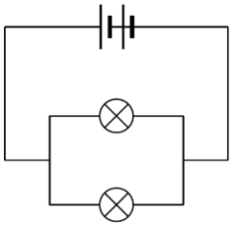
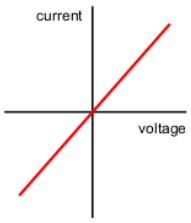
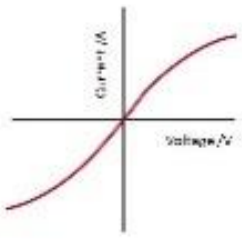
YEAR 11 GCSE Physics Combined

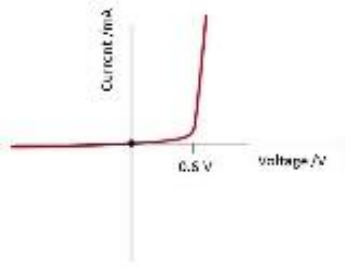
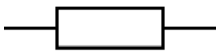
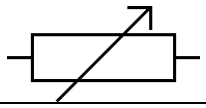
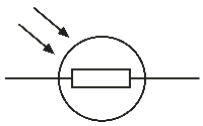
Spring Term Knowledge Organiser

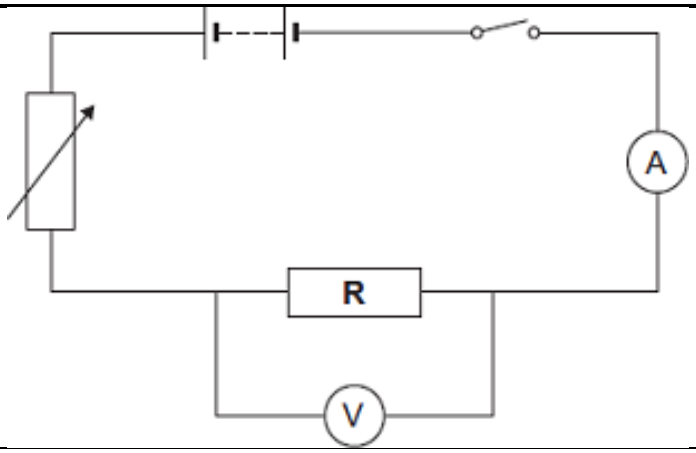
Electricity Introduction		
1	State two conditions needed for a current to flow.	1) A complete circuit 2) A source of potential difference (e.g. a cell, battery)
2	Define 'electrical current'	The **rate** of flow of **charge.**
3	In a circuit, which particle moves to cause a flow of charge?	Electrons
4	State the equation linking charge and current	$Q = I \times t$ Charge flow (C) = current (A) x time (S)
5	State the units for charge	Coulombs (C)
6	How does the potential difference of a source affect the current in a circuit?	The higher the potential difference of the source (cell, or battery) the higher the current in the circuit.
7	How does the amount of resistance in a circuit affect current?	The higher the resistance, the lower the current (for a given potential difference).
8	What causes resistance in a wire?	**Collisions** of electrons **with ions** in the wire
9	How does increasing the length of a wire affect its resistance?	• **More ions** in the wire • So **more collisions** of electrons with ions • So **more resistance**
10	State one factor, other than length, that affects the resistance of a wire.	Thickness of the wire (Thinner the wire, the greater the resistance)
11	Write Ohm's law as an equation	$V = I \times R$
12	What are the units of potential difference?	Volts (V)
13	What are the units of current?	Amperes (A)
14	What are the units of resistance?	Ohms (Ω)
15	Which piece of equipment is used to measure current in a circuit?	Ammeter
16	Which piece of equipment is used to measure voltage in a circuit?	Voltmeter

Series and parallel circuits		
1	What is a series circuit?	A circuit with only one loop. (All components are connected “one after another”)
2	What is a parallel circuit?	A circuit with more than one loop.
3	Describe the distribution of current in a series circuit	It is the same everywhere.
4	Describe the distribution of potential difference in a series circuit.	Potential difference is shared between components in the circuit
5	Describe the distribution of current in a parallel circuit	Current is shared between the separate branches (the sum of the current in each branch is equal to the total current flowing through the cell)
6	Describe the distribution of potential difference in a parallel circuit	The potential difference is the same across each branch
7	In a series circuit, how is potential difference shared between the components?	The proportion of the cell’s potential difference across the component is equal to the proportion of the component’s proportion of the total resistance (e.g. half the total resistance, it has half the cell’s potential difference)

