s crashes head-on into another 1800 kg car moving west at 30 m/s causing both cars to come to a complete stop. How much thermal energy was produced during this collision?

7. How high must the roller coaster be released from rest in order to remain on the track at the top of the vertical circle?



6. A roller coaster is released from rest at point A. (a) How fast is it moving at point B? (b) How high is point C relative to point B? (c) How fast is it moving at point D?

8. A ball is released from rest from the top of a 200 m building. How fast will it be going just before it hits the ground?



9. A ball rolls off a 300 m cliff with an initial horizontal speed of 15 m/s. How fast will it be going just before it hits the ground?

11. A ball is launched from a 400 m cliff at a speed of 50 m/s at a 25° angle. (a) What is the maximum height of the ball? (b) How fast will it be moving just before it hits the ground?

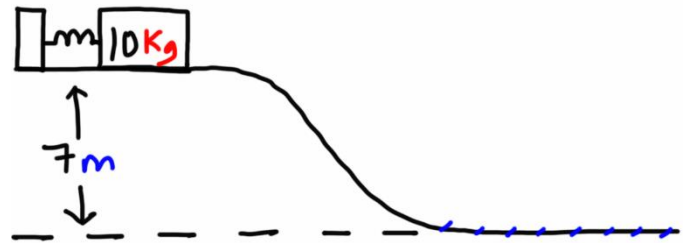
10. A ball is thrown upward with an initial speed of 50 m/s. (a) How high will it go? (b) How fast is it moving when it reaches a height of 75 m?

12. A ball is released from a height H above the ground and acquires the speed V just before it hits the ground. At what height should the ball be released from rest so that it acquires a speed of $3V$ just before it hits the ground?

- A. $\sqrt{2}H$
- B. $\sqrt{3}H$
- C. $3H$
- D. $6H$
- E. $9H$

13. A rock is thrown straight down with an initial speed of 20 m/s from a height of 100 m above the ground. At what height relative to the ground will the kinetic energy of the rock be equal to its gravitational potential energy?

15. A spring ($K = 400 \text{ N/m}$) is compressed by a 10 kg block by a distance of 1.5 m beyond its natural length. The block is situated at the top of the frictionless incline 7 m above the ground. The coefficient of kinetic friction between the block and the horizontal surface is 0.25. (a) How far will the block travel until it comes to a complete stop? (b) What is the magnitude of the frictional force acting on the block? (c) How much mechanical energy will friction convert into thermal energy after the block has traveled a distance of 30 m across the horizontal surface?



14. A 2500 kg car is initially moving at a speed of 25 m/s. The driver gently presses on the brakes until the speed is reduced to 10 m/s. The car travels a distance of 100 m during this time period. Using conservation of energy, calculate the average force exerted by the brakes on the vehicle. (Ignore friction)

Answers:

1. 54.2 m/s
- 2a. 15.3 m/s
- 2b. 12.0 m
- 3a. 63.7 m/s
- 3b. 44.8 m/s
4. 1350 J
5. 1,728,750 J
- 6a. 31.3 m/s
- 6b. 29.6 m
- 6c. 26.2 m/s
7. 37.5 m
8. 62.6 m/s
9. 78.1 m/s
- 10a. 128 m
- 10b. 32.1 m/s
- 11a. 422.8 m
- 11b. 101.7 m/s
12. E
13. 60.2 m
14. 6562.5 J
- 15a. 46.367 m
- 15b. 24.5 N
- 15c. 735 J