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| **Lesson Number: 24.1** |
| **Lesson Title: Current-carrying conductors in a magnetic field** |
| **Specification Reference** | **3.7.5.1** |
| **Learning Objectives** |
| Force on a current-carrying wire in a magnetic field: *F* = *BIl* when field is perpendicular to current.Fleming’s left hand rule.Magnetic flux density B and definition of the tesla. |
| **Opportunities for Assessment** |
| Page 399 questions |
| **Starter:** | Slide #1 asks students to think of any possible link between electric and magnetic fields. They may realise that electromagnetism or motors incorporate both areas of physics |
| **Main:** | Slide #2 explains that moving charges create magnetic fieldsDemonstrate the plotting compasses being effected by a current carrying wireSlide #3 is interesting in that pupils get confused as to whether the North pole of the Earth is a north seeking or South seeking poleSlide #4 explains the motor force acting on a wireDemonstration – place a wire from a low voltage unit (2-4V) between a pair of attracting magnets. See the wire move when the power is switched on – Optional use AC to watch the wire shudderSlide #5 is a bit of extension – the maths for angular intercepts of current and magnetism are not needed for A-LevelSlides #6 - #8 define the unit of the Tesla as well as giving some examplesSlide #9 explains Flemming’s left-hand ruleSlide #10 explains the torque effect in a motor – link to any previous work on motors and moments |
| **Plenary:** | Slide #11 is a summary |

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| **Homework:** | Page 399 questions; research the electric motor and its history, research Tesla |
| **Differentiation / Extension / S&C** |
| Extend the idea of motor force beyond the syllabus to include any angle |
| **Numeracy / Literacy** | **SMSC / Fundamental British Values** |
| Units and formulae | Nikola Tesla and his research, arguments about AC / DC safety for houses |
| **RESOURCES:** |
| Demonstrations:* LV supply
* Insulated wire (approx. 1m)
* Bar magnets x2 and holder (U shaped)
* Plotting compass
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| **Risk Assessment** e.g. CLEAPSS card reference |
| Wires can get hot, do not exceed 4V, internal fuses can go on LV packs if used for more than a few seconds as this demonstration is a short circuit |
| **Working Scientifically (HSW)** |
| “The electric motor” page 398 |

Pictures courtesy of:

Slides #1, #7 and #9 – Wikipedia

Slide #2 - [https://www.flickr.com/photos/121935927@N06/13580502213](https://www.flickr.com/photos/121935927%40N06/13580502213)