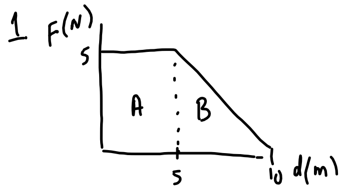
1



$A_A = (5.0N)(5.0m)$

$A_A = 25J$

$A_B = \frac{1}{2}(5.0N)(5.0m)$

$A_B = 12.5J$

$A_{TOTAL} = 38\ J$

2.

$W = F\Delta d\cos\theta$

$W = 6.54 \times 10^3 J$

3.

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

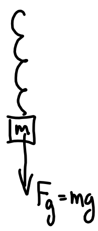
$E_K = \frac{1}{2}(7.26kg)(7.50m/s)^2$

$E_K = 204\ J$

$2.04 \times 10^2 J$

$2.0\cancel{0} \times 10^2 J$

4.



a) $F_a = kx$

$F_a = (600N/m)(0.075m)$

$F_a = 45N \longrightarrow F_g = mg$

$45N = m(9.81 m/s^2)$

$m = 4.6kg$

b) $E_e = \frac{1}{2}kx^2$

$E_e = \frac{1}{2}(600N/m)(0.075)^2$

$E_e = 1.7J\ \ (2J)$

5. -0 12.0m

$E_g = mgh$

$E_g = (2.00kg)(9.81m/s^2)(2.00m)$

$E_g = 39.2J$

6.

$W = \Delta E_K$

$F\Delta d\cos\theta = E_{K2} - E_{K1}$

$F\Delta d\cos\theta = \frac{1}{2}mv_2^2 - \frac{1}{2}mv_1^2$

$F(2.3m)\cos 180^\circ = \frac{1}{2}(1000kg)(10m/s)^2 - \frac{1}{2}(1000kg)(25m/s)^2$

$-F(2.3m) = 50000J - 312500J$

$-F(2.3m) = -262500J$

$F = 1.1 \times 10^5 N$

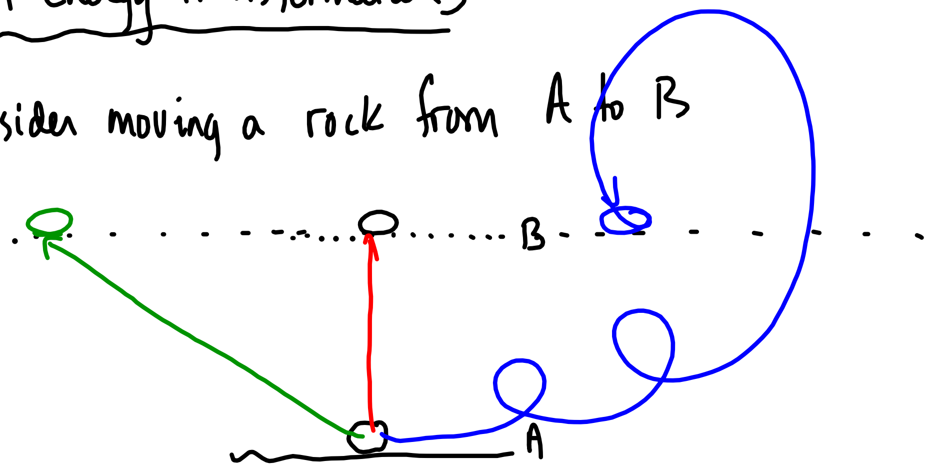
$1 \times 10^5 N$

100 000N

Chapter 7 - Conservation of Energy & Momentum

§7-1 Energy Transformations

Consider moving a rock from A to B

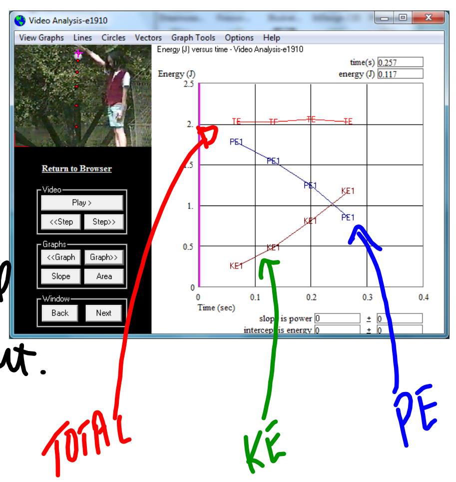


Conservative force - a force that does work on an object in such a way that the path taken does not matter (example -> gravity)

non-conservative force - a force that does work on an object in such a way that the path taken does matter (example -> airresistance / friction)

Law of Conservation of Mechanical Energy

In an isolated system (i.e. no non-conservative forces), the total mechanical energy remains constant.

