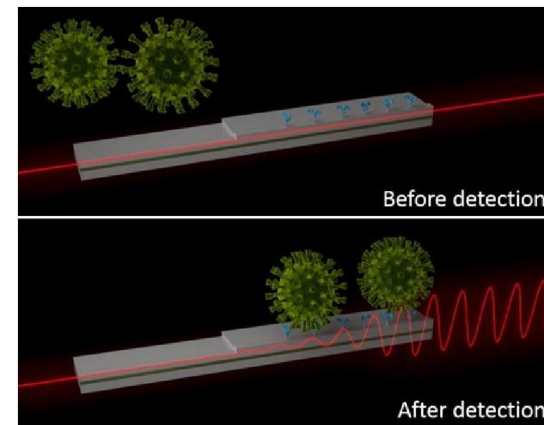
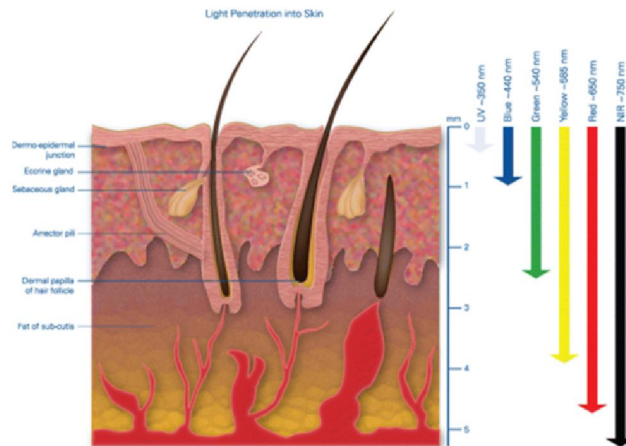
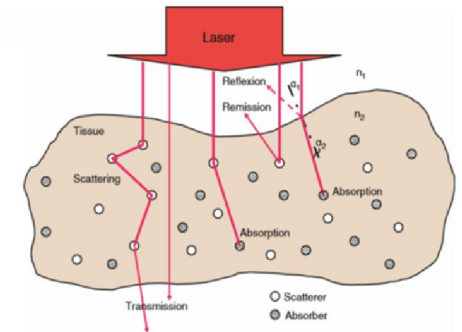


Laser in medicine

Academic Year: 2022/2023

4th Class - Physics (medical branch)

Lecturer: Msc. Eman .A. Saied



Course Book :-

Chapter one : principle of lasers :-

1.1 historically back ground .

1.2 properties of laser beam.

1.3 Absorption and emission of radiation:-

1.3.1 absorption

1.3.2 spontaneous emission

1.3.3 stimulated emission

1.4 Boltzmann distribution.

1.5 Einstein coefficients.

1.6 population inversion.

Chapter two :- laser theory :-

2.1 Active medium

2.1.1 Three level system.

2.1.2 Four level system.

2.2 pumping source, types of pumping source.

2.3 Resonators.

2.3.1 plane parallel (fabry-perrot)resonators.

2.3.2 Stable resonator.

2.3.3.Unstable resonator.

2. 4 Resonator modes

2. 5.Bandwidth of laser beam

2. 6 Reducing bandwidth of laser beam

2.7 Expanding and shaping of laser out put:

Chapter three: Laser operation

3.1 laser types based on mode of operation

3.1.1 continues wave laser system

3.1.2 pulsed laser system

3.2 Properties and characterises of pulsed laser system.

3.3 Type of pulsed operation of lasers

A- Q. switching.

B- mode locking.

C- cavity damping

**Chapter four : laser interaction with tissue
(optical and thermal response of tissue):-**

4.1 The optical response of tissue

4.2 Reaction mechanism

4.3 Basic effect of laser on tissue

Chapter five :- laser types

5.1 laser types based on active medium state

5.1.1 solid state laser .

5.2.2 Gas laser.

5.3.3 liquid laser .

5.2 laser types based on emission range

5.2.1 far infrared lasers

5.2.2 mid infrared lasers

5.2.3 visible

5.2.4 ultra violet

Chapter six :-Classification of Lasers and Laser hazards

Chapter seven :-laser application in medicine

6.1 laser application in dental

6.2 Laser in ophthalmology

Chapter eight : semiconductor laser:-

9.1 Semiconductor Physics

9.2 Modern Diode Lasers

9.2.1 Wavelength of Diode Lasers

9.2.2 Vertical Cavity,

Surface-Emitting Lasers.

9.3 semiconductor laser application in medicine

Some important subjects

- Non linear optics
- Fiber optics
- Free electron laser

References :

- 1- **Principles of laser**:- by O.sevilto and D.Hanna (5th edition)2009, springer.
- 2- **Introduction to laser technology** , by B.hitiz ,J.Ewing ,Jeff Hech, (3rd edition)2001new yourk .
- 3- **Laser-Tissue Interactions**, by Rudolf Steiner
- 4- **Lasers for medical applications**(Diagnostics, therapy and surgery), by Helena Jelínková 2013
- 5- **Basics of Laser Physics** (For Students of Science and Engineering), by Karl F. Renk 2017.

Any other laser physics text books, articles from media and internet.