Physics Triple

Can you…?	☺	😐	☹
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.			

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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 = useful output energy transferred by the device (J) / total input energy transferred to the device (J)			
Power (P) (watts, W) **= energy transferred to appliance (E)** (joules, J) **/ time taken for energy to be transferred (t)** (seconds, s)			
efficiency = useful power out / total power in **(X 100)**			
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)			
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'.*			

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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…?	☺	😐	☹
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.			

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Describe how you can reduce the rate of energy transfer from your home.			
Describe what cavity wall insulation is.			
Equations I need to know.			
None!			
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)			
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 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.*			

Physics Triple

Can you…?	☺	😐	☹
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.			
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.*			

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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.*			

Physics Triple

Can you…?	☺	😐	☹
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.			
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) = <u>**energy transferred *(E)*** (joules, J)</u> / **charge (Q)** (coulombs, C)

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

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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.*			

Physics Triple

Can you…?	☺	😐	☹
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.			
Equations I need to know.			
power supplied (*P*) = current (*I*) x potential difference (*V*) (watts, W) (amperes, A) (volts, V) **Power (*P*)** (watts, W) = $\frac{\textbf{energy transferred } (E) \text{ (joules, J)}}{\textbf{time } (t) \text{ (seconds, s)}}$ **power (*P*) = current² (*I*²) x resistance (*R*)** (watts, W) (amperes, A) (ohms, Ω)			

Physics Triple

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

Physics Triple

Can you…?	☺	😐	☹
Molecules and matter			
Define density and write down its unit.			
Describe how to measure the density of a solid object or a liquid.			
Use the density equation to calculate the mass or the volume of an object or a sample.			
Describe how to tell from its density if an object will float in water.			
Describe the different properties of solids, liquids, and gases.			
Describe the arrangement of particles in a solid, a liquid, and a gas.			
Explain *why* gases are less dense than solids and liquids.			
Explain why the mass of a substance that changes state stays the same.			
Write down what the melting point of and the boiling point of a substance mean.			
Describe what you need to do to melt a solid or to boil a liquid.			
Explain the difference between boiling and evaporation.			
Use a temperature-time graph to find the melting point or the boiling point of a substance.			
Describe how increasing the temperate of a substance affects its internal energy.			
Explain the different properties of a solid, a liquid, and a gas.			
Describe how the energy of the particles of a substance changes when it is heated.			
Explain in terms of particles why a gas exerts pressure.			
Write down what latent heat means as a substance changes its state.			
Write down what specific latent heat of fusion and of vaporisation mean.			
Use specific latent heat in calculations.			
Describe how to measure the specific heat latent heat of ice and of water.			
Describe how a gas exerts pressure on a surface.			
Describe how changing the temperature of a gas in a sealed container affects the pressure of the gas.			
Explain why raising the temperature of a gas in a sealed container affects the pressure of the gas.			
Describe how to see evidence of gas molecules moving around at random.			
Describe how pressure (or volume) changes affect the volume (or pressure) of the gas.			
Describe why the pressure of a gas changes when its volume is changed at constant temperature.			
Use the equation pV = constant.			
Explain why the temperature of a gas increases when it is compressed quickly enough.			

