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**Knowledge Rich Curriculum Plan**

SCIENCE- (Forces and Motion)



| **Lesson/Learning Sequence** | **Intended Knowledge:**  *Students will know that…* | **Prior Knowledge:**  *In order to know this, students need to already know that…* | **Working Scientifically** | **Tiered Vocabulary and Reading Activity** | **Assessment** | **Support** |
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| ***Forces*** | * *Students will know how to identify forces and the ways in which they are acting. (push or pull).* * *Students will know that Newtons is the unit of force.* * *Students will know that a Newton meter can be used to measure force.* * *Students will know that examples of forces are friction, up-thrust, air resistance, weight due to gravity, normal force, thrust, tension, water resistance, magnetism and electrostatic forces.* * *Students will know how to identify different forces acting on a variety of objects.* | * *Students should already know that forces can push, pull or twist objects.* * *Students should already know that forces act in particular directions.* | *Measuring the force exerted and recording the data in a tabulated format.* | ***Force:***  *A push or pull acting on an object due to an interaction*  ***Variety:***  *The state of being different*  ***Newtons:***  *The unit of measurement for force*  ***Newton meter:***  *The apparatus used to measure the force acting on an object* | *Retrieval questions*  *Simple exam questions*  *Homework quiz 1* [*https://www.satchelone.com/quizzes/66787070-assessment---year-7-quiz---forces*](https://www.satchelone.com/quizzes/66787070-assessment---year-7-quiz---forces)  *End of topic test*  *Summative assessment 3*  *‘What piece of apparatus might we use to measure a force?’ = A Newton meter*  *‘What forces might be acting on an aeroplane?’ = Thrust, air resistance (drag), weight, up-thrust* | *Knowledge organiser (provided on Teams and in class)*  [*https://www.bbc.co.uk/bitesize/topics/z4brd2p/articles/zs3896f*](https://www.bbc.co.uk/bitesize/topics/z4brd2p/articles/zs3896f)  [*https://www.youtube.com/watch?v=9kMNtZvYmqQ*](https://www.youtube.com/watch?v=9kMNtZvYmqQ) |
| ***Forces, Speed, Direction & Shape*** | * *Students will know that a force acting on an object can cause it to change direction, change shape or change speed.* * *Students will know that speed is a measure of how fast an object is moving.* * *Students will know how to describe the effect that a force will have on an object.* | * *Students need to already know the speed of a moving object is a measure of how far it would travel in a certain time.* * *Students need to already know how quickly an object's motion is changed depends on the force acting and the object's mass.* | *Determine trends in data. Converting units* | ***Speed:***  *The rate of change of distance.*  ***Direction:***  *The course along which something moves*  ***Shape:***  *The external form or outline of something* | *Retrieval questions*  *Simple exam questions*  *Homework quiz 1* [*https://www.satchelone.com/quizzes/66787070-assessment---year-7-quiz---forces*](https://www.satchelone.com/quizzes/66787070-assessment---year-7-quiz---forces)  *End of topic test*  *Summative assessment 3*  *‘How might a force affect an object?’ = change direction, change speed or change shape*  *‘How might we expand on this answer?’*  *‘How might we describe the effect of changing direction?’ = forward/backward, up/down*  *‘How might we describe the effect of changing speed?’= speed up/slow down*  *‘How might we describe the effect of changing shape?’= compress/stretch* | *Knowledge organiser (provided on Teams and in class)*  [*https://www.bbc.co.uk/bitesize/topics/z4brd2p/articles/zs3896f*](https://www.bbc.co.uk/bitesize/topics/z4brd2p/articles/zs3896f)  [*https://www.youtube.com/watch?v=9kMNtZvYmqQ*](https://www.youtube.com/watch?v=9kMNtZvYmqQ) |
