Unit 12 - Week 10

Assignment 10

The due date for submitting this assignment has passed. **Due on 2018-10-10, 23:59 IST.**
As per our records you have not submitted this assignment.

1) ***0 points***

The nonlinear phase change in a Kerr medium of cross section 100 μm^2 length 10 km due to an incident light of wavelength 1 μm and power 1 wa (the Kerr coefficient $n_2 = 3 \times 10^{20} m^2/W$;)

(a) 12π (b) 6π (c) 2π (d) 8π

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

No, the answer is incorrect.
Score: 0

Accepted Answers:
(b)

2) ***2 points***

The nonlinear frequency shift due to self-phase modulation for an optical pulse has a Gaussian temporal profile given by $I(\tau) = I_0 e^{-\frac{2t^2}{t_0^2}}$

(a) $\frac{4n_2 I_0}{t_0^2} e^{-\frac{2t^2}{t_0^2}}$ (b) $\frac{4n_2 I_0 k_0 z t}{t_0^2}$ (c) $\frac{4n_2 I_0 k_0 z t}{t_0^2} e^{-\frac{2t^2}{t_0^2}}$ (d) $\frac{2n_2 I_0}{t_0^2}$

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

No, the answer is incorrect.
Score: 0

Accepted Answers:
(c)

3) ***2 points***

Follow the above question (Q.2), the maximum wavelength shift per meter wi (where $T_0 = 100fs$, $I_0 = 1GW/cm^2$, $n_2 = 10^{-16} cm^2/W$ and the central wavele of the input radiation is 1550 nm)

(c)
(d)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(d)

4) **2 points**

The nonlinear polarization for Centrosymmetric molecule is $P_{NL} = \varepsilon_0 \chi^{(3)} E^3$. Co the electric field as $E = E_0 \cos(\omega t)$ .The no of frequencies in the output will be

(a) 1 (b) 3 (c) 4 (d) 2

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

No, the answer is incorrect.
Score: 0

Accepted Answers:
(d)

5) **2 points**

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

(a) 6×10^{-14} (b) 16×10^{-12} (c) 12×10^{-12} (d) 3×10^{-13}

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

No, the answer is incorrect.
Score: 0

Accepted Answers:
(c)

6) **2 points**

For centrosymmetric material (invariant under inversion) which of the followir correct (Hint: consider the transformation operation corresponding to a 45° rot about the z-axis)

(a) $\chi^{(3)}_{xxxx} = \chi^{(3)}_{xxyy} + \chi^{(3)}_{xyyx} + \chi^{(3)}_{xyxy}$

(b) $\chi^{(3)}_{xxxx} = \chi^{(3)}_{xxyy} + \chi^{(3)}_{xyyx}$

(c) $\chi^{(3)}_{xxxx} = \chi^{(3)}_{xxyy} + \chi^{(3)}_{xyxy}$

(a)
(b)
(c)

No, the answer is incorrect.
Score: 0

Accepted Answers:

(a)

7) **2 points**

If $\chi^{(3)}$ is complex, then the nonlinear absorption coefficient β in terms of imag part of $\chi^{(3)}$ is

(a) $\frac{3\omega}{2\epsilon_0 n^2 c^2} Im[\chi^{(3)}]$ (b) $\frac{3\omega}{4\epsilon_0 n^2 c^2} Im[\chi^{(3)}]$ (c) $\frac{3\omega}{\epsilon_0 n^2 c^2} Im[\chi^{(3}$

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

No, the answer is incorrect.
Score: 0

Accepted Answers:
(a)

8) **2 points**

Following from the Q7 the value of β for silicon at 1550 nm is ($n = 3.5$; $Im[\chi^{(}$ $3 \times 10^{-20}\ m^2/V^2$)

(a) $4.6 \times 10^{-12}\ m/W$ (b) $6.6 \times 10^{-13}\ m/W$ (c) $5.6 \times 10^{-12}\ m/$

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

No, the answer is incorrect.
Score: 0

Accepted Answers:
(c)

9) **2 points**

Following from Q 8 if a light of intensity $I_0 = 5\ GW/cm^2$ incidents on a medium of length 1 m what will be the intensity at the output

(a) $1.78 \times 10^{11} W/m^2$ (b) $2.82 \times 10^{10}\ W/m^2$ (c) $1.78 \times 10^{12} W/m^2$

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

No, the answer is incorrect.
Score: 0

Accepted Answers:
(a)

10) **2 points**

The self-focussing phenomenon is governed by

(a) n_2^I (b) β_{TPA} (c)n_0

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

No, the answer is incorrect.
Score: 0

Accepted Answers:
(a)

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