Physics Triple

Equations I need to know.			
Density (ρ) (kg/m³) = **mass (m)** (kg) / **volume (V)** (m³) **Specific latent heat of fusion (L_F)** (J/kg) = **energy (*E*)** (J) / **mass (m)** (kg) **Specific latent heat of vaporisation (L_V)** (J/kg) = **energy (*E*)** (J) / **mass (m)** (kg)			
Equations I am given and need to use.			
change in thermal energy (*ΔE*) = mass (*kg*) × specific heat capacity(*c*) × temperature change (*Δϑ*) change in thermal energy: **joules, J** mass: **kilograms, kg** specific heat capacity: **J/kg °C** temperature change: **°C** **pressure (*p*)** (pascals, P) **x volume (*v*)** (m^3) **= constant**			
Key words I need to know			
Absolute zero: *the temperature at which the pressure of a gas drops to zero. It is -273°C or 0K.*			
Boiling point: *temperature at which a pure substance boils or condenses.*			
Change of state: the changing of matter from one state to another e.g. from solid to liquid.			
Chemical changes: *a change that results in the formation of new substances.*			
Density: *mass per unit volume of a substance.*			
Freezing point: *the temperature at which a pure substance freezes.*			
Gas pressure: *the force on a surface caused by the collisions of gas particles with the surface. Gas pressure acts at right angles to a surface.*			
Internal energy: *the energy of the particles of a substance due to their individual motion and positions.*			
kelvin (K): *the unit in the kelvin temperature scale. One kelvin is the same temperature interval as 1°C.*			
kelvin temperature scale: *a temperature scale that measures temperatures relative to absolute zero.*			
Kinetic theory: *the model that explains the properties of different states of matter in terms of the movement of particles.*			

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Latent heat: *the energy transferred to or from a substance when it changes its state.*			
Melting point: *temperature at which a pure substance melts or freezes (solidifies).*			
pascal (Pa): *a unit of pressure . 1 Pa = 1 N/m^2*			
Physical change: *a change in which no new substances are produced.*			
Specific heat capacity: *the energy needed to raise the temperature of 1kg of a substance by 1 °C.*			
Specific latent heat of fusion, L_F: *energy needed to melt 1kg of a substance with no change of temperature.*			
Specific latent heat of vaporisation, L_V: *energy needed to boil away 1kg of substance with no change of temperature.*			
States of matter: *there are three different forms that a substance can be in: solid, liquid or gas. These are the three states of matter.*			
Sublimation: *when a solid changes directly to a gas without becoming a liquid first.*			
Temperature: *a measure of how hot something is.*			
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. It is sometimes called 'heat energy'.*			
Work done: *a measure of the energy transferred when a force acts through a distance.*			

Physics Triple

Can you…?	☺	😐	☹
Radioactivity			
Write down what a radioactive substance is.			
Write down the types of radiation given out from a radioactive substance.			
Write down what happens when a radioactive source emits radiation (radioactive decay).			
Write down the different types of radiation emitted by radioactive sources.			
Describe how the nuclear model of the atom was established.			
Explain why the 'plum pudding' model of the atom was rejected.			
Describe what conclusions were made about the atom from experimental evidence.			
Explain why the nuclear model was accepted.			
Write down what an isotope is.			
Describe how the nucleus of an atom changes when it emits an alpha particle or a beta particle.			
Represent the emission of an alpha particle from the nucleus.			
Represent the emission of a beta particle from the nucleus.			
Write down how far each type of radiation can travel in air.			
Describe how different materials absorb alpha, beta, and gamma radiation.			
Describe the ionising power of alpha, beta and gamma radiation.			
Explain why alpha, beta, and gamma radiation are dangerous.			
Write down what the half-life of a radioactive source means.			
Write down what the count rate from a radioactive source means.			
Describe what radioactive isotopes are used for in medicine.			
Describe how to choose a radioactive isotope for a particular job.			
Describe what type of nuclear radiation be used for medical imaging.			
Explain how to use radioactivity to destroy cancer cells.			
State what nuclear fission is.			
Explain the difference between spontaneous fission and induced fission.			
State what a chain reaction is.			
Describe how a chain reaction in a nuclear reactor is controlled.			
State what nuclear fusion is.			
Describe how nuclei can be made to fuse together.			
Describe where the Sun's energy comes from.			
Explain why it is difficult to make a nuclear fusion reactor.			
State what radon gas is and why it is dangerous.			
Describe how safe nuclear reactors are.			
Explain why nuclear waste is dangerous.			
Explain what happens to nuclear waste.			

