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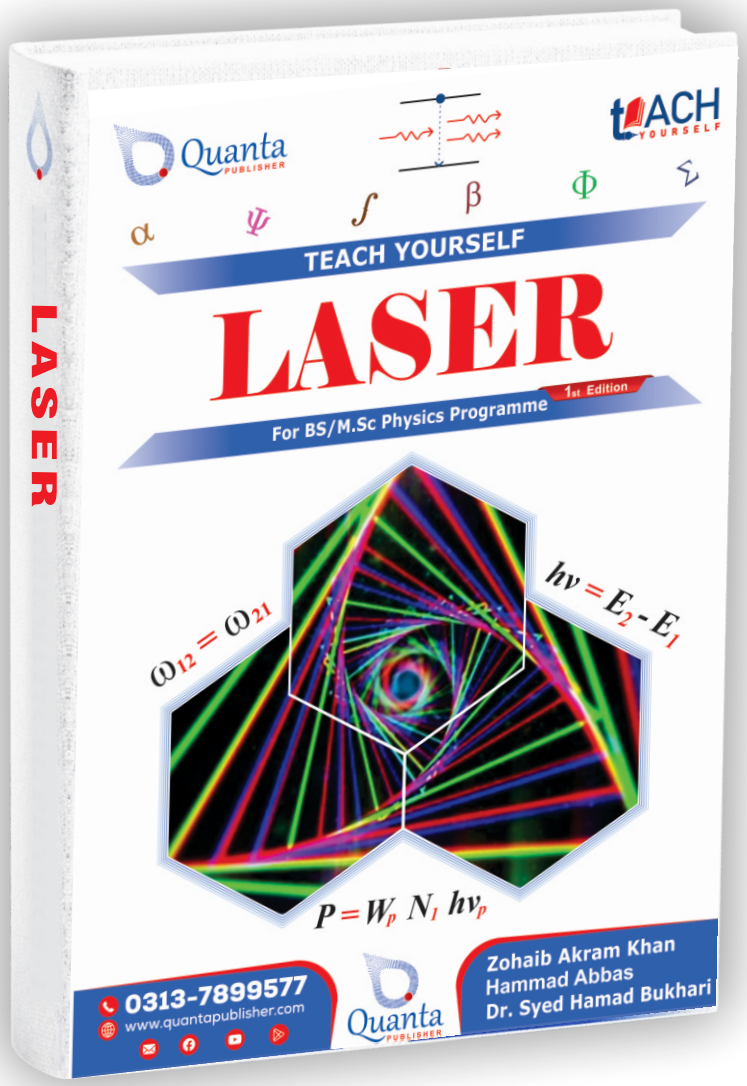
BS Physics

PAST PAPERS



GOVERNMENT COLLEGE UNIVERSITY, FAISALABAD
Affiliated Colleges Semester Examinations

Roll No._____

Semester 8th

Course title: Laser and optics | Paper timing: 1 hr. | Course code: PHY- 608
Session: 2016-2020 | Credit hour: 3(3-0) | Max Marks: 50

Choose the correct option.

1. The time during which an electron can exist in the ground state is:

(a)unlimited (b) 10^{-8} s (c)10^{-3} s (d) 10^{-19} s

2. Rate of spontaneous emission is proportional to the number of atoms in the:

(a) excited state (b) ground state (c) All energy states (d) none of these

3. The rate of stimulated emission depends upon number of atoms in the excited state and the:

(a) intensity of an external field (b) frequency of field

(c) direction of external field (d) none of these

4. The time during which an electron can exist in the excited state is called:

(a) decay time (b) life time (c) spontaneous time (d) stimulated time

5. The absorption rate and emission rate in equilibrium must be:

(a) absorption rate<emission rate same (b) Different

(c) absorption rate>emission rate (d) same

6. The life time of electron in metastable state is:

(a)10^{-3} s (b) 10^{-5} s (c) 10^{-8} s (d) 10^{-7} s

7. $A^* \rightarrow A + h\upsilon$, process represents:

(a) spontaneous emission (b) stimulated emission

(c) Absorption (d) Thermionic emission

8. According to the equation $E = nh\upsilon$, The relation gives photon/second is:

(a) $\frac{E}{h}$ (b) $\frac{E}{nh}$ (c) $\frac{E}{h\upsilon}$ (d) $\frac{E}{n\upsilon}$

9. The condition when spontaneous emission and stimulation emission is balanced with absorption is called :

(a) steady state condition (b) Threshold condition

(c) critical condition (d) Resonator condition

10. $A^* \rightarrow h\upsilon$ $A + h\upsilon$, process represents:

(a) spontaneous emission (b) stimulated emission

(c) Absorption (d) Thermionic emission

11. A laser is a optical source that emits photons in the form of a:

(a) Non coherent beam (b) Coherent beam (c) both a and b (d) none

12.A system in which population inversion is achieved is called:

