Name: _____**-Hour** _____

Relativity Notes

weird stuff!

Up until 1905 the laws of motion were based on the theories of _____.

Newton's Laws (inertia, F=ma, action/reaction) work, but only at _____speeds.

_____: Einstein's **Theory of Special Relativity-** At the speed of light: **Length decreases** to zero, **mass increases** to infinity, **time slows** to a stop, and mass can be converted into energy! (General Theory of Relativity published in 1915)

The **speed of light** (c) in a vacuum will always = _____**m/s** _____**miles/s**
Ultimate speed!

Cool Stuff Einstein Predicted:

To an observer:

1) At the speed of light, time _____

If you could travel at the speed of light, you would appear to age slower.

2) At the speed of light, length _____

3) At the speed of light, mass _____

Has this stuff been proven?

Yes! In laboratories such as Fermilab, just outside of Chicago, scientists can accelerate particles to speeds around 99% the speed of light. These fast-moving particles decay _____ _____ and their masses have been found to _____1000's of times!

Einstein's Most Famous Equation: **Remember: K.E. =**

You can continually apply _____ to an object, but there is a limit on _____, so therefore the _____ of an object must increase! _____ and _____ are equivalent. Or: **When you add energy to an object, it's the same as adding mass**

1 gram of matter has more energy contained in it than is used to power Minneapolis for 1 day!

***THE LAST EQUATION OF THE YEAR*:**

E =

m =

c =

How much energy is contained in a penny with a mass of 4 grams?

Name: _____-Hour _____

1. The sun loses 3.92 x 10^{26} J of energy every second as sunlight. How much mass does it lose every second? (4.36 x 10^{9} kg)

2. Imagine you could turn a jar of baby food (46 g) into pure energy.
   a. How much energy would it contain? (4.14 x 10^{15} J)

   b. How long would it power a 100 Watt light bulb in **years**? (Use P = W / Δt) Remember: Work=energy (Energy is just the ability to do work) (1,312,785 years!)

Einstein Article: Relativity Explanation: https://www.youtube.com/watch?v=wteiuxyqtoM

1. Briefly describe the 3rd and 4th papers Einstein published in 1905.

3rd:

4th:

2. Briefly describe Einstein's General Theory of Relativity. (1915)

3. List 2 things you learned about Einstein that you didn't already know.

Einstein's Gravitational Waves detected…

1. What is a gravitation wave?

2. Where did the gravitational waves that have been discovered come from?

3. What did the colliding black holes do to spacetime?

4. When did Einstein first propose the existence of gravitational waves? _____