

Work and Kinetic Energy

Applying a force on an object through a certain displacement increases its **energy**. In this case, we say that **work** was performed on the object.

(Work = Force x Displacement)

Any moving object has some energy associated with its movement. We call this the **Kinetic Energy**.

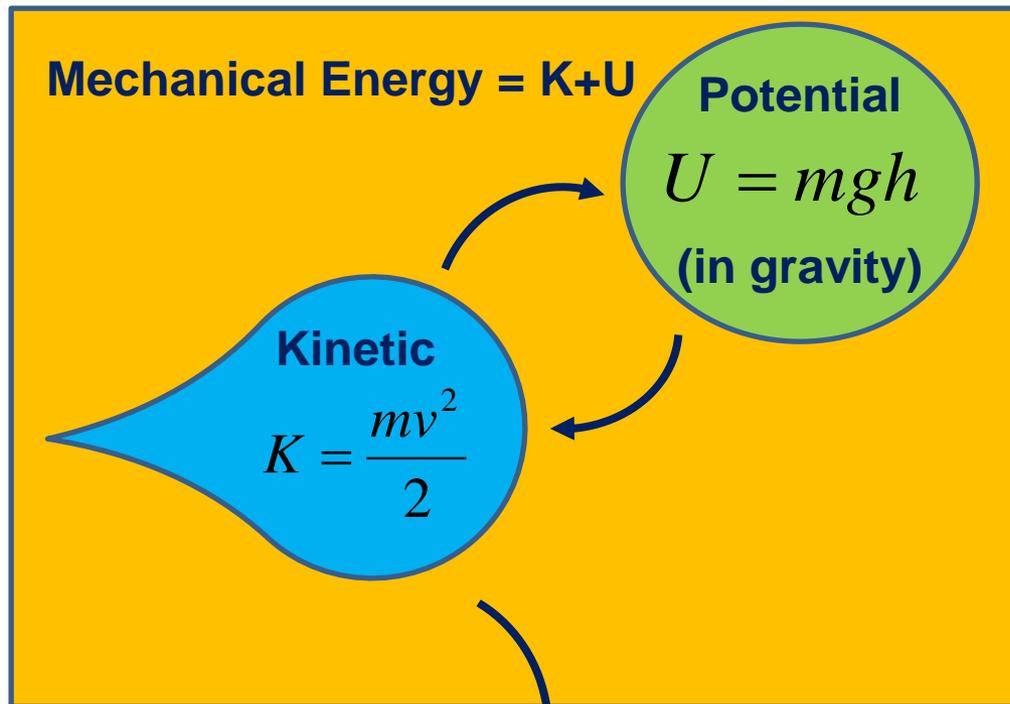
“Change in **kinetic energy** is equal to the **mechanical work** done by all forces”

$$\Delta K = W$$

$$K = \frac{m v^2}{2} \quad \text{---> Kinetic Energy}$$

$$W = F \Delta x \quad \text{---> Work}$$

Mechanical Energy and Work



Change in Energy = Work

$$W = F\Delta x$$

Unit of Energy & Work is called Joule (J)

$$1J = 1N \cdot m = 1 \frac{kg \cdot m^2}{s^2}$$

Homework

Problem 1. a) In cliff diving, people jump from a high cliff to the sea. Suppose that John falls down from a 30m tall cliff. Through his way down, gravity is doing work on John. Given that John has a mass of 70Kg, find the total work done by gravity on John. Neglect air resistance.

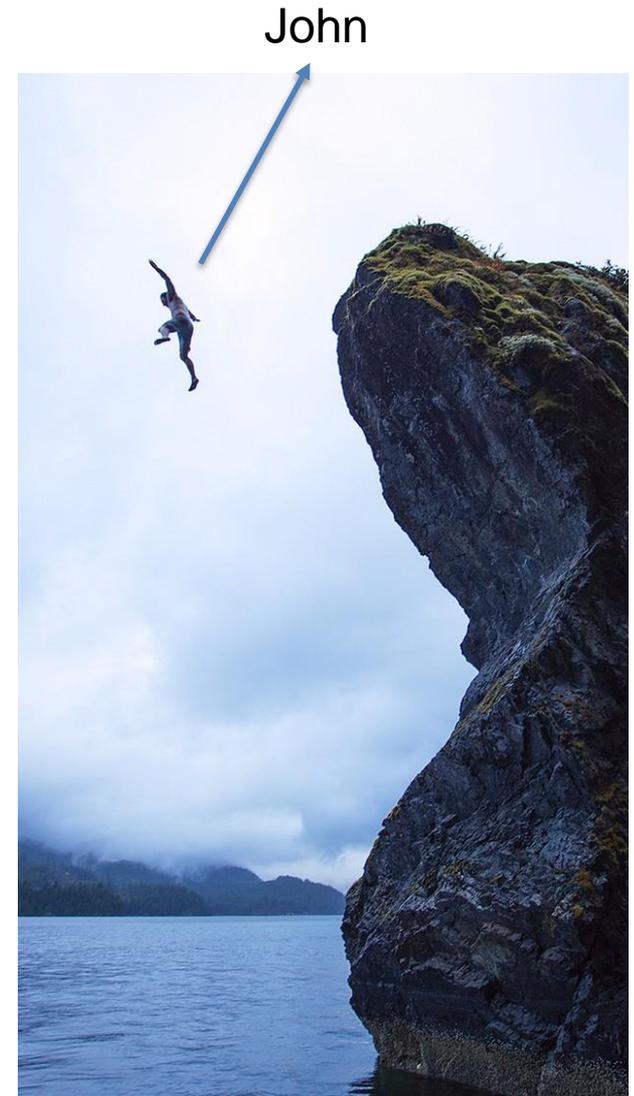
Hint: Recall that $W = F \Delta x$.

Problem 1. b) What speed will John have right before he touches the water, assuming he started his fall at rest ($v=0$ m/s)?

Hint 1: Recall that the change of kinetic energy K of an object is equal to the work W performed on the object.

Hint 2: Recall that the kinetic energy of an object is

given by $K = \frac{m v^2}{2}$



Problem 2. Kingda Ka, the highest roller coaster in the world, has a drop of 140m. Imagine the roller coaster follows the trajectory pictured below, and neglect any friction or air resistance (energy is constant).

a) What is the speed of the roller coaster on points A and B?

- Hint 1: The loss of potential energy will be gained as kinetic energy.
- Hint 2: You do not need to know the mass of the roller coaster to solve this problem.

problem.

b) Bonus: The roller coaster will try to climb back up to point C. What is the highest point that the roller coaster could get to?