8	How are voltmeters connected in a circuit?	in parallel, to measure the potential difference **across** the component
9	How are ammeters connected in a circuit?	In series, to measure current **through** a component
10	State the equation for calculating resistance in a series circuit	$R_{total} = R_1 + R_2 \ldots$
11	How do you calculate total resistance in a series circuit?	Add the resistance of each component in the circuit
12	What effect does adding resistors have in a series circuit on the total resistance?	Increases the total resistance
13	What effect does adding resistors in **parallel** have on a circuit's total resistance?	Decreases the total resistance
14	Why does adding resistors in parallel reduce total resistance?	More paths are made available for current to travel, so there is a greater rate of flow of charge
15	Draw a circuit with a battery and two bulbs connected in parallel.	
16	For two resistors connected in parallel, the total resistance must be…	…less than the resistance of the smallest individual resistor of the two.

Ohmic/non-ohmic types of resistors		
1	In ohmic components, which two variables are directly proportional?	Current and potential difference
2	If current and potential difference are directly proportional, what does this tell us about the resistance?	It is constant (gradient on I-V graph).
3	Sketch an I-V graph for an ohmic conductor	
4	Sketch a graph an I-V for a filament bulb.	

5	Sketch an IV graph for a diode.	
6	What is an ohmic conductor?	Electrical component where current and voltage are DIRECTLY PROPORTIONAL
7	What is a non-ohmic conductor?	Electrical component where current and voltage are NOT directly proportional
8	Name 4 non-ohmic conductors.	Filament bulb, diodes, thermistors, LDRs
9	Why are filament light bulbs non-ohmic?	Because as current increases, • the temperature of the filament increases, • the ions have more kinetic energy, causing more collisions with electrons • so the resistance increases
10	What does LED stand for?	Light emitting diode.
11	What does LDR stand for?	Light dependent resistor.
12	Describe the relationship between current and potential difference for a diode.	Current only flows in one direction (has a very high resistance in the other direction)
13	Describe the relationship between temperature and resistance in a thermistor.	As the temperature of the thermistor increases, the resistance of the thermistor decreases
14	State one use of a thermistor.	Thermostat – to control central heating
15	Describe the relationship between light intensity and resistance in an LDR.	As the light intensity on the LDR increases, the resistance of the LDR decreases
16	State a use of an LDR.	Switching lights on when it gets dark e.g. street lamps.
17	What is the symbol for a resistor?	
18	What is the symbol for a variable resistor?	
19	What is a variable resistor?	A component which has a resistance that can be varied by changing the amount of wire.
20	What is the symbol for an LDR?	
21	What is the symbol for a thermistor?	
22	What is the symbol for a diode?	

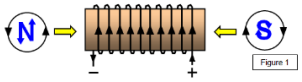
23	Draw a circuit that could be used to investigate whether a component obeys Ohm's law.	
24	Describe the measurements you would take using the circuit above, and explain the need for the variable resistor and the switch.	• Measure the current through the component, using the ammeter • Measure the potential difference across the component, using the voltmeter • Change the resistance of the variable resistor to get a range of values of PD and current • The switch should be closed only when measurements are being taken, to keep the temperature of R constant

Mains Electricity		
1	Is mains electricity AC or DC?	AC
2	What do AC and DC mean?	Alternating current Direct current.
3	State the frequency of UK mains supply	50 Hz
4	State the potential difference of UK mains supply	230 V
5	What are the names of the three wires in a three-core cable?	Live, neutral, earth.
6	State the colour of a) earth wire b) live wire c) neutral wire	a) Green and yellow stripes b) brown c) blue
7	State the function of the live wire.	Carries alternating potential difference from the supply
8	State the function of the neutral wire.	Completes the circuit
9	State the function of the earth wire.	Used in metal appliances Safety wire to remove excess potential difference (to stop the appliance becoming live)
10	State the potential difference between the live wire and earth wire.	230 V
11	State the potential difference of the neutral wire.	At or close to 0 V
12	State the potential difference of the earth wire.	0 V unless there is a fault.
12a	energy transferred = current × potential difference × time	$E = I \times V \times t$
13	State the equation for electrical power (that uses potential difference).	$P = I \times V$
14	State two things that affect the amount of energy an appliance transfers.	Power and time ($E = P \times t$)

