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NPTEL

Courses » **Modern Optics**

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Unit 7 - Week 6

Course outline

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Assignment Solution

Week 6 Assignment 6

The due date for submitting this assignment has passed.   **Due on 2018-09-12, 23:59 IST.**
As per our records you have not submitted this assignment.

1)   *1 point*

The origin of electrooptic phenomenon may be looked upon as

(A) electric field causes distortion of electron clouds that are attached to the atoms/molecules of crystal lattice

(B) electron clouds are distorted by the optical field producing anisotropic response

(C) electric field imparts a uniform distortion to electron clouds that are attached to the atoms/molecules of crystal lattice in all dielectric materials

(D) electric field modifies the ellipsoid of a medium be it isotropic or anisotropic by altering RI's associated with directions

☐ (A)

☐ (B)

☐ (C)

☐ (D)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(A)
(D)

2)   *1 point*

The two electrooptic effects are the Pockels effect and Kerr effect. The two electrooptic phenomena are due to externally applied electric field on a crystal carrying the optical beam. Identify the correct statement/statements from the following

(A) In Pockels effect the change in RI is proportional to the square of the applied electric field

(B) In Kerr effect the change in RI is proportional to the applied electric field

(C) In Pockels effect the change in impermeability is proportional to the square of applied electric field

(D) In Kerr effect the change is impermeability is proportional to the square of applied electric field

○ (A)

○ (B)

○ (C)

○ (D)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(D)

3) Which of the following crystals is/are naturally isotropic?   *1 point*

  (A) GaAs

  (B) ZnS

  (C) Quartz

G+

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☐ (D)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(A)
(B)
(D)

4) Which of the following crystals is/are naturally anisotropic?   *1 point*
   (A) KDP
   (B) ADP
   (C) InAs
   (D) Lithium Tantalate

☐ (A)
☐ (B)
☐ (C)
☐ (D)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(A)
(B)
(D)

5) Which of the following about a centrosymmetric crystal is/are true?   *1 point*
   (A) linear electro-optic effect vanishes
   (B) crystal exhibits quadratic electrooptic effect
   (C) crystal exhibits linear electrooptic effect
   (D) Si is centrosymmetric crystal

☐ (A)
☐ (B)
☐ (C)
☐ (D)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(A)
(B)
(D)

6)   *1 point*

Consider an **electric field applied along z-axis** on to a GaAs crystal. What happens to the optical properties (RI) of the crystal under the external field?

(A) Under the external electric field, the medium becomes anisotropic
(B) Under the external electric field, the ellipsoid of the medium undergoes only a rotation of axes but no change occurs in the lengths of semi axes
(C) Under the external electric field, the magnitude of change of RI for the $x-$ and y polarised light are the same
(D) Under the external electric field, the RI for the $z-$ polarised light only changes in magnitude

☐ (A)
☐ (B)
☐ (C)
☐ (D)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(A)
(B)
(C)

7)   *1 point*

In longitudinal configuration of **GaAs**, the retardation/ phase delay

(A) between x and y polarised light is proportional to the length of crystal travelled by light beam
(B) does not depend on the magnitude of electric field applied to the crystal
(C) between x and y polarised light is same (equal) to that between y and z polarised light
(D) between y and z polarised light can be used to configure an amplitude modulator of light beam

☐ (A)

☐ (B)

☐ (C)

☐ (D)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(A)
(D)

8)   ***1 point***

In phase modulation of an optical beam using electrooptic effect

(A) The phase of the optical beam is modulated along with changes in the polarisation state of light
(B) The index ellipsoid of the electrooptic crystal does not undergo any rotation but undergoes uniform change of the ellipsoid axes
(C) input optical beam needs to be polarized along one of the new principal axes x' or y' and the field will not alter this polarization during modulation
(D) the phase shift is independent of the length of crystal travelled by light but phase-shift is linearly proportional to applied voltage

☐ (A)

☐ (B)

☐ (C)

☐ (D)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(B)
(C)
(D)

9)   ***1 point***

The half voltage of an electrooptic modulator

(A) depends on the magnitude of electrooptic coefficient in case of a longitudinal phase modulator
(B) depends on the length of the crystal travelled by optical beam in case of a longitudinal phase modulator
(C) depends on the length of the crystal travelled by optical beam in case of a transverse modulator
(D) does not depends on the transverse width of the crystal across which the electric field is applied in case of a transverse modulator

☐ (A)

☐ (B)

☐ (C)

☐ (D)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(A)
(C)

10)   ***1 point***

In Kerr electrooptic effect

(A) an optically isotropic medium in a static electric field becomes birefringent

(B) a Kerr cell of length L and electrode distance d gives a retardation: $\Delta\phi \propto \dfrac{v^2}{L\,d}$, where V is applied

(C) Barium Titanate: $BaTiO_3$ is a transparent solid crystal used as Kerr cell
(D) in presence of electric field E, the change in RI is $\propto E^2$

- [ ] (A)
- [ ] (B)
- [ ] (C)
- [ ] (D)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(A)
(C)
(D)

11)   *0 points*

To a dielectric medium an external electric field is applied in some orientation. Which of the following does/ do not happen under any situation? The electric field may

(A) alter the RI properties of the medium
(B) induce birefringence in otherwise isotropic medium
(C) alter existing birefringence property of anisotropic medium
(D) change anisotropic medium to an isotropic one

- [ ] (A)
- [ ] (B)
- [ ] (C)
- [ ] (D)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(A)
(B)
(C)

12)   *1 point*

Using electrooptic phenomenon, adjusting a suitable configuration/orientation of electric field with respect to the medium/crystalline axes

(A) birefringence of the medium can be electrically controlled
(B) retardation in a waveplate is controlled to make optical switch
(C) a quarter-wave plate placed between two crossed polarisers makes it a phase modulator
(D) the state of polarisation of an anisotropic medium can be altered

- [ ] (A)
- [ ] (B)
- [ ] (C)
- [ ] (D)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(A)
(B)
(D)

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