(b)   Muons are particles which are created in the upper atmosphere via cosmic interactions. These particles travel vertically downward to the surface of the Earth at a speed of $0.995c$ where c represents the speed of light in vacuum. When muons are at rest, they have a half-life of $1.56\mu s$. A muon counter is placed at the top of a mountain 2000 m high. The counter records 568 muons in 1 hour.

       (i)   According to classical concepts, what will be the number of muons counted in 1 hour if the counter is placed at the foot of the mountain?   [2 marks]

       (ii)   In a typical experiment, a counter placed at the foot of the mountain record 422 muons in 1 hour. Why does the result of this experiment differ so much from your result in part (i)?   [2 marks]

(iii)   What is the "height" of the mountain according to muons?   [1 mark]

(iv)   While the muons are travelling downward to the earth, another particle also travels in the same direction with speed $0.9995c$. What is the velocity of this particle in the muon's inertial frame?   [2 marks]