Meden School Curriculum Planning							
Subject	Physics	**Year Group**	10	**Sequence No.**	15	**Topic**	P5a (Triple)

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: KS1 year 2: -find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching KS2 years 3 & 4: -compare how things move on different surfaces -notice that some forces need contact between 2 objects, but magnetic forces can act at a distance KS2 years 5 & 6. -explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object identify the effects of air resistance, water resistance and friction, that act between moving surfaces	**<u>L1: Vectors and scalars.</u>** **Scalar** quantities have **magnitude only**. **Vector** quantities have **magnitude** and an associated **direction.** A vector quantity may be represented by an **arrow**. The length of the arrow represents the magnitude, and the direction of the arrow the direction of the vector quantity. **L2: <u>Contact and non-contact forces.</u>**: A force is a push or pull that acts on an object due to the interaction with another object. All forces between objects are either: **contact forces** – the objects are physically touching **non-contact force**s – the objects are physically separated. Examples of contact forces include **friction, air resistance, tension and normal contact force**. Examples of non-contact forces are **gravitational force, electrostatic force and magnetic force**. **Force is a vector quantity**. Students should be able to describe the interaction between pairs of objects which produce a force on each object. The forces to be represented as vectors. **L3: Force Diagrams and Free Body Diagrams**	**Application: discussion of weightlessness at the international space station**

-recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect KS3 Y7 : -forces as pushes or pulls, arising from the interaction between 2 objects using force arrows in diagrams, adding forces in 1 dimension, balanced and unbalanced forces -forces measured in newtons -measurements of stretch or compression as force is changed force-extension linear relation; Hooke's Law as a special case -non-contact forces: gravity forces acting at a distance on Earth and in space, forces between magnets, and forces due to static electricity Y9 Gravity and Space W=m x g.	A number of forces acting on an object may be replaced by a single force that has the same effect as all the original forces acting together. This single force is called the **resultant force.** Students should be able to calculate the resultant of two forces that act in a straight line. (HT only) Students should be able to: describe examples of the forces acting on an isolated object or system use **free body diagram**s to describe qualitatively examples where several forces lead to a resultant force on an object, including balanced forces when the resultant force is zero. **L4: Resolving Forces** (HT only) A single force can be resolved into two components acting at right angles to each other. The two component forces together have the same effect as the single force. (HT only) Students should be able to use vector diagrams to illustrate resolution of forces, equilibrium situations and determine the resultant of two forces, to include both magnitude and direction (scale drawings only). **L5 :Weight = mass x gravity**. **Weight** is the force acting on an object due to **gravity**. The force of gravity close to the Earth is due to the gravitational field around the Earth. The weight of an object depends on the gravitational field strength at the point where the object is. The weight of an object can be calculated using the equation: weight = mass × gravitational field strength $W = m\ g$ weight, W, in newtons, N mass, m, in kilograms, kg	**Application: tracking projected flight or boat crossings, taking into account**

	gravitational field strength, g, in newtons per kilogram, N/kg (In any calculation the value of the gravitational field strength (g) will be given.) The weight of an object may be considered to act at a single point referred to as the object's 'centre of mass'. The weight of an object and the mass of an object are directly proportional. Weight is measured using a calibrated spring-balance (a newtonmeter).	**for the currents.** **planning a swim across the channel and the importance of timing swim with the correct current to minimise drift and conserve energy.**
	<u>**L6: work done**</u> 6.5.2: When a force causes an object to move through a distance **work is done** on the object. So a force does work on an object when the force causes a displacement of the object The work done by a force on an object can be calculated using the equation: **work done = force × distance** moved along the line of action of the force $W = F s$ work done, W, in joules, J force, F, in newtons, N distance, s, in metres One joule of work is done when a force of one newton causes a displacement of one metre. 1 joule = 1 newton-metre Students should be able to describe the energy transfer involved when work is done. Students should be able to convert between n**ewton-metres and joules.** Work done against the frictional forces acting on an object causes a rise in the temperature of the object.	**Career: engineers choosing springs with a suitable spring constant to meet the needs of the machine. Eg mountain bike and car suspensions, or firmness of mattresses**

