“The best thing about the course is that it is not just a superficial study but is a complete conceptual based study of the subject. I enjoyed every bit of it, right from the Quantum physics to the medical application.”

Dr Shailja Dhir, India

“*Oh, what an experience! I will recommend others to enroll for your courses. Your courses are scientific, professional and of high quality. I therefore cannot add or subtract anything from the contents of the courses*.”

Dr. Qentso Bikane, South Africa

“I would like to thank you, Raymond Schoeman for the intense support you have given me throughout this course. I came across the course on the Internet whilst sieving through courses which would best serve me, in my studies as well as profession. I have to say, I am incredibly grateful for the support you have given me from day one with direction as well as communication on a number of things. I have found this course very stimulating and have found it hugely beneficial as it has grown me as a person and increased the platform which I work on to continuously improve my skills. I am excited about the next journey I will embark on with regards to Advanced Cosmetic Laser.”

Rachel Greene, South Africa

Textbook for aesthetic laser therapy.

To Luc Bijnens

Who gave me my start in the world of lasers and gently but persuasively pushed me to strive for excellence.

Textbook for aesthetic laser therapy.

Raymond Schoeman

© 2019 by Raymond Fisher Schoeman

Produced by LaserCollege
P.O.Box 750
Thabazimbi
0380
South Africa
www.lasercollege.org
info@lasercollege.org

Hardcover edition published in 2019
ISBN: 978-9-4021-8733-5

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any from or by any means – for example, electronic, photocopy, and recordings – without the prior written permission of the author. The only exception is brief quotations in printed reviews

Foreword.

The use of lasers and other light-based equipment has become widespread in the aesthetic industry.
However, therapists are still largely left to their own experiments to gain insight into technology and to establish treatment protocols that are both safe and effective. Little or no assistance can be expected from the equipment manufacturer. That is why there is a need for information in the aesthetic laser industry that offers the principles, safety aspects, as well as effective treatment protocols and practical experience.

With this book I hope to address the most frequent and prominent questions asked by laser therapists and technologists in the aesthetic industry.

Index

Laser physics.

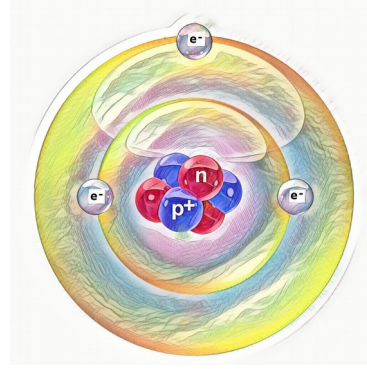
How laser light works.

The word LASER is an acronym that stands for: **L**ight **A**mplification by **S**timulated **E**mission of **R**adiation.
The first laser was built in 1960 by Theodore H. Maiman at Hughes Research Laboratories, based on theoretical work by Charles Hard Townes and Arthur Leonard Schawlow.

How a laser works.

With the use of population inversion of electrons and stimulated emission of photon in the laser resonator, sufficient energy with the exact same wavelength can be generated to enable a laser beam.

All atoms consist of protons (in the middle of an atom) and electrons that surround the centre in 4 main energy levels (S1, S2, P1, P2). Keep in mind that there are different sub levels. When electrons gain energy, they move from a lower energy level to a higher energy



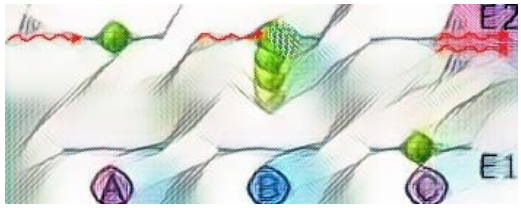
level. That is, from S1 to S2 or P1 to P2. This depends on how much energy is given to the electron. However, electrons always want to be at the lowest possible energy level. When an electron falls from a higher energy level to a lower level, it loses part of its energy - the energy that it loses is known as photon emission. These photons form the energy that we know as laser light.

Population inversion is when a large amount of electrons are excited at the same time to jump to a higher energy level.

Photon emission (spontaneous emission) is the energy that is emitted when an electron falls from a higher energy level to a lower energy level. Photon emission and stimulated emission are the same action, stimulated emission indicates the presence of an external stimulation that will improve the emission of photons.

Stimulated emission is the radiation emitted when the internal energy of the system falls from an excited level to a lower level.

This is when an external energy source was used to get



as many electrons as possible to an excited level (the higher energy levels in an atom), which can produce enough photons when it falls back to a lower energy level to create a laser beam. Remember that this process is continuous and that electrons constantly change the energy level to produce photons.

In the natural state, there are not enough electrons that simultaneously fall from a higher energy level to a lower level to generate enough photons to create a laser beam. Therefore, it must be stimulated to release enough photons to generate the laser beam. In other words, stimulated emission is when the electrons get a little help to ensure that they release enough photons. While the electrons are in the excited state; if the atom is illuminated with an incoming photon with exactly the same energy as would be required for a transition that would occur spontaneously, the incoming photon can stimulate the electrons to return to the lower state and simultaneously emit a photon with the same transition energy. A single photon that acts on an excited electron