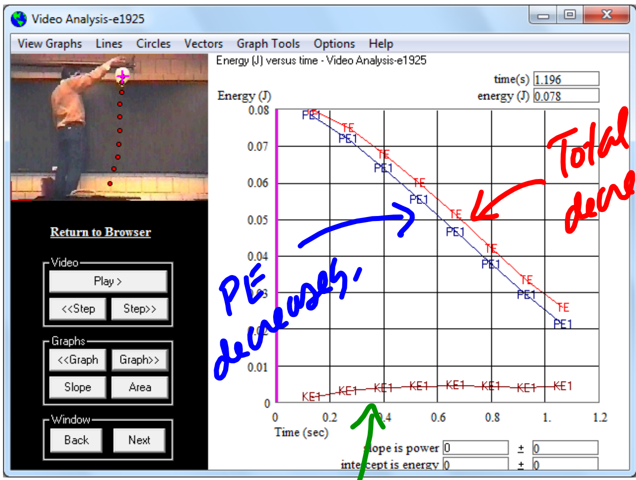


$$E_{total} = E'_{total}$$

(before) (after)

$$E_K + E_g + E_e = E'_K + E'_g + E'_e$$

If a non-conservative force like air resistance is present, then the total mechanical energy is not conserved and decreases.



Total decreases

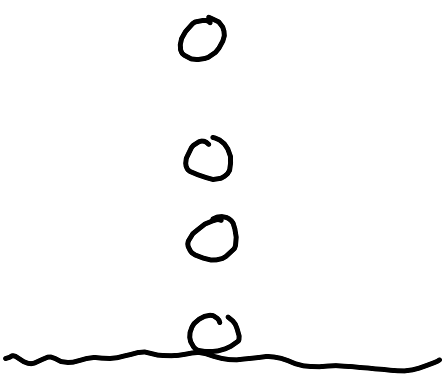
PE decreases

KE is the same (terminal velocity)

Another way to think of the Law of (Conservation of) Mechanical Energy

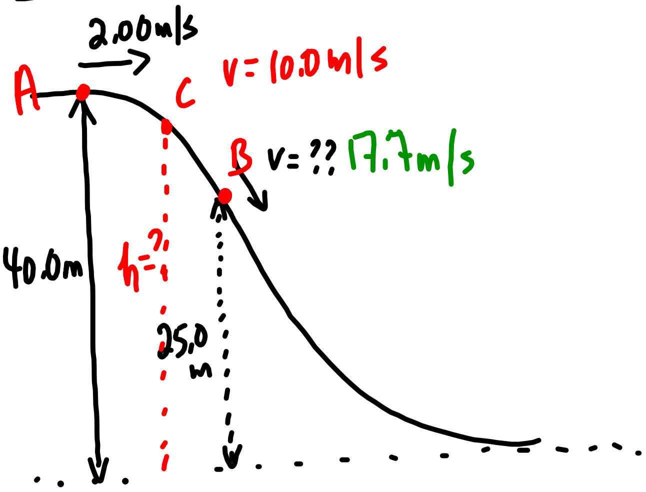
=> a loss in PE equals a gain in KE

If a rocks falls (no air resistance) and it loses 100J of gravitational potential energy, then it must gain 100J of kinetic energy.



$E_g = 250J$	$E_K = 0J$	$E_{TOT} = 250J$
$E_g = 200J$	$E_K = 50J$	$E_{TOT} = 250J$
$E_g = 100J$	$E_K = 150J$	$E_{TOT} = 250J$
$E_g = 0J$	$E_K = 250J$	$E_{TOT} = 250J$

MP|285



Frictionless

→ Law of Cons. of Mechanical Energy.

According to the Law of Conservation of Mechanical Energy

$$E_{total} = E'_{total}$$
$$(A) \qquad (B)$$

$$E_K + E_g = E_K' + E_g'$$

$$\frac{1}{2}\cancel{m}v_A^2 + \cancel{m}gh_A = \frac{1}{2}\cancel{m}v_B^2 + \cancel{m}gh_B$$

$$\frac{1}{2}v_A^2 + gh_A = \frac{1}{2}v_B^2 + gh_B$$

$$\frac{1}{2}(2.00\,m/s)^2 + (9.81\,m/s^2)(40.0\,m) = \frac{1}{2}v_B^2 + (9.81\,m/s^2)(25.0\,m)$$

$$2.00\,\frac{m^2}{s^2} + 392.4\,\frac{m^2}{s^2} = \frac{1}{2}v_B^2 + 245.25\,\frac{m^2}{s^2}$$

$$394.4\,\frac{m^2}{s^2} = \frac{1}{2}v_B^2 + 245.25\,\frac{m^2}{s^2}$$

$$149.15\,\frac{m^2}{s^2} = \frac{1}{2}v_B^2$$

$$298.3\,\frac{m^2}{s^2} = v_B^2$$

$$\boxed{v_B = 17.3\,m/s}$$

b) $E_{total} = E'_{total}$

$(A) \qquad (C)$

$$E_K + E_g = E_K' + E_g'$$

$$\frac{1}{2}\cancel{m}v_A^2 + \cancel{m}gh_A = \frac{1}{2}\cancel{m}v_C^2 + \cancel{m}gh_C$$

$$\frac{1}{2}v_A^2 + gh_A = \frac{1}{2}v_C^2 + gh_C \; ??$$

finish

TO DO: PP|287|1-3