

Entry number 1 2021-01-24

Division: physical and chemical sciences

Topic: quantum physics

Study: antimatter

Gathered academic sources for research.

<https://home.cern/science/physics/antimatter> 1

<https://www.britannica.com/science/antimatter> 2

<https://newscenter.lbl.gov/2010/11/17/antimatter-atoms/> 3

<https://www.exploratorium.edu/orhttps://www.forbes.com/sites/jillianscudder/2017/03/15/astroquizzical-antihydrogen-annihilation/?sh=f2dcd0819bc2igins/cern/ideas/antimatter.html> 4

<https://www.nature.com/articles/s41586-020-2177-05>

<https://www.nature.com/articles/d41586-020-01117-x6>

<https://www.journals.uchicago.edu/doi/10.1093/bjps/axp0097>

<https://www.particleadventure.org/antimatter.html>8

<https://www.forbes.com/sites/jillianscudder/2017/03/15/astroquizzical-antihydrogen-annihilation/?sh=f2dcd0819bc2> (9)

<https://home.cern/science/accelerators/antiproton-decelerator> (10)

Entry number 2 2021 01 28

Gathered research from sources.

- Antimatter was discovered by british physicist Paul Dirac from his equation that could have the answer as  $x=2$  or  $x=-2$  and that meant that there were particles with the opposite charge than normal ones. that meant for every electron there would be a positron, or a antielectron.(1)
- When antimatter and matter come together they annihilate each other: destroying each other in a blast of gamma energy. (2)
- The ALPHA group successfully stored an antihydrogen atom for the first time. An antihydrogen atom is a positron rotating around a antiproton.(3)
- If an antihydrogen and a hydrogen atom collided in the room you were in, you likely would not notice it and would be fine, except for a miniscule amount of radiation. (9)
- A big mystery in antimatter and matter is that when the big bang happened, there should have been equal amounts of antimatter and matter created, but there is much more matter in the universe than antimatter, why? (4)
- Electrons and positrons were observed in a bubble chamber that made positive charged particles curl right and negative ones curl left, so there would be two spirals curling opposite that would collide and annihilate. (8)
- Antiprotons are created or found in the antiproton decelerator, when they come from a proton beam that hits a block of metal. When they go into the antiproton decelerator, a ring of magnets, they are cooled and ready to be sent into antimatter experiments. (10)

Entry number 3 2021 01 28

Testable question... what would happen if we set an apple made of antimatter on a matter table.

Entry number 4 2021 01 31

Thesis: I think that it would: a) annihilate itself and a section of the table, and b) explode and release enough gamma radiation to kill you.

The equation of energy created in a matter/antimatter collision is the famous  $E=mc^2$  <sup>[2]</sup>

Entry number 5 2021 02 06

<https://www.britannica.com/science/E-mc2-equation>

<https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-numbers-operations/cc-8th-orders-of-magnitude/v/multiplying-multiples-of-powers-of-10>

The mass of the weighed apple and equivalent desk is 0.34 kg

$e=mc^2$  is einstein's equation of relativity. Energy equals mass times speed of light squared. This theory proves that mass and energy are the same entity and can be changed to each other. The equation for my question is  $E = mc^2$

$$E = 0.34 \text{ kg} \times (8.99 \times 10^{16} \text{ m/s})^2$$

$$e = 3.0 \times 10^{16} \text{ kg m/s}^2$$

$$e = 3.0 \times 10^{16} \text{ joules.}$$

This is the amount of energy in an apple of antimatter  $3.1 \times 10^{16}$  joules

note\* this is based on the assumption that weight = mass.

Entry number 6 2021 02 12

Concepts: theory of relativity, annihilation

Results: the explosion of an apple of antimatter and a desk of matter would be massive, larger than the fat man bomb used on Nagasaki. You need to take the weight of the apple, the equivalent weight of the matter it's reacting with, multiply them by the speed of light squared and

you would get the energy of the blast. The explosion of the apple and the equivalent matter would be equivalent to 719 kilotons of tnt.

<http://www.kylesconverter.com/energy,-work,-and-heat/joules-to-tons-of-tnt> the converter i used.

Entry number 7 2021 02 14

I put my work into the slide and learned about citations.