Energy

Jarrick, Faith, Saro and Gaby

What is it?

Energy is the ability to do work

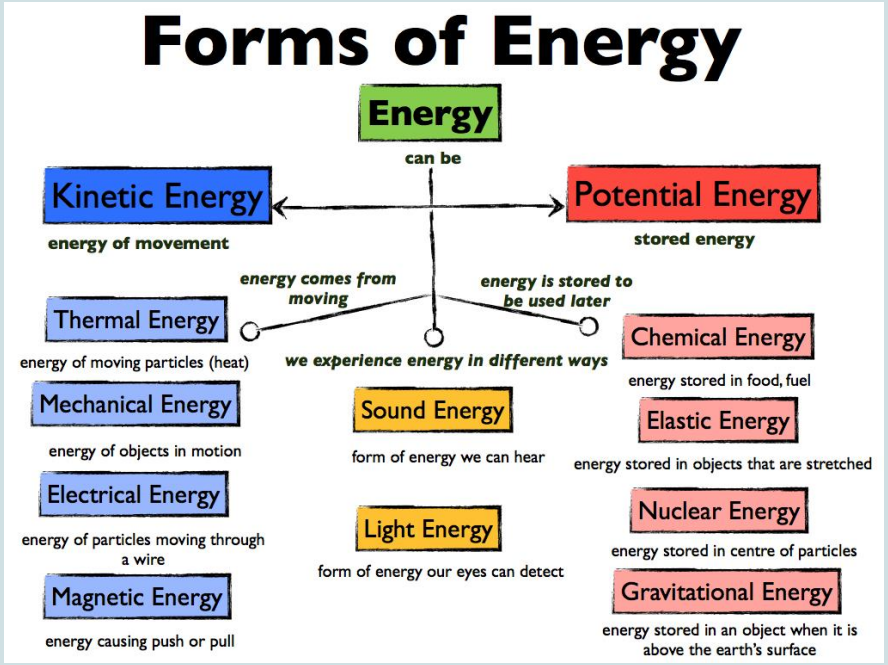
Energy is a scalar quantity

Energy is conserved- it can be neither created nor destroyed

Measured in the Joule (J)

Forms of Energy

- Kinetic/Mechanical
- Gravitational
- Elastic
- Heat
- Chemical
- Electrical
- Nuclear
- Mass



Work

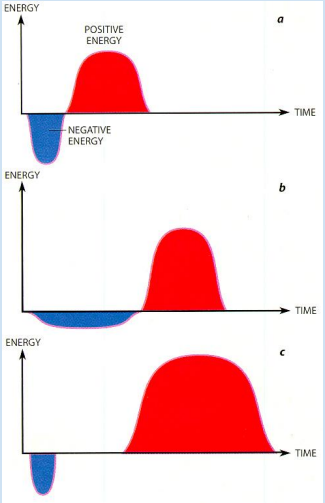
Work is the energy needed to move an object through some displacement.

$W = F \parallel d$

It is Force parallel because the force acting parallel is the only force doing “work”

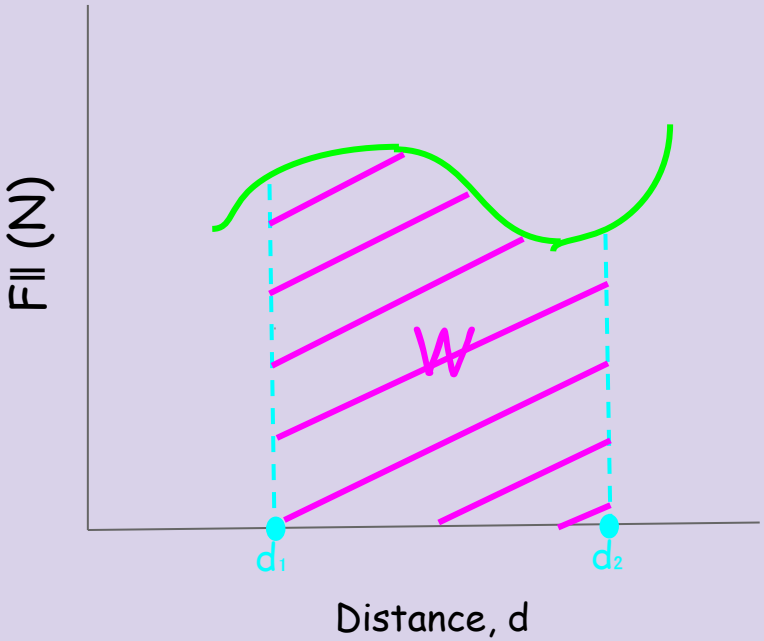
Negative Energy

- Certain forces do work against motion
- The most common of these negative working forces is Friction
- You can also think of this in terms of energy
  - Energy put into the system is positive
  - Energy taken out of the system is negative



