

Year 12 VCE Physics Muon Questions

Cosmic radiation from distant parts of the universe interacts with oxygen particles in the atmosphere and produces muons.

- Muons are unstable with a half life of approximately $2.2 \mu\text{s}$ ($1 \mu\text{s} = 1 \times 10^{-6} \text{ s}$). Muons travel at approximately $0.995 c$.
- If the number of muons at time $t = 0$ is N_0 and the muons enter the atmosphere at a height of 20000 m , calculate the percentage of muons which reach sea level.
- The calculated value does not agree with empirical research, which detects a much higher number of the original muons reaching the ground. Use the theory of relativity to find how many of the initial muons survive and calculate the half life of the muons in the Earth's frame of reference.

Repeat this question for the following initial conditions. Check your answers by substituting the values into the calculator at <http://hyperphysics.phy-astr.gsu.edu/hbase/Relativ/muon.html>:

