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| **Electromagnetic Waves** | | | | |
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| Look at the type of electromagnetic radiation used in different imaging techniques | | | | |
| **Subject(s):** Science, Design & Technology  **Approx time:** 10 mins |  | **Key words / Topics:**   * electromagnetic spectrum * medical physics * brain scan * applications & implications of science | | |
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| **Stay safe** |  |  | | |
| Whether you are a scientist researching a new medicine or an engineer solving climate change, safety always comes first. An adult must always be around and supervising when doing this activity. You are responsible for:    •        ensuring that any equipment used for this activity is in good working condition  •        behaving sensibly and following any safety instructions so as not to hurt or injure yourself or others    Please note that in the absence of any negligence or other breach of duty by us, this activity is carried out at your own risk. It is important to take extra care at the stages marked with this symbol: ⚠ | | |
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| **Suggested Learning Outcomes** |  |  | |
| * Appreciate that the electromagnetic spectrum consists of radiation with a continuous range of wavelengths, frequencies and associated properties * Be aware that there are practical applications of electromagnetic radiation in medicine through the use of scanners | | | |
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| **Introduction** |  |  | | |
| The use of different types of signals is hugely important in all areas of healthcare. Signal processing engineers are involved in everything from extracting information from the body’s own electrical and chemical signals to using wireless signals to allow search-and-rescue robot swarms to communicate with each other.  This resource allows students to investigate the wide range of sophisticated imaging technology available in modern hospitals, and to explore the latest ideas in search-and-rescue robotics.  **Purpose of this activity**  This activity is intended to provide a quick, engaging start to a lesson looking at properties and applications of waves in general and the electromagnetic spectrum in particular. | | |

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| **Activity** |  | **Teacher notes** |
| **1.** Using the **Quiz** handout, provide students with a series of five statements pertaining to a single particular wavelength of electromagnetic radiation.  A good source of information about electromagnetic radiation is the online encyclopaedia *Wikipedia* (<http://en.wikipedia.org/wiki/Electromagnetic_radiation>)  **Quiz (Handout)**  **2.** After each statement students have time to discuss, in mixed ability teams, what they consider to be the correct type of radiation.  **3.** The **Quiz** handoutincludes statements for four rounds. This activity could be extended if required by simply adding properties for other areas of the spectrum such as infra-red, ultraviolet etc. |  | *(ca five minutes)*  If the intention is to use this activity to lead into a lesson on medical imaging, it may be useful to use those rounds relating to X-rays or gamma rays to finish on. *(ca five minutes)* |

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| **Differentiation** |  | |  | |
| **Basic** |  | | **Extension** | |
| Introduce the different types of radiation first and then ask students to match the statements to the given types. |  | | Teams compete against each other, ‘University Challenge’ style.  Who can find out the correct type of radiation first?  30 seconds only (this can be shortened). | |
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| **Resources** |  | | **Required files** | |
|  |  | | Electromagnetic waves Quiz (Handout) | |
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| **Additional websites** | |  | |  | |
| * Wikipedia: A good source of information about electromagnetic radiation (<http://en.wikipedia.org/wiki/Electromagnetic_radiation>) | | | | | |
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| **Related activities (to build a full lesson)** |  | |  |
| **Starters** (Options)   * FILM: Mind Mapping * ACTIVITY: Engineers Can Read Your Mind * ACTIVITY: **Making Waves** * ACTIVITY: Medical imaging   **Main** (Options)   * ACTIVITY: Which medical imaging technique? * ACTIVITY: Which medical imaging technique? Practical | | **Extension** (Options)   * ACTIVITY: Robot Swarms   **Plenary**   * GAME: Move It * QUIZ: Brainwaves * Opportunities within activity for presentations, peer/self assessment * Reflection on Objectives and PLTS skills used | |
| **The Engineering Context** A black and white logo  Description automatically generated | | | |
| * **The story** Mind Mapping | | | |

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| **Curriculum links** | | | |
| **England: National Curriculum**  Science   * KS4 1.2b, 1.3c, 2.3c,d | | **Northern Ireland Curriculum**  Science  Developing pupils’ knowledge, Understanding and Skills   * research scientific information from a range of sources * Forces and energy   (Objective 2) Developing pupils as Contributors to Society   * investigate how the media help inform the public about science and science related issues. * media awareness * explore some ethical dilemmas arising from scientific developments   Technology & Design  Learning Outcomes   * show deeper understanding by thinking critically and flexibly, solving problems and making informed decisions, using Mathematics and ICT where appropriate; * communicate effectively in oral, visual (including graphic), written, mathematical and ICT formats showing clear awareness of audience and purpose. | |
| **Scotland: Curriculum for Excellence**  Sciences   * SCN 3-11b * SCN 4-11b, SCN 4-20a   Technologies   * TCH 3-01a | | **Wales: National Curriculum**  Science   * KS3 Skills (Communication 2) * KS3 Range (How things work) * KS4 Skills (Communication 1) * KS4 Range (Energy, electricity and radiations 3, 4) | |
| **GCSE Science**  AQA Combined Science Trilogy   * 6.6.2.1, 6.6.2.2, 6.6.2.3, 6.6.2.4   AQA Combined Science: Synergy   * 4.1.4.3   Edexcel Combined Science   * Physics: 5.7, 5.8, 5.10, 5.11, 5.12, 5.13, 5.14, 5.22   Eduqas Combined Science   * 2.3: 6.1, 6.2   OCR Gateway Science: Combined Science A   * P4.2   OCR 21st Century Science: Combined Science B   * P1.1 | | **GCSE Physics**  AQA Physics   * 4.6.2.1, 4.6.2.2, 4.6.2.3, 4.6.2.4   Edexcel Physics   * 5.7, 5.8, 5.10, 5.11, 5.12, 5.13, 5.14, 5.22   Eduqas Physics   * 6.1, 6.2   OCR Gateway Science: Physics A   * P5.2   OCR 21st Century Science: Physics B   * P1.1 | |
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| **Assessment opportunities** | | |
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| **Personal, learning & thinking skills (PLTS)** | | |
| * Creative Thinker * Team Worker | | |