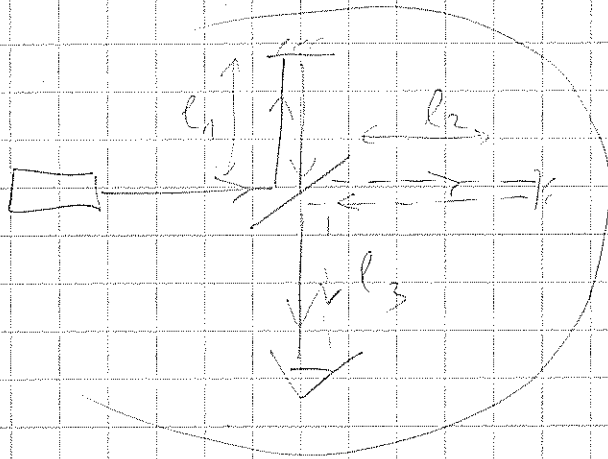


Answer of two questions, 1st

Qn 1:



ASSUME:

(a) moves w/ v w.r.t ether

(b) light moves at c w.r.t ether

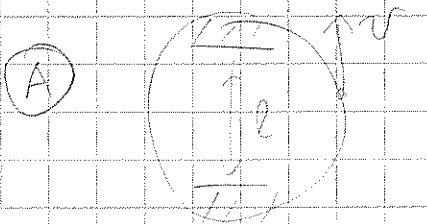
• light ray 1 & 2 will speed different times

(if $l_1 \neq l_2$, even if light same speed in all dir's)

• l_3 doesn't matter (both rays travel same l_3 @ same speed (in the same direction), so cancels out in $\Delta t = t_1 + t_2$ (phase diff $\approx \omega \Delta t$)

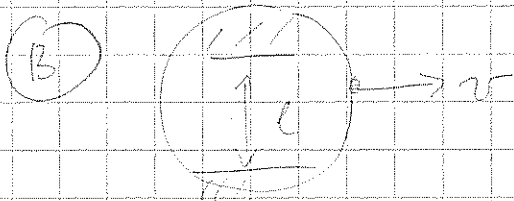
↑
interference

two cases 1st:

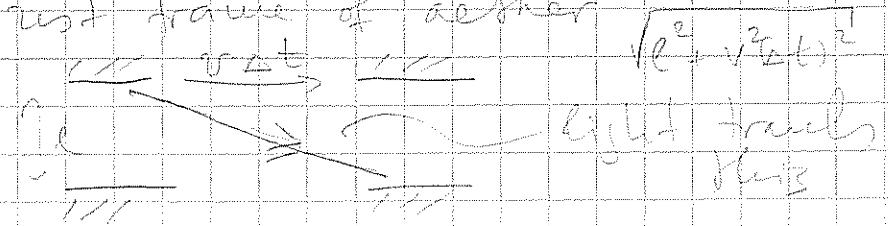


$$\Delta t_A = \frac{l}{c-v} + \frac{l}{c+v} = \frac{2lc}{c^2 - v^2} \approx \frac{2l}{c} \left(1 + \frac{v^2}{c^2} \right)$$

↑ $c-v$ ↓ $c+v$



a bit trickier -- easier in rest frame of ether



$$(c^2 - v^2 t^2)^2$$

so
$$\Delta t_B = \frac{2}{c} \times \sqrt{l^2 + v^2 \left(\frac{\Delta t_B}{2}\right)^2}$$

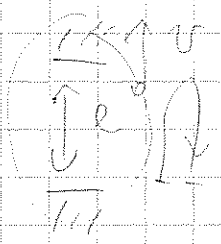
$$\Delta t_B = \frac{2l}{c} \sqrt{1 + \frac{v^2 \Delta t_B^2}{4l^2}}$$

$$\frac{c^2}{4l^2} \Delta t_B^2 = 1 + \frac{v^2}{4l^2} \Delta t_B^2$$

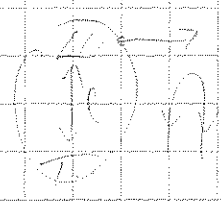
$$\left(\Delta t_B\right)^2 \left(\frac{c}{2l}\right)^2 \left[1 - \frac{v^2}{c^2}\right] = 1$$

