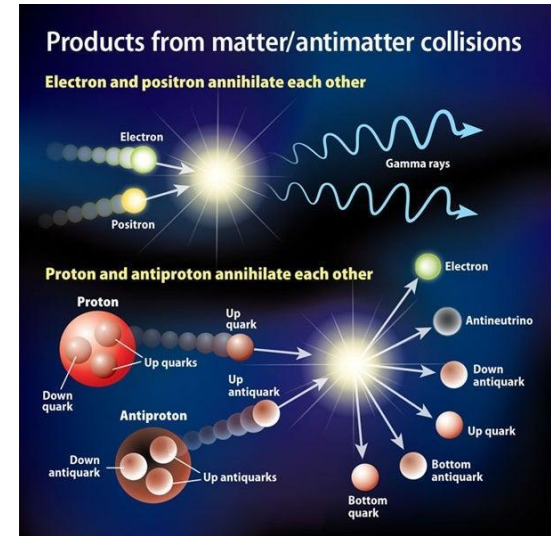


Antimatter Research

HST2024 Study Group 6



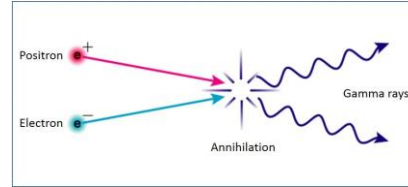
<http://www.astronomy.com>

Curriculum & Classroom Connections

IBDP Physics Curriculum

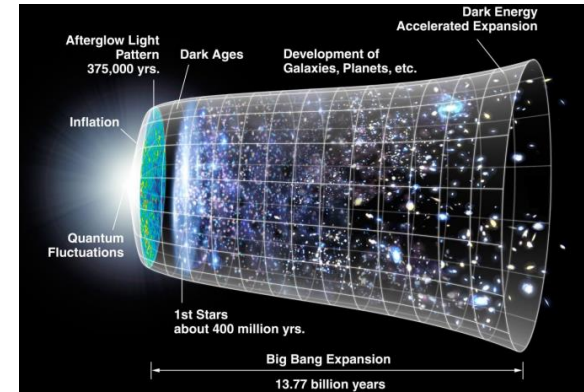
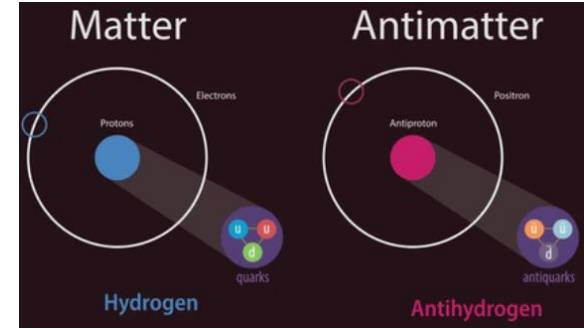
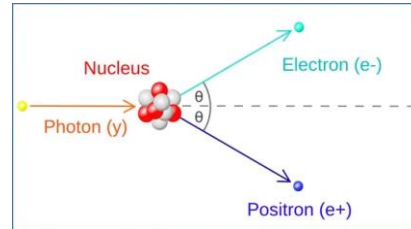
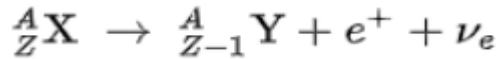
- E.1 Structure of the Atom
- E.3 Radioactive Decay
- E.5 Fusion and Stars

the radioactive decay equations involving $\alpha, \beta^-, \beta^+, \gamma$
the existence of neutrinos ν and antineutrinos $\bar{\nu}$



Turkish Physics Curriculum

- U.1 Introduction to the Atom and Radioactivity
- U.6 Medical imaging (Proton Emission Tomography)



Key Ideas

Antimatter is made of antiparticles which have same mass as particles but have opposite charge.

E.g. **A positron** has the same mass but the opposite charge of an electron.

Cosmic rays collide with atoms in the atmosphere to produce antimatter.

