








Electromagnetic radiation

Type of radiation	Hazard	Comment
Radio waves Wavelength 10^3 m	LOW HAZARD	There is no evidence that electric and magnetic fields at ordinary intensities affect the human body.
Microwaves Wavelength 10^{-2} m	 NON-IONISING RADIATION	These are strong sources which produce local heating. Microwave ovens should be operated and maintained according to instructions, so that microwaves cannot leak out. Using mobile phones is safe if the power is less than 100 W m^{-2} . Microwave radiation has been used medically to give relief from pain.
Infra-red Wavelength 10^{-5} m	 NON-IONISING RADIATION	It can produce skin burns and strong sources (eg, furnaces for melting iron) may damage the cornea of the eye. It may ignite combustible materials. Infra-red radiation has been used medically to give relief from pain. TV remote control units are safe.
Visible Wavelength 0.5×10^{-6} m	  NON-IONISING RADIATION LASER RADIATION	Intense sources (eg, from the Sun and narrow beams from class 3 & 4 lasers) may damage the retina. Class 1 (but not 1M) lasers (eg, in laser printers) are totally enclosed. Class 2 (but not 2M) lasers are low power (less than 1 mW) and safe unless the 'blink response' is overridden or ignored. Some cheap laser pointers are wrongly classified and may be class 3B (typical power 3 mW). Some are even 100 mW. These are dangerous, especially if misused. Direct observation of eclipses of the Sun often results in blindness.
Ultra violet Wavelength 10^{-8} m UV-A, $315-400 \times 10^{-9}$; UV-B, $218-315 \times 10^{-9}$; UV-C, $100-280 \times 10^{-9}$.	 NON-IONISING RADIATION	It can cause sunburn. There is a risk of skin cancer. Do not sunbathe without adequate protection. Only class 1 UV lasers are safe. UV-A is used in sun beds. UV-B and UV-C can damage the eyes. Although UV-A is safer, many sources produce all wavelengths. UV is produced in electric-arc or oxy-acetylene welding. Glass which is 4 mm thick stops UV-B and UV-C. Wear snow goggles when skiing.
X-rays Wavelength 10^{-10} m	 IONISING RADIATION	X-rays are produced in low-pressure systems by sparks and discharges at more than 6 kV. Large doses cause burns and may induce cancer. X-rays are used in medicine for diagnosis and treatment (but should be avoided during pregnancy).
Gamma (γ) rays Wavelength 10^{-12} m	 IONISING RADIATION	See CLEAPSS Student Safety Sheet 11, Radioactive materials.

Typical control measures to reduce risk

- X-ray sets are permitted in schools only where there are suitably-qualified staff.
- Ultra-violet lamps must be screened or personal protective equipment used (also for welding).
- Lasers for use in schools must be class 1 or class 2, when the rule is "Do not stare down the beam".
- Use sun lotions with a suitable protection factor and do not sunbathe without adequate protection.
- Never look directly at the Sun (even during an eclipse) or through a lens, filter or pin hole.

Assessing the risks

- *What are the details of the activity to be undertaken? What are the hazards?*
- *What is the chance of something going wrong?*
- *How serious would it be if something did go wrong?*
- *How can the risk(s) be controlled for this activity?*
eg, can it be done safely? Does the procedure need to be altered?

Emergency action

- **Radiation burns to the skin** Treat as for a heat burn, ie, cool burnt skin under gently-running tap water for 10 minutes. Consult a medic if more than an area the size of a small coin is affected.
- **Suspected eye damage** Cover and consult a medic.