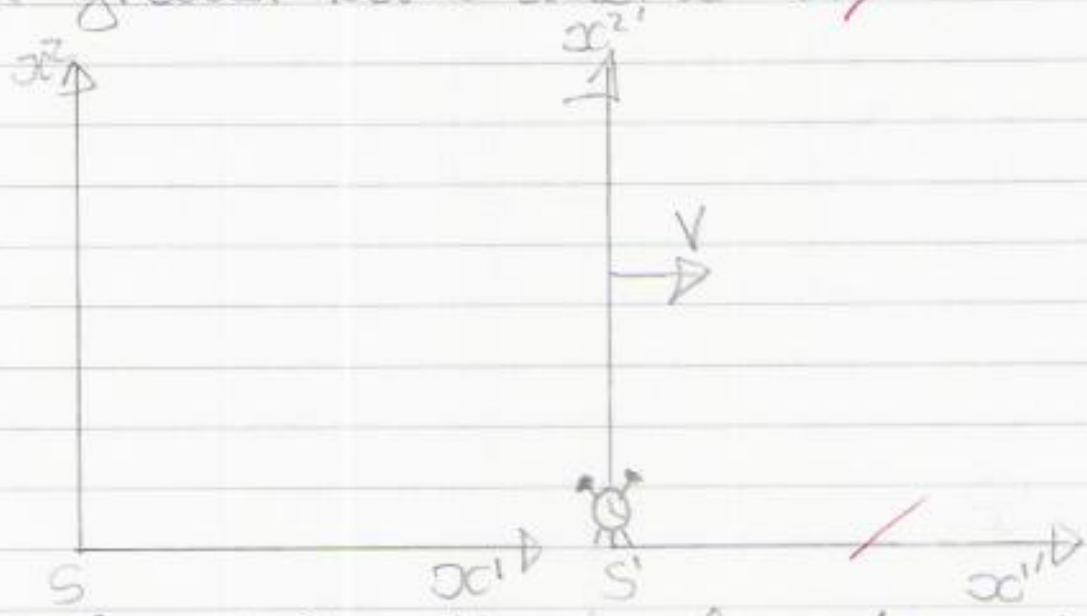
2) i) Time dilation in special relativity is the phenomenon whereby two events, such as successive ticks on a clock, occurring at the same space coordinates in an inertial frame S', which moves with constant velocity V relative to a second inertial frame S, are according to S separated by a greater time interval τ.



The time intervals according to each observer are related by $\tau = \frac{\tau_0}{\sqrt{1-v^2/c^2}}$

Since $\sqrt{1-v^2/c^2} < 1$ for $V > 0$, $\tau > \tau_0$ (c = speed of light).

Time dilation is summed up in the phrase, 'moving clocks run slow'; the time between ticks, 1s according to S', will be greater than 1s according to S.

If an astronaut for example takes a clock and flies off to a distant star system, then turns around and flies back, travelling at constant speed V relative to his stay at home partner, then the time elapsed on his clock will be less than that on a clock kept by his partner by a factor $\sqrt{1-v^2/c^2}$. The faster he travels relative to his partner, the greater will be the