**Little Heath Sixth Form**

**Physics A2** Personal Learning Checklist

**Student Name: ……………………….…………………………………..………**

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| **Unit Name:** Unit 4 –Fields and further mechanics **Side B Teacher** | **Unit Code:**PHYA4 |
| *Minimum Target Grade:* | *Aspirational Target Grade:* |

*KEY:* ***Red =*** *with difficulty* ***Amber*** *= not sure* ***Green*** *= yes*

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| --- | --- | --- | --- | --- |
| **Knowledge/Specification**  | **Red** | **Amber** | **Green** | **To address this before the exam I will:-** |
| **4.4 Capacitance** |  |  |  |  |
| **Capacitance** |  |  |  |  |
| * I can define capacitance and use the equation:
 |  |  |  |  |
| **Energy stored in a capacitor** |  |  |  |  |
| * I understand the area under a charge against voltage (pd) graph represents the energy stored in a capacitor.
 |  |  |  |  |
| * I can use the graph to derive the equation E = ½ QV for the energy stored in a capacitor.
 |  |  |  |  |
| * I can apply the following equations for energy stored in a capacitor to both multiple choice and long answer questions

 |  |  |  |  |
| **Capacitor discharge** |  |  |  |  |
| * I understand which equations I can use when capacitors are charged at a constant rate, including Q = It
 |  |  |  |  |
| * I can draw graphs for the charging and discharging of capacitors through resistors.
 |  |  |  |  |
| * I have plotted the discharging curves of capacitors using a data logger and voltage sensor and can explain the practical.
 |  |  |  |  |
| * I can explain what exponential decay means in relation to a capacitor discharging.
 |  |  |  |  |
| * time constant = RC

I can explain what the time constant means and what unit it is measured in. |  |  |  |  |
| * I can calculate the time constant from
1. a graph discharge curve of a capacitor
2. a log graph for the discharge of a capacitor
 |  |  |  |  |
| **Knowledge/Specification (continued)** | **Red** | **Amber** | **Green** | **To address this before the exam I will:-** |
| **Capacitor discharge (continued)** |  |  |  |  |
| * I can apply the following equations to the exponential discharge of capacitors:

 V = Voe-t/CR  I = Ioe-t/CR* I can take logs to the base e to rearrange these equations to calculate t or CR or to plot a InV against t graph and be able to explain the significance of the gradient and y intercept.
 |  |  |  |  |
| **4.5 Magnetic Fields** |  |  |  |  |
| **Magnetic flux density** |  |  |  |  |
| * I understand that a current-carrying wire in a magnetic field experiences.
* *F = B I l*, when the magnetic field is perpendicular to the current.
 |  |  |  |  |
| * I can apply Fleming's left hand rule to predict the direction of force(motion) on a current carrying conductor in a magnetic field.
 |  |  |  |  |
| * I can explain what Magnetic flux density, B ,means and use the equation F = BIL to define the unit tesla (T).
 |  |  |  |  |
| * I can apply the idea of F=BIL to explain how a simple motor works
 |  |  |  |  |
| **Moving charges in a magnetic field** |  |  |  |  |
| * I understand that if charged particles are moving at right-angles to a magnetic field they will experience a force which is equal to:

*F = B Q v,* when the field is perpendicular to velocity. |  |  |  |  |
| * I can explain why charged particles move in circular motion in a magnetic field, using the concept of centripetal force.
 |  |  |  |  |
| * I can explain why charged particles in circular motion are accelerating even through their speed is constant
 |  |  |  |  |
| * I can predict the direction in which charged particles will start to move when entering a uniform magnetic field. (both + and – charges)
 |  |  |  |  |
| * I can equate the equations

F = BQv and F = mv2/r to derive the equation for the radius of curvature r = mv/BQ |  |  |  |  |
| * I can apply the above ideas to explain how the mass spectrometer works.
 |  |  |  |  |
| * I can apply the above ideas to explain how the cyclotron works and show that the time of a cycle/switching frequency of the ac voltage is independent of the speed of the accelerated protons.
 |  |  |  |  |

