Meden School Curriculum Planning							
Subject	Physics	**Year Group**	10	**Sequence No.**		**Topic**	P3 and P1a

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!'
KS1 year 1: -describe the simple physical properties of a variety of everyday materials -compare and group together a variety of everyday materials on the basis of their simple physical properties KS1 year 2: - identify and compare the suitability of a variety of everyday materials for particular uses KS2 years 3 & 4: - compare and group materials together, according to whether they are solids, liquids or gases -observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C) KS2 years 5 & 6.	**L1: Density.** 6.3.1.1: The **density** of a material is defined by the equation: $density = \frac{mass}{volume}$ $\rho = \frac{m}{V}$ density, ρ, in **kilograms per metre cubed**, kg/m3 mass, m, in kilograms, kg volume, V, in metres cubed, m3 The particle model can be used to explain he different states of matter ifferences in density. Students should be able to recognise/draw simple diagrams to model the difference between **solids, liquids and gases.** Students should be able to explain the differences in density between the different states of matter in terms of the **arrangement** of atoms or molecules	

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<td>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 explaining changes of state, shape and density</td>
<td><u>L2: Density required prac.</u>
Required practical activity 17: use appropriate apparatus to make and record the measurements needed to determine the densities of regular and irregular solid objects and liquids. Volume should be determined from the dimensions of regularly shaped objects, and by a displacement technique for irregularly shaped objects. Dimensions to be measured using appropriate apparatus such as a ruler, micrometer or Vernier callipers.
AT skills covered by this practical activity: physics AT 1

<u>L3: States of matter.</u>
Students should be able to describe how, when substances change state (melt, freeze, boil, evaporate, condense or sublimate), mass is conserved.
Changes of state are physical changes which differ from chemical changes because the material recovers its original properties if the change is reversed.

<u>L4: Internal Energy/ states of change.</u>
6.3.2.1: Energy is stored inside a system by the particles (atoms and molecules) that make up the system. This is called internal energy.
Internal energy is the total kinetic energy and potential energy of all the particles (atoms and molecules) that make up a system.
Heating changes the energy stored within the system by increasing the energy of the particles that make up the system. This either raises the temperature of the system or produces a change of state.
If the temperature of the system increases:
The increase in temperature depends on the mass of the substance heated, the type of material and the energy input to the system.

<u>L5: Latent heat</u></td>
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	6.3.2.3: If a change of state happens: The energy needed for a substance to change state is called **latent heat.** When a change of state occurs, the energy supplied changes the energy stored (internal energy) but not the temperature. The **specific latent heat of a substance** is the amount of energy required to change the state of one kilogram of the substance with no change in temperature. *energy f or a change o f state = mass × speci f ic latent heat* $E = m L$ energy, E, in joules, J mass, m, in kilograms, kg specific latent heat, L, in joules per kilogram, J/kg **Specific latent heat of fusion** – change of state from solid to liquid **Specific latent heat of vaporisation** – change of state from liquid to vapour Students should be able to interpret **heating and cooling graphs** that include changes of state. Students should be able to distinguish between specific heat capacity and specific latent heat. **<u>L6: Energy Stores</u>** 6.1.1.1 A system is an object or group of objects. There are changes in the way energy is stored when a system changes. Students should be able to describe all the changes involved in the way energy is stored when a system changes, for common situations. For example:	

	an object projected upwards a moving object hitting an obstacle an object accelerated by a constant force a vehicle slowing down bringing water to a boil in an electric kettle. use calculations to show on a common scale how the overall energy in a system is redistributed when the system is changed. L7: 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. Throughout this section on Energy students should be able to calculate the changes in energy involved when a system is changed by: **heating** **work done by forces** **work done when a current flows** **L8: Kinetic energy** The **kinetic energy** of a moving object can be calculated using the equation: *kinetic energy* = 0.5 × *mass* × *speed* ^{2} $E_k = \frac{1}{2} m v^2$		

	kinetic energy, E_k, in joules, J mass, *m*, in kilograms, kg speed, *v*, in metres per second, m/s **L9: Gravitational potential enrgy** $E_p = m\ g\ h$ **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 **L10: 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 **L11: Specific Heat Capacity**. The amount of energy stored in or released from a system as its temperature changes can be calculated using the equation	

	change in thermal energy = mass × speci f ic heat capacity × temperature change $\Delta E = m c \Delta \vartheta$ change in thermal energy, Δ*E*, in joules, J mass, *m*, in kilograms, kg specific heat capacity, *c*, in joules per kilogram per degree Celsius, J/kg °C temperature change, Δϑ, in degrees Celsius, °C 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. **<u>L12: SHC prac</u>**. **Required practical activity 14:** an investigation to determine the **specific heat capacity** of one or more materials. The investigation will involve linking the decrease of one energy store (or work done) to the increase in temperature and subsequent increase in thermal energy stored. AT skills covered by this practical activity: physics AT 1 and 5. **<u>L13: Power</u>** **Power** is defined as the rate at which energy is transferred or the rate at which **work is done.** $power = \frac{energy\ trans\ f\ erred}{time}$		

	$P = \frac{E}{t}$ $\text{power} = \frac{\text{work done}}{\text{time}}$ $P = \frac{W}{t}$ 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. **<u>L14: Conduction and convection.</u>** Students do not need to know the definition of **thermal conductivity** The higher the thermal conductivity of a material the higher the rate of energy transfer by conduction across the material. **<u>L15: Reducing energy transfer.</u>** 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'**	**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.**

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.

<u>L16: Efficiency.</u>

The energy efficiency for any energy transfer can be calculated using the equation:

$$efficiency = \frac{useful\ output\ energy\ transfer}{total\ input\ energy\ transfer}$$

Efficiency may also be calculated using the equation:

$$efficiency = \frac{useful\ power\ output}{total\ power\ input}$$

(HT only) Students should be able to describe ways to increase the efficiency of an intended energy transfer.

<u>L17: Revision</u>

<u>L18: End of Topic Test</u>

<u>L19: GPA test feedback</u>