Physics Triple

Key words I need to know			
Activity: *the number of unstable atoms that decay per second in a radioactive source.*			
Alpha radiation: *alpha particles, each composed of two protons and two neutrons, emitted by unstable nuclei.*			
Atomic number: *the number of protons (which equals the number of electrons) in an atom. It is sometimes called the proton number.*			
Background radiation: *ionising radiation that is around us all the time from a number of sources. Some background radiation is naturally occurring, but some comes from human activities.*			
Beta radiation: *beta particles that are high energy electrons created in, and emitted from, unstable nuclei.*			
Control rod: *a rod that can be lowered into the core of a nuclear reactor, to absorb neutrons and slow down the nuclear chain reaction.*			
Cosmic rays: *charged particles with a high energy that come from stars, neutron stars, black holes and supernovae.*			
Count rate: *the number of counts per second detected by a Geiger counter.*			
Decay: *when a radioactive isotope emits ionising radiation.*			
Decommission: *dismantle safely.*			
Fuel rod: *a rod containing the nuclear fuel for a nuclear reactor.*			
Gamma radiation: *electromagnetic radiation emitted from unstable nuclei in radioactive substances.*			
Geiger-Muller (GM) tube: *a device that can detect ionising radiation and is used to measure the activity of a radioactive source.*			
Half-life: *average time taken for the number of nuclei of the isotope (or mass of the isotope) in a sample to half.*			
Ionisation: *any process that in which atoms become charged.*			
Irradiated: *an object has been exposed to ionising radiation.*			
Isotopes: *atoms with the same number of protons and different number of neutrons.*			
Mass number*: the number of protons and neutrons in a nucleus.*			
Nuclear equation: *an equation representing a change in an atomic nucleus due to radioactive decay. The atomic numbers and mass number must balance.*			
Random: *any process that cannot be predicted and can happen at any time is said to be random.*			
Unstable: *an unstable nucleus in an atom is one that will decay and give out ionising radiation.*			

Physics Triple

Can you…?	☺	😐	☹
Forces in balance			
Write down what displacement is.			
Write down what a vector quantity is.			
Write down what a scalar quantity is.			
Describe how to represent a vector quantity.			
Write down what forces can do.			
Write down the unit of force.			
Write down what a contact force is.			
Describe the forces being exerted when two objects interact.			
Describe what a resultant force is.			
Describe what happens if the resultant force on an object is zero.			
Describe what happens if the resultant force on an object is greater than zero.			
Calculate the resultant force when an object is acted by two forces acting along the same line.			
State what a free-body force diagram is.			
State what the moment of a force measures.			
Calculate the moment of a force.			
Describe how the moment of a force can be increased.			
Describe why levers are force multipliers.			
Describe how levers act as force multipliers.			
Explain how you can tell if a lever is a force multiplier.			
Describe what gears do.			
Explain how gears can give a bigger turning effect.			
State what the centre of mass of an object is.			
State where the centre of mass of a metre ruler is.			
Find the centre of mass of an object suspended from a fixed point.			
Find the centre of mass of a symmetrical object.			
Use your knowledge of forces and moments to explain why objects at rest don't turn.			
Identify the forces that can turn an object about a fixed point.			
Identify whether a turning force that can turn an object turns it clockwise or anticlockwise.			
Calculate the size of a force (or its perpendicular distance from a pivot) acting on an object that is balanced.			
State what a parallelogram of forces is.			
State what a parallelogram of forces is used for.			
Write down what is needed to draw a scale diagram of a parallelogram of forces.			
Use a parallelogram of forces to find the resultant of two forces.			

Physics Triple

Describe what resolving a force means.			
Describe how to resolve a force into two components.			
Define equilibrium.			
Explain why an object at rest is in equilibrium.			
Equations I need to know.			
moment (*M*) = force (*F*) x perpendicular distance* (*d*) (N m) (N) (m) ***from the line of action of the force to the pivot.**			
Key words I need to know			
Displacement: *distance in a given direction.*			
Force: *a force (in newtons, N) can change the motion of an object.*			
Friction: *the force opposing the relative motion of two solid surfaces in contact.*			
Load: *the weight of an object raised by a device used to lift the object, or the force applied by a device when it is used to shift an object.*			
Magnitude: *the size or amount of a physical quantity.*			
Moment: *the turning effect of a force.*			
Newton's first law of motion: *if the resultant force on an object is zero, the object stays at rest if it is stationary, or it keeps moving with the same speed in the same direction.*			
Newton's third law: *when two objects interact with each other, they exert equal and opposite forces on each other.*			
Parallelogram of forces: *a geometrical method used to find the resultant of two forces that do that do not act along the same line.*			
Principle of moments: *for an object in equilibrium, the sum of all the clockwise moments about any point = the sum of all the anti-clockwise moments about that point.*			
Resultant force: *a single force that has the same effect as all the forces acting on the object.*			
Scalars: *a physical quantity, such as mass or energy that has magnitude only (unlike a vector which has magnitude and direction).*			
Vector: *a vector is a physical, such as displacement or velocity that has a magnitude and a direction (unlike a scalar which has magnitude only).*			

