Year 10 : Cycle 1: Science – 100% sheet

Section 1: Lab Equipment	
Mass balance	Measures the mass of an object in units called grams.
Measuring cylinder	Measures the volume of a liquid in units of ml or cm^2.
Bunsen burner	A device used to heat substances by burning natural gas.
Gas syringe	A large glass syringe used to collect and measure volume of gases.
Water bath	Used to heat and maintain samples at a constant temperature.

Section 2: Planning an Investigation	
Independent variable	The variable that is altered during a scientific experiment.
Dependent variable	The variable being tested or measured during a scientific experiment.
Control variable	A variable that is kept the same during a scientific experiment.
Method	Step by step instructions for an investigation.
Results table	Left hand column = independent variable. Right hand column = dependent variable.

Section 3: Respiration	
Respiration	An exothermic reaction that releases energy from glucose in cells
Aerobic respiration	Occurs in the mitochondria, requires oxygen. Glucose + oxygen → carbon dioxide + water
Anaerobic respiration in animals	Occurs in the cytoplasm when oxygen cannot be supplied fast enough e.g., during exercise. It is the incomplete oxidation of glucose. Glucose → lactic acid
Anaerobic respiration in yeast	Known as fermentation. Used in making bread and alcoholic drinks like wine. Glucose → ethanol + carbon dioxide

Section 4: Energy Stores	
Electrostatic energy store	Energy between two objects with a charge e.g. electrons.
Nuclear energy store	Energy inside the nucleus of an atom.
Gravitational energy store	Energy due to an object's position in a gravitational field.
Elastic energy stores	An elastic object is stretched or squashed.
Thermal energy store	Energy in hot objects.

Section 5: Endothermic and Exothermic Reactions	
Conservation of Energy	Energy is conserved in chemical reactions. The amount of energy in the universe at the end of a chemical reaction is the same as before it takes place.
Exothermic reaction	A reaction which transfers energy to the surroundings. It causes increase in temperature of surroundings.
Examples	Combustion, neutralisation, oxidation and respiration. Everyday uses include hand warmers and self-heating cans.
Endothermic reactions	A reaction where energy is taken in from the surroundings. It causes a decrease in temperature of the surroundings.
Examples	Thermal decomposition and photosynthesis. Everyday uses include sports injury packs.

Section 6: Photosynthesis	
Photosynthesis	An endothermic reaction in which plants take in energy to make glucose for plants. It occurs in chloroplasts in palisade cells in leaves.
Word equation	Carbon dioxide + water → glucose + oxygen
Symbol equation	$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$
Chlorophyll	Green pigment in chloroplasts that absorbs energy from sunlight required for photosynthesis.
Uses of glucose	For respiration to release energy. Stored as insoluble starch for using later. Making other substances e.g., cellulose (for cell walls), lipids and proteins (with nitrate ions).

Section 7: Reaction Profiles	
Exothermic reactions	-Energy level decreases because energy is given out to surroundings. -Products are at a lower energy than the reactants. -The difference in height represents the overall energy change. -Initial rise represents the activation energy.
Endothermic reactions	-Energy levels increase as energy is taken in from the surroundings. -Products are at a higher energy than the reactants. -The difference in height represents the overall energy change. -Initial rise represents the activation energy.
Activation energy	The minimum amount of energy that particles must have to react.

Section 8 Energy Pathways	
Mechanical	When a force acts upon an object.
Electrical	When an electrical current flows.
Heating	A temperature difference between objects.
Radiation	Sound, light and electromagnetic radiation.

Section 9: Limiting Factors of Photosynthesis	
Limiting factors	A factor that limits the rate of photosynthesis. If the factor increases, rate increases.
Light intensity	As light intensity increases -> rate increases (as it is the LF). Graph flattens -> rate is constant -> another factor is now the LF.
CO_2 conc.	As CO_2 conc. increases -> rate increases (as it is the LF). Graph flattens -> rate is constant -> another factor is now the LF.
Temperature	As temp increases -> rate increases (as it is the LF). Optimum temperature -> maximum rate. Beyond optimum-> rate decreases -> enzymes denatured.
Chlorophyll	May be limiting factor due to infectious disease (tobacco mosaic virus) or lack of minerals (magnesium).

Section 10: Energy Efficiency	
Conservation of energy	Energy cannot be created or destroyed – it can be transferred usefully, stored, or dissipated
Reduce wasted energy	By insulation or lubrication of moving parts.
Dissipate	Some energy is wasted into the surroundings.
Efficiency	How much energy is usefully transferred. • useful output energy ÷ total input energy • useful power input ÷ total power input

Section 11: Exercise	
Muscle cells	When exercising, more energy required for contraction, respire faster.
Heart Rate	Increases during exercise to pump blood faster. Oxygen and glucose delivered to muscle cells faster.
Breathing	Breathing rate and volume of breaths increases.
Anaerobic Respiration	Occurs if insufficient oxygen, lactic acid causes muscle fatigue.
Oxygen debt	Amount of oxygen needed to react with and remove the lactic acid built up during anaerobic respiration.

Section 12: Work Done and Power	
Work done	Is the same as energy transferred. Measured in Joules (J)
Work done equation	Work done = Force x distance (J) (N) (m)
Power	Rate at which energy is transferred. Measured in Watts (W)
Power equations	Power = Energy ÷ time (W) (J) (s) Power = Work done ÷ time (W) (J) (s)

Section 13: Changes in Energy and Heat Transfer	
K.E.	Kinetic energy = 0.5 x mass x velocity^2
E.P.E.	Elastic potential energy = 0.5 x spring constant x extension^2
G.P.E.	Gravitational potential energy = mass x gravitational field strength x change in height
SHC	Specific heat capacity = the energy required to raise the temperature of one kilogram of a substance by one degree Celsius. Change in thermal energy = mass x SHC x temperature change