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| **Knowledge/Specification (continued)** | **Red** | **Amber** | **Green** | **To address this before the exam I will:-** |
| **Magnetic flux and flux linkage** |  |  |  |  |
| * Magnetic flux by Φ *= B A*, where *B (magnetic flux density)* is normal to *A (Area of loop)*
 |  |  |  |  |
| * Flux linkage as *N* Φ*,* where *N* is the number of turns of the loop of wire.
 |  |  |  |  |
| * The flux linkage passing through a rectangular coil rotated in a magnetic field changes as it’s angle changes:

flux linkage *N* Φ *= BAN cos* θ, where θ is the angle between the normal to the plane of the coil and the magnetic field. |  |  |  |  |
| **Electromagnetic induction** |  |  |  |  |
| * I can explain how to show that an emf can be induced by cutting magnetic field lines and apply Faraday’s law to explain how we can increase the size of the induced emf.
 |  |  |  |  |
| * I can use the equation E = Blv for the induced emf for a conductor cutting a magnetic field at right-angles. Where B = Magnetic flux density, l = length of conductor in the field and v = speed at which conductor is moving. E.g. aeroplane wings cutting the magnetic field lines of the Earth
 |  |  |  |  |
| * I can use Fleming’s Right hand rule to predict the direction of the induced current.
 |  |  |  |  |
| * Faradays law:

Magnitude of induced emf = rate of cutting of flux lines = |  |  |  |  |
| * I can explain how to show that an emf can be induced by changing the flux linkage in a coil of wire and apply Faraday’s law to explain how we can increase the size of the induced emf:
* Magnitude of induced emf =

rate of change of flux linkage =  |  |  |  |  |
| * I can state what Lenz's law is and use it to explain the direction of the induced current or direction of the induced magnetic field in a coil of wire.
 |  |  |  |  |
| * I can use Faraday’s law and Lenz’s law to explain why a magnets acceleration when dropped through a coil of wire is less the 9.81ms-2 if the coil is a closed circuit(e.g. connected to an ammeter)
* I can explain why there will be no effect on the magnet’s acceleration if the coil is connected to a voltmeter.
 |  |  |  |  |
| * The can use the equation for the Emf induced in a coil rotating uniformly in a magnetic field which is given by:

Where ϖ = 2πf and peak emf = BANϖ |  |  |  |  |
| **Knowledge/Specification (continued)** | **Red** | **Amber** | **Green** | **To address this before the exam I will:-** |
| **Electromagnetic induction (continued)** |  |  |  |  |
| * I can sketch the construction of a set up or step down transformer and explain how a transform works using Faraday’s Law (electromagnetic induction)
 |  |  |  |  |
| * I can explain why a transformer will only work on ac.
 |  |  |  |  |
| * I can able to apply the transformer equation:

 |  |  |  |  |
| * I can calculate the efficiency of a Transformer using the following equation:

 efficiency =*I*s *V*s / *Ip Vp* |  |  |  |  |
| * I can state and explain the causes of inefficiency of a transformer and steps that are taken in the design to reduce the energy losses.
 |  |  |  |  |
| * I can explain why transmission of electrical power takes place at very high voltages
 |  |  |  |  |
| **4.3 Electric Fields** |  |  |  |  |
| **Coulomb’s Law** |  |  |  |  |
| * E is the force per unit charge defined by:

 |  |  |  |  |
| * Representation by electric field lines.
 |  |  |  |  |
| * Magnitude of *E* in a radial field given by:

 |  |  |  |  |
| * Magnitude of *E* in a uniform field given by:
 |  |  |  |  |
| **Electric potential** |  |  |  |  |
| * Understanding of definition of absolute electric potential, including zero value at infinity, and of electric potential difference.
 |  |  |  |  |
| * Work done in moving charge *Q* given by:

 |  |  |  |  |
| * Magnitude of *V* in a radial field given by:

 |  |  |  |  |
| * Graphical representations of variations of *E* and *V* with *r.*
 |  |  |  |  |
| **Comparison of electric and gravitational fields** |  |  |  |  |
| * Similarities; inverse square law fields having many characteristics in common.
 |  |  |  |  |
| * Differences; masses always attract but charges may attract or repel.
 |  |  |  |  |
| **REVISION****Use the information on this checklist to make revision cards and notes** |

**Grade tracking:**

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| **Graded activity for unit 4 Side B** | **Grade** | **Date** |
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*Note: You should discuss this checklist regularly with your subject teacher/mentor*