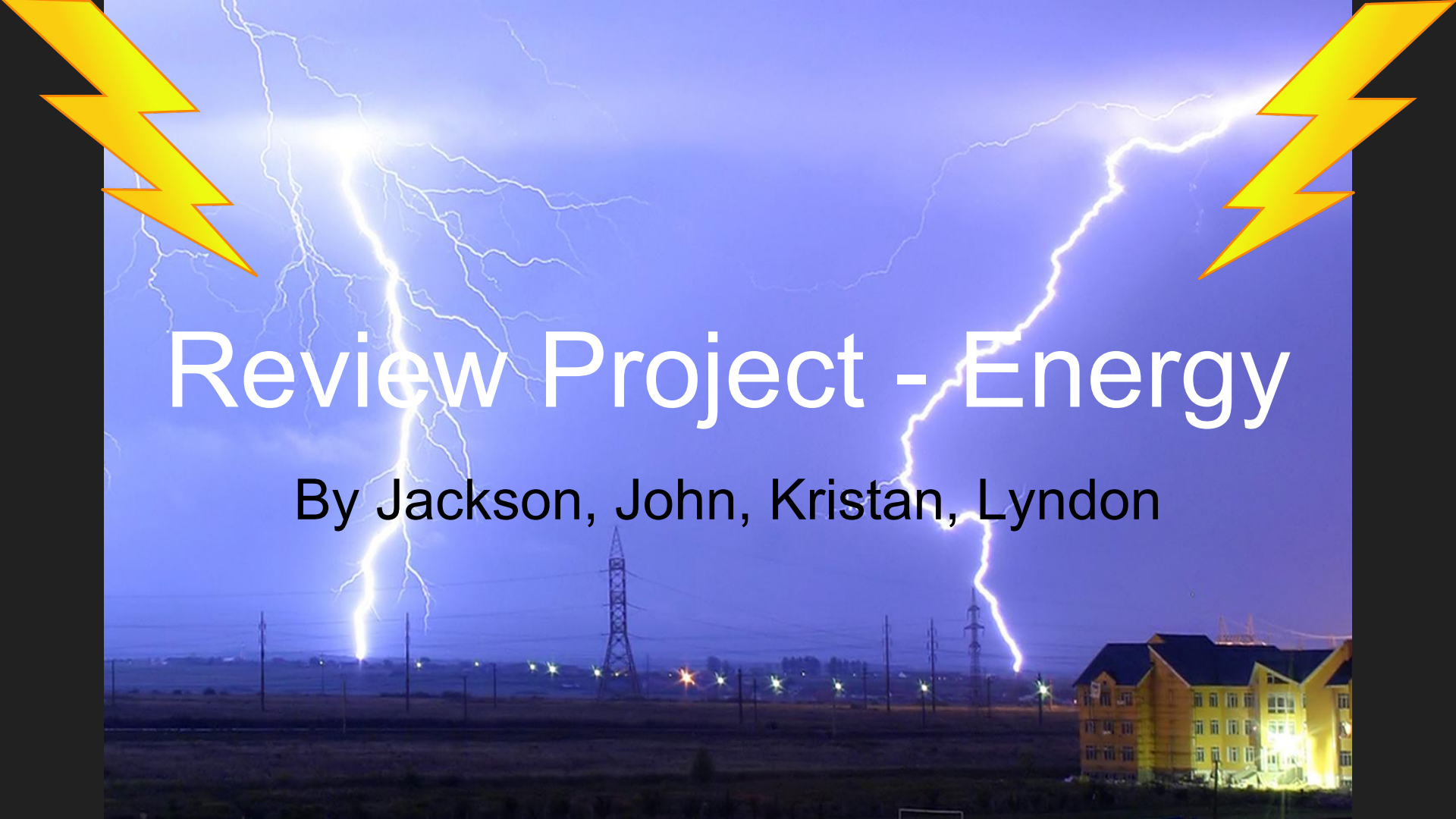

Review Project - Energy

By Jackson, John, Kristan, Lyndon

Equations to Know

$W = F_{||} d$

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

$PE_{grav} = mgh$

$PE_{elastic} = \frac{1}{2} kx^2$

$E = KE + PE$

$MA = F_{out} / F_{in} \quad (= L_{in}/L_{out}) \; (= L/h) \; (= n) \; (= d_{in}/d_{out})$