15	State the equation we use to calculate the energy transferred by a device that uses charge flow.	E = Q × V

Energy and power of electricity and the National Grid		
1	State the equation that links current, potential difference and power	P = IV power (W) = current (A) x potential difference (V)
2	State the equation that links current, power and resistance	$P = I^2R$ Power (W) = current^2 (A) x resistance (Ω)
3	State the two most commonly wasted forms of energy	Thermal and sound
4	When energy is wasted, what happens to it?	It is dissipated into the environment
5	State the equation that links time, energy and power	E = P × t energy (J) = power (W) x time (s)
6	State the equation that links energy, potential difference and charge flow	E = Q × V energy (J) = charge flow (C) x potential difference (V)
7	What is the national grid composed of?	Cables and transformers linking power stations to consumers.
8	What is the national grid used for?	Supplying electrify to houses
9	State the effect of step up transformers on potential difference	Increases p.d.
10	State the effect of step down transformers on potential difference	Decreases p.d.
11	State the effect of step up transformers on current.	Decreases current, increases p.d
12	State the effect of step down transformers on current.	Increases current, decreases p.d
13	Why are step up transformers used?	To reduce energy loss from cables (thermal)
14	Why are step down transformers used?	To reduce the potential difference to make it safe for domestic use.
15	Why is the national grid efficient?	Transformers reduces heat loss from wires when electricity travels long distances
16	Current is doubled, how does this affect power transferred?	Power quadruples. (P is proportional to current squared)

	Magnetism	
1	State the three magnetic elements.	Iron (steel is an alloy of iron), nickel, cobalt
2	Is a magnetic force an example of a contact or non-contact force?	Non-contact
3	What is the region around a magnet called?	A magnetic field
4	Where is the field the strongest around a bar magnet?	At the poles
5	What does the concentration of field lines around a bar magnet represent?	Strength of the field

6	Which of the following are attraction or repulsion: A:  **B:**  C:  D: 	A : Repulsion B : Attraction C: Repulsion D: Attraction
7	What direction do magnetic field lines act?	North to South
8	Describe what a permanent magnet is.	A permanent magnet produces its own magnetic field and it always has a north and south pole.
9	Describe what is meant by an induced magnet.	An induced magnet is a magnetic material that becomes a magnet when it is placed in a magnetic field. When removed from the magnetic field an induced magnet loses most/all of its magnetism quickly.
10	When a compass is held at rest in your hand, which direction will the North of the compass point to it point to?	The geographic North pole which is the magnetic south pole.
11	Why does a compass point to the geographical North pole?	The Earth has a magnetic field. It acts like a large bar magnet with a south pole at the geographical north
	Motor Effect	
1	What is produced around a wire when a current passes through it?	A magnetic field
2	Describe the shape of the field lines produced when a current passes through a single wire.	Circular field lines that get further apart as the field decreases further away from the wire.
3	Describe how the magnetic effect of a current can be demonstrated.	By putting compasses around the wire and then when the current is switched on the compasses will follow the direction of the field lines around
4	State two things does the strength of the field around the wire depend on?	The distance from the wire The size of the current passing through the wire
5	What is a solenoid?	A solenoid is a coil of wire
6	What do a solenoid and a bar magnet have in common?	The shape of the field lines around them are the same
7	Describe the magnetic field lines inside a solenoid	The magnetic field inside a solenoid is strong and uniform.
8	State 4 ways to increase the strength of a field around a solenoid?	Increase the number of coils of wire. Put the coils of wire closer together. Increase the size of the current. Include a soft iron core
9	What is the difference between an electromagnet and a solenoid?	An electromagnet has a soft iron core
10	Describe how to identify the poles of an electromagnet.	A**N**ti-clockwise current – **N**orth Pole Clockwise current – South Pole 
	Fleming's left-hand rule and Electric Motors	
1	What do the arrows represent below:	A: Thumb = Thurst or Force B: First finger = Field

	 A: Thumb = B: First finger = C: Second finger =	C: Second finger = Current
2	What is the Motor effect?	When a conductor carrying a current is placed in a magnetic field the magnet producing the field and the conductor exert a force on each other.
3	How can you increase the size of the force produced in the motor effect?	Increase the size of the current or the strength of the magnetic field
4	What is the equation that links force, magnetic flux density and length?	force = magnetic flux density × current × length F = B I l
5	What are the units for magnetic flux density?	T (Tesla)
6	In a motor which 2 magnetic fields interact to cause a force which makes the coil to rotate?	The field due to the permanent magnet The field due to the electromagnet in the field
7	What is the role of the split ring commutator in a d.c. motor?	The commutator switches the direction of the current every half turn to makes sure that the force on the coil is always in the same direction.
8	How could you increase the power of the motor?	Current in the coil is increased A larger number of turns is wound on the coil An iron core is used A stronger permanent magnet is used
9	State two ways you could reverse the direction of the motor.	Reverse the direction of the current Reverse the direction of the magnetic field