

Solutions

2.1 Answer: C. $\mathbf{z} \times \mathbf{x} = \mathbf{y}$, ensuring $\mathbf{E} \times \mathbf{B}$ points $+\mathbf{z}$.

Compare the rejected options: $+\mathbf{x}$; $-\mathbf{x}$; $-\mathbf{y}$; $+\mathbf{z}$. Use the stated model and conditions.

2.2 Answer: B. Normal $\mathbf{B}$ is continuous and therefore zero; a tangential component can remain.

Compare the rejected options: Normal to the surface; Zero at all outside points; Time dependent; Parallel to $\mathbf{E}$ in every case. Use the stated model and conditions.

2.3 0.25. $v/c = 1/\sqrt{16} = 1/4$.

2.4 True. The gap term is $\epsilon_0 d\Phi\mathbf{E}/dt$ in vacuum.

3.1 $\mathbf{B} = \hat{\mathbf{n}} \times \mathbf{E}/c$ points along positive y since $(-\hat{x}) \times \hat{z} = \hat{y}$. $\langle S \rangle = E_0^2/(2\mu_0 c) = \epsilon_0 c E_0^2/2$ for a sinusoid. Absorbed power is $\langle S \rangle A$ and force magnitude is $\langle S \rangle A/c$, along negative x . Award magnetic direction, mean flux, power and force/direction. A perfect reflector would double the force; it is a different boundary condition.