	L7: Forces and Elasticity 6.5.3: Students should be able to: give examples of the forces involved in **stretching, bending or compressing** an object explain why, to change the shape of an object (by stretching, bending or compressing), more than one force has to be applied – this is limited to stationary objects only describe the difference between **elastic deformation and inelastic deformation** caused by stretching forces. The extension of an elastic object, such as a spring, is **directly proportiona**l to the force applied, provided that the limit of proportionality is not exceeded. **L8/9 Investigating Springs** **Required practical activity 18:** investigate the relationship between force and extension for a spring. : Force = spring constant x extension *f orce = spring constant* × *extension* $F = k e$ force, *F*, in newtons, N spring constant, *k*, in newtons per metre, N/m extension, *e*, in metres, m This relationship also applies to the compression of an elastic object, where '*e*' would be the compression of the object. Students should be able to: calculate a spring constant in linear cases interpret data from an investigation of the relationship between force and extension calculate work done in stretching (or compressing) a spring (up to the limit of proportionality) using the equation: $elastic\ potential\ energy = 0.5 \times spring\ constant \times extension^2$	**Application: bungee jumping companies need to know the weight of the jumper in order to ensure elastic limit of the bungee cord is not exceeded for safety reasons**

$E_e = \frac{1}{2} k e^2$

L10: inelastic/ limits of proportionality.

A force that stretches (or compresses) a spring does work and elastic potential energy is stored in the spring. Provided the spring is not inelastically deformed, the work done on the spring and the elastic potential energy stored are **equal**.

Students should be able to:

describe the difference between a linear and non-linear relationship between force and extension

L11 Moments

A force or a system of forces may cause an object to rotate. The turning effect of a force is called the moment of the force. The size of the moment is defined by the equation: $moment\ of\ a\ force = force \times distance$

If an object is balanced, the total clockwise moment about a pivot equals the total anticlockwise moment about that pivot. Students should be able to calculate the size of a force, or its distance from a pivot, acting on an object that is balanced

L12 Levers

A simple lever and a simple gear system can both be used to transmit the rotational effects of forces. Students should be able to explain how levers and gears transmit the rotational effects of forces.

L13 Pressure

A fluid can be either a liquid or a gas. The pressure in fluids causes a force normal (at right angles) to any surface. The pressure at the surface of a fluid can be calculated using the equation:

$$\text{pressure} = \frac{\text{force normal to a surface}}{\text{area of that surface}}$$

pressure, p, in pascals, Pa

force, F, in newtons, N

	area, A, in metres squared, m^2 The atmosphere is a thin layer (relative to the size of the Earth) of air round the Earth. The atmosphere gets less dense with increasing altitude. Air molecules colliding with a surface create atmospheric pressure. The number of air molecules (and so the weight of air) above a surface decreases as the height of the surface above ground level increases. So as height increases there is always less air above a surface than there is at a lower height. So atmospheric pressure decreases with an increase in height. • Students should be able to: describe a simple model of the Earth's atmosphere and of atmospheric pressure • explain why atmospheric pressure varies with height above a surface. **L14 Upthrust** The pressure due to a column of liquid can be calculated using the equation: pressure = height of the column × density of the liquid × gravitational field strength pressure, p, in pascals, Pa height of the column, h, in metres, m density, ρ, in kilograms per metre cubed, kg/m3 gravitational field strength, g, in newtons per kilogram, N/kg (In any calculation the value of the gravitational field strength (g) will be given.) Students should be able to explain why, in a liquid, pressure at a point increases with the height of the column of liquid above that point and with the density of the liquid. Students should be able to calculate the differences in pressure at different depths in a liquid. A partially (or totally) submerged object experiences a greater pressure on the bottom surface than on the top surface. This creates a resultant force upwards. This force is called the upthrust. Students should be able to describe the factors which influence floating and sinking **L15: Revision** **L16: End of Topic Test** **L17: GPA test feedback**	