

Question 19 (4 marks)

In one of Einstein's famous thought experiments, a passenger travels on a train that passes through a station at 60% of the speed of light. According to the passenger, the length of the train carriage is 22 m from front to rear. $v = 0.6c$
 $l = 22$

- (a) A light in the train carriage is switched on. Compare the velocity of the light beam as seen by the passenger on the train and a rail worker standing on the station platform. 1

The rail worker sees the velocity of the light travelling slower than the passenger viewing the light

- (b) Calculate the length of the carriage as observed by the rail worker on the station platform. 3

$$l_v = l_0 \sqrt{1 - \frac{v^2}{c^2}}$$

$$v = 0.6c$$

$$l_0 = 22$$

$$= 22 \sqrt{1 - 0.36}$$

$$= 22 \times 0.8$$

$$= 17.6 \text{ m}$$