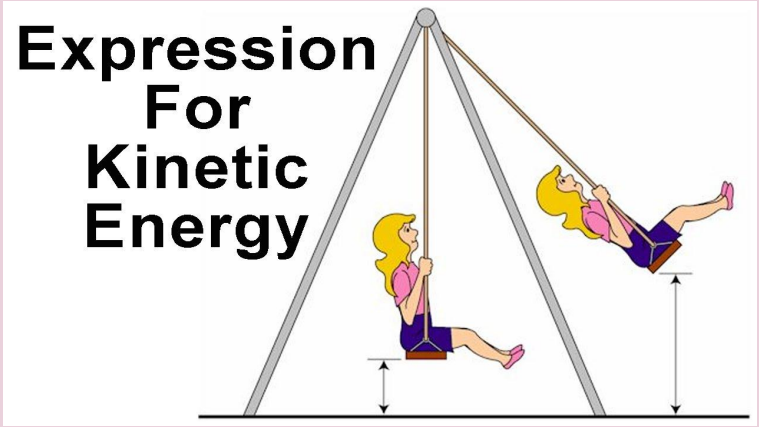
Work and varying forces

- Certain forces like that on a stretched spring or those unevenly applied, cannot be found the same way
- For these forces we can use a graph



Kinetic Energy

- What is Kinetic Energy?
- Kinetic Energy is the energy of motion
- KE=1/2mv2



EXAMPLE #1

Question: What is the Kinetic energy of a Honda CRV moving at 60 km/hr and with a mass of 75 kg?

Answer:

$$60 \text{ km/hr} \times \frac{1000\text{m}}{1\text{ km}} \left| \frac{1\text{ hr}}{3600\text{s}} \right| = 16.7 \text{ m/s}$$

$$KE = \tfrac{1}{2} mv^2$$

$$KE = \tfrac{1}{2} (75 \text{ kg}) (16.7 \text{ m/s})^2 = 20917 \text{ J}$$

20.9 KJ

COMMON ERROR: The unit for Kinetic Energy is Joules, which converts to $kg \times m^2/s^2$, therefore you must remember to convert the velocity if it is not already in m/s, like this problem, where its given in km/hr.

Work Energy theorem

$W_{net} = KE_f - KE_i$

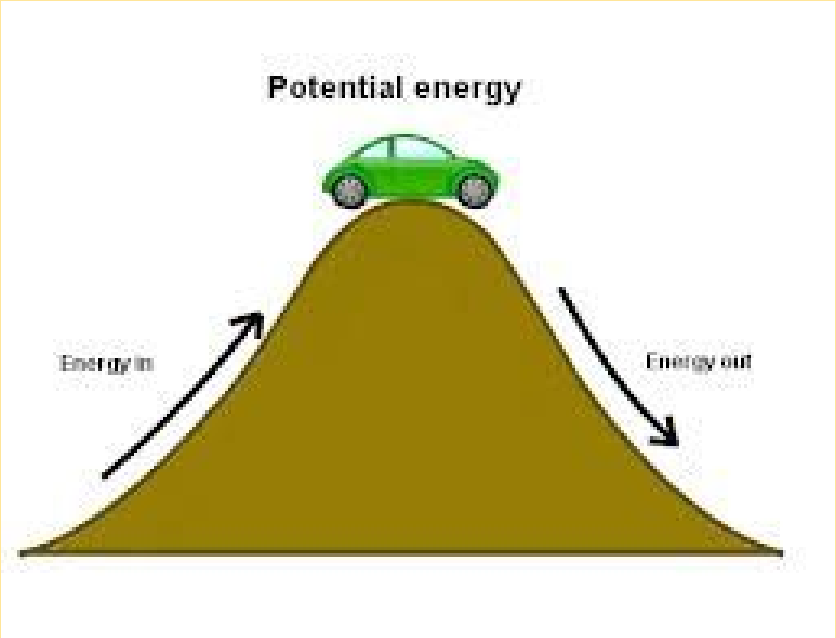
$W_{net} = \Delta KE$

*the net work done on an object is equal to the change in kinetic energy

Potential Energy

How much energy an object has as a result of position or configuration

Ex: a car at the top of a hll



Gravitational Potential Energy

- $PE_g = mgh$
- $W_g = -\Delta PE_g$

- m= mass of the object in kg
- G= gravitational acceleration= 9.81 m/s^2
- h= height the object is from the ground
  - The work done by gravity depends upon the vertical height

What energy borrows from other units...

- Uses the quantities of force to calcualte work
  - W=F // xd
- Force of gravity = 9.81m/squared

Common mistakes

- Forgetting to convert kg/hr into m/s
- Forgetting to realize that it is only the **force parallel** times the displacement when solving for work
- Mixing up which forces are conservative (gravity) versus nonconservative (Friction)

How to avoid them?

Always double check units
Make sure you have the correct formula

How to tackle Free-response questions

1. First identify everything you know
2. Identify everything you don't know
3. Choose your equation based on your variables
4. Make sure all of your units are properly converted
5. Solve!

https://play.kahoot.it/#/k/4f47697d-644a-4ee-90bc-d90a96b412da