ENERGY

- KINETIC ENERGY
- POTENTIAL ENERGY

KINETIC ENERGY

STATE OF MOTION OF AN OBJECT.

$$KE = \frac{1}{2} m v^2$$

m = MASS (kg)

V = VELOCITY (m/s)

UNIT – JOULES (J)

Pb A LOCOMOTIVE IS MOVING AT 0.26 m/s^2 ACCELERATION AND IT IS WEIGHED 1.2×10^6 N. WHAT IS KINETIC ENERGY? IT MOVES FOR 3.2×10^3 m.

$$v^2 = u^2 + 2as$$

$$v^2 = 0^2 + 2 \times 0.26 \times 3.2 \times 10^3$$

$$v^2 = 2 \times 0.26 \times 3.2 \times 10^3$$

$$v = \sqrt{2 \times 0.26 \times 3.2 \times 10^3} = 40.8 \text{ m/s}$$

$$f = mg$$

$$1.2 \times 10^6 = m \times 9.81$$

$$m = \frac{1.2 \times 10^6}{9.81} = 1.22 \times 10^5 \text{ kg}$$

$$KE = \frac{1}{2} m v^2$$

$$= \frac{1}{2} \times 1.22 \times 10^5 \times (40.8)^2$$

$$= 2 \times 10^8 \text{ J}$$

$+ 2aS$

$+ \quad 2 \times 0.26 \times 3.2 \times 10^3$

$0.26 \times 3.2 \times 10^3$

$\sqrt{0.26 \times 3.2 \times 10^3} = 40.8 \text{ m/s}$

mg

$m \times 9.81$

$\frac{2 \times 10^6}{9.81} = 1.22 \times 10^5 \text{ kg}$

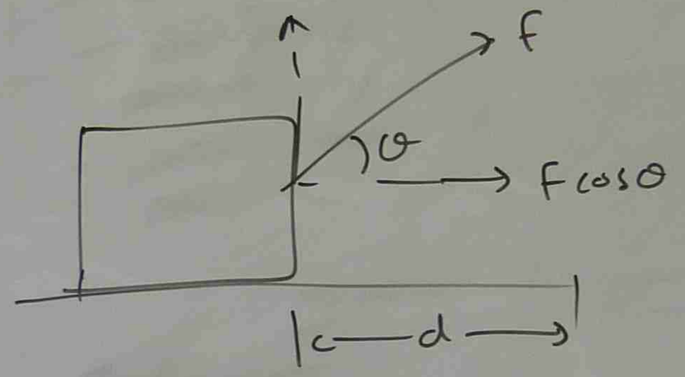
$\frac{mv^2}{2}$

$\frac{1}{2} \times 1.22 \times 10^5 \times (40.8)^2$

$2 \times 10^6 \text{ J}$

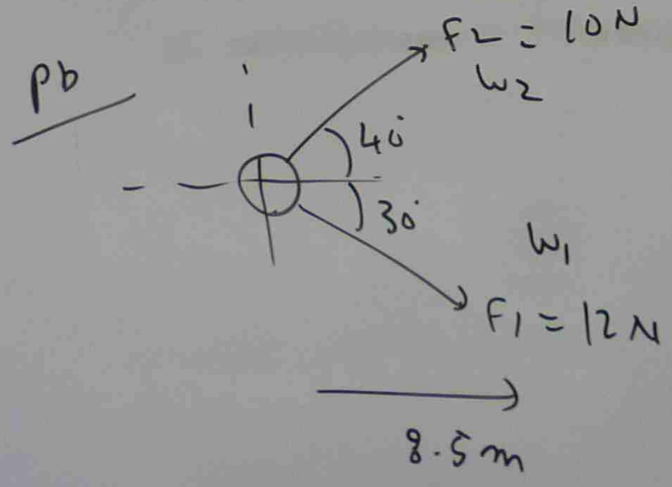
WORK

WORK (W) IS ENERGY TRANSFERRED TO (OR) FROM AN OBJECT BY MEANS OF A FORCE ACTING ON THE OBJECT. ENERGY TRANSFERRED TO THE OBJECT IS POSITIVE WORK, AND ENERGY TRANSFERRED FROM THE OBJECT IS NEGATIVE WORK.



