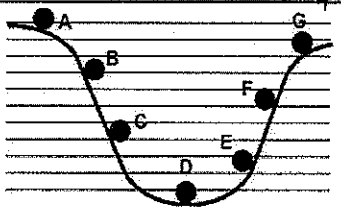
Name: _____ Unit 8:3

Period: _____ 16

Is work positive, negative, or zero?

+ An object speeds up. gaining E_K
− An object is lowered back to the ground. losing E_P
− Friction slows down an object. losing E_K
0 An object slides down a ramp without friction.
+ An object is lifted up from the ground. gaining E_P
0 An object is thrown into the air without friction. $E_P = E_K$

An object falls from A to D.



What kind of energy before? E_P

What kind of energy after? E_K

Put these together into the Law of Conservation of Energy.

$E_B = E_K$ $E_P = E_K$ $mgh = \frac{1}{2}mv^2$

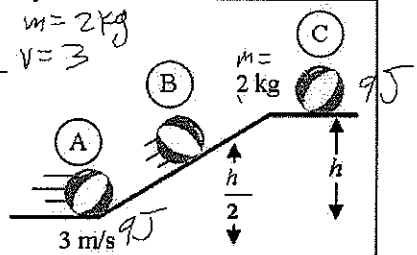
1. $Ep = Ek$ G
2. $Ek = Ep$ C
3. $Ek_{before} + W = Ek_{after}$ D
4. $0 + W = Ek_{after}$ B
5. $Ek_{before} - W = Ek_{after}$ E
6. $Ek_{before} - W = 0$ A
7. $Ep_{before} - W = 0$ F

A. A moving object stops.
B. An object at rest is moved by a force.
C. An object is thrown into the air.
D. A force speeds up an object.
E. An object slows down.
F. An object is lowered to the ground.
G. An object falls.

Find the energy at A. E_K $m = 2kg$ $v = 3$

$E_K = \frac{1}{2}mv^2 = \frac{1}{2}(2)(9) = 9\,J$

Ek at B = 4.5 J
Ep at B = 4.5 J
Ek at C = 0 J
Ep at C = 9 J



A 5 kg rock is 8 m above the ground. Calculate its energy.

$m = 5\,kg$ $h = 8m$ $g = 10$

$E_p = mgh = 5(10)(8) = 40(10) = 400\,J$

If it falls how Ek_{bottom} = 400 J

Half-way down, Ek = 200 J (and 200 J of E_P)

If you had an efficiency greater than 100%, what would be greater W_{in} or W_{out}?

Why is this not possible? No — means E is being created out of nothing.

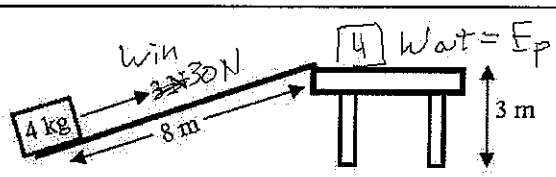
A 4 kg rock is dropped from 5 m. There is no friction.

A) What kind of energy does it have before? $E_{before} = E_P$
B) What kind of energy does it have after? $E_{after} = E_K$
C) Does $E_{before} = E_{after}$ yes
D) Was work done? no
E) Put the above into the Law of Conservation of Energy.

$E_P = E_K$ $mgh = \frac{1}{2}mv^2$ $gh = \frac{1}{2}v^2$

F) *Solve for the speed of the object at the bottom.*

$gh = \frac{1}{2}v^2$ $10(5) = \frac{1}{2}v^2$ $50 = \frac{1}{2}v^2$ $100 = v^2$ $v = 10\,m/s$



What is W_{in}? Calculate W_{in}.

$F = 3N$ $d = 8m$ $W = Fd = 30(8) = 240\,J$

What is W_{out}? Calculate W_{out}.

$E_p = mgh = 4(10)(3) = 120\,J$

Calculate Efficiency.

$$Eff = \frac{W_{out}}{W_{in}} \times 100 = \frac{120}{240} \times 100 = 50\%$$

An 8 kg box at rest is pushed by a force for 12 m. The box ends up going 3 m/s (and there is no friction).

A) $E_{before} = 0$

B) $E_{after} = \frac{1}{2}mv^2 = \frac{1}{2}(8)(9) = 4(9) = 36\,J$

C) Does $E_{before} = E_{after}$? no, W was done

D) Put the above information into the Law of Conservation of Energy equation. $0 + W = \frac{1}{2}mv^2$

E) *Solve for the force.* $0 + Fd = \frac{1}{2}mv^2$ $F(12) = \frac{1}{2}(8)(3)^2$ $12F = 36$ $F = 3N$

$12F = 4(9)$

A 8 kg box at rest is pushed for 10 m with a 60 N force. If it is accelerated to 10 m/s. Calculate the efficiency of the force.

$m = 8kg$ $d = 10m$ $F = 60\,N$ $v = 10\,m/s$

$W_{in} = Fd = 60(10) = 600$

$W_{out} = \frac{1}{2}mv^2 = \frac{1}{2}(8)100 = 400$

$$Eff = \frac{400}{600} \times 100 = \frac{2}{3} = 66\%$$