Physics Triple

Can you…?	☺	😐	☹
Motion			
Calculate speed for an object moving at constant speed.			
Use a distance-time graph to determine whether an object is stationary or moving at constant speed.			
State what the gradient of the line on a distance-time graph can tell you.			
Use the equation for constant speed to calculate distance moved or time taken.			
State the difference between speed and velocity.			
Calculate the acceleration of an object.			
State the difference between acceleration and deceleration.			
Explain that motion in a circle involves constant speed but changing velocity.			
Measure velocity change.			
State what the horizontal line on a velocity-time graph tells you.			
Use a velocity time graph to work out whether an object is accelerating or decelerating.			
State what the area under a velocity-time graph tells you.			
Calculate speed from a distance-time graph where the speed is constant.			
Calculate speed from a distance-time graph where the speed is changing.			
Calculate the acceleration from a velocity-time graph.			
Calculate the distance from a velocity-time graph.			
Equations I need to know.			
speed (*v*) (m/s) = $\frac{\textbf{distance } (s) \text{ (metres, m)}}{\textbf{time taken} (t) \text{ (seconds, s)}}$ **acceleration (*a*)** (m/s^2) = $\frac{\textbf{change in velocity } (\Delta v) \text{ (m/s)}}{\textbf{time taken } (t) \text{ (s)}}$			
Key words I need to know			
Acceleration: *change of velocity per second (in metres per second per second (m/s^2).*			
Deceleration: *change of velocity per second when an object slows down.*			
Displacement: *distance in a given direction.*			
Distance-time graph: *a graph of the distance travelled against time for a moving object. The gradient of the line on a distance-time graph gives us the speed.*			
Force: *a force (in newtons, N) can change the motion of an object.*			
Magnitude: *the size or amount of a physical quantity.*			
Newton's first law of motion: *if the resultant force on an object is zero, the object stays at rest if it is stationary, or it keeps moving with the same speed*			

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in the same direction.			
Scalars: *a physical quantity, such as mass or energy that has magnitude only (unlike a vector which has magnitude and direction).*			
Vector: *a vector is a physical, such as displacement or velocity that has a magnitude and a direction (unlike a scalar which has magnitude only).*			
Velocity: *speed in a given direction (in metres/second, m/s).*			
Velocity-time graph: *a graph of velocity against time for a moving object. The gradient of the line on a velocity-time graph gives us the acceleration. The area under the graph gives us the distance travelled.*			

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Can you…?	☺	😐	☹
Force and motion			
Describe how the acceleration of an object depends on the size of the resultant force acting upon it.			
Describe the effect that the mass of an object has on its acceleration.			
Describe how to calculate the resultant force on an object from its acceleration and its mass.			
State what the inertia of an object means.			
Describe the difference between mass and weight.			
Describe and explain the motion of a falling object acted on only by gravity.			
State what terminal velocity means.			
State what can be said about the resultant force acting on an object that is falling at terminal velocity.			
Describe the forces that oppose the driving force of a vehicle.			
State what the stopping distance of a vehicle depends on.			
State what can cause the stopping distance of a vehicle to increase.			
Describe how to estimate the braking force of a vehicle.			
Calculate momentum.			
State the unit of momentum.			
Describe what momentum means in a closed system.			
Describe what happens when two objects push each other apart.			
Explain how momentum can be described as having direction as well as size.			
Explain why two objects that push each other apart always move away at different speeds.			
Explain what happens to the momentum of two objects when they collide.			
Explain what affects the force of impact when two vehicles collide.			
Describe how the impact force depends on the impact time.			
Explain what can be said about the impact forces and the total momentum when two vehicles collide.			
Explain why the impact force depends on the impact time.			
Describe how cycle helmets and cushioned surfaces reduce impact forces.			
Explain why seat belts and air bags reduce the force on people in car accidents.			
Explain how side impact bars and crumple zones work.			
Explain how we can work out if a car in a collision was speeding.			
State what elastic means.			
Describe how to measure the extension of an object when it is stretched.			
Describe how the extension of a spring changes with the force applied to it.			
State what the limit of proportionality of a spring means.			

