Question bank (LASER AND NANOMEDICIEN)

Lecture (Eman abdulmajed saied)

Q/ Answer the following

1- Ultraviolet laser ranged from ---------- nm .

2- Write disadvantage of Acousto-optic switching

3-Write two advantage of LED .

4- what means by SHG

5-Write two difference between laser diode and LED

6-According to band theory all material have three bands ----------,----------,----------

7- Define Q-Value (quality of resonator)

8- Write 3 primary methods to control laser pulse time .

9- Graphically explain active mode locking.

10-what means by Partial cavity dumping.

11- Extrinsic semiconductor is ----------

12- if you Know L=2.5 m for a laser λ=520nm find round tripe time of light

13- Explain Dye Q-switching

14- Defined non-linear optic

15- Graphically explain mechanism of laser diode

16- Light of wavelength 589 nm is used to view an object under a microscope. If the aperture of the objective has a diameter of 0.900 cm, what is the limiting angle of resolution?

a- 7.98×10^5 rad. b- 9.78×10^5 rad. c- 7.98×10^4 rad. d- 8.98×10^5 rad.

17- Write Sources of loss in side resonator

18- Transmittance of laser mirror between ----------

19- coherence is

20- Write types of laser mode

21- State second Huygens principle

22- Write a relation represent radius of curvature (R) at any distance (Z) .

23-Write benefit of resonator in any laser instrument

24- Drive matrix representation for a beam of light reflected on mirror

25- For a system in thermal equilibrium calculate the temperature at which the spontaneous and stimulated emission rates are equal for a wavelength of 500 nm, and the wavelength at which these rates are equal at a temperature of 4000 K.

26- Graphically explain the following

1-Reducing laser band width by reflectivity of resonator mirrors.

2-Elctro-optical (E-O)Q-switches.

3- Transverse modes for(TEM_{00} ,TEM_{63}, TEM_{05})

.

Answer the following questions:-

27- The intensity of radiation equal to ---------- .

28-The gain medium is substance which can be ----------,----------or ----------.

29- Laser is widely used as tools in imaging diagnosis (give example).

30- Explain temporal and regular coherence by drawing three waves.

31- Write two applications of polarizations in medicine.

32- Draw close-coupling pump.

33- Write equation of Gaussian profile in polar coordinate (explain parameters)

34-energy losses by an exited atom can be performed in two basic ways ----------,----------

35- Write equation of 1- Stefan Boltzmann equation

2- Maximum gain

36- Laser is …….

37- Explain pumping mechanism of ammonia maser.

38- Write two application of light in medicine.

39- What means by glow discharge explain?

40- The length of optical cavity in CO2 laser 50 cm. the emitted wavelength is 10.6 µm. Calculate

1- Gain coefficient. 2- Frequency. 3-Photon energy 4- ZR(w0=150µm).

41- Draw energy diagram of three and four level system.

42- (Required pumping rate of 4 level systems is lower than 3 level system) explain the statement using Rate equation.

43/ Choose correct answer

1- A transparent medium has an index of refract that is ----------.

(a) less than 1 (b)equal to 1 (c)greater than 1 (d)any of a above.

2- Irradiance unit is ----------.

(a) watt/m^2 (b)watt/m.sec (c)watt.sec/m^2 (d)joule/m^2.

3- In femtosecond laser thermal vaporization accrue after ----------.

(a) 1ns (b) 1Ps (c)100 ns (d)~ms .

4- When laser irradiance tumor tissue ,including gold nanoparticle a ---------- is generate.

(a) photoablation (b)photothermal (c)photochemical (d)plasma-induced

5- ---------- is an optical device that exhibited an intensity depend transition

(a) passive Q-switching (b) dye mode locking (c) saturable absorber (d) saturable gain

6- Mode locking used to produced ---------- pulses.

(a) 10^{-9}-10^{-12} (b)10^{-12}-10^{-15} (c) 10^{-15}-10^{-18} (d) 10^{-3}-10^{-6}

7- Rate of energy flow in every pulse called .

(a) average power (b)input power (c) peak power (d) output power

8- cooling tissue by radio frequency used for ---------

(a) increased epidermis thickness (b) compact collagen (c) treatment low and high absorption (d) all above

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Q44/Complete the following:

1*- Longer intervals between the pulse help to ----------*

2- LIBS is acronym of ----------

3- defined duty cycle ----------

4- Q-switching used in solid state laser because ----------

5- state bifrings material ----------

6- in micro pulse laser micro crack produced by the effect of ----------

7- kerr cell no longer used in E-O Q-switching because ---------- and ----------

8- Pulse beam creates ---------- effect on the target ,that destroyed ---------- material like ---------- and ----------

Q45/put (YES) or(NO)

Properties / Type	High cost	Vibration	Noise	Addition instrument e.g (motor,crystal,….)
Mechanical Q-switching				
E-O Q-switching				
A-O Q-switching				
Dye Q-switching				

46-Explian homogenous boarding in gas laser.

47-Write equation represents photo life time

48- Diffracted limited spot size equal to ---------- .

49- Write properties of light (only five).

50- What means by Transverse magnetic modes

51- Find beam diameter of laser at distance 5m if you know the following
($\phi=2.74^0$, $w_0=1mm$, $\lambda=514$ nm, beam diameter at $w_0=3mm$)

52- By drawing explain reducing laser bandwidth by using prism inside resonator.

53- Lasers are widely used as tools in imaging (give example)

54-Write relation between (I_{sat}) and angular frequency.

55- Explain exotic pumping.

56-non-radiative decay live time of atom in the rang ---------- while radiative decay in the rang ----------.

57- MIRACL is acronym of ----------

58- Generally electrical pumping used for---------- while optical pumping used for ----

59-draw energy level diagram for three level laser system.

60- State Black body's (Briefly).

61-Maching

Lasers	***wavelengths /nm***
Ruby laser	*694*
Nd-YAG	*1064*
GaAs	*632.8*
CO_2	*905*
He-Ne	*10600*
	11750
	964

62- Draw close coupling optical pumping laser.