	PHYSICS 4.2 ENERGY SPECIFICATION	NEED TO KNOW	REVISION
4.2.1.1	The changes involved in the way energy is stored when a system changes.	A system is an object or group of objects Describe, for common situations, the changes involved in the way energy is stored when a system changes.	
4.2.1.2	The amount of energy stored by an object can be calculated. Calculations to include kinetic energy, elastic potential energy and gravitational potential energy. Equations for kinetic energy and gravitational potential energy will **not** be given in the examination.	Calculate the amount of energy stored by a moving object, a stretched spring and an object raised above ground level. The amount of gravitational potential energy gained by an object raised above the ground level can be calculated using the equation: $[Ep = m\,g\,h]$ The kinetic energy of a moving object can be calculated using the equation: $[EK = \frac{1}{2}\,m\,v^2]$ The amount of elastic potential energy stored in a stretched spring can be calculated using the equation: $[Ee = \frac{1}{2}\,k\,e^2]$ (assuming the limit of proportionality has not been exceeded)	
4.2.1.3	The way energy is stored in a system can change. This change can be calculated. The equations are covered in detail in sections 4.2.1.4-6. The specific heat capacity of a substance is the amount of energy required to change the temperature of one kilogram of the substance by one degree Celsius. $E = m \times c \times \theta$	Calculate changes in the way energy is stored when a system is changed by: • heating • work done by forces • work done when charge flows. Use calculations to show how the overall energy in a system is redistributed when the system is changed. The amount of energy stored in or released from a system as its temperature changes can be calculated using the equation: $[\Delta E = m\,c\,\Delta\theta]$	

		The specific heat capacity of a substance is the amount of energy required to raise the temperature of one kilogram of the substance by one degree Celsius. Students should carry out an investigation to measure the specific heat capacity of one or more materials. The investigation will involve linking the decrease of one energy store to the increase in thermal energy stored.	
4.2.1.4	The work done on an object is determined by the size of the force that acts on it and the displacement that the application of the force produces. The amount of energy transferred by electrical work is determined by the flow of charge and the potential difference.	A force does work on an object when the force causes a displacement of the object: $[W = f \, x \, d]$ Work is done when charge flows in a circuit. The amount of energy transferred by electrical work can be calculated using the equation: $[E = Q \, x \, V]$	
4.2.1.5	The power rating of an appliance states how much energy is being transferred or the rate at which work is done	Power is defined as the rate at which energy is transferred or the rate at which work is done. $[P = E \, / \, t]$ An energy transfer of one joule per second is equal to a power of 1 watt.	
4.2.2.1	The total amount of energy in a system remains constant though the way the energy is stored in the system can change. The energy transfers in a system are not always useful. Energy that is transferred in a way that is not considered useful is often described as being wasted. Reducing unwanted energy transfers. Reducing heat loss from a home by use of insulation.	Energy can be transferred usefully, stored or dissipated, but cannot be created or destroyed. Describe examples where there are energy transfers in a closed system, that there is no net change to the total energy. Whenever there are energy transfers in a system only part of the energy is usefully transferred. The rest of the energy is dissipated so that it is stored in less useful ways. This energy is often described as being wasted. Unwanted energy transfers can be reduced in a number of ways, for example, through lubrication and the use of thermal insulation. Describe how the rate of cooling of a building is affected by the thickness and thermal conductivity of its walls.	

		The higher the thermal conductivity of a material, the higher the rate of energy transfer by conduction across the material. Students should investigate ways of reducing the unwanted energy transfers in a system.	
4.2.2.2	Calculating efficiency. How to increase efficiency.	The energy efficiency for any energy transfer can be calculated using the equation: $efficiency = \frac{useful\ output\ energy\ transfer}{total\ input\ energy\ transfer}$ Describe ways to increase the efficiency of an intended energy transfer.	
4.2.3	Energy Resources. Renewable and non-renewable energy resources.	Describe the main energy resources available for use on Earth. These include: • fossil fuels (coal, oil and gas) • nuclear fuel • bio-fuel • wind • hydro-electricity • geothermal • the tides • the Sun • water waves. Distinguish between energy resources that are renewable and energy resources that are non-renewable. Compare the ways that different energy resources are used. The uses to include transport, electricity generation and heating.	