Solar flares create electron-positron pairs, up to 500g antiparticles.

Star



star

If there would be **anti-galaxies**, made of **anti-stars...**

What would they look like? **Stars and anti-stars** emit exactly the same light... because Photons are also Anti-Photons! (no charge)

Finding an **anti-helium or anti-carbon atom** could solve questions about antimatter scarcity

*Annihilation of hydrogen
at CERN*

Conclusion

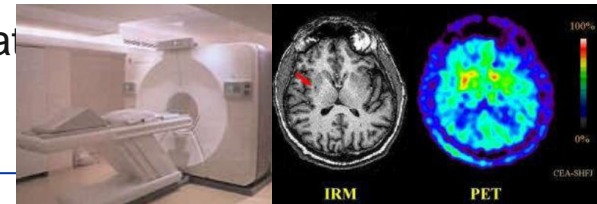
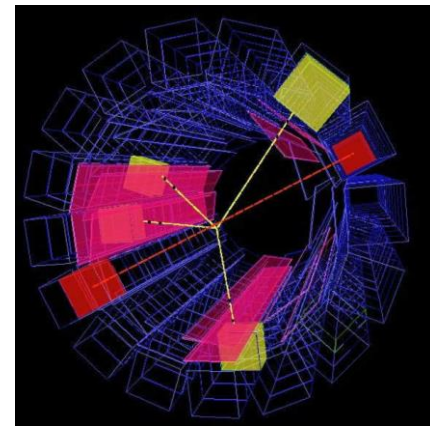
The Universe contains **Antimatter**, which is investigated at **CERN**

Antimatter provides important **information** about physical phenomena.

It also provides information about **cosmological history**.

It could be the key to **new physics!**

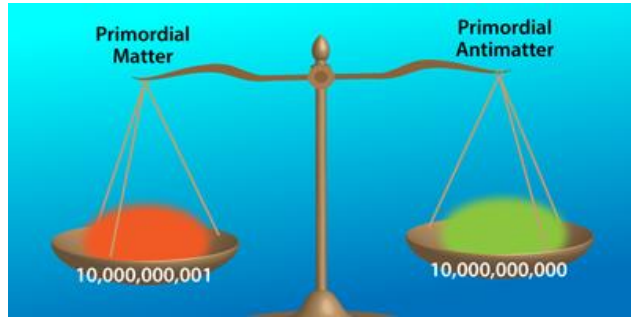
(primary evaporat
Antimatter even



tumors!

Potential Students' Conceptions & Challenges

There is the same amount of antimatter in universe as there is matter.



