3rd Year Summer 2018: GCSE Physics Revision Checklists and Key Information Summaries

This document is to help support independent revision over the Summer Holiday. We *strongly* recommend the boys go through their notes and make sure all sections are complete, wrong answers corrected, diagrams labelled and any missed lessons caught up. They should then be doing (light) revision, especially for topic areas they have found tricky or areas they did not answer well in their summer exam.

The checklists and notes are split into different chapter sections, which match the www.kerboodle.com "AQA GCSE Sciences (9-1) Physics Student Book" digital textbook, and the other Kerboodle resources that pupils can access. This is a comprehensive and useful set of tools the boys **should be utilising** if they wish to do well in their physics work. Each boy must make sure he has a working, valid Kerboodle login; contact school IT support if there are any issues.

BBC Bitesize is also a very useful website, especially for basic understanding and quick revision. Again, the boys should be accessing the AQA Physics (single science) version:

https://www.bbc.com/education/examspecs/zsc9rdm

It is organised into the eight topics the boys cover over the three years of the course. For the 3rd -> 4th year boys, it is topics 1, 2 and 8 they should be reviewing (Energy, Electricity and Space Physics).

Further potentially useful websites:

http://www.physicsandmathstutor.com/physics-revision/gcse-aqa/

https://isaacphysics.org/

Can you…?	☺	😐	☹
Chapter 1: Energy and energy resources			
Describe ways in which energy can be stored.			
Describe how energy can be transferred.			
Describe the energy transfers that happen when an object falls.			
Describe the energy transfers that happen when a falling object hits the ground without bouncing back.			
Describe what conservation of energy is.			
Explain why conservation of energy is a very important idea.			
Describe what a closed system is.			
Describe energy transfers in a closed system.			
Describe what work means in science.			
Describe how work and energy are related.			
Calculate the work done by a force.			
Describe what happens to work that is done to overcome friction.			
Describe what happens to the gravitational potential energy store of an object when it moves up and down.			
I can explain why an object moving up increases its gravitational potential energy store.			
Explain why it is easier to lift an object on the Moon rather than on Earth.			
Calculate the change in gravitational potential energy of an object when it moves up and down.			
Write down what the kinetic energy of an object depends on.			
Calculate kinetic energy.			
Describe what an elastic potential energy store is.			
Calculate the amount of energy in an elastic potential energy store.			
Describe what is meant by useful energy.			
Describe what is meant by wasted energy.			
Describe what eventually happens to wasted energy.			
Describe if energy is still as useful after it is used.			
Describe what is meant by efficiency.			
Write down the maximum efficiency of any energy transfer.			
Describe how machines waste energy.			
Describe how energy is supplied to our homes.			
Explain why electrical appliances are useful.			
Describe what most everyday electrical appliances are used for.			
Explain how to choose an electrical appliance for a particular job.			
Describe what is meant by power.			
I can calculate the power of an appliance.			
Calculate the efficiency of an appliance in terms of power.			
Calculate the power wasted by an appliance.			

Chapter 1: Equations I need to know.			
Work done (W) = force applied (F) x distance (s) (joules,J) (newtons,N) (metres, M)			
Change in GPE store(ΔEp) = mass (m) x gravitational field strength (g) x change in height (Δh) (joules, J) (kg) (N/kg) (m)			
Kinetic energy (Ek) = ½ x mass (m) x speed^2 (v^2) (joules, J) (kg) (m/s^2)			
efficiency = <u>useful output energy transferred by the device (J)</u> total input energy transferred to the device (J)			
Power (P) (watts, W) **= <u>energy transferred to appliance (E)</u>** (joules, J) **time taken for energy to be transferred (t)** (seconds, s)			
efficiency = <u>useful power out</u> total power in **(X 100)**			
Chapter 1: Equations I am given and need to use.			
elastic potential energy (E_e) = 0.5 × spring constant (k) × extension^2 (e^2) (joules, J) (N/m) (m)			
Chapter 1: Key words I need to know			
Atomic/nuclear energy: *a term used to describe energy when it is stored inside atoms. It is another name for nuclear energy.*			
Chemical energy: *a term used to describe energy when it is stored in chemical substances. Food, fuel and batteries all store chemical energy.*			
Dissipated: *spread out.*			
Efficiency: *the proportion of input energy that is transferred to a useful form. A more efficient machine wastes less energy.*			
Elastic potential energy/strain energy: *a name used to describe energy when it is stored in stretched or squashed things that can stretch back to their original shape. Another name for 'strain energy'.*			
Energy: *something that is needed to make things happen or change.*			
joules (J): *a unit for measuring energy.*			

