

UNIT 2

Q. LASER is a abbreviation of

- A. Light amplification by spontaneous emission of radiation
- B. Light amplification by stimulated emission of radiation
- C. Light absorption by stimulated emission of radiation
- D. Light absorption by spontaneous emission of radiation

Ans. B

Q. Laser beam is made of

- A. Highly coherent electrons
- B. Highly coherent photons
- C. Highly coherent phonons
- D. None of them

Ans. B

Q. The life time of electron in metastable state is of the order of

- A. 10^{-9} S.
- B. 10^{-3} S.
- C. 10^{-8} S.
- D. 10^{-7} S.

Ans. B

Q. The energy state of an atom is said to be metastable when its

- A. Life time is of the order of 0.01 sec
- B. Life time is of the order of 0.001 sec
- C. Life time is of the order of 0.1 sec
- D. Life time is of the order of 1 sec

Ans. B

Q. In the population inversion

- A. The number of electrons in higher energy state is more than the ground state
- B. The number of electrons in lower energy state is more than higher energy state
- C. The number of electrons in higher and lower energy state is same
- D. None of them

Ans. A

Q. The characteristics of laser beam are

- A. Highly directional

B. Highly intense

C. Highly monochromatic

D. All of them

Ans. D

Q. The energy of photon is equal to

A. $h\nu$

B. $\frac{3}{2}h\nu$

C. $h\nu/2$

D. None of them

Ans. A

Q. Which event is likely to take place when a photon of energy equal to the difference in energy between two levels is incident in a system?

A. Absorption

B. Emission

C. Absorption and emission

D. None of the above

Ans. C

Q. The first laser was invented in May, 1960 by

A. T.H. Maiman

B. Maxwell

C. Einstein

D. C. V. Raman

Ans. A

Q. When atom is expose to radiation having a stream of photons each with energy $h\nu$, then the following processes can take place

A. Absorption

B. Spontaneous emission

C. Stimulated emission

D. All A,B and C can take place.

Ans. D

Q. An atom or molecule in the ground state of energy E_1 can absorb photon of energy $h\nu$ and go the higher energy state E_2 , this process is known as

A. Stimulated radiation

B. Stimulated absorption

C. Stimulated emission

D. Spontaneous absorption

Ans. B

Q. In spontaneous emission the atoms or molecules in the higher energy state E_2 eventually return to the ground state E_1 by emitting their excess energy spontaneously. The rate of spontaneous emission is

- A. Directly proportional to population of the excited energy level E_2 .
- B. Directly proportional to population of the energy level E_1 .
- C. Inversely proportional to population of the energy level E_2 .
- D. None of the above

Ans. A

Q. In stimulated emission, a photon having energy E equal to the difference in energy between two levels E_2 and E_1 , stimulate an atom in the higher state to make a transition to the

- A. Lower energy state with a creation of second photon.
- B. Metastable state with creation of second photon.
- C. Higher energy state with a creation of two photons.
- D. None of the above

Ans. A

Q. The rate of spontaneous emission depends upon the number of atoms in the

- A. A Ground state
- B. Excited state
- C. Metastable state
- D. None of the above

Ans. B

Q. The rate of stimulated emission depends both on

- A. The energy of external photon and on the number of atoms in the excited state.
- B. The energy of external photon and the number of atoms in the ground state.
- C. The energy of external photon and on the number of atoms in the metastable state
- D. None of the above

Ans. C

Q. The spontaneous emission produces

- A. A Coherent light
- B. Incoherent light
- C. White light
- D. None of the above

Ans. B

Q. The material in which population inversion can take place is called _____

- A. Active medium
- B. Passive medium
- C. Gaseous medium
- D. Vapour medium

Ans. A

Q. In case of population inversion, the number atoms is _____

- A. more in higher energy state than in the lower energy state
- B. more in higher energy state than in meta-stable state
- C. more in lower energy state than in the higher energy state
- D. None of them

Ans. A

Q. The state of population inversion is also known as _____

- A. positive temperature state
- B. Negative temperature state
- C. Equilibrium state
- D. Infinite temperature state

Ans. B

Q. The process of raising the atoms from a lower energy state to higher, to create population inversion is called

- A. Exothermal reaction
- B. Endothermic reaction
- C. Pumping
- D. None of the above

Ans. C

Q. In case of optical pumping, an external optical source like Xenon flash lamp is employed to produce

- A. A lower population in the meta stable state of laser medium
- B. Low population in the higher energy level of laser medium

C. Higher population in the lower energy level of laser medium
D. High population in the higher energy level of laser medium
Ans. D

Q. Optical pumping is suitable for any medium which is
A. A Transparent to light
B. Not transparent to light
C. Metallic
D. None of the above
Ans. A

Q. Electrical pumping is used for some medium which can conduct electricity
A. affecting the laser activity
B. without affecting the laser activity
C. without affecting excited energy state
D. None of the above
Ans. B

Q. In a semiconductor laser, electrical energy is directly converted to
A. Light energy
B. Sound energy
C. Heat energy
D. Nuclear energy
Ans. A

