

In matter we have,

$$\begin{aligned}\nabla \cdot \mathbf{D} &= \rho_f & \nabla \cdot \mathbf{B} &= 0 \\ \nabla \times \mathbf{E} &= -\frac{\partial \mathbf{B}}{\partial t} & \nabla \times \mathbf{H} &= \mathbf{J}_f + \frac{\partial \mathbf{D}}{\partial t}\end{aligned}$$

with

$$\mathbf{D} = \epsilon_0 \mathbf{E} + \mathbf{P} \quad \mathbf{H} = \mathbf{B}/\mu_0 - \mathbf{M}$$

If there are no free charges or current, is $\nabla \cdot \mathbf{E} = 0$?

- A. Yes, always
- B. Yes, under certain conditions (what are they?)
- C. No, in general this will not be true
- D. ??

In linear dielectrics, $\mathbf{D} = \epsilon_0\mathbf{E} + \mathbf{P} = \epsilon\mathbf{E}$. In a linear dielectric is $\epsilon > \epsilon_0$?

- A. Yes, always
- B. No, never
- C. Sometimes, it depends on the details of the dielectric.

In a non-magnetic, linear dielectric,

$$v = \frac{1}{\sqrt{\mu\epsilon}} = \frac{1}{\sqrt{\mu\epsilon_r\epsilon_0}} = \frac{c}{\sqrt{\epsilon_r}}$$

How does v compare to c ?

- A. $v > c$ always
- B. $v < c$ always
- C. It depends

A light rope (small m/L) is fused to a heavy rope (large m/L).

If I wiggle the **light** rope,

- A. most of the wiggles are reflected back; very few wiggles transmit through the heavy rope
- B. some of the wiggles are reflected back; some of the wiggles transmit through the heavy rope
- C. very few of the wiggles are reflected back; most of the wiggles transmit through the heavy rope
- D. ???

A light rope (small m/L) is fused to a heavy rope (large m/L).

If I wiggle the **heavy** rope,

- A. most of the wiggles are reflected back; very few wiggles transmit through the light rope
- B. some of the wiggles are reflected back; some of the wiggles transmit through the light rope
- C. very few of the wiggles are reflected back; most of the wiggles transmit through the light rope
- D. ???

How do the speed of the waves compare in the light rope (v_l) and heavy rope (v_H)?

A. $v_l < v_H$

B. $v_l = v_H$

C. $v_l > v_H$