$$\Delta t_B = \frac{2l}{c} \sqrt{1 - \frac{v^2}{c^2}}$$

$$\Delta t_B \approx \frac{2l}{c} \left(1 - \frac{v^2}{2c^2}\right)$$

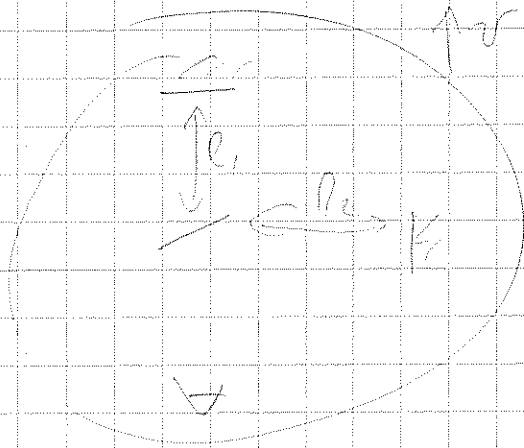


$$\Delta t_A \approx \frac{2l}{c} \left(1 + \frac{v^2}{c^2}\right)$$



$$\Delta t_B \approx \frac{2l}{c} \left(1 - \frac{v^2}{2c^2}\right)$$

Back to M to



$$\Delta t = \Delta t_1 - \Delta t_2$$

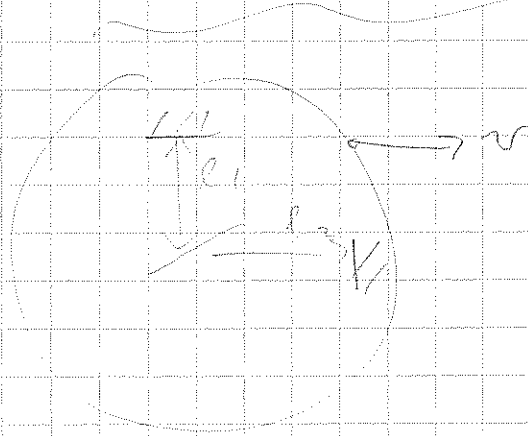
↓ ↓

A B

w/l₁ w/l₂

$$= \frac{2l_1}{c} \left(1 + \frac{v^2}{c^2}\right) - \frac{2l_2}{c} \left(1 - \frac{v^2}{2c^2}\right)$$

$$\Delta t = \frac{2(l_1 - l_2)}{c} + \frac{2l_1 + l_2}{c} \frac{v^2}{c^2}$$



$$\Delta t = \Delta t_1 - \Delta t_2$$

↓ ↓

B w/l₁ A w/l₂

$$= \frac{2l_1}{c} \left(1 - \frac{v^2}{2c^2}\right) - \frac{2l_2}{c} \left(1 + \frac{v^2}{c^2}\right)$$

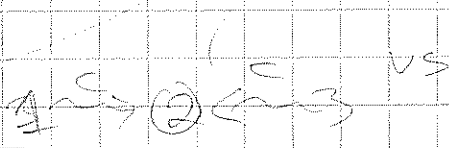
$$\Delta t = \frac{2(l_1 - l_2)}{c} - \frac{l_1 + 2l_2}{c} \frac{v^2}{c^2}$$

even if $l_1 = l_2$ $\Delta t = \left\{ \begin{array}{l} + \frac{3l}{c} \frac{v^2}{c^2} \\ - \frac{3l}{c} \frac{v^2}{c^2} \end{array} \right\}$ if turned at 90° with each other.

if 180° - no matter.

Ques 2:

Why not 2 receiving things at diff times? 7



simultaneous

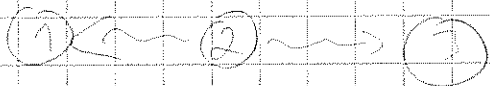


later

earlier

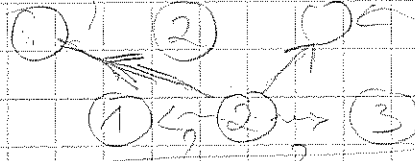
↓ "reverse" let 2 send at t

(2 separate "explodes" in 2. half) no light



received @

same time



earlier receive



similar, earlier