Q. An optical resonator plays a major role in
A. Stimulating more and more atoms from excited state to ground state
B. Generation of intense laser output
C. Generation of unidirectional beam of photons
D. All of them
Ans. D

Q. Ruby laser is a solid state laser, the active medium is
A. Crystalline substance
B. Non crystalline substance
C. Gaseous substance
D. Amorphous substance
Ans. A

Q. Laser light is produced mainly due to
A. interference phenomenon

B. spontaneous emission of light
C. stimulated emission of radiation.
D. diffraction phenomenon
Ans. C

Q. Which of the following conditions is essential for the production of laser light?
A. Stimulated absorption
B. Stimulated emission process
C. Population inversion process
D. All of them
Ans. D

Q. Which of the following is not a pumping process?
A. Optical pumping
B. Electrical pumping
C. Chemical pumping
D. Thermal pumping
Ans. D

Q. Which of the following is not a laser property?
A. Coherence
B. Divergence
C. Extreme brightness
D. Highly directional
Ans. B

Q. Laser system does not include
A. Active medium
B. Pumping mechanism
C. Optical activity
D. Optical resonator
Ans. C

Q. Which source of light is brightest?
A. Sunlight
B. Laser light
C. Arc light
D. Sodium light
Ans. B

Q. The mathematical expression for existence of stimulated emission was proposed by
A. Einstein
B. de-Broglie
C. Kelvin
D. Heisenberg

Ans. A

Q. The population inversion takes place at _____ medium.

- A. active
- B. passive
- C. moderate
- D. none of the above

Ans. A

Q. The spontaneous emission means emitting a photon because of.....

- A. transition of atom from excited state to ground state after completion of life time on its own accord.
- B. transition of atom from ground state to excited state after completion of life time on its own accord.
- C. transition of atom from excited state to ground state before completion of life time on its own accord.
- D. Stimulation of atom from excited state to ground state before completion of life time on its own accord.

Ans. A

Q. The stimulated emission of radiation means

- A. before completion of life time, stimulation of an atom from higher state to lower energy state
- B. after completion of life time, stimulation of an atom from higher state to lower energy state
- C. before completion of life time, stimulation of an atom from lower state to higher energy state
- D. none of the above

Ans. A

Q. The condition needed for laser action is.....

- A. stimulated absorption
- B. spontaneous emission
- C. stimulated emission
- D. population inversion.

Ans. D

Q. The population inversion is to.....

- A. Depopulate lower energy state
- B. Depopulate higher energy state
- C. Depopulate metastable state
- D. none of the above

Ans. A

Q. In the optical pumping

- A. Photons are used to excite the atoms in the medium
- B. electrical energy is used to excite the atoms in the medium
- C. magnetic energy is used to excite the atoms in the medium
- D. All of these

Ans. A

Q. Because of _____ in laser system, laser beam is unidirectional.

- A. active medium
- B. composition of active medium
- C. resonant cavity
- D. pumping mechanism

Ans. C

Q. The He-Ne laser is a kind of neutral atom gas laser in which the wavelength of laser is

- A. 6443\AA
- B. 6328\AA
- C. 10600\AA
- D. None of the above

Ans. B

Q. Ruby is crystalline substance of Aluminium oxide doped with

- A. Approximately 0.005% by weight of Chromium oxide.
- B. Approximately 0.5% by weight of Chromium oxide.
- C. Approximately 0.05% by weight of Chromium oxide.
- D. Approximately 5% by weight of Chromium oxide

Ans. A

Q. In case of Ruby laser, the resultant pink colour is due to presence of Cr^{+3} ions in the appropriate concentration which

- A. Replace Na atoms in the crystal lattice
 - B. Replace Oxide atoms in the crystal lattice
 - C. Replace Al atoms in the crystal lattice
 - D. Replace some Al atoms and some Na atoms in the crystal lattice
- Ans. C

Q. The main advantage of gas lasers is that

- A. They can operate in the pulse mode
 - B. They cannot be operated continuously
 - C. They can operate continuously
 - D. None of the above
- Ans. C

Q. Advantages of semiconductor diode laser are

- A. Efficiency is more than 10%
 - B. They can have a continuous wave output or pulsed output.
 - C. Highly economical, and the arrangement is compact
 - D. All of them
- Ans. D

Q. The applications of laser in communication are the laser beams are used to transmit thousands of TV programs and simultaneous telephone conversation at

- A. time
 - B. The communication between the planets has been made possible using laser beams
 - C. The laser light waves are not absorbed by water and hence it can be successfully employed to establish under water communication between submarines
 - D. All of them
- Ans. D

Q. Which laser was invented first?

- A. Semiconductor laser
 - B. Ruby laser
 - C. He-Ne laser
 - D. CO₂ laser
- Ans. B

Q. Which of the following is a gas laser?

- A. He-Ne laser
 - B. Ruby laser
 - C. Semiconductor laser
 - D. Nd-YAG laser
- Ans. A