Kinetic energy: *a term used to describe energy when it is stored in moving things.*			
Law of conservation of energy: *the idea that energy can never be created or destroyed, only transferred from one form to another.*			
Power: *the amount (rate) of energy transferred per second. The units are watts (W).*			
System: *a set of things being studied. For example, a kettle, the water in it and its surroundings form a simple system.*			
Thermal energy: *a term used to describe energy when it is stored in hot objects. The hotter something is, the more thermal energy it has. Sometimes called 'heat energy'.*			
Useful energy: *energy transferred to where it is wanted in the way that is wanted.*			
Wasted energy: *energy that is not usefully transferred.*			
watts (W): *the unit for measuring power. 1 watt = 1 joule of energy transferred every second.*			
Work: *the energy transferred by a force. Work done (joules, J) = force (newtons, N) x distance moved in the direction of the force (metres, m).*			
Work done: *a measure of the energy transferred when a force acts through a distance.*			

Can you…?	☺	😐	☹
Chapter 2: Energy transfer by heating.			
Write down which materials make the best conductors.			
Write down which materials make the best insulators.			
Describe how the thermal conductivity of a material affects the rate of energy transfer through it by conduction.			
Describe how the thickness of a layer of material affects the rate of energy transfer through it by conduction.			
Describe what the specific heat capacity of a substance means.			
Calculate the energy needed to change the temperature of an object.			
Describe how the mass of a substance affects how quickly its temperature changes when you heat it.			
Describe how to measure the specific heat capacity of a substance.			
Describe how homes are heated.			
Describe how you can reduce the rate of energy transfer from your home.			
Describe what cavity wall insulation is.			
Chapter 2: Equations I need to know.			
None!			

Chapter 2: Equations I am given and need to use.			
change in thermal energy (ΔE) = mass (m) × specific heat capacity (c) × temperature ($\Delta\vartheta$) (J) (kg) (J/kg°C) (°C)			
Chapter 2: Key words I need to know			
Absorb: *to soak up or take in – for waves, it is when the wave disappears as the energy it is carried is transferred to a material.*			
Black body radiation: *the radiation emitted by a perfect black body (a body that absorbs all the radiation that hits it).*			
Conduction: *the way energy is transferred through solids by heating. Vibrations are passed on from particle to particle.*			
Convection: *circulation of a liquid or gas (fluid) caused by increasing its thermal energy.*			
Emit: *to give out.*			
Fluid: *liquid or a gas.*			
Infrared Radiation: *electromagnetic waves between visible light and microwaves in the electromagnetic spectrum.*			
Specific heat capacity: *energy needed to raise the temperature of 1kg of a substance by 1°C.*			
Thermal conductivity: *property of a material that determines the rate of energy transfer through it by conduction.*			
Thermal Conductor: *a material that allows energy to be transferred through it easily by heating.*			
Thermal Insulator: *a material that does not allow energy to be transferred through it easily by heating.*			

Can you…?	☺	😐	☹
Chapter 3: Energy resources.			
Describe how most energy demands are met today.			
Name the energy resources that are used.			
Describe how nuclear fuels are used in power stations.			
Name the other fuels that are used in power stations.			
Name the other fuels that are used to generate electricity.			
Describe what a wind turbine is made up of.			
Describe how waves can be used to generate electricity.			
Name the type of power station that uses water running downhill to generate electricity.			
Describe how the tides can be used to generate electricity.			
Describe what solar cells are and how they are used.			