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Equations I need to know.			
resultant force (*F*) = mass (*m*) x acceleration (*a*) (N) (kg) (m/s^2) **weight (*W*) = mass (*m*) x gravitational field strength (*g*)** (N) (kg) (N/kg) **momentum (*M*) = mass (*m*) x velocity (*v*)** (kg m/s) (kg) (m/s) **force applied (*F*) = spring constant (k) x extension (*e*)** (N) (N/m) (m)			

Key words I need to know			
Braking distance: *the distance travelled by a vehicle during the time it takes for its brakes to act.*			
Conservation of momentum: *in a closed system, the total momentum before an event is equal to the total momentum after the event. Momentum is conserved in any collision or explosion, provided no external forces act on the objects that collide or explode.*			
Directly proportional: *a graph will show this if the line of best fit is a straight line through the origin.*			
Elastic: *a material is elastic if it is able to regain its shape after it has been squashed or stretched.*			
Gravitational field strength: *the force of gravity on an object of mass 1kg (in newtons per kilogram, N/kg). It is also the acceleration of free fall.*			
Hooke's Law: *the extension of a spring is directly proportional to the force applied, as long as its limit of proportionality is not exceeded.*			
Inertia: *the tendency of an object to stay at rest or to continue in uniform motion.*			
Limit of proportionality: *the limit for Hooke's law applied to the extension of a stretched spring.*			
Mass: *the quantity of matter in an object – a measure of the difficulty of changing the motion of an object (in kilograms, kg).*			
Momentum: *this equals mass (kg) x velocity (m/s).*			
Newton's Second Law of motion: *the acceleration of an object is proportional to the resultant force on the object, and inversely proportional to the mass of the object.*			
Stopping distance: *the distance travelled by the vehicle in the time it takes for the driver to think and brake.*			
Terminal velocity: *the velocity reached by an object when the drag force on it is equal and opposite to the force making it move.*			

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Thinking distance: *the distance travelled by the vehicle in the time it takes the driver to react.*			
Weight: the force of gravity on an object (in newtons, N).			

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Can you…?	☺	😐	☹
Force and pressure			
Define the term pressure.			
State the unit of pressure.			
Use the pressure equation.			
Explain why the area of contact is important in pressure applications.			
Describe how the pressure in a liquid increases with liquid depth.			
Explain why the pressure along a horizontal line in a liquid is constant.			
State what the pressure in a liquid depends on.			
Calculate the pressure caused by a liquid column.			
Explain why the atmosphere exerts a pressure.			
Explain how and why atmospheric pressure changes with altitude.			
Explain how the density of the atmosphere changes with altitude.			
Calculate the force on a flat object due to a pressure difference.			
Explain why the atmosphere exerts a pressure.			
Explain how and why atmospheric pressure changes with altitude.			
Explain how the density of the atmosphere changes with altitude.			
Calculate the force on a flat object due to a pressure difference.			
State what is meant by an upthrust on an object in a fluid.			
Describe what causes upthrust.			
Describe what the pressure in a fluid depends on.			
Explain whether an object in a fluid floats or sinks.			
Equations I need to know.			
Pressure (*p*) (Pa) = $\frac{\textbf{force (F)} \text{ (N)}}{\textbf{area (A)} \text{ (m}^2\text{)}}$			
Equations I am given and need to use.			
pressure due to a column of liquid (*p*) (Pa) **= height of column (*h*)** (m) **x density of liquid (*ρ*)** (kg/m^3) **x gravitational field strength (*g*)** (N/kg)			
Key words I need to know			
Density: *mass per unit volume of a substance.*			
Force: *a force (in newtons, N) can change the motion of an object.*			
gas pressure: *the force on a surface caused by the collisions of gas particles with the surface. Gas pressure acts at right angles to a surface.*			
pascals (Pa): *a unit of pressure. 1 Pa = 1 N/m²*			
Pressure: force per unit cross-sectional area for a force acting on a surface at			