(a) laser cavity (b) pumping source (c) Amplification (d) Active medium

13. The method of raising the particle from lower energy state to higher energy state is called :

(a) Pumping (b) Threshold condition

(c)population inversion (d)Gain of laser cavity

14. Laser light consist of:

(a) seven wavelengths (b) Four wavelengths

(c) Multiple wavelengths (d) one wavelengths

15. Laser radiation is:

(a) Monochromatic (b) Unidirectional

(c) produced with large power (d) All of these

16. The method of population inversion to the laser in He-Ne laser is:

(a) Atomic collision (b) Direct conversion

(c) Electric discharge (d) electron impact

17. The population inversion cannot be achieved in a :

(a) 2- level system (b) 3- level system (c) 4-level system (d) none

18. Which color of the laser light has the shortest wavelength:

(a) Yellow (b) Blue (c) Red (d) Green

19. Which scientist first came up with the idea of stimulated emission:

(a) Graham Bell (b) Newton (c) Schalow (d) Einstein

20. The steady state condition is achieved in laser cavity when:

(a) Gain>Loss (b) Gain=Losses (c) Gain< Losses (d) Gain=(losses)^2

21. A VAG laser has a frequency of 2.8×10^{14} Hz. The wavelength of laser beam is:

(a) 1.2×10^{-23} m (b) 1.1×10^{-6} (c) 1.2×10^{-2} (d)9.4×10^{5} m

22. The basic principle involved in laser action is phenomenon of:

(a) Spontaneous emission (b) Absorption process

(c) Stimulated emission (d) Bandwidth

23. Laser beam is made of:

(a) Electrons (b) coherent photons (c) Elastic particles (d)Excited atioms

e frequency for m=l, of first longitudinal mode in laser cavity is called:

asic frequency (b) Harmonic frequency

(c) Overturned frequency (d) Amplitude modulation

25. The frequency of the longitudinal modes in laser cavity is:

(a) υ_m=m(c/2nL) (b) υ_m =m(c/nL) (c) υ_m m(c/2n) (d) υ_m=h$\upsilon\lambda$

26. The basic frequency of the laser cavity is equal to:

(a) Mode spacing (b) Fringe spacing (c) Diffraction pattern (d) wavelength

27. The difference " $\Delta\upsilon$" between frequencies of adjacent longitudinal modes is:

(a) $\Delta\upsilon = c/2nL$ (b) $\Delta\upsilon = \lambda c/2nL$ (c) $\Delta\upsilon$ =hc/2nL (d) $\Delta\upsilon$ =$h^2c^2/2$

28. The mechanical shutters in laser cavity are used for:

(a) Q-switching (b) Mode locking (c) Population inversion (d) Line width

29. The optical path from one mirror to the other mirror and back mirror is called:

(a) Roundtrip (b) Wavelength (c) Amplitude (d) Planck's constant

30. The dimension of Planck's constant are that of:

(a) Linear momentum (b) Angular momentum (c) Energy (d) Speed

31. The relation $I=\sigma T^4$ for black body radiation curve represents:

(a) Wein's displacement law (b) Stefan-Boltzmann's law

(c) Rayleigh-Jean law (d) none

32. The total radiated power per unit area of cavity aperture is called radiant:

(a) Intensity (b) Frequency (c) Wavelength (d) None

33. The Ruby laser is:

(a) Continuous laser (b) Gas laser (c) Semiconductor laser (d) Pulsed laser

34. The method of achieving population inversion in Ruby laser is:

(a) Optical laser (b) Inelastic scattering (c) Forward laser (d) Chemical laser

35. The He-Ne laser is:

(a) Continuous laser (b) Gas laser (c) Semiconductor laser (d) Pulsed laser

36. The method of achieving population inversion in He-Ne laser is:

(a) Optical laser (b) Inelastic scattering (c) Forward laser (d) Chemical laser

37. A semiconductor diode laser is :

(a) Four level laser (b) Three level laser (c) Two level laser (d) One level laser

38. A He-Ne laser is:

(a) Four level laser (b) Three level laser (c) Two level laser (d) One level laser

39. Which of the following can be used for generation of laser pulse?

(a) Ruby laser (b) Carbon dioxide laser (c) Helium neon laser (d) Nd-YAG laser

40. Which of the following can be used in a vibrational analysis of structure?

(a) Maser (b) Quarts (c) electrical waves (d)Laser

41. The value of Planck's constant is:

(a) 6.63×10^{-31} J-s (b) 6.63×10^{-34} J-s (c) 1.67×10^{-27} J-s (d) 6.02×10^{23} J-s

42. There "Bagel" TEM is composed of:

(a) TEM_{01} and TEM10 (b)TEM_{11} and TEM_{12}

(c) TEM_{11} and TEM_{13} (d) TEM_{21} and TEM_{12}

43.When light travelling in a certain medium falls on surface of another medium, a part of it turns back in same medium. This phenomenon is called:

(a) Reflection (b) Refraction (c) Diffraction (d) Acoustics

44. To describe change in speed of light in a medium, term used is called:

(a) Index of reflection (b) Index of refraction

(c) Index of diffraction (d) Index of acoustics

45. When a ray of light enters from denser medium to rarer medium, it bends:

(a) Towards normal (b) Away from normal

(c) Perpendicular to normal (d) Parallel to normal

46. Lens which diverges light from a single point is:

(a) Concave lens (b) Convex lens (c) Biconvex (d) Both b and c

47. Reflection by smooth surface is called:

(a) Irregular reflection (b) Refraction

(c) Regular reflection (d) Reflection

48. A point on principle axis at center of lens is known as:

(a) Principle axis (b) Optical center (c) Principle focus (d) Focal length

49.If "i" is angle of incidence , "r" is angle of refraction and n is constant then sin i/sin r=n is known as:

(a) Snell's law (b) Newton's law (c) Hooke's law (d) Einstein's law

50. Study of light behavior is called:

(a) Lenses (b) Optics (c) Mechanics (d) Heat

SUBJECTIVE PART **Time Allowed: 50Min** **Max Marks: 25**

Attempt all short questions.

Q1. Calculate wavelength of a photon of light with a frequency of 6.2×10^{14} Hz.

4/4

QS2. Explain stimulation emission.

Q3. State conditions which determine the radiation modes in laser cavity.

Q4. What is meant by optical resonator.

Q5. Write down four applications of laser.

BS-678-19-23

BAHAUDDIN ZAKARIYA UNIVERSITY, MULTAN

Final Term Exam, BS4Y-VIII (2023), Course: Lasers PHYS 402 (BS-

Time allowed: 2h 30min, Max. Marks: 60 *PRESS COPY*

Attempt all questions. Each question carry equal marks

Q.1. a) Discuss the phenomena of absorption, spontaneous and stimulated emission. (5 marks)

b) Derive Einsteins' Coefficients for absorption, spontaneous emission, and stimulated emission. (5-marks)

Q.2 a) What is paraxial approximation. (2 marks)

b) Obtain the matrix elements for reverse propagation A, B,C,D through any optical element. (8 marks)

Q.3 a) Briefly describe the Temporal Coherence of laser beam. (4-marks)

b) Discuss the construction and working of Fabry Perot/Plane parallel resonator (6 marks)

Q.4 a) Discuss the construction and working of He-Ne laser.? (8 marks)

b) Find the ratio of populations of the two states in a He-Ne laser that produces light of wavelength 6328Å at 27°C. (2 marks)

Q.5 Discuss the behaviour of Line shape function (Line broadening). (10 marks)

Q.6 a) What is mode locking method?. Explain. (4 marks)

b) What is the principle of Holography?. How it can be constructed and reconstructed. Give two applications. (6 marks)

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BAHAUDDIN ZAKARIYA UNIVERSITY, MULTAN

Name of Examination: BS Physics Sem-VIII (2018-22)
Subject: **Physics** **Course code:PHYS-402,** Paper: **Lasers**
Time Allowed: 2 h Maximum Marks: 60
Note: Attempt any All questions. Each question carry equal marks.

	Questions	Mark
a)	Describe the process of Absorption, Spontaneous and Stimulated emission.	6
b)	Derive the condition for gain per pass of laser through the active medium and obtain the condition for oscillation.	6
a)	Why metastable state is necessary for the production of laser beam.	2
b)	Derive Einstein's Coefficients.	10
a)	Differentiate between three level and four level pumping scheme?.	4
b)	Discuss the stimulated transitions between two rotational-vibrational levels of different electronic states in molecules.	8
a)	Discuss the construction and working of plane parallel resonators.	5
b)	What is the Quality factor of the plane parallel resonator.	2
c)	Discuss the phenomena of Q-switching and mode locking.	5
a)	Discuss the construction and working of He-Ne laser.	10
b)	List few applications of He-Ne laser.	2
	Discuss the behavior of the Line shape function (Line broadening) of a laser beam.	12

GOVERNMENT COLLEGE UNIVERSITY, FAISALABAD

spring semester examinations 2019 Roll No _____

SUBJECTIVE PART

CLASS: M.Sc PHYSICS SEMESTER: IV PAPER: LASER & OPTICS

COURSE CODE: PHY-658 TIME: 2 HOURS & 30 MINUTES

NAME:---------- ROLL #:-129807---------

NOTE: All questions carry equal marks.

Q2	(a)What is optical feedback in a laser system? Also discuss various types of losses involved in optical feedback systems?	3
	(b) Calculate the mirror reflectance required to sustain laser oscillations in a laser which is 0.1 m long given that the small signal gain coefficient is 1 m^{-1}. (assume one has 100% reflectance)	3
Q3	Write a detailed note on 4 level laser system.	6
Q4	Draw the stability diagram and describe how it can be used to find the stability of optical resonators.	6
Q5	What is laser spectrum broadening, discuss various causes of broadening.	6
Q6	What is holography and how it is different from conventional photography. Also discuss why holography is not possible with conventional light sources.	6