$Eff. = W_{out}/W_{in}$

$W_{net} = \Delta KE$

$E = mc^2$

Work

Work is the ability to move matter, especially against opposing forces like friction and gravity.

$W = F||d$

Units- Joules (J)

Work is measured in Joules.

A Joule is equal to the work done by the force of one Newton

Unit- Watt (w)

A Watt is one Joule per second so can be used to measure the rate of energy transfer over time.

Such as in electronic machines found in most homes like microwaves and lamps.

Kinetic Energy

Energy that a body possesses by virtue of being in motion.

KE=1/2mv^2

Gravitational Potential Energy

Gravitational potential energy is energy an object possesses because of its position in a gravitational field.

$PE=mgh$

Elastic Potential Energy

Elastic potential energy is Potential energy stored as a result of deformation of an elastic object, such as the stretching of a spring.

$PE=1/2kx^2$

Energy Examples

- Nuclear
- Coal
- Hydro
- Solar
- Biomass
- Propane

Common Misconceptions

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“Things use up energy” - like batteries

“Doubling the speed of a moving object doubles its kinetic energy”

“Gravitational Potential Energy relies on Gravity only”

“An Object at rest has no potential energy”

Misconception Refutations

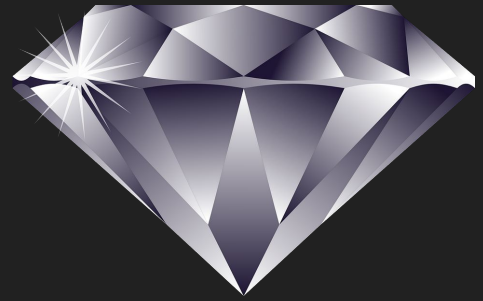
“Things use up energy” - like batteries

Actually, energy is conserved and cannot be created nor destroyed, so even if energy appears to be lost at some point it was let off as light or heat energy

“Doubling the speed of a moving object doubles its kinetic energy”

KE=1/2mv^2, the quantity of the velocity is squared so in reality is quadruples

Misconception Refutations cont.



“Gravitational Potential Energy relies on Gravity only”

PE_{grav} = mgh The quantity of the potential energy relies on mass and height, and gravity

“An Object at rest has no potential energy”

This is false because even if an object is at rest it still has gravitational potential energy, the only reason it does not convert into kinetic is because the object is being held up by an equal normal force to the object

Strategies for Answering FRQs

Using a pulley system with 4 pulleys, a lumberjack lifts a 2500 newton log upwards 5 meters

How much rope did the lumberjack pull?

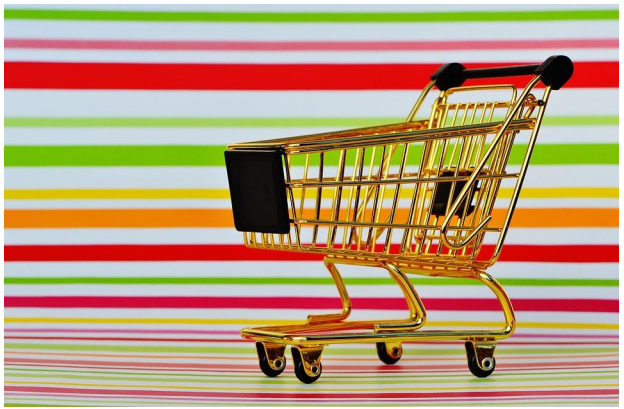
What is it asking for? (d_{in}) What do you know? MA = the number of pulleys (4) d_{out}= 5 meters. Equations with all those variables? MA= d_{in}/d_{out}

Repeat this process for all FRQ Questions, What is it asking for, what do you know, and what equation has all of those variables included in it. Disclaimer: Some questions may not have all of the variables you want, in that case, you will have to use other formulas to find the variable that you need

Problems

You apply 20 N of force horizontally to move a grocery cart 100 cm. How much work is applied?

