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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 fields  Demonstrate the plotting compasses being effected by a current carrying wire  Slide #3 is interesting in that pupils get confused as to whether the North pole of the Earth is a north seeking or South seeking pole  Slide #4 explains the motor force acting on a wire  Demonstration – 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 shudder  Slide #5 is a bit of extension – the maths for angular intercepts of current and magnetism are not needed for A-Level  Slides #6 - #8 define the unit of the Tesla as well as giving some examples  Slide #9 explains Flemming’s left-hand rule  Slide #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 | | |
| **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>