right angles to the surface. The unit of pressure is the pascal (Pa) or newton per square metre (N/m^2).			
Upthrust: *the upward force that acts on a body partly or completely submerged in a fluid.*			

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Can you…?	☺	😐	☹
Wave properties			
Describe what waves can be used for.			
Describe what transverse waves are.			
State what longitudinal waves are.			
State which types of wave are transverse and which are longitudinal.			
Define the amplitude, frequency, and wavelength of a wave mean.			
Describe how the period of a wave is related to its frequency.			
State the relationship between the speed, wavelength, and frequency of a wave.			
Use the wave speed equation in calculations.			
Draw the patterns of reflection and refraction of plane waves in a ripple tank.			
Determine whether plane waves that cross a boundary between two different materials are refracted.			
Explain reflection and refraction using the behaviour of waves.			
Describe what can happen to a wave when it crosses a boundary between two different materials.			
State what sound waves are.			
State what echoes are.			
Describe how to measure the speed of sound in air.			
State what affects the loudness of a musical note.			
Explain how sound waves are detected by the ear.			
Explain why human hearing is limited.			
State what ultrasound waves are.			
Explain why ultrasound waves can be used to scan the human body.			
Describe how ultrasound waves are used to measure distances in medicine and in industry.			
Describe why an ultrasound scan is safer than taking an x-ray image.			
State what seismic waves are.			
Explain how seismic waves are produced.			
Describe what primary seismic waves and secondary seismic waves are.			
Explain what information seismic waves give about the structure of the Earth.			
Equations I need to know.			
wave speed (*v*) (m/s) **= frequency (*f*)** (Hz) **x wavelength (λ)** (m)			

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speed (v) (m/s) = **distance (s)** (metres, m) / **time taken(t)** (seconds, s)			
Equations I am given and need to use.			
period (T) (s) = **1/ frequency (f)** (Hz)			
Key words I need to know.			
Amplitude: *the size of vibrations or the maximum distance a particle moves away from its resting position when a wave passes.*			
Compression: *squeezing together.*			
Electromagnetic waves: *a group of waves that all travel at the same speed in a vacuum, and are all transverse.*			
Frequency: *the number of cycles of a wave per second, measured in hertz (Hz).*			
hertz (Hz): *the unit for frequency, 1 hertz is 1 wave per second.*			
Longitudinal wave: *a wave where the vibrations are parallel to the direction in which the wave is travelling, i.e. in a sound wave.*			
Mechanical wave: *vibration that travels through a substance.*			
Medium: *material through which electromagnetic waves travel.*			
Period: *the time taken for one complete wave to pass a point. It is measured in seconds.*			
Rarefaction: *stretched apart.*			
Reflection: *the change in direction of a light ray or wave at a boundary when the ray or wave stays in the incident medium.*			
Refraction: *the change in direction of light ray when it passes across a boundary between two transparent substances (including air).*			
Seismic wave: *vibrations in the rocks of the Earth caused by earthquakes or explosions. There are transverse and longitudinal seismic waves.*			
Speed: *the speed of an object (metres per second) = distance moved by the object (metres) ÷ time taken to move the distance travelled (seconds).*			
Transmission: *A wave passing through a substance.*			
Transverse wave: *a wave where the vibration is perpendicular to the direction of energy transfer.*			
Ultrasound: *sound wave at a frequency greater than 20 000 Hz (the upper frequency limit of the human ear).*			
Wavelength: *the distance from one wave crest to another.*			