Describe the difference between a panel of solar cells and a solar heating panel.			
Describe what geothermal energy is.			
Describe how geothermal energy can be used to generate electricity.			
Describe what fossil fuels do to the environment.			
Explain why people are concerned about nuclear power.			
Describe the advantages and disadvantages of renewable energy resources.			
Evaluate the use of different energy resources.			
Describe how best to use electricity supplies to meet variations in demand.			
Compare the economic costs of different energy resources.			
Name energy resources that need to be developed to meet people's energy needs in the future.			
Chapter 3: Equations I need to know.			
None!			
Chapter 3: Equations I am given and need to use.			
None!			
Chapter 3: Key words I need to know			
Biofuel: *any fuel taken from living or recently living materials, such as animal waste.*			
Carbon-neutral: *a biofuel from a living organism that takes in as much carbon dioxide from the atmosphere as is released when the fuel is burned.*			
Climate change:			
Fossil fuels: *a fuel formed from the dead remains of organisms over millions of years (e.g. coal, oil, or natural gas).*			
Geothermal energy: *energy that comes from energy released by radioactive substances deep within the Earth.*			
Hydroelectricity: *electricity generated by moving water, usually falling from a reservoir, to turn turbines and generators.*			
Non-renewable: *any energy resource that will run out because it cannot be renewed, e.g. oil.*			
Nuclear fuel: *substance used in nuclear reactors that releases energy due to nuclear fission.*			
Nucleus: *tiny positively charged object composed of protons and neutrons at the centre of every atom.*			
Reactor core: *the thick steel vessel used to contain fuel rods, control rods and the moderator in a nuclear fission reactor.*			
Renewable energy: *energy from natural sources that is always being replenished so it never runs out.*			

Solar cell: *a flat plate that uses energy transferred by the light to produce electricity.*			
Solar energy: *energy from the Sun.*			
Tidal power: *generating electricity using the movement of tides.*			
Uranium: a radioactive metal that can be used as a nuclear fuel.			
Wind turbine: *a kind of windmill that generates electricity using energy transferred by the wind.*			

Can you…?	☺	😐	☹
Chapter 4: Electric circuits.			
Describe how electric circuits are shown as diagrams.			
Write down the difference between a battery and a cell.			
Describe what determines the size of an electric current.			
Calculate the size of an electric current from the charge flow and the time taken.			
Write down what is meant by potential difference.			
Write down what resistance is and what its unit is.			
Write down Ohm's law.			
Describe what happens when you reverse the potential difference across a resistor.			
Describe what happens to the resistance of a filament lamp as its temperature increases.			
Describe how the current through a diode depends on the potential difference across it.			
Describe what happens to the resistance of a temperature-dependent resistor as its temperature increases.			
Describe what happens to the resistance of a light-dependent resistor as the light level increases.			
Describe the current, potential difference, and resistance for each component in a series circuit.			
Describe the potential difference of several cells in series.			
Calculate the total resistance of two resistors in series.			
Explain why adding resistors in series increases the total resistance.			
Describe the currents and potential differences for components in a parallel circuit.			
Calculate the current through a resistor in a parallel circuit.			
Explain why the total resistance of two resistors in parallel is less than the resistance of the smaller individual resistor.			
Explain why adding resistors in parallel decreases the total resistance.			

Chapter 4: Equations I need to know.

charge flow (*Q*) = current (*I*) x time taken (*t*)
(coulombs, C) (amperes, A) (seconds, s)

potential difference across a component (*V*) = energy transferred *(E)* (joules, J) **charge (*Q*)** (coulombs, C)

resistance (*R*) = potential difference (*V*) (volts, V) **current (*I*)** (coulombs, C)
(ohms, Ω)

Chapter 4: Equations I am given and need to use.

