Work and Energy

1. Define work in terms in terms of physics

    In physics work is the product of the net force applied to an object and the displacement that the force moves the object.

    Work is a mechanism that transfers energy to or from an object for later use.

Number 2:

In order to do work on an object, the force & the displacement must be in the __same__ direction.

Remember, from above, work transfers energy from one object to another.

Consider a box pulled to the right with a constant force. Is work being done on the box?

Number 3:

Work is a scalar, but it does have a sign.

Work is positive when done in the direction of the displacement.

Work is negative when done in the opposite direction of the displacement.

<u>Numbers 4 & 5:</u>

What is the equation for work?

$$W = F \, x \, d$$

The Units for work is a Joule (J)

A Joule is actually a N·m, and is a derived unit named after James Joule.

One Joule of work is done when a force of 1 Newton moves an abjsct 1 meter.

a. If you lift a 2.0 N book the top of a shelf 2.0 m high, how much work have you done?

$$W = f \, x \, d$$

$$W = 2.0 \, N \; x \; 2.0 \, m \; = 4.0 \, \text{Joules}$$

b. As you carry a 15 N book bag down the hall for 25 m at constant velocity, how much work have you done?

$$W = f \; x \; d$$

$$W = 0$$

No work is done because the displacement is not in the direction of the applied force.

c. You , push against a big rock all day long and it doesn't move, much work have you done?

$$W = f \; x \; d$$

$$W = f \; x \; 0$$

No work is done because there is no displacement.

Number 6:

What is energy?

The Greek word *en* means "in".

The Greek word for "work "is *ergon*.

Therefore "work in" is energon,

and in English, energy.

Number 6:

It isn't all that easy to define what energy is.

From Greek, it is work in, in other words, one can say that energy "stores work" for later use.

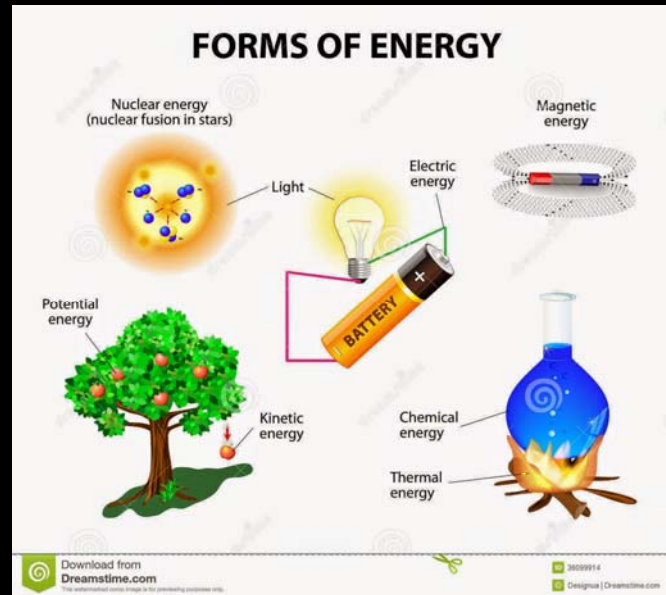Another common definition is that energy is the ability to do work.

Number 7 & 8:

What some types of Energy?

What are the types of Mechanical Energy?

Potential (Gravitational)

Kinetic

FORMS OF ENERGY

Nuclear energy (nuclear fusion in stars)

Magnetic energy

Light

Electric energy

Potential energy

BATTERY

Kinetic energy

Chemical energy

Thermal energy

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Number 9:

What type of energy is stored by virtue of an object's position?

Potential

What is the equation for Gravitational Potential Energy?

$$PE = mgh$$

Number 10:

What type of energy is associated with the motion of an object?

Kinetic

What is the equation for Kinetic Energy?

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

11. What is TME?

TME = Total Mechanical Energy

$$TME = PE + KE$$

c.. What is the potential energy of a 0.4 kg can of soup that is on a 1.5 m high shelf?

$$PE = mgh$$

$$PE = 0.4 * 9.8 * 1.5 = 5.88\ J$$

d. What is the kinetic energy of the 0.4 kg can of soup that is rolling across the floor at 4.0 m/s?

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

$$KE = \frac{1}{2}\ (0.4)\ 4^2 = 3.2\ J$$