$W = f \cos\theta \times d \quad (J)$

Pb



CALCULATE WORK

$W_1 = F_1 \cos\theta_1 \, d$

$= 12 \cos 30 \times 8.5$

$= 88.33 \text{ J}$

$W_2 = F_2 \cos\theta_2 \, d$

$= 10 \cos 40 \times 8.5$

$= 65.11 \text{ J}$

$W_T = W_1 + W_2$

$= 88.33 + 65.11$

$= 153 \text{ J}$

ph THE WORK DONE IS 153.4 J, MASS IS 225 kg, CALCULATE VELOCITY.

$$\frac{1}{2} m v^2 = W$$

$$\frac{1}{2} \times 225 \times v^2 = 153.4$$

$$v^2 = \frac{2 \times 153.4}{225}$$

$$v = \sqrt{\frac{2 \times 153.4}{225}}$$

$$= 1.17 \text{ m/s}$$

ph

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SPRING

K f

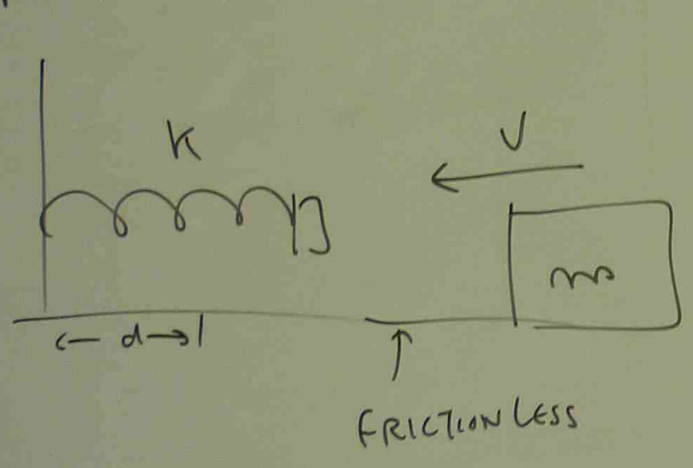
FINAL

KINETIC

ENERGY

...CULATE VELOCITY.

pb A CUMIN CANISTER of MASS $m = 0.40\ kg$ SLIDES ACROSS A HORIZONTAL FRICTIONLESS COUNTER WITH SPEED $V = 0.5\ m/s$. IT THEN RUNS INTO AND COMPRESSES A SPRING of SPRING CONSTANT $K = 750\ N/m$. CALCULATE THE DISTANCE THE SPRING IS COMPRESSED.



$$K_f - K_i = -\frac{1}{2} K d^2$$

K_f: FINAL KINETIC ENERGY

K_i: INITIAL KINETIC ENERGY

$$KE = \frac{1}{2} m v^2$$

$v_f = 0$

$v_i = 0.5\ m/s$

$$\frac{1}{2} m v_f^2 - \frac{1}{2} m v_i^2 = -\frac{1}{2} \times 750 \times d^2$$

$$\frac{1}{2} \times m \times 0^2 - \frac{1}{2} m \times (0.5)^2 = -\frac{1}{2} \times 750 \times d^2$$

$$-\frac{1}{2} \times 0.4 \times 0.5^2 = -\frac{1}{2} \times 750 \times d^2$$

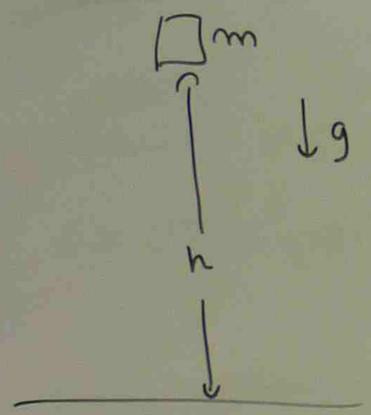
$$0.4 \times 0.5^2 = 750\, d^2$$

$$d = \sqrt{\frac{0.4 \times 0.5^2}{750}} = 1.2 \times 10^{-2}\ m = 1.2\ cm$$

POTENT...

PE = pote...

POTENTIAL ENERGY



PE = POTENTIAL ENERGY = mgh

CONSERVATION OF MECHANICAL ENERGY

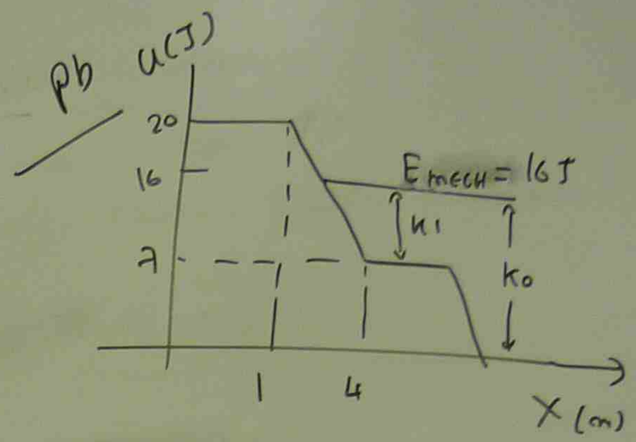
$$E_{MECH} = K + U$$

E_{MECH} = MECHANICAL ENERGY

K = KINETIC ENERGY

U = POTENTIAL ENERGY

Pb



CALCULATE FORCE FOR GIVEN ENERGY CHANGE GRAPH.

$$\text{FORCE} = \frac{\text{CHANGE OF ENERGY}}{\text{CHANGE OF DISTANCE}}$$

$$= \frac{20-7}{1-4} = \frac{13}{-3} = -4.3\ N$$

Pb