Meden School Curriculum Planning							
Subject	Physics	**Year Group**	10	**Sequence No.**	17	**Topic**	P1a Energy Transfers

Retrieval	Core Knowledge	Student Thinking
What do teachers need **retrieve** from students before they start teaching **new content**?	What **specific ambitious knowledge** do teachers need teach students in this sequence of learning?	What real life examples can be applied to this sequence of learning to **development of our students thinking, encouraging them to see the inequalities around them** and 'do something about them!'
KS2 years 5 & 6. KS3 : - comparing energy values of different foods (from labels) (kJ) - comparing power ratings of appliances in watts (W, kW) - comparing amounts of energy transferred (J, kJ, kW hour) -heating and thermal equilibrium: temperature difference between 2 objects leading to energy transfer from the hotter to the cooler one, through contact (conduction) or radiation; such transfers tending to reduce the temperature difference; use of insulators -work done and energy changes on deformation the differences in arrangements, in motion and in closeness of particles	**<u>L1: 6.1.1.1 Energy Stores and Systems</u>** A system is an object or group of objects. There are changes in the way energy is stored when a system changes. Energy has 8 stores: Kinetic, Thermal, Chemical, Gravitational Potential, Elastic Potential, Electrostatic, Magnetic and Nuclear **L2: 6.1.1.2 Energy Transfers** Students should be able to calculate the amount of energy associated with a moving object, a stretched spring and an object raised above ground level. Energy has 5 transfer mechanisms : Mechanically (using a force, this includes mechanical waves eg sound and water), electrically, by heating(conduction and convection) , chemically and radiation (EMS) use calculations to show on a common scale how the overall energy in a system is redistributed when the system is changed. Examples include • an object projected upwards • a moving object hitting an obstacle	

explaining changes of state, shape and density	• an object accelerated by a constant force • a vehicle slowing down • bringing water to a boil in an electric kettle. **L3: Gravitational potential energy** $E_p = m\,g\,h$ **gravitational potential energy**, E_p, in joules, J mass, m, in kilograms, kg gravitational field strength, g, in newtons per kilogram, N/kg (In any calculation the value of the gravitational field strength (g) will be given). height, h, in metres, m **L4 6.1.1.2 Kinetic energy** The **kinetic energ**y of a moving object can be calculated using the equation: *kinetic energy* = 0.5 × *mass* × *speed* ^{2} $E_k = ½\,m\,v^2$ kinetic energy, E_k, in joules, J mass, m, in kilograms, kg speed, v, in metres per second, m/s **L5 6.1.1.2 Transfers between GPE and KE.** A falling object transfers all of its GPE to KE before it hits the ground. Assumptions include no energy to transferred to the surroundings due to friction/air resistance. Calculations to to find velocity of a falling object. **L5: 6.1.1.2 Elastic Potential Energy**. The amount of **elastic potential energy** stored in a stretched spring can be calculated using the equation: ***elastic potential energy*** **=** 0.5 × *spring constant* × *extension* ^{2} $E_e = \frac{1}{2}\,k\,e^2$ (assuming the limit of proportionality has not been exceeded) elastic potential energy, E_e, in joules, J	

	spring constant, *k*, in newtons per metre, N/m extension, *e*, in metres, m **L7: 6.1.1.4 Power** **Power** is defined as the rate at which energy is transferred or the rate at which **work is done.** $power = \frac{energy\ transferred}{time}$ $P = \frac{E}{t}$ $power = \frac{work\ done}{time}$ $P = \frac{W}{t}$ power, *P*, in watts, W energy transferred, *E*, in joules, J time, *t*, in seconds, s work done, *W*, in joules, J An energy transfer o**f 1 joule per second is equal to a power of 1 watt.** Students should be able to give examples that illustrate the definition of power eg comparing two electric motors that both lift the same weight through the same height but one does it faster than the other. **L8: 6.1.2.1 Energy transfers in a system** Energy can be transferred usefully, **stored** or **dissipated**, but cannot be **created** or **destroyed.** Students should be able to describe with examples where there are energy transfers in a closed system, that there is no net change to the total energy. Students should be able to describe, with examples, how in all system changes energy is dissipated, so that it is stored in less useful ways. This energy is often described as being **'wasted'** Students should be able to explain ways of reducing unwanted energy transfers, for example through lubrication and the use of thermal insulation.	

	Students should be able to describe how the rate of cooling of a building is affected by the thickness and thermal conductivity of its walls. Students do not need to know the definition of **thermal conductivity** But do need to know that the higher the thermal conductivity of a material the higher the rate of energy transfer by conduction across the material. L9/10:Investigating Insulation **Required practical activity 2 (physics only):** investigate the effectiveness of different materials as thermal insulators and the factors that may affect the thermal insulation properties of a material. **L11: Efficiency.** The energy efficiency for any energy transfer can be calculated using the equation: $efficiency = \frac{useful\ output\ energy\ transfer}{total\ input\ energy\ transfer}$ or $efficiency = \frac{useful\ power\ output}{total\ power\ input}$ (HT only) Students should be able to describe ways to increase the efficiency of an intended energy transfer. **L12: Revision** **L13: End of Topic Test** **L14: GPA test feedback**	**Application: poorly insulated homes can result in high energy bills as well as contribute to global warming. Grants are provided for low income households to improve their insulation and reduce spending.** **Choosing efficient appliances for the home will reduce energy use and therefore save money.**