Laser Definitions

Ablation: Removal of a segment of tissue using thermal energy; also termed vaporization or thermal decomposition.
Absorption: The transfer of radiant energy into the target tissue resulting in a change in that tissue.
Active Medium: Any material within the optical cavity of a laser that, when energized, emits photons (radiant energy).
Attenuation: The decline in the energy or power as a beam passes through an absorbing or scattering medium.
Average Power: An expression of the average power emission over time expressed in Watts; total amount of laser energy delivered divided by the duration of the laser exposure. For a pulsed laser, the product of the energy per pulse (Joule) and the pulse frequency (Hertz).
Beam: Radiant electromagnetic rays that may be divergent, convergent, or collimated (parallel).
Chopped Pulse: See Grated Pulse Mode.
Chromophore: A substance or molecule exhibiting selective light-absorbing qualities, often to specific wavelengths.
Class IV Laser: A surgical laser that requires safety personnel to monitor the nominal hazard zone, eye protection, and training. This class of laser poses significant risk of damage to eyes, any nontarget tissue, and can produce plume hazards.
Coagulation: An observed denaturation of soft tissue proteins that occurs at 60˚C.
Contact Mode: The direct touching/contact of the laser delivery system to the target tissue.
Continuous Mode: A manner of applying the laser energy in an uninterrupted (non-pulsed) fashion, in which beam power density remains constant over time; also termed continuous wave, and abbreviated as 'CW'. Contrast with 'Pulsed Mode'.
Energy: The ability to perform work, expressed in Joules. The product of power (Watts) and duration (seconds). One Watt second = one Joule; 1 J = 1 Watt x 1 second.
Energy Density: The measurement of energy per area of spot size, usually expressed as Joules per square centimeter; also known as fluence.
Fluence: See Energy Density.
Free-Running Pulse Mode: A laser operating mode where the emission is truly pulsed and not gated. A flashlamp is used as the external energy source so that very short pulse durations and peak powers of thousands of Watts are possible. A laser operated in continuous wave.
Gated Pulse Mode: A laser operating mode where the emission is a repetitive on-and-off cycle. The laser beam is actually emitted continuously, but a mechanical shutter or electronic control 'chops' the laser beam into pulses. This term is synonymous with chopped pulse mode.
Intensity: See Power Density.
Irradiance: See Power Density.
Joule: See Energy. A unit of energy or work equal to an exposure of 1 Watt of power for 1 second.
Low-Level Laser Therapy (LLLT): See Photobiomodulation (PBM).

Noncontact Mode: A laser technique in which the delivery system is used without touching the target tissue; light radiation made be defocused or focused, depending on operator's technique and procedure.
Photobiomodulation (PBM): The use of light radiation to elicit biological responses in living cells.
Peak Power: The highest power in each pulse.
Plume: Essentially the smoke produced for aerosolization of by-products due to laser-tissue interaction. It is composed of particulate matter, cellular debris, carbonaceous and inorganic materials, and potentially biohazardous products.
Power: The amount of work performed per unit time, expressed in Watts (Joules per second). 1 Watt = 1 Joule x 1 Second.
Power Density: The measurement of power per area of spot size, usually expressed as Watts per square centimeter; also known as intensity, irradiance, and radiance.
Pulse Duration: A measurement of the total amount of time that a pulse is emitted; also known as pulse width.
Pulse Width: See Pulse Duration.
Pulsed Mode: Laser radiation that is emitted intermittently as short bursts or pulses of energy rather than in a continuous fashion. Contrast with 'Continuous Mode'.
Repetition Rate: Number of pulses per second, also known as pulse rate; usually expressed in Hertz (Hz) or pulses per second (PPS).
Scattering: An interaction as the laser beam disperses in a non-uniform manner throughout the tissue.
Superpulse: A variation of gated pulsed mode in which the pulse durations are very short, producing high peak power; also termed very short pulse.
Thermal Effect: For lasers, the absorption of the radiant energy by tissue producing an increase in temperature.
Thermal Relaxation Time: The amount of time required for temperature of the tissue that was raised by absorbed laser radiation to cool down to one half of that value after the laser pulse.
Vaporization: The physical process of converting a solid or liquid into a gas; for dental procedures, it describes conversion of liquid water into steam.
Watt: See Power.