

PHYSICS 122 EXAM I SOLUTIONS

- 1) Destructive interference whenever the two waves arriving at the person differ by an odd number of half wave lengths. That is

$$d_1 - d_2 = (n + \frac{1}{2})\lambda$$

$$d_1 - d_2 = 5 - 4.9 = 0.1$$

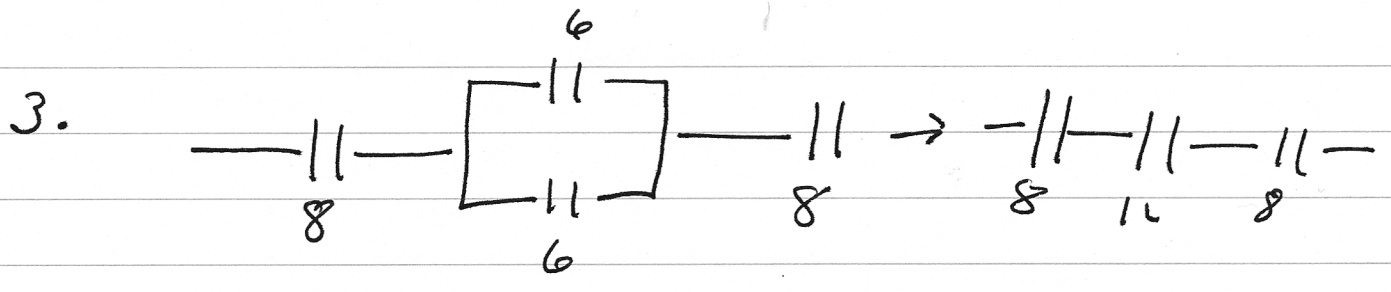
a) $n = 0$ $0.1 = \frac{1}{2}\lambda$, $\lambda = 0.2$

$$f = \frac{330}{0.2} = 1650 \text{ Hz}$$

b) $n = 1$ $0.1 = \frac{3}{2}\lambda$, $\lambda = \frac{0.2}{3}$

$$f = \frac{330}{(\frac{0.2}{3})} = 3 \times 1650 = 4950 \text{ Hz}$$

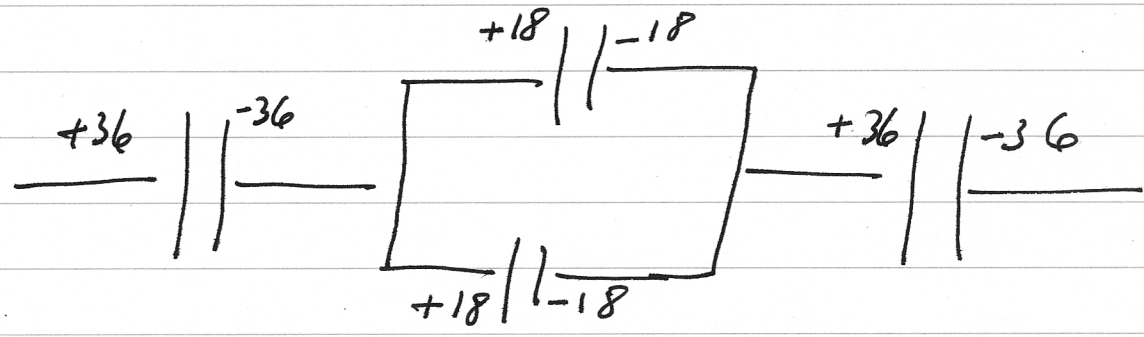
- 2) The pie pans get charged with charges of the same sign. They repel each other & when the repulsion is strong enough, the top pan flies off.



$$\frac{1}{C_{eff}} = \frac{1}{8} + \frac{1}{12} + \frac{1}{8} = \frac{4}{12}, \quad C_{eff} = 3 \mu F$$

Use $Q = C \Delta V \Rightarrow Q = 36 \text{ C}$

This has to be arranged like

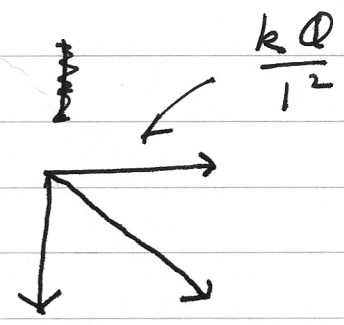


4) Consider the arrangement on left

Field at B = 0 due to cancellation of

the vectors

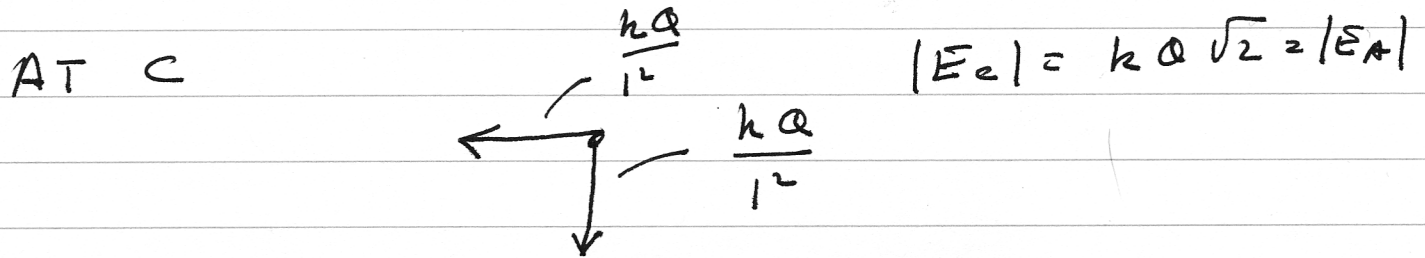
\vec{E} Field at A =



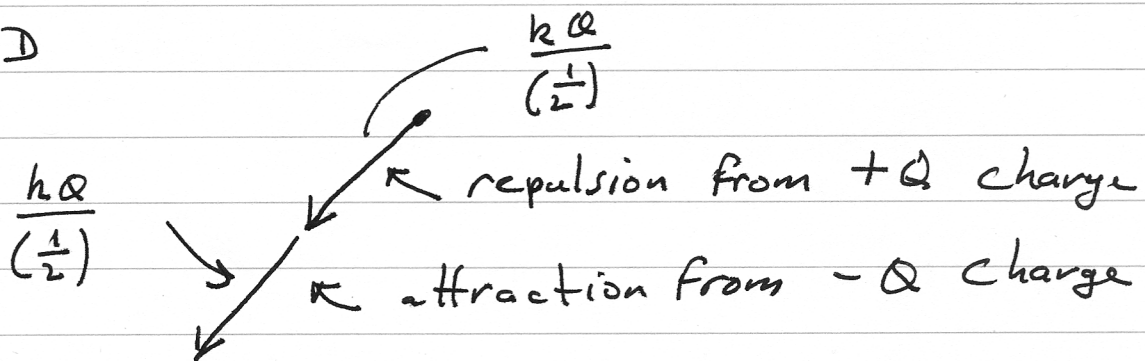
$$|E_A| = kQ\sqrt{2}$$

$$\frac{kQ}{12}$$

Consider Arrangement on Right



AT D



$$|E_D| = 2kQ$$

So

$$E_D > E_c = E_A > E_B = 0$$

5) Mention that if the source is moving

the sound waves get compressed in the direction and wave length decreases.

of motion & If the observer is moving toward the

source, the observer encounters more wave lengths

than if standing still & frequency increases,