| ***Describing Forces*** | *Students will know how to identify forces acting on a variety of objects.*  *Students will know that contact forces are forces that require contact between objects to occur*  *Students will know that non-contact forces are forces that can act on objects without coming physically in contact with it.* | *Students will already know that examples of forces are friction, upthrust, air resistance, weight due to gravity, normal force, thrust, tension, water resistance, magnetism and electrostatic forces.*  *Students need to already know that forces act in particular directions.*  *Students need to already know that forces can cause an object to change direction, shape or speed.*  *Students need to already know how to describe the effect a force has on an object.* |  | ***Contact Force:***  *A force that can only exist when two objects are touching*  ***Non-Contact force:***  *A force that can act on objects even when they aren’t touching* | *Retrieval questions*  *Simple exam questions*  *Homework quiz 1* [*https://www.satchelone.com/quizzes/66787070-assessment---year-7-quiz---forces*](https://www.satchelone.com/quizzes/66787070-assessment---year-7-quiz---forces)  *End of topic test*  *Summative assessment 3*  *How might we describe a non-contact force? A force that can act on an object without physically coming in contact with it*  *What examples of non-contact forces are there? Weight due to gravity, magnetism, electrostatic*  *How might we describe a contact force? A Force that requires physical contact between objects.*  *What examples of contact forces are there? Push, Pull, Tension, thrust, air resistance (drag), up-thrust, normal, water resistance, buoyancy(up-thrust in water)*  *‘How might we explain that air resistance is a contact force?’*  *As the air causes friction on the object by physically touching it*  *‘Why might an object not slow down in space?’*  *As there are no air particles in space (which we call a vacuum), hence no air resistance to slow it down* | *Knowledge organiser (provided on Teams and in class)* |
| ***Free Body Diagrams*** | *Students will know that forces are represented using arrows.*  *Students will know that the size of the arrow represents the size of the force.*  *Students will know that the direction of the arrow shows the direction the force is acting in.*  *Students will know how to represent forces using free body diagrams.* | *Students need to already know that forces act in particular directions.* |  | ***Magnitude:***  *The size or extent of something*  ***Size:***  *The extent of something* | *Retrieval questions*  *Simple exam questions*  *Homework quiz 2*  *End of topic test*  *Summative assessment 3*  *‘What symbol might we use to represent a force?’ An arrow*  *‘What information might the arrow provide us with?’*  *Size of force and direction* | *Knowledge organiser (provided on Teams and in class)*  [*https://www.bbc.co.uk/bitesize/guides/z3xvk2p/revision/3*](https://www.bbc.co.uk/bitesize/guides/z3xvk2p/revision/3) |
| ***Balanced and Unbalanced Forces*** | *Students will know that forces are usually in pairs acting in opposite directions.*  *Students will know that if the forces acting in opposite directions are equal in size then the forces are described as balanced.*  *Students will know that if the forces acting in opposite directions aren’t equal in size then the forces are unbalanced.*  *Students will know that if the forces are unbalanced it can cause an object to change shape, direction or speed.*  *Students will know that if the forces are balanced then an object will either remain stationary or remain at constant speed.* | *Students need to already know that forces can cause an object to change shape, direction and speed.* | *Predict the direction of travel dependent on the forces acting on free body diagrams* | ***Balanced:***  *Fair and equally split*  ***Unbalanced:***  *Unfair, unequally split*  ***Equilibrium:***  *A state in which opposing forces are balanced.*  ***Resistive force:***  *A force that acts against the motion of an object.* | *Retrieval questions*  *Simple exam questions*  *Homework quiz 2*  *End of topic test*  *Summative assessment 3*  *What might unbalanced forces tell us about the motion of an object?*  *That object is changing speed, shape or direction*  *Therefore, what might balanced forces tell us about the motion of an object?*  *That the object is not changing its speed, shape or direction* | [*https://www.youtube.com/watch?v=YyJSlcIbd-s*](https://www.youtube.com/watch?v=YyJSlcIbd-s)  *Knowledge organiser (provided on Teams and in class)*  [*https://www.bbc.co.uk/bitesize/topics/z4brd2p/articles/zhnfp4j*](https://www.bbc.co.uk/bitesize/topics/z4brd2p/articles/zhnfp4j) |