None!

Chapter 4: Key words I need to know

Ammeter: *an instrument for measuring the size of a current. It is put into a circuit in series with other components.*
Ampere (amps, A): *the unit of electric current. One ampere is a flow of 1 coulomb of charge per second.*
Battery*: a number of electrical cells in series.*
Charge: *a conserved property of some particles (e.g. electron, proton) which causes them to exert a force on each other.*
Component: *a part of something e.g. a lamp might be a component of an electric circuit.*
Diode: *a non-ohmic conductor that has a much higher resistance in one direction (its reverse direction) than in the other direction (its forward direction).*
Discharge: *to remove an electric charge by conduction.*
Earthed: *connected to earth so that any electrostatic charges can flow away.*
Electric field: *a charged object (X) creates an electric field around itself, which causes a non-contact force on any other charged object in the field.*
Electrons: *tiny negatively charged particles that move around the nucleus of an atom.*
Induce: *to create. For example, a wire in a changing magnetic field has a current in it.*
Ion: *a charged atom.*
Light-dependent resistor (LDR): *a resistor whose resistance depends on the intensity of the light incident on it.*
Light-emitting diode (LED): *a diode that emits light when it conducts.*
Neutrons: *uncharged particles of the same mass as protons. The nucleus of an atom consists of protons and neutrons.*
ohm (Ω): *the unit for measuring electrical resistance.*
Parallel: *components connected in a circuit so that the potential difference is the same across each one.*

Potential difference: *a measure of the work done or energy transferred to the lamp by each coulomb of charge that passes through it. The unit of potential difference is the volt (V).*			
Protons: *positively charged particles with an equal and opposite charge to that of an electron.*			
Resistance: *a way of saying how difficult it is for electricity to flow through something.*			
Series: *components connected in a circuit in such a way that the same current passes through them.*			
Static electricity: *unbalanced electric charges on the surface or within a material.*			
Thermistor: *a resistor whose resistance depends on the temperature of the thermistor.*			
volt, V: *the unit for measuring potential difference (voltage).*			
Voltmeter: *an instrument for measuring the potential difference across a component. Connected in parallel to a circuit.*			

Can you…?	☺	😐	☹
Chapter 5: Electricity in the Home			
Write down what direct current is and what alternating current is.			
Describe what is meant by the live wire and the neutral wire of a mains circuit.			
Describe the National Grid.			
Describe how to use an oscilloscope to measure the frequency and peak potential difference of an alternating current.			
Describe what the casing of a mains plug or socket is made of and explain why.			
Write down what is in a mains cable.			
Write down the colours of the live, neutral, and earth wires.			
Explain why a three-pin plug includes an earth pin.			
Describe how power and energy are related.			
Use the power rating of an appliance to calculate the energy transferred in a given time.			
Calculate the electrical power supplied to a device from its current and potential difference.			
Work out the correct fuse to use in an appliance.			
Calculate the flow of electric charge given the current and time.			
Write down the energy transfers when electric charge flows through a resistor.			
Describe how the energy transferred by a flow of electric charge is related to potential difference.			

Link the electrical energy supplied by the battery in a circuit to the energy transferred to the electrical components.			
Calculate the energy supplied to an electrical appliance from its current, its potential difference, and how long it is used for.			
Work out the useful energy output of an electrical appliance.			
Work out the output power of an electrical appliance.			
Compare different appliances that do the same job.			

Chapter 5: Equations I need to know.

power supplied (*P*) = current (*I*) x potential difference (*V*)
(watts, W) (amperes, A) (volts, V)

Power (*P*) (watts, W) = **energy transferred *(E)*** (joules, J) / **time (*t*)** (seconds, s)

power (*P*) = current^2 (I^2) x resistance (*R*)
(watts, W) (amperes, A) (ohms, Ω)

charge flow (*Q*) = current (*I*) x time taken (*t*)
(coulombs, C) (amperes, A) (seconds, s)

Chapter 5: Equations I am given and need to use.