<https://physics.aps.org/articles/v8/s17>

*Antimatter is same
as dark matter.*



<https://astrobackyard.com/how-big-is-the-universe/>

*Antimatter is only a theoretical term (it does
not exist in reality).*

Useful Material & Resources



CERN Videos on antimatter

<https://www.youtube.com/@CERN/search?query=antimatter>



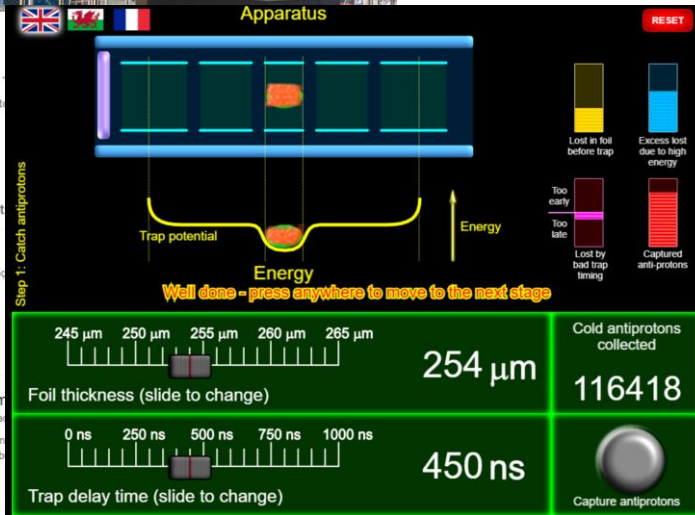
Início Vídeos Shorts Em direto Podcasts



Antimatter
CERN • 16 mil visualizações



The BASE experiment
CERN • 9,7 mil visualizações



Virtual tour to the anti-matter factory

<https://alpha.web.cern.ch/sites/default/files/360-tours/CERN-AD/HD/index.htm>



Hands-on anti-hydrogen trapping

<https://massen.web.cern.ch/hoat/>

Search resources at <https://home.cern/science/physics/antimatter>

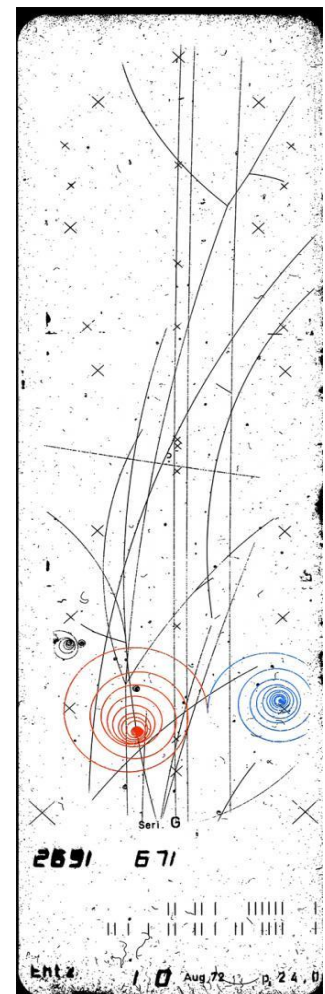
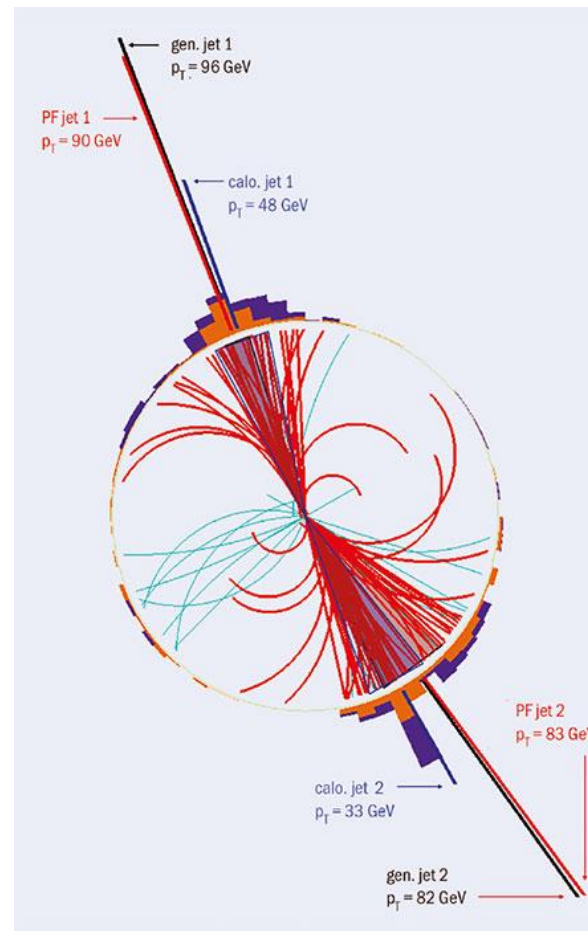
Best Practice Example

When discussing motion of charged particles in a magnetic field, we can distinguish various particles and antiparticles based on charge and mass.

Electrons and positrons will curve in the opposite directions but they will have an equal radius of curvature.

Protons and antiprotons can be distinguished similarly.

Other particles and antiparticles with shorter lifetimes can also be seen.



HST2024 Study Group 6

Valérie (France), Duarte (Portugal), Izel (Turkey), Tomaž (Slovenia), Ray (USA)



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