SUBJECT: Physics YEAR: 11 MTP TITLE: Magnets and motors HALF TERM: 4 NO. OF LESSONS (approx): 6

Deliberate and specific retrieval of expected prior knowledge (be specific)

Magnetic materials (iron, cobalt, nickel) and basic attraction/repulsion between poles.
Magnetic fields around bar magnets drawn with field lines.
Simple knowledge of Earth's magnetic field and compass use.
Introduction to electromagnets – wrapping wire around an iron core and connecting a battery.
Understanding that electric current can produce a magnetic effect

Academic transformation (be specific)

The concept and drawing of magnetic field lines, and how field strength varies with distance.
Magnetic forces as non-contact forces, and the distinction between permanent and induced magnets.
Construction and working of electromagnets, and how their strength can be increased.
The motor effect and how it's used in devices (e.g. loudspeakers, electric motors).
Understanding and using Fleming's Left-Hand Rule to predict motion in magnetic fields.
The principles of electromagnetic induction, including how generators work.
Practical applications: transformers, the National Grid, and power transmission

Personal transformation (2 or 3)

How MRI machines use electromagnetism to scan the human body.
The science behind maglev trains and their use of magnetic levitation.
Exploration of wireless charging and its basis in electromagnetic induction.
The role of electromagnets in scrapyards, doorbells, and relays – linking physics to the real world.
The historical context: Michael Faraday's groundbreaking work and how it changed the world.

Can I Learning Questions

Can I recall knowledge of magnets from KS3?
Can I describe how an electromagnet works?
Can I describe how an electric motor works?
Can I explain how electrical generators work?
Can I explain how a transformer works?

Literacy and Oracy

Written Tasks:
Research report: *"How does an MRI scanner use electromagnetism to save lives?"*
Article: *"Should we replace all trains with maglev technology?"*
Discussion Tasks:
Debate: *"Is wireless energy the future of electricity transmission?"*
Group presentation: *"The most important invention based on electromagnetism"*
Useful Websites:
BBC Bitesize – Magnets and Electromagnetism: https://www.bbc.co.uk/bitesize/guides/zxxmn39/revision/1
Institute of Physics – Electromagnetism: https://www.iop.org/resources/topic/electromagnetism
Isaac Physics – Electricity and Magnetism: https://isaacphysics.org/concepts/cp_magnetism

Misconceptions (5 or 6 examples)

All metals are magnetic – students often confuse electrical conductivity with magnetism.
Magnetic field lines represent actual paths or currents – misunderstanding them as physical entities.
An electromagnet is always stronger than a permanent magnet – not always true; depends on current and design.
The motor effect is the same as electromagnetic induction – confusion between cause and effect.
Electricity is lost in transformers – not understanding that they conserve power (ignoring real-world inefficiencies).
Current always flows in the same direction when a magnet moves – not grasping alternating current in generators.