None!

Chapter 5: Key words I need to know

Alternating current: *electric current in a circuit that repeatedly reverses its direction.*			
Circuit breakers: *an electrical component that interrupts the current in a circuit if there is a fault and the current rises to dangerous levels.*			
Direct current: *electric current in a circuit that is in one direction only.*			
Earth wire: *the wire in a mains cable used to connect the metal case of an appliance to earth.*			
Fuse: *a fuse contains a thin wire that melts and cuts the current off if too much current passes through it.*			
Live wire: *the mains wire that has a voltage that alternates in voltage (between + 325V and 325 V in Europe).*			
Neutral wire: *the wire of a mains circuit that is earthed at the local substation so its potential is close to zero.*			
Power: *the amount of energy (in joules) transferred every second. It is measured in watts (W).*			
Power rating: *the energy transferred per second by an appliance.*			

watts (W): *the unit for measuring power. 1 watt = 1 joule of energy transferred every second.*			

Can you…?	☺	😐	☹
Chapter 16: Space			
Describe how the solar system formed.			
Describe what is meant by a protostar.			
Explain how energy is released inside the Sun.			
Explain why the Sun is stable.			
Explain why stars eventually become stable.			
Explain the stages in the life of a star.			
Describe what will eventually happen to the Sun.			
Describe what a supernova is.			
State what forces keep planets and satellites moving along their orbits.			
Identify the direction of the force on an orbiting body in a circular orbit.			
Describe how the velocity of a body in a circular orbit changes as the body moves around the orbit.			
Explain why an orbiting body needs to move at a particular speed for it to stay in a circular orbit.			
State what is meant by the red-shift of a light source.			
Explain how red-shift depends on speed.			
Explain how people know that the distant galaxies are moving away from Earth.			
Explain why people think the Earth is expanding.			
Describe what the Big Bang theory of the universe is.			
Explain why the universe is expanding.			
Explain what cosmic microwave background radiation is.			
Explain what evidence there is that the universe was created in a Big Bang.			
Chapter 16: Equations I need to know.			
None!			
Chapter 16: Equations I am given and need to use.			
None!			
Chapter 16: Key words I need to know.			
Big Bang theory: *the theory that the universe was created in a massive explosion (the Big Bang), and that the universe has been expanding ever since.*			
Black dwarf: *a star that has faded out and gone cold.*			

Black hole: *an object in space that has so much mass that nothing, not even light, can escape from its gravitational field.*			
Centripetal force: *the resultant force towards the centre of a circle acting on an object acting in a circular path.*			
Cosmic microwave background radiation (CMBR): *electromagnetic radiation that has been travelling through space ever since it was created shortly after the big bang.*			
Dark matter*: matter in a galaxy that cannot be seen. Its presence is deduced because galaxies would spin much faster if their stars were their only matter.*			
Main sequence: *the main sequence is the life stage of a star during which it radiates energy because of fusion of hydrogen nuclei in its core.*			
Neutron star: *the highly compressed core of a massive star that remains after a supernova explosion.*			
Red giant: *a star that has expanded and cooled, resulting in it becoming red and much larger and cooler than it was before it expanded.*			
Red supergiant: *a star much more massive than the Sun will swell out after the main sequence stage to become a red supergiant before it collapses.*			
Redshift: *increase in the wavelength of electromagnetic waves emitted by a star or galaxy due to its motion away from us. The faster the speed of a star or galaxy, the greater the redshift is.*			
Protostar: *the concentration of dust clouds and gas in space that forms a star.*			
Supernova: *the explosion of a massive star after fusion in its core ceases and the matter surrounding its core collapses onto the core and rebounds.*			
White dwarf: *a star that has collapsed from the red giant stage to become much hotter and denser.*			