| ***Investigating the strength of carrier bags*** | *To conduct an experiment to determine the affect of forces on the elasticity of a variety of plastic carrier bags* | *Students will already know that forces are measured in newtons (N). Students will already be able to identify variables. Students will already be able to read a newton meter.* | *Identifying variables*  *Drawing conclusions*  *Tabulating data*  *Drawing a bar chart*  *Removing anomalous results* | ***Trend:***  *The general direction in which something is changing*  ***Hypothesis:***  *A proposed explanation based on limited evidence.* | *Retrieval questions*  *Simple exam questions*  *Homework quiz 2*  *End of topic test*  *Summative assessment 3*  *What might our independent variable be? Type of carrier bag*  *What might our dependent variable be? The amount of force needed to break the bag*  *What might our control variable be? The size of bag*  *How might we represent our data in graphical form? Bar chart*  *Expand: Which variables would be on the x axis/y axis? Independent – x and dependent - y* | [*https://www.youtube.com/watch?v=5Ys2tTmKc9w*](https://www.youtube.com/watch?v=5Ys2tTmKc9w)  *Knowledge organiser (provided on Teams and in class* |
| ***Resultant Forces*** | *Students will be able to calculate resultant force by considering forces that are acting in opposite directions.*  *Students will know how to describe the motion of an object dependent on the resultant force acting on it.* | *Students need to already know that balanced forces and unbalanced forces can affect the motion of an object.*  *Students will know that forces can cause an object to change direction, shape or speed.* | *Calculating the resultant force by removing the smaller force from the larger force.* | ***Vertical:***  *Acting upwards or downwards*  ***Horizontal:***  *Acting sideways*  ***Resultant force:***  *The overall (net) force acting on an object* | *Retrieval questions*  *Simple exam questions*  *Homework quiz 3*  *End of topic test*  *Summative assessment 3* | *Knowledge organiser (provided on Teams and in class*  [*https://www.youtube.com/watch?v=yg3bTMcAnsM*](https://www.youtube.com/watch?v=yg3bTMcAnsM)  [*https://www.bbc.co.uk/bitesize/topics/z4brd2p/articles/zhnfp4j*](https://www.bbc.co.uk/bitesize/topics/z4brd2p/articles/zhnfp4j) |
| ***Friction*** | *Students will know that friction acts opposite the direction of motion.*  *Students will know that friction requires contact between two objects.*  *Students will know that friction can lead to heat.*  *Students will know that lubricant is used to reduce friction.*  *Students will know that friction can cause an object to slow down.*  *Students will be able to describe situations where friction is useful or non-useful.* | *Students need to already know that forces act in particular directions.* |  | ***Friction:***  *A resistive force acting when one object rubs against another.*  ***Drag:***  *The resistive force offered by a fluid*  ***Thermal:***  *Relating to heat*  ***Lubricant:***  *A substance that reduces friction between objects* | *Retrieval questions*  *Simple exam questions*  *Homework quiz 3*  *End of topic test*  *Summative assessment 3* | *Knowledge organiser (provided on Teams and in class*  [*https://www.bbc.co.uk/bitesize/topics/zsxxsbk/articles/zxqrdxs*](https://www.bbc.co.uk/bitesize/topics/zsxxsbk/articles/zxqrdxs) |
| ***Friction Investigation*** | *Students will know how to investigate the affect of friction on the motion of the object.*  *Students will know that a Newton meter is used to measure friction.*  *Students will know how to analyse and interpret experimental results.* | *Students need to already know that the independent variable is the one they change; the dependent variable is the one you measure and the control variables are the variables that are kept the same.* | *Identifying variables*  *Improving reliability of results*  *Comparisons of data*  *Identification of anomalies* | ***Motion:***  *A change in the position of an object*  ***Analyse:***  *A comparison of the benefits and drawbacks of a certain scenario*  ***Interpret:***  Explain the meaning of | *Retrieval questions*  *Simple exam questions*  *Homework quiz 3*  *End of topic test*  *Summative assessment 3* | *Knowledge organiser (provided on Teams and in class*  [*https://www.bbc.co.uk/bitesize/topics/zsxxsbk/articles/zxqrdxs*](https://www.bbc.co.uk/bitesize/topics/zsxxsbk/articles/zxqrdxs) |
