Physics First Honors
2010-11

Work & Energy

Work & Energy Review

1. Define with an equation and in words:
   a. kinetic energy ENERGY DUE TO the motion of an object

   b. potential energy Energy associated w/ The location of an objec

   c. work F x d

   ~~d. power~~

2. Define the principle of conservation of energy and tell how it applies to a swinging pendulum. at The top of The swing all PE → KE
   at The bottom Back to PE

3. Give the standard and fundamental units for

   ~~a. work~~ J ~~b. power~~

   c. energy (kinetic) J d. energy (potential) J

4. What is meant by the term mechanical energy?
   Energy obtained by mechanical means

5. Apply the Law of Conservation of Energy in the following problem:
   A 2000 kg car traveling at 40 m/s suddenly slams on its brakes which supply a 100,000 N braking force. How far will the car skid before coming to a complete stop?

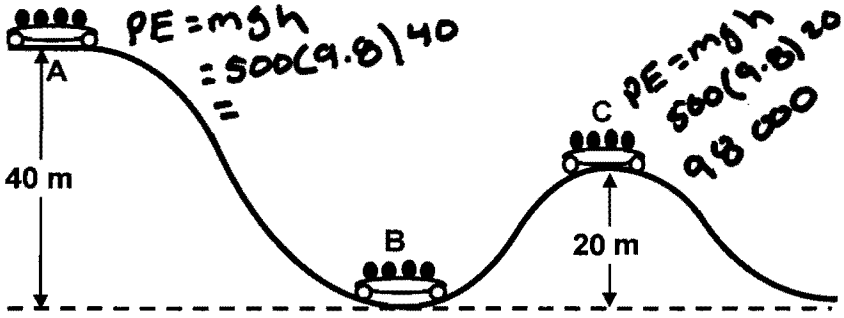
$E_I + W = E_f$

$\frac{1}{2}mv^2 - F \cdot d = 0$ → $\frac{1}{2}(2000)40^2 = 100{,}000d$

$1600000 = 100000d$

$d = 16\text{ m}$

6. Find the KE and PE at all the marked points on the roller coaster. If it begins at rest at point A. (mass = 500 kg) Assume mechanical energy is conserved.



PE = mgh
= 500(9.8)40
=

C PE = mgh
500(9.8)20
98 000

	KE	PE
A	0	196000
B	196000	0
C	98000	98000

T
196,000

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7. Spiderman (84 kg) climbs 150 m up the side of a building.
   a) How much work did Spiderman do to reach this height?

   $W = F_g \cdot d = Mgd = 84(9.8)(150) = 123,480\ J$

   b) How much PE does he have at this height?

   $PE = mgh = 84(9.8)(150) = 123,480\ J$

   c) If he reached this height in 2 min. how much power did he generate?

   —

8. a) How much work is done when lifting a 25 kg box to a shelf 3 m above the floor? (Just enough force is used to overcome the box's weight?)

   $W = F_g \times d = mgd = 25(9.8)(3) = 735\ J$

   b) What is the potential energy of the box as it sits on the shelf?

   $PE = mgh = 25(9.8)(3) = 735\ J$

   c. If the box were to fall, how much kinetic energy would it have just before hitting the floor?

   735 J

   d. How much work would the floor have to do to stop to box?!

   735 J

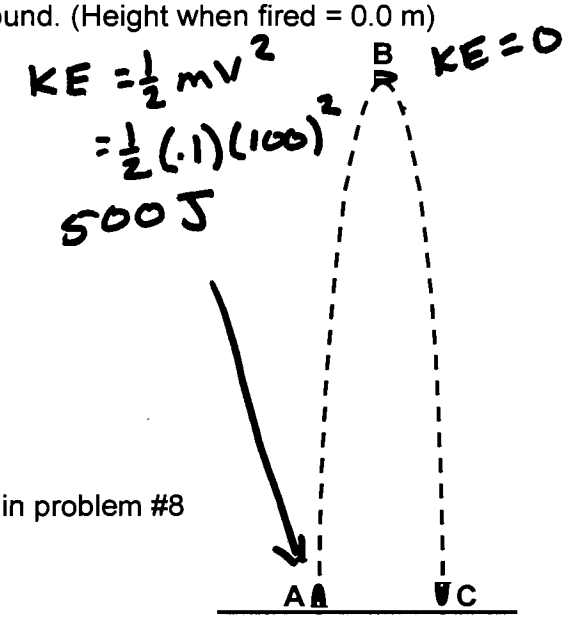
9. A 0.1 kg bullet is fired at 100 m/s directly from the ground. (Height when fired = 0.0 m)
   Fill in the chart below. Assume no air resistance.

	When fired (A)	At the Peak (B)	Just before it hits the ground (C)
PE	0	500	0
KE	500	0	500
TE	500	500	500

$KE = \frac{1}{2}mv^2$

$= \frac{1}{2}(.1)(100)^2$

500 J



10. Using energy considerations, How high will the bullet in problem #8 go?

    $PE = mgh$

    $500 = (0.1)(9.8)h$

    $h = \frac{500}{.98}$

    $h = 510\ m$

11. How fast will the bullet in problem #8 be going when it hits the ground?

    100 m/s