P4 Module Outline

- Describe the attraction and repulsion between unlike and like poles for permanent magnets
- Describe the difference between permanent and induced magnets
- Describe the characteristics of the magnetic field of a magnet showing how strength and direction change from one point to another
- Explain how the behaviour of a magnetic (dipping) compass is related to evidence that the core of the Earth must be magnetic
- Describe how to show that a current can create a magnetic effect and describe the directions of the magnetic field around a conducting wire
- Recall that the strength of the field depends on the current and the distance from the conductor
- Explain how solenoid arrangements can enhance the magnetic field
- **Describe how a magnet and a current carrying wire exert a force on one another (Higher only)**
- **Show that Fleming's left hand rule represents the relative orientations of the force, the current and the magnetic field (Higher only)**
- **Apply the equation that links the force on a conductor to the magnetic flux density, the current and the length of conductor to calculate the forces involved. (Higher only)**
- **Explain how the force exerted from a magnet and a current-carrying conductor is used to cause rotation in electric motors (Higher only)**
- ***Recall that a change in the magnetic field around a conductor can give rise to an induced potential difference across its ends which could drive a current, generating a magnetic field that would oppose the original change (Higher only) (Separate Science only)***
- ***Explain how this effect is used in an alternator to generate ac and in a dynamo to generate dc. (Higher only) (Separate Science only)***
- ***Explain how the effect of an alternating current in one circuit in inducing a current in another is used in transformers (Higher only) (Separate Science only)***
- ***Explain how the ratio of the potential differences across the two depends on the ratio of the numbers of turns in each (Higher only) (Separate Science only)***
- ***Apply the equation linking the potential differences and numbers of turns in the two coils of a transformer (Higher only) (Separate Science only)***
- ***Explain the action of the microphone in converting the pressure variations in sound waves into variations in current in sound waves into variations in current in electrical circuits and the reverse effect as used in loudspeakers and headphones (Higher only) (Separate Science only)***

P4 Formulae to use (provided in the exam)

Force on a conductor (at right angles to a magnetic field) carrying a current (N) = magnetic flux density (T) x current (A) x length (m)

$F = BIL$

Potential difference across primary coil (V) / potential difference across secondary coil (V) = Number of turns in primary coil / number of turns in secondary coil

$$\frac{V_p}{V_s} = \frac{N_p}{N_s}$$