WJEC A-Level Physics

2.8 Lasers

Flashcards

What is stimulated emission?

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This is the process by which lasers produce light. It occurs when an electron is already in an excited state. If a photon has an energy equal to the energy difference between the electron's excited level and the level below, it can stimulate the electron to drop down to that lower level, releasing a photon of equal energy to the incoming photon.

The photons produced by stimulated emission have a constant phase difference and frequency (because they are of the same energy) and therefore form coherent light.

What is population inversion?

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Population inversion is a process required by laser technology, when there are more electrons in the upper level than the lower level. More electrons need to be in the upper level compared to the lower level because otherwise, the process of absorption will have a higher chance of taking place as opposed to stimulated emission.

What are semiconductor lasers?

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In comparison with other lasers (see above), semiconductor lasers are smaller and cheaper to produce. Therefore, they are often used in domestic appliances such as CD and DVD players. Barcode scanners and laser printers will also use semiconductor lasers. In addition to this, semiconductor lasers use much less power (and are more efficient) than other lasers allowing them to be run on low voltage sources – suitable for domestic appliances.

What is the amplifying medium?

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A laser consists of an amplifying medium. This is a medium composed of atoms which are subject to the pumping process. This is the region where stimulated emission takes place.

State 4 safety precautions that must be followed when using a laser.

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1. Wear laser safety goggles.
2. Don’t shine the laser at reflective surfaces.
3. Display a warning sign.
4. Never shine the laser at a person.