Unit 11 - Week 9

Assignment 9

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

Due on 2018-10-03, 23:59 IST.

1) *1 point*

For a centrosymmetric media, if there is additional symmetry of mirror reflection yz plane with the transformation matrix $\begin{bmatrix} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$, then which one of following is correct?

(a) $\chi^{(3)}_{xxxy} \neq 0$; (b) $\chi^{(3)}_{xxxy} = 0$; (c) $\chi^{(3)}_{xyyy} \neq 0$; (d) $\chi^{(3)}_{xxyy} = 0$.

- (a)
- (b)
- (c)
- (d)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(b)

2) *1 point*

The relation between nonlinear index of refraction (n_2^I) and $\chi^{(3)}$ is (the symbols their usual meaning)

(a) $n_2^I = \frac{3}{8\epsilon_0 n^2 c}\chi^{(3)}$ (b) $n_2^I = \frac{3}{4\epsilon_0 nc}\chi^{(3)}$ (c) $n_2^I = \frac{3}{4\epsilon_0 n^2 c}\chi^{(3)}$

- (a)
- (b)
- (c)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(c)

3) *1 point*

The change in refractive index (Δn) due to Kerr effect when a light with power falls on a medium of cross-sectional area $1mm^2$ ($n_2 = 6 \times 10^{-18} m^2/W$

(a) 6×10^{-14} (b) 6×10^{-12} (c) 3×10^{-14} (d) 3×10^{-13}

No, the answer is incorrect.
Score: 0

Accepted Answers:
(b)

4) **1 point**

The following equation dictates the propagation of a wave of frequency ω driver the third order nonlinear polarization at the same frequency. $\frac{dA}{dz} = i\frac{3\omega\chi^{(3)}}{8nc}|A|$
If the complex amplitude $A(z) = u(z)e^{i\varphi(z)}$ then the evolution equation for phase φ is

(a) $\int_z \frac{3\omega\chi^{(3)}}{8nc}dz$ (b) $\int_z \frac{3\omega\chi^{(3)}}{4nc}|A|dz$

(c) $\int_z \frac{3\omega\chi^{(3)}}{4nc}|A|^2dz$ (d) $\int_z \frac{3\omega\chi^{(3)}}{8nc}|A|^2dz$

- (a)
- (b)
- (c)
- (d)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(d)

5) **1 point**

Follow the above question (Q.4), what will be the maximum frequency shift d self-phase modulation for an optical pulse that has a Gaussian temporal profile g by $I(\tau) = I_0e^{-\frac{2\tau}{T_0}}$

(a) $\frac{2n_2I_0}{T_0}e^{-\frac{2\tau}{T_0}}$ (b) $\frac{2n_2I_0k_0z}{T_0}e^{-\frac{2\tau}{T_0}}$ (c) $\frac{2n_2I_0k_0z}{T_0}$ (d) $\frac{2n_2I_0}{T_0}$

- (a)
- (b)
- (c)
- (d)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(c)

6) **1 point**

Follow the above question (Q.5), the maximum frequency shift per unit length (H unit) will be (where $T_0 = 20fs$, $I_0 = 1GW/cm^2$, $n_2 = 10^{-16}cm^2/W$ and the ce frequency of the input radiation is $10^{14}Hz$.)

(a) 10^{16} (b) 2×10^{15} (c) 2×10^{13} (d) 2×10^{-15}

- (a)
- (b)
- (c)
- (d)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(c)

7) **1 point**

Follow the above question (Q.6), the output frequency from a 2cm long crystal is
(a) 1.004×10^{13} (b) 1.004×10^{14} (c) 1.004×10^{15}

- (a)
- (b)
- (c)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(b)

8) **1 point**

The number of independent susceptibility tensor elements ($\chi^{(3)}$) for centrosymme crystals
(a) 1 (b) 2 (c) 3 (d) 4

- (a)
- (b)
- (c)
- (d)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(c)

9) **1 point**

The process $\chi^{(3)}_{xxyy}(\omega_1;\omega_2,\omega_3,\omega_4) = \chi^{(3)}_{yyxx}(\omega_1;\omega_2,\omega_3,\omega_4)$ transforms under
(a) inversion symmetry (b) permutation symmetry (c) rotation-inversion symme

- (a)
- (b)
- (c)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(a)

10) **1 point**

The process $\chi^{(3)}_{xxyy}(\omega_1;\omega_2,\omega_3,\omega_4) = \chi^{(3)}_{yyxx}(\omega_3;-\omega_4,\omega_1,-\omega_2)$ transforms und
(a) inversion symmetry (b) permutation symmetry (c) rotation-inversion symm

- (a)
- (b)
- (c)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(b)

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