SUBJECT A2 Physics — Year 13 LP 3

This half term: Skills, Knowledge and Understanding to be developed:

- **Skills (students will be able to by the end of the Learning Programme):** carry out calculations using the equations for capacitance, calculate the capacitance of capacitors in series and parallel, interpret exponential graphs and use exponential equations for charging and discharging capacitors and draw graphs with error bars and gradient calculations; carry out calculations using the equations for the force on a current carrying conductor and a charged particle in a magnetic field and the field strength due to a straight wire and a solenoid. They will also be able to predict the direction of movement of current carrying conductors and charged particles in magnetic fields.
- **Knowledge (students will know by the end of the Learning Programme):** what is meant by a parallel plate capacitor, how a capacitor stores charge and energy, what a dielectric is and how it affects capacitance, and how a capacitor charges and discharges through a resistor; how a Hall voltage is produced, the shape of magnetic fields around wires and solenoids, that adding an iron core increases the field strength in a solenoid and how the movement of charged particles in magnetic fields is used in linear accelerators, cyclotrons and synchrotrons.
- **Understanding (students will demonstrate their understanding):** by answering a range of A2 level exam questions relating to capacitors.

Key Terms/Words: parallel plate capacitor, vacuum, charge, capacitance, energy, voltage, permittivity, dielectric, charging, discharging, time constant, current carrying conductor, magnetic field, force, Hall voltage, solenoid, field strength, magnetic flux density,

LP 3 – Week 1 & 2 Learning Outcomes:

Students will apply and demonstrate new knowledge and skills in a Mock Examination.

1. Students will know that a simple parallel plate capacitor consists of a pair of equal parallel metal plates separated by a vacuum or air
2. Students will know that a capacitor stores energy by transferring charge from one plate to the other, so that the plates carry equal but opposite charges (the net charge being zero)
3. Students will know the definition of capacitance as $C = Q/V$ and be able to use the equation
4. Students will be able to use $C = \varepsilon_o A/d$ for a parallel plate capacitor, with no dielectric
5. Students will know that a dielectric increases the capacitance of a vacuum-spaced capacitor

Assessment
Mock
Mark
Grade:

Success criteria:
MOCK EXAM

1. Calculate the capacitance of a capacitor.

Homework 1: LP 3

Prepare for Mock Exam

LP 3 – Week 3 & 4 Learning Outcomes:

1. Students will be able to use the equations for capacitors in series and in parallel
2. Students will be able to use the equation $U = ½ QV$ for the energy stored in a capacitor
3. Students will know that the E field within a parallel plate capacitor is uniform and be able to use the equation $E = V/d$
4. Students will be able to describe the process by which a capacitor charges and discharges through a resistor
5. Students will be able to use the exponential equations for the charging and discharging of a capacitor, where RC is the time constant.
6. Students will be able to investigate the charging and discharging of a capacitor to determine the time constant, and investigate the energy stored in a capacitor in Specified Practical Work

Assessment
APP1
Mark

Success criteria:

1 Calculate the capacitance of a combination of capacitors.
2 Calculate the energy stored on a capacitor.
3 Use exponential equations and graphs to calculate the charge stored, the voltage across and the current through a charging or discharging capacitor.

APP1

Homework 2: LP 3

A Level Exam Questions

LP 3 – Week 5 & 6 Learning Outcomes:		**Success criteria:**	**Homework 3: LP 3**
1. Students will be able to determine the direction of the force on a current carrying conductor in a magnetic field using Flemings Left Hand Rule. 2. Students will be able to calculate the magnetic field, B, by considering the force on a current carrying conductor in a magnetic field i.e. understand how to use $F = BIl\sin\theta$ 3. Students will understand the processes involved in the production of a Hall voltage and understand that $V_H \propto B$ for constant I.		1. Calculate the field strength. 2. Predict the direction of the force using FLHR.	A2 Exam Questions