| ***Energy Stores*** | *Students will know that different objects have different types of energy stores Students will know the 8 energy stores; chemical, kinetic, elastic potential, gravitational potential, nuclear, thermal, electrostatic and magnetic.*  *Students will be able to identify the energy store for particular objects with their reasoning.*  *Students will know that the unit of energy is joules.* | *Students will know that there are various ways about changing objects, such as, heating objects to change state, wind can rotate blades of a wind turbine. The kilo means x1000.* |  | ***Kinetic:***  *Relating to motion*  ***Thermal:***  *Relating to heat*  ***Gravitational:***  *Relating to the force of gravity*  ***Nuclear:***  *Relating to the nucleus of an atom*  ***Magnetic:***  *Relating to magnets or magnetic objects*  ***Electrostatic:***  *Relating to electric charges*  ***Chemical:***  *Relating to substances and chemical bonds*  ***Elastic:***  *Relating to stretching and squashing* | *Retrieval questions*  *Simple exam questions*  *Homework quiz 4*  *End of topic test*  *Summative assessment 3* | *Knowledge organiser (provided on Teams and in class*  [*https://www.youtube.com/watch?v=VUworhvk5rw*](https://www.youtube.com/watch?v=VUworhvk5rw)  [*https://www.bbc.co.uk/bitesize/guides/z8hsrwx/revision/1*](https://www.bbc.co.uk/bitesize/guides/z8hsrwx/revision/1) |
| ***Energy Transfers*** | *Students will know and understand what energy is, that it cannot be created or destroyed Students will know that energy transfers from one store to another and the sum of the stores will be the same before and after the transfer. Students will know that the start energy store decreases and the end energy stores of any transfer increases Students will know that energy can transfer to more than one store.* | *Students need to know that energy cannot be created or destroyed. Students need to know that energy is measured in Joules (J) Students need to know that increase means to go up and decrease to go down Students need to know the energy stores, chemical, kinetic, elastic, thermal, gravitational potential, nuclear, electrostatic and magnetic.* |  | ***Law of conservation:***  *A principle that states that a certain physical property is not changed in a closed system*  ***The sum of***  *Adding two or more numbers together* | *Retrieval questions*  *Simple exam questions*  *Homework quiz 4*  *End of topic test*  *Summative assessment 3* | *Knowledge organiser (provided on Teams and in class*  [*https://www.youtube.com/watch?v=VUworhvk5rw*](https://www.youtube.com/watch?v=VUworhvk5rw)  [*https://www.bbc.co.uk/bitesize/guides/z8hsrwx/revision/1*](https://www.bbc.co.uk/bitesize/guides/z8hsrwx/revision/1) |
| ***Fuel Bills, Use and Cost*** | *Students will know that different electrical devices have different power ratings Students will know that power is a measure of energy transferred per second. Students will know approximately how much the cost of a unit will be Students will be able to identify through calculation the electrical devices which cost the most to run Students will know how to estimate/calculate the cost of how much electricity is used per day.* | *Students need to already know that kilo means 1000 so 1kW = 1000W Students need to already know how energy is dissipated to the thermal store of the surroundings Students will know that to estimate is to roughly calculate or guess the quantity of something.* | *Calculating the cost of different bills. Evaluate products effectiveness and cost.* | ***Power:***  *The rate at which energy is transferred*  ***Dissipated:***  *To be transferred in an unhelpful way*  ***Estimate:***  *Make an educated guess based on the available information* | *Retrieval questions*  *Simple exam questions*  *Homework quiz 4*  *End of topic test*  *Summative assessment 3* | *Knowledge organiser (provided on Teams and in class* |