Week 6 Assignment 6

The due date for submitting this assignment has passed.

As per our records you have not submitted this assignment.

1)

For type-1 second harmonic generation and for an incident beam of 100 \( \text{W/cm}^2 \) at \( \lambda = 1.06 \ \mu m \). Calculate the second harmonic conversion efficiency perfectly phase matched 2.5 cm long KDP crystal. (For KDP crystal 1.5, \( d_{\text{eff}} = 0.28 \times 10^{-12} \text{m/V} \)).

(a) 1.7%  
(b) 7%  
(c) 17%  
(d) 34%

No, the answer is incorrect.
Score: 0
Accepted Answers:
(c)

2)

Consider a crystal where Second Harmonic Generation (SHG) is achieved with fundamental wave at \( \lambda = 1.55 \ \mu m \) for an incident beam of 100 \( \text{MW/cm}^2 \). refractive indices of the crystal at \( \lambda = 1.55 \ \mu m \) and \( \lambda = 0.775 \ \mu m \) are given \( n = 1.56891 \) and \( n = 1.59892 \) respectively. The \( I_{\text{SHG}}/I_{\text{fundamental}} \) for 2.5 cm crystal is approximately. (For the crystal \( d_{\text{eff}} = 0.28 \times 10^{-12} \text{m/V} \)).

(a) \( 10^{-3} \)  
(b) \( 10^{-6} \)  
(c) \( 10^{-9} \)  
(d) \( 10^{-12} \)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(c)
Consider a crystal where 2nd order Quasi Phase Matching (QPM) is achieved via Second Harmonic Generation (SHG) with the fundamental wave at $\lambda = 1.55 \, \mu m$. Refractive indices of the crystal at $\lambda = 1.55 \, \mu m$ and $\lambda = 0.775 \, \mu m$ are given as $n = 1.56891$ and $n = 1.59892$ respectively. The period of nonlinearity ($\Lambda$) is

(a) 52$\mu m$  
(b) 26$\mu m$  
(c) 78$\mu m$  
(d) 100$\mu m$  

No, the answer is incorrect.  
Score: 0  
Accepted Answers:  
(a)  

4) Consider a crystal where 1st order Quasi Phase Matching (QPM) is achieved via Second Harmonic Generation (SHG) with the fundamental wave at $\lambda = 1.06 \, \mu m$. Refractive indices of the crystal at $\lambda = 1.06 \, \mu m$ and $\lambda = 0.53 \, \mu m$ are given as $n$ and $n = 1.52$ respectively. The period of nonlinearity ($\Lambda$) is

(a) 53$\mu m$  
(b) 26.5 $\mu m$  
(c) 13.25$\mu m$  
(d) 75$\mu m$  

No, the answer is incorrect.  
Score: 0  
Accepted Answers:  
(b)  

5) The third order QPM periodicity for a second harmonic ($e \rightarrow e + e$) process in lithium tantalite with $\vec{k}$ along the x-axis is (the fundamental wavelength is 1.064,$n(\omega) = 2.145$ ; $n(2\omega) = 2.215$)

(a) 11.4$\mu m$  
(b) 7.6 $\mu m$  
(c) 22.8$\mu m$  
(d) 34.2$\mu m$  

No, the answer is incorrect.  
Score: 0  
Accepted Answers:  
(c)  

6) The first order QPM periodicity for a sum frequency ($\omega_2 + \omega_3 \rightarrow \omega_3$) gener process ($e + e \rightarrow e$) process in lithium niobate with $\vec{k}$ along the x-axis is ($n(\omega) = 2.233$ ; $n(\omega_2) = 2.211; n(\omega_3) = 2.287$). Given $\lambda_2 = 1.064 \, \mu m, \lambda_3 = 1.550 \, \mu m$.

(a) 10$\mu m$  
(b) 20 $\mu m$  
(c) 5$\mu m$  
(d) 15 $\mu m$
7) $d_{\text{eff}}$ for a first order QPM interaction is maximized for a structure that has a cycle.

(a) 25%  (b) 30%  (c) 50%  (d) 70%

No, the answer is incorrect.
Score: 0
Accepted Answers: (c)

8) $d_{\text{eff}}$ for a third order QPM interaction is maximized for the value of $D$.

(a) 1/3  (b) 1/4  (c) 1/5  (d) 1/6

No, the answer is incorrect.
Score: 0
Accepted Answers: (c)

9) Under $180^\circ$ rotation about x-axis the first order susceptibility $\chi^{(1)}_{ii}$ transform:

(a) $\chi^{(1)}_{ii} = -\chi^{(1)}_{ii}$  (b) $\chi^{(1)}_{ii} = \chi^{(1)}_{ii}$  (c) $\chi^{(1)}_{ii} = 0$  (d) none of these

No, the answer is incorrect.
Score: 0
Accepted Answers: (b)

10) In Centro symmetric medium which order of susceptibility is non-zero.

(a) $\chi^{(2)}$  (b) $\chi^{(5)}$  (c) $\chi^{(8)}$  (d) $\chi^{(10)}$

No, the answer is incorrect.
Score: 0
Accepted Answers: (b)
No, the answer is incorrect.
Score: 0
Accepted Answers:
(b)