1) a) $E_J = A(\omega t - kx)$ $\therefore k = 1$

$\lambda_{incident} = \frac{2\pi}{k} = 2\pi$

$v_p = \frac{\omega}{k} = \frac{c}{n} \rightarrow \omega = \frac{ck}{n}$ ($n_{air} = 1$) $= 299792458$ rad/s

b) $v_p = \frac{c}{\sqrt{\varepsilon_r \mu_r}} = \frac{\omega}{k} = 1f$

$f = \frac{v_p}{\lambda} = \frac{c}{\lambda_{air}}$ $\therefore \lambda_{material\ transmitted} = \frac{\lambda_{air}}{\sqrt{3}}$

c) $Z = \frac{|E_{air}|}{|H_{air}|} = \sqrt{\frac{\mu_0}{\varepsilon_0}}\ [\Omega]$

d) time-averaged transmitted pwr: $\langle \vec{S} \rangle = \frac{1}{2} \vec{E} \times \vec{H}$ (Poynting vector) & $H_{material} = \frac{E_{mat}}{Z_{mat}}$

$[W m^{-2}]$

↓ angle calc: to do