AQA (Trilogy) Combined Science GCSE **Student Progress Sheet**

Name: **Target:**

Unit 6.1 – Energy

6.1.1. Energy Changes in a System (and the ways energy is stored before and after such changes)

6.1.1.1. Energy Stores and Systems

		☹	😐	☺
a	I know that a system is an object or group of objects.			
b	I know that there are changes in the way energy is stored when a system (object or group of objects) changes.			
c	I can describe all the changes involved in the way energy is stored when a system changes, for common situations e.g.: • 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.			
d	I can calculate the changes in energy involved when a system is changed by: • heating • work done by forces • work done when a current flows.			
e	I can use calculations to show on a common scale how the overall energy in a system is redistributed when the system is changed.			

6.1.1.2. Changes in Energy

a	I can recall and apply the equation below to calculate the kinetic energy of a moving object. kinetic energy = 0.5 × mass × speed^2 or $E_k = \frac{1}{2} mv^2$ where: kinetic energy, Ek, in joules, J mass, m, in kilograms, kg speed, v, in metres per second, m/s			
b	I can apply the equation below to calculate the amount of elastic potential energy stored in a stretched spring (assuming the limit of proportionality has not been exceeded). elastic potential energy = 0.5 × spring constant × extension^2 or $E_e = \frac{1}{2} ke^2$ where: elastic potential energy, E_e, in joules, J spring constant, k, in newtons per metre, N/m extension, e, in metres, m			
c	I can recall and apply the equation below to calculate the amount of gravitational potential energy gained by an object raised above ground level. g p e = mass × gravitational field strength × height or $E_p = m\ g\ h$ where: 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) height, h, in metres, m			

6.1.1.3. Energy Changes in Systems

a	I can apply the equation below to calculate the amount of energy stored in or released from a system as its temperature changes. change in thermal energy = mass × specific heat capacity × temperature change or $\Delta E = m\,c\,\Delta\emptyset$ where: change in thermal energy, ΔE, in joules, J mass, m, in kilograms, kg specific heat capacity, c, in joules per kilogram per degree Celsius, J/kg °C temperature change, Δ Ø, in degrees Celsius, °C			
b	I know that 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.			

6.1.1.4. Power

a	I know that Power is defined as the rate at which energy is transferred or the rate at which work is done.			
b	I can recall and apply the equations below to calculate power. power = energy transferred ÷ time or $P = E/t$ power = work done ÷ time or $P = W/t$ where: power, P, in watts, W energy transferred, E, in joules, J time, t, in seconds, s work done, W, in joules, J			
c	I know that an energy transfer of 1 joule per second is equal to a power of 1 watt.			
d	I can describe some examples that illustrate the definition of power e.g. comparing two electric motors that both lift the same weight through the same height but one does it faster than the other.			

6.1.2. Conservation and Dissipation of Energy

6.1.2.1. Energy Transfers in a System

a	I know that energy can be transferred usefully, stored or dissipated, but cannot be created or destroyed (this is the Law of Conservation of Energy).			
b	I can describe (using examples) the energy transfers in a closed system and show that there is no net change to the total energy.			
c	I can describe (using 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'.			
d	I can explain ways of reducing unwanted energy transfers e.g. through lubrication and the use of thermal insulation.			
e	I can explain how the higher the thermal conductivity of a material, the higher the rate of energy transfer, by conduction, across the material.			
f	I can describe how the rate of cooling of a building is affected by the thickness and thermal conductivity of its walls.			

6.1.2.2. Efficiency

a	I can recall and apply the equations below to calculate the energy efficiency for any energy transfer: efficiency = useful output energy transfer / total input energy transfer efficiency = useful power output / total power input			
b	I can describe ways to increase the efficiency of an intended energy transfer. (HT only)			

6.1.3. National and Global Energy Resources

a	I can describe the main energy resources available for use on Earth as: fossil fuels (coal, oil and gas), nuclear fuel, bio-fuel, wind, hydroelectricity, geothermal, the tides, the Sun and water waves.			
b	I know that a renewable energy resource is one that is being (or can be) replenished as it is used and I can give examples of renewable and non-renewable energy resources.			
c	I can compare the ways that different energy resources are used, to include: transport, electricity generation and heating.			
d	I can explain (using examples) why some energy resources are more reliable than others.			
e	I can describe the environmental impact arising from the use of different energy resources.			
f	I can explain patterns and trends in the use of energy resources.			
g	I can discuss the environmental issues that may arise from the use of different energy resources.			
h	I can explain how science has the ability to identify environmental issues arising from the use of energy resources but does not always have the power to deal with the issues because of political, social, ethical or economic considerations.			