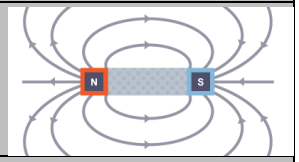
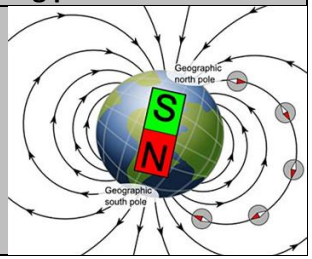
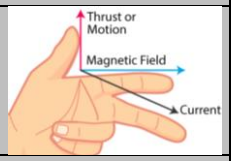
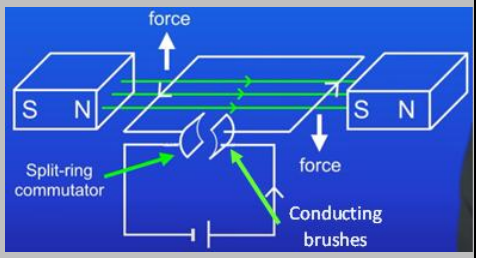
1 – Magnets	
Magnetic force	A **non-contact force** between **two magnets** or a **magnet** and a **magnetic metal**.
Non-contact force	The objects do **not** need to be **touching** for the **force** to act.
Attraction	**N** and **S poles attract**. A **magnet** and a **magnetic metal** always **attract**.
Repulsion	**N** and **N poles repel**. **S** and **S poles repel**.
Magnetic metals	**Nickel**, **iron**, **cobalt** and **steel**. (**NICS**)
Permanent magnet	Always has its own **magnetic field**. E.g., a **bar magnet.**
Induced magnet	A **magnetic metal temporarily** gains its own **magnetic field** when placed in a **magnetic field**. E.g., a piece of **iron** placed next to a **bar magnet**.
2 – Magnetic Fields	
Magnetic fields	**Area** around a **magnet** where **another magnet** or **magnetic material** experiences a **force**.
Field lines	Always go from **north** to **south poles**. Use an **arrow** to show **direction**. **Closer together lines** = **stronger field**.
Bar magnets	1. Field lines go from **N** to **S pole**. 2. Field is **strongest** at the **poles.** 3. Field gets **weaker** as you go **further** from the magnet. 
Investigating using iron filings	Place **magnet** under **paper**, **sprinkle iron filings** and **tap paper** to make **filings line up** with the **field**.
Investigating using a plotting compass	Place **compass** near **N pole**, **mark** where it **points**, move **compass** to **point** and **repeat** until you reach **S pole**. **Connect points** and **repeat** from **different starting positions**.
Earth's magnetic field	Created by **iron moving** in the **Earth's core**. Same **shape** as a **bar magnet** with a **magnetic S pole** at the **geographic north**. **Compasses** point to **magnetic S pole** -> used for **navigation**. 

3 – Electromagnets	
Electromagnet	Made from a **solenoid** (**coil** of **wire**) that has a **current** passing through it. **Magnetic field** around it is **shape** as **bar magnet**. **Inside solenoid** the **field** is **strong** and **uniform**.
Increasing strength (3 C's)	1. Use an **iron core**. 2. **Increase** the **current**. 3. **Increase** the number of **coils**.
Advantages	Can be turned **on** and **off**. **Strength** can be **varied**. Can **reverse poles** (reverse the battery). **Stronger** than **permanent magnets**.
4 – Motor Effect and Fleming's Left Hand Rule (HT only)	
Motor effect	When a **current-carrying wire** is placed in a **magnetic field** it **experiences** a **force**. The **force** is at **right angles** to the **current** and to the **magnetic field**.
Fleming's left hand rule	Used to predict the **direction** of the **force**. Thu**M**b = **M**otion/Force **F**irst finger = **F**ield Se**C**ond finger = **C**urrent 
Increasing the size of the force	1. **Increase** the **strength** of the **magnetic field**. 2. **Increase** the **current** through the **wire**.
Calculating force	**Force** = **magnetic flux density** x **current** x **length of wire** **F** = **B** x **I** x **l**
Magnetic flux density	Represents **strength** of **magnetic field**. Measured in **tesla** (**T**).
5 – Uses of the Motor Effect (HT only)	
Motors	**Loop** of **wire** in a **magnetic field**. **Current** is **passed** through **wire**. Each **side** of **loop** **experiences force** and **loop rotates**. **Direction** of **current changes** after each **half turn**. 

GCSE Science

Physics P7 Magnetism & Electromagnetism