Q. Pulsed laser light is produced from a

- A. Ruby laser
 - B. CO₂ laser
 - C. Semiconductor laser
 - D. He-Ne laser
- Ans. A

Q. In Ruby laser which ions give rise to the laser action?

- A. Al₂O₃
 - B. Al⁺³
 - C. Cr⁺³
 - D. O⁺³
- Ans. C

Q. Example of solid-state laser is

- A. He-Ne laser
 - B. Ruby laser
 - C. CO₂ laser
 - D. none of the above
- Ans. B

Q. In a Ruby laser, the active medium consist of aluminum-oxide doped with 0.005 wt. of

- A. chromium oxide
 - B. carbon oxide
 - C. iron oxide
 - D. Silver oxide
- Ans. A

Q. In a Ruby laser, the laser action is achieved by

- A. gas discharge
 - B. electrical pumping
 - C. optical pumping
 - D. Molecular collision
- Ans. C

Q. Ruby laser radiates an intense pulse laser of wavelength

- A. 6328 Å
- B. 6938 Å

C. 6943 Å⁰

D. 6334 Å⁰

Ans. C

Q. The light source used for optical pumping in Ruby laser is.....

A. Neon

B. Xenon

C. Argon

D. none of these.

Ans. B

Q. The active medium of a helium-neon laser is made up of ratio of helium-neon.

A. 10:2

B. 10:1

C. 10:3

D. 10:49

Ans. B

Q. Complete the following reaction for helium-neon laser reaction $\text{He}^* + \text{Ne} \rightarrow \text{He} + \underline{\hspace{2cm}}$

A. Ne^*

B. He^*

C. Ne

D. He

Ans. A

Q. In a He-Ne laser, helium is used to decrease the population in

A. higher level of Ne

B. lower level of Ne

C. metastable level of Ne

D. Intermediate level of Ne

Ans. B

Q. Diode laser consists of doped in a single crystal.

A. p-n junction

B. p type

C. n-type

D. n-p-n transistor

Ans. A

Q. LED is converted into a laser diode employing a.....

A. low current

B. high current

C. medium current

D. none of the above

Ans. B

Q. This is not a type of laser

A. solid state lasers

B. gas lasers

C. semiconductor lasers

D. liquid laser

Ans. D

Q. The advantages of using laser drilling in industries is/are

A. it generates very low heat in the material during drilling

B. it is possible to drill at different angles

C. its accuracy and consistency are very high

D. all of them

Ans. D

Q. The advantages of gas cutting laser is/are

A. very fast and accurate

B. very simple and cost effective

C. it is used to cut materials of any thickness with high precision

D. all of them

Ans. D

Q. The condition of total internal reflection is that

A. the angle of incidence exceeds the critical angle

B. the angle of incidence is less than critical angle

C. the angle of incidence is equal to critical angle

D. none of the above

Ans. A

Q. The critical angle is defined as

A. the refraction at which the total internal reflection occurs

B. the reflection at which the total internal reflection occurs

C. the angle of incidence at which total internal reflection occurs

D. none of the above

Ans. C

Q. The main principle of optical fiber is
A. total internal reflection
B. total internal refraction
C. total internal dispersion
D. none of the above
Ans. A

Q. The application of laser beam in computer peripherals is/are
A. optical disks
B. optical wave guide
C. CD ROM disk
D. all of them
Ans. D

Q. The method of producing 3D image of an object due to the is known as holography.
A. interference of non coherent light waves on a photographic plate
B. interference of coherent light waves on a photographic plate
C. only reflection of coherent light waves
D. none of the above
Ans. B

Q. In holography
A. Only phase of a wave reflected from the object is recorded on the film
B. Only amplitude of a wave reflected from the object is recorded on the film
C. Amplitude as well as phase of a wave reflected from the object is recorded on the film
D. Neither amplitude nor phase of a wave reflected from the object is recorded on the film
Ans. C

Q. When hologram is reconstructed we get the 3D image of the object because
A. Only phase of a wave reflected from the object is recorded on the hologram
B. Only amplitude of a wave reflected from the object is recorded on the hologram
C. Amplitude as well as phase of a wave reflected from the object is recorded on the hologram

D. Neither amplitude nor phase of a wave reflected from the object is recorded on the hologram
Ans. C

Q. The basic principle of holography is that
A. to create the interference pattern of object wave and reference wave
B. to create the interference pattern of object wave only
C. to create the interference pattern of reference wave only
D. none of the above
Ans. A

Q. Holography was invented by
A. C.K.N.Patel in 1948
B. Leith and Upatnicks in 1962
C. Dennis Gabour in 1948
D. Ali-Jawan
Ans. C

Q. The applications of holography are
A. Holographic storage (mainly used in ROM devices)
B. Three dimensional display of an object
C. Used to determine Young's modulus of metallic rods.
D. all of them
Ans. D

Q. Lasers are used in fibre optic communication because
A. lasers are unidirectional
B. lasers are coherent
C. both A and B
D. neither A nor B
Ans. C