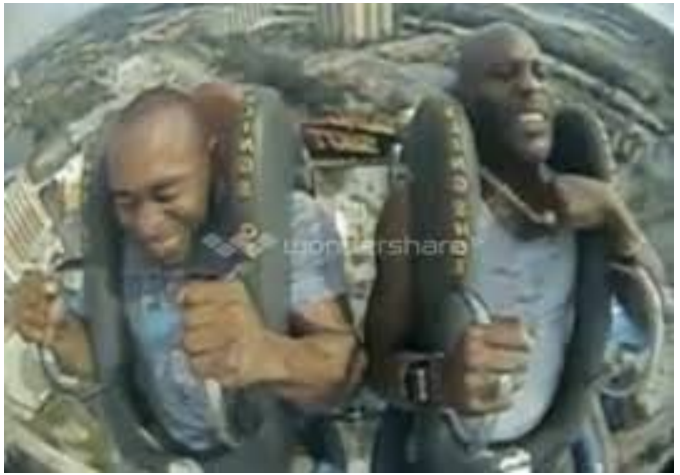
a. 200 J
b. 20 J
c. 200 W
d. 20 W



Problems cont.

A roller coaster has a potential energy of 600 J at the top. How much Kinetic Energy does it have at the bottom?

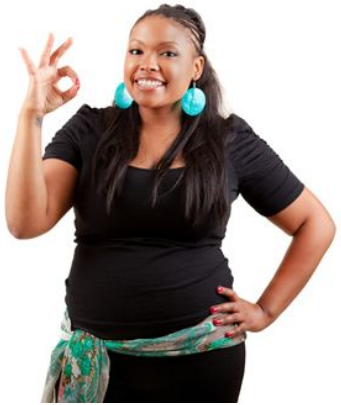
a. 600 KJ
b. 600 J
c. 60 J
d. 6 J



Problems cont.

A machine has an input force of 100 N to produce 1000 N. What is the mechanical advantage of this machine?

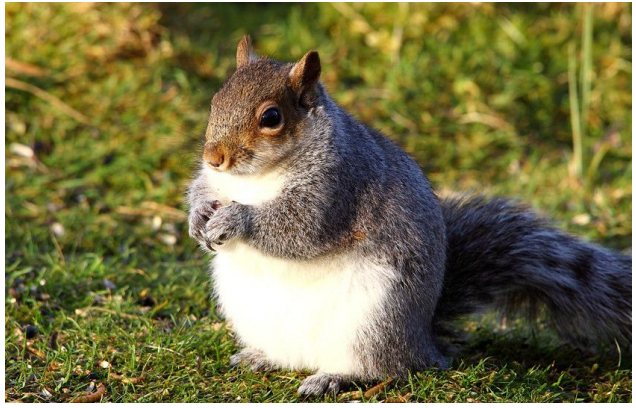
a. 1
b. 10
c. 11
d. 100



Problems cont.

While training for breeding season, a 380 gram male squirrel does 32 pushups in a minute, displacing its center of mass by a distance of 8.5 cm for each pushup. Determine the total work done on the squirrel while moving upward (32 times).

a. 1 J
b. 10. J
c. 100 J
d. 11 J



Problems cont.

Determine the kinetic energy of a 625-kg roller coaster car that is moving with a speed of 18.3 m/s.

a. 1.05 x 10^5
b. 1.05 x 10^6
c. 1.10 x 10^5
d. 1.10 x 10^6