

CONCEPT: ELASTIC (SPRING) POTENTIAL ENERGY

- Just like objects "STORE" energy when lifted to a height (U_g), springs store energy when compressed/stretched (_____):

Gravitational Potential Energy

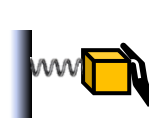
m

$$W_g = -mg\Delta y = -\Delta U_g$$

$$U_g = mgy$$

(Work by Gravity = change in Grav Pot. Energy)

Elastic Potential Energy



$$W_s = -\frac{1}{2}kx^2 = \underline{\hspace{2cm}}$$

$$U_{el} = \underline{\hspace{2cm}}$$

(Work by Spring = change in Spring Pot. Energy)

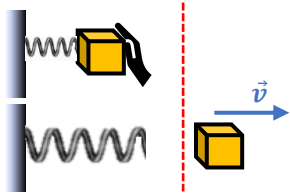
Mechanical Energy		
Kinetic	Potential	
	Elastic	Gravitational

- These 2 energies are the same TYPE, so we combine them in the Conservation of Energy Equation

$$K_i + U_i + W_{NC} = K_f + U_f$$

$$U = \underline{\hspace{2cm}}$$

EXAMPLE: A 4kg block is attached to a spring on a smooth, horizontal surface. The spring constant $k = 500 \text{ N/m}$. You push the block with a force of 100N. (a) Calculate the compression distance of the spring. (b) You release the spring and the box accelerates to the right. Calculate its launch speed.



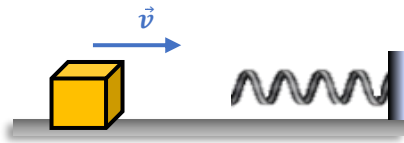
CONSERVATION OF ENERGY

- 1) Draw Diagram
- 2) Write Cons. of Energy EQ
- 3) Eliminate & expand terms
- 4) Solve

- In spring problems where objects are STATIONARY, solve by using _____
- If objects are MOVING between two points (initial $\rightarrow$ final), solve by using _____ (because $F \neq \text{constant!}$)

PROBLEM: A 4-kg block moving on a frictionless, horizontal surface with 20 m/s strikes a massless, horizontal spring of force constant 600 N/m. Calculate the maximum distance that the block will compress the spring by.

- A) $\Delta x = 0.365$ m
- B) $\Delta x = 1.63$ m
- C) $\Delta x = 2.00$ m
- D) $\Delta x = 2.67$ m



CONSERVATION OF ENERGY
1) Draw Diagram
2) Write Cons. of Energy EQ
3) Eliminate & expand terms
4) Solve

PRACTICE: A 4-kg block moving on a flat surface strikes a massless, horizontal spring of force constant 600 N/m with a 20 m/s. The block-surface coefficient of friction is 0.5. Calculate the maximum compression that the spring will experience.

