# Unit 4 - Week 1 Lectures



# Assignment-1

**The due date for submitting this assignment has passed.**
**As per our records you have not submitted this assignment.**

**Due on 2019-08-14, 23:59 IST.**

1) What is the energy of blue ($\lambda = 400nm$) photons? *1 point*

- $79.56 \times 10^{-19} J$
- $4.97 \times 10^{-19} J$
- $1.8 \times 10^{-19} J$
- $8 \times 10^{-19} J$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$4.97 \times 10^{-19} J$

2) Which of the following electric fields represents a uniform plane wave travelling in $z$-direction? *1 point*

- $\hat{x}E_0cos(\omega_0 t - \beta z)$
- $\hat{x}E_0cos(\omega_0 t - \beta x)$
- $\hat{x}E_0cos(\omega_0 t)cos(\beta z)$
- $\hat{x}E_0cos(\omega_0 t + \beta y)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\hat{x}E_0cos(\omega_0 t - \beta z)$

3) The wave equation for the magnetic field $\vec{H}(\vec{r}, t)$ corresponding to a uniform plane wave propagating in free-space medium is *1 point*

- $\nabla^2 \vec{H}(\vec{r}, t) = c^2 \frac{\partial^2 \vec{H}(\vec{r},t)}{\partial t^2}$
- $\nabla^2 \vec{H}(\vec{r}, t) = \frac{1}{c^2} \frac{\partial^2 \vec{H}(\vec{r},t)}{\partial t^2}$
- $\nabla^2 \vec{H}(\vec{r}, t) = \frac{\partial^2 \vec{E}(\vec{r},t)}{\partial t^2}$
- $\nabla^2 \vec{H}(\vec{r}, t) = c \frac{\partial^2 \vec{H}(\vec{r},t)}{\partial t^2}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\nabla^2 \vec{H}(\vec{r}, t) = \frac{1}{c^2} \frac{\partial^2 \vec{H}(\vec{r},t)}{\partial t^2}$

4) For the electric field given in Question 2, the corresponding magnetic field component is *1 point*

- $\hat{x}120\pi E_0cos(\omega_0 t - \beta z)$
- $\hat{x}\frac{E_0}{120\pi}cos(\omega_0 t - \beta y)$
- $\hat{z}E_0cos(\omega_0 t - \beta y)$
- $\hat{y}\frac{E_0}{120\pi}cos(\omega_0 t - \beta z)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\hat{y}\frac{E_0}{120\pi}cos(\omega_0 t - \beta z)$

5) Given $\vec{E}(x,t) = \hat{y}E_0cos(62.831 \times 10^6 t - 0.42x)$, determine the polarization of the plane wave *1 point*

- Elliptical
- Linear
- Right-circular
- Left-circular

No, the answer is incorrect.
Score: 0

Accepted Answers:
*Linear*

6) For the electric field given in Question 5, the direction of propagation of the uniform plane wave is *1 point*

- y
- -x
- x
- -y

No, the answer is incorrect.
Score: 0

Accepted Answers:
*x*

7) Using the electric field equation given in Question 5, the relative dielectric permittivity of the medium is *1 point*

- 3
- 4
- 2
- 1

No, the answer is incorrect.
Score: 0

Accepted Answers:
*4*

8) The instantaneous Poynting vector of the uniform plane wave given in Question 5 is *1 point*

- $\hat{x}\frac{E_0^2}{120\pi}cos^2(\omega_0 t - \beta z)$
- $\hat{y}\frac{E_0^2}{120\pi}cos^2(\omega_0 t - \beta y)$
- $\hat{x}\frac{E_0^2}{120\pi}cos^2(\omega_0 t - \beta x)$
- $\hat{y}\frac{E_0^2}{120\pi}cos^2(\omega_0 t - \beta z)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\hat{x}\frac{E_0^2}{120\pi}cos^2(\omega_0 t - \beta x)$

9) The electric field of a uniform plane wave that is propagating in the $x$-$z$ plane with the propagation vector making an angle of 30° with respect to $x$-axis is (assume that the electric field is perpendicular to the $x$-$z$ plane) *1 point*

- $\hat{y}E_0cos(\omega_0 t - \frac{\sqrt{3}}{2}kx - \frac{1}{2}kz)$
- $\hat{x}E_0cos(\omega_0 t + \frac{\sqrt{3}}{2}kx - \frac{1}{2}kz)$
- $\hat{y}E_0cos(\omega_0 t - \frac{\sqrt{3}}{2}kx + \frac{1}{2}kz)$
- $\hat{x}E_0cos(\omega_0 t - \frac{\sqrt{3}}{2}kx - \frac{1}{2}kz)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\hat{y}E_0cos(\omega_0 t - \frac{\sqrt{3}}{2}kx - \frac{1}{2}kz)$