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Can you…?	☺	😐	☹
Electromagnetic Waves			
State the parts of the electromagnetic spectrum.			
Explain the range of wavelengths within the electromagnetic spectrum that the human eye can detect.			
Describe how energy is transferred by electromagnetic waves.			
Calculate the frequency or wavelength of electromagnetic waves.			
Describe the nature of white light.			
List some uses of infrared radiation, microwaves, and radio waves.			
State what mobile phone radiation is.			
Explain why these types of electromagnetic radiation are hazardous.			
Explain why radio waves of different frequencies are used for different purposes.			
State which waves are used for satellite TV.			
Describe how to decide whether or not mobile phones are safe to use.			
Describe how fibre optics are used in communications.			
Describe what a carrier wave is.			
Describe the differences between ultraviolet and visible light.			
List some uses of X-rays and gamma rays.			
State ionising radiation.			
Explain why ultraviolet waves, X-rays, and gamma rays are dangerous.			
Describe what x –rays are used for in hospitals.			
State which parts absorb x-rays when they pass through the body.			
Explain the difference between the uses of low- and high-energy X-rays in hospitals.			
Equations I need to know.			
wave speed (*v*) (m/s) **= frequency (*f*)** (Hz) **x wavelength (*λ*)** (m)			
Equations I am given and need to use.			
None!			
Key words I need to know.			
Charge-coupled device (CCD): *an electronic device that creates an electronic signal from an optical image formed on the CCD's array of pixels.*			
Contrast medium: *an x-ray absorbing substance used to fill a body organ so the organ can be seen on a radiograph.*			
Gamma rays: *a high frequency electromagnetic wave emitted from the*			

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nucleus of a radioactive atom. Gamma rays have the highest frequency in the electromagnetic spectrum.			
Infrared radiation: *electromagnetic waves between visible light and microwaves in the electromagnetic spectrum.*			
Ionisation: *a process in which atoms become charged.*			
Microwaves: *electromagnetic waves between infrared radiation and radio waves in the electromagnetic spectrum.*			
Radiation dose: *amount of ionising radiation a person receives.*			
Radio waves: *electromagnetic waves of wavelengths greater than 0.10m.*			
Ultraviolet radiation: *electromagnetic waves between visible light and x-rays on the electromagnetic spectrum.*			
Visible light: *electromagnetic waves that can be detected by the human eye.*			
Wave speed: *the distance travelled per second by a wave crest or trough.*			
X-rays: *electromagnetic waves smaller in wavelength than ultraviolet radiation produced by x-ray tubes.*			

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Can you…?	☺	😐	☹
Light			
Identify the normal in a diagram of light rays.			
State the law of reflection of a light ray at a plane mirror.			
Describe how an image is formed by a plane mirror.			
Describe what is meant by specular reflection and diffuse reflection.			
Identify where refraction of light can happen.			
Describe how a light ray refracts when it goes from air into glass or from glass into air.			
Describe how the wavelength of light changes across the visible spectrum.			
Explain what determines the colour of a surface.			
Define what a translucent object is.			
Explain the difference between a translucent object and a transparent object.			
Define what a convex lens is.			
Define what a concave lens.			
Calculate magnification.			
Find the position and nature of an image formed by a lens.			
Identify what type of image is formed by a convex lens when the object is between the lens and its principal focus (you may be required to draw this).			
Describe what type of lens is used in a camera and in a magnifying glass.			
Identify what type of image is formed in a camera and what type in a magnifying glass.			
Equations I am given and need to use.			
$$\text{magnification} = \frac{\text{image height}}{\text{object height}}$$			
Key words I need to know.			
Angle of incidence: *angle between the incident ray and the normal.*			
Angle of reflection: *angle between the reflected ray and the normal.*			
Concave (diverging) lens*: a lens that makes parallel rays diverge (spread out).*			
Convex (converging) lens: *a lens that makes light rays parallel to the principal axis converge (meet at a point).*			
Diffuse reflection: *reflection from a rough surface – the light rays are scattered in different directions.*			
Focal length: *the distance from the centre of a lens to the point where light rays parallel to the principal axis are focused (or, in the case of a diverging lens, appear to diverge from).*			
Magnification: *the image height divided by the object height.*			

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Normal: *straight line through a surface or boundary perpendicular to the surface or boundary.*			
Principal focus: *the point where light rays parallel to the principal axis of a lens are focused (or, in the case of a diverging lens, appear to diverge from).*			
Real image: *an image formed by a lens that can be projected onto a screen.*			
Refraction: *the change of direction of a light ray when it passes across a boundary between two transparent substances (including air).*			
Specular reflection: *reflection from a smooth surface. Each light ray is reflected in a single direction.*			
Virtual image: *an image, seen in a lens or a mirror, from which light rays appear to come after being refracted by a lens or reflected by a mirror.*			

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Can you…?	☺	😐	☹
Electromagnetism			
State the force rule for two magnetic poles near each other.			
Describe the pattern of magnetic field lines around a bar magnet.			
Describe what induced magnetism is.			
Explain why steel, not iron, is used to make permanent magnets.			
Describe the pattern of the magnetic field around a straight wire carrying a current and in and around a solenoid.			
Describe how the strength and direction of the field varies with position and with the current.			
Describe what a uniform magnetic field is.			
Describe what an electromagnet is.			
State what electromagnets can be used for.			
Explain how devices that use electromagnets work.			
Describe how to change the size and reverse the direction of the force on a current-carrying wire in a magnetic field.			
Explain how a simple electric motor works.			
Explain what is meant by magnetic flux density.			
Calculate the force on a current-carrying wire.			
Explain what the generator effect is.			
Explain how a potential difference can be induced in a wire.			
Describe what affects the size of the induced potential difference.			
Deduce the direction of an induced current.			
Describe how a simple alternator (alternating-current generator) is constructed and operated.			
Describe how the induced potential difference of an a.c. generator varies with time.			
Explain how a simple dynamo (direct-current generator) is constructed and operated.			
State what transformers are used for.			
Describe what a step-up transformer does and what a step-down transformer does.			
Explain why transformers only work with a.c.			
Describe what a transformer is made up of.			
Explain how the ratio of the primary potential difference to the secondary potential difference depends on the number of turns on each coil.			
Explain how the number of turns on the secondary coils relates to the number of coils on the primary coil for a step-down transformer and for a step-up transformer.			
State what you can say about a transformer that is 100% efficient.			
Explain why less power is wasted by using high potential difference to			

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transfer power through the grid system.			
Equations I am given and need to use.			
$\frac{\text{potential difference across primary coil}}{\text{potential difference across secondary coil}} = \frac{\text{number of turns in primary coil}}{\text{number of turns in secondary coil}}$ **primary potential difference (V_p) x primary current (I_p) = secondary potential difference (V_s) x secondary current (I_s)**			
Key words I need to know.			
Alternator: *an alternating current generator*.			
Electromagnet: *an insulated wire wrapped around an iron bar that becomes magnetic when there is a current in the wire.*			
Electromagnetic induction: *the process of inducing a potential difference in a wire by moving the wire so it cuts across the lines of force of a magnetic field.*			
Fleming's left-hand rule: *a rule that gives the direction of the force on a current-carrying wire in a magnetic field according to the direction of the current and the field.*			
Generator effect: *the production of a potential difference using a magnetic field.*			
Magnetic field: *the space around a magnet or a current-carrying wire.*			
Motor effect: *when a current is passed along a wire in a magnetic field, and the wire is not parallel to the lines of the magnetic field, a force is exerted on the wire by the magnetic field.*			
Step-down transformer: *electrical device that is used to step-down the size of an alternating potential difference.*			
Step-up transformer: *electrical device used to step-up the size of an alternating potential difference.*			
Transformer: *electrical device used to change a (alternating) voltage.*			

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Can you…?	☺	😐	☹
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.			
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.*			

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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.*			