EGGLESCLIFFE SCHOOL AND SIXTH FORM COLLEGE

CRUCIAL KNOWLEDGE

What I will know and understand this term

This term in Biology (Combined Science) we will be learning about:

	Grade 7-9	Grade 5-6	Grade 4	Grade 1-3
KNOWLEDGE	❑ 4.2.2l Explain how the natural resting heart rate is controlled and how irregularities can be corrected ❑ 4.2.2r Describe and evaluate treatments for coronary heart disease and heart failure (inc drugs, mechanical devices or transplant) ❑ 4.2.2v Describe how different types of diseases may interact and translate disease incidence information between graphical and numerical forms	❑ 4.2.2d Explain the effect of temperature and pH on enzymes ❑ 4.2.2g Describe the features and functions of bile and state where it is produced and released from ❑ 4.2.2k Explain how the heart moves blood around the body (inc role & position of the aorta, vena cava, pulmonary artery & vein and coronary arteries) ❑ 4.2.2q Describe what happens in coronary heart disease & what statins are used for ❑ 4.2.2s Recall that heart valves can become faulty & describe the consequences of this ❑ 4.2.2t Describe how patients can be treated in the case of heart failure ❑ 4.2.2w Describe what risk factors are & give examples discussing human and financial costs of non-communicable diseases at local, national and global levels	❑ 4.2.2b Describe basic features of enzymes (inc rate calculations for chemical reactions) ❑ 4.2.2e Describe the digestive enzymes, including their names, sites of production and actions ❑ 4.2.2j Describe the structure of the human heart and lungs (inc how lungs are adapted for gaseous exchange) ❑ 4.2.2o Describe blood and identify its different components, inc identifying blood cells from photographs/diagrams ❑ 4.2.2p Describe the functions of blood components, including adaptations to function ❑ 4.2.2x Describe what cancer is and explain the difference between benign and malignant tumours	❑ 4.2.1a Describe the levels of organisation within living organisms ❑ 4.2.2a Describe the digestive system & how it works as an organ system ❑ 4.2.2c Describe the lock and key theory as a model of enzyme action & explain how the shape a of the active sites makes the enzyme specific ❑ 4.2.2f Describe how the products of digestion are used ❑ 4.2.2m Describe the structure & function of arteries, veins and capillaries ❑ 4.2.2u Describe health and the explain causes of ill-health and the relationship between health and disease ❑ 4.2.2y Describe the known risk factors for cancer, including genetic and lifestyle risk factors
SKILLS & APPLICATION		❑ 4.2.2n Use simple compound measures such as rate and carry out rate calculations for blood flow	❑ 4.2.2h RP4: use qualitative reagents to test for a range of carbohydrates, lipids and proteins ❑ 4.2.2i RP5: investigate the effect of pH on the rate of reaction of amylase enzyme	

AUTUMN TERM YEAR 10

EGGLESCLIFFE SCHOOL AND SIXTH FORM COLLEGE

CRUCIAL KNOWLEDGE

What I will know and understand this term

This term in Biology (Combined Science) we will be learning about:

	Grade 7-9	Grade 5-6	Grade 4	Grade 1-3
KNOWLEDGE	❑ 4.2.3g Describe the role of stomata and guard cells in the control of gas exchange and water loss	❑ 4.2.3b Explain how the structure of plant tissues are related to their function within the leaf (plant organ) inc stomata and guard cells ❑ 4.2.3c Recall the plant parts that form a plant organ system that transports substances around the plant ❑ 4.2.3d Explain how root hair cells, xylem and phloem are adapted to their functions ❑ 4.2.3e Describe the process of transpiration and translocation including the role of the different plant tissues ❑ 4.2.3f Explain how the rate of transpiration can be affected by different factors (inc naming the factors)	❑ 4.2.3a Describe plant tissues (epidermal, palisade mesophyll, spongy mesophyll, xylem, phloem and meristem) and describe their functions	
SKILLS & APPLICATION				

EGGLESCLIFFE SCHOOL AND SIXTH FORM COLLEGE

CRUCIAL KNOWLEDGE

What I will know and understand this term

This term in Biology (Combined Science) we will be learning about:

	Grade 7-9	Grade 5-6	Grade 4	Grade 1-3
KNOWLEDGE	❑ 4.7.3e Explain the consequences of peat bog destruction	❑ 4.7.3j Describe both positive and negative human interactions in an ecosystem and explain their impact on biodiversity ❑ 4.7.3k Describe programmes that aim to reduce the negative effects of humans on ecosystems and biodiversity	❑ 4.7.3b Describe the impact of human population growth and increased living standards on resource use and waste production ❑ 4.7.3c Explain how pollution can occur, and the impacts of pollution ❑ 4.7.3g Explain the consequences of deforestation ❑ 4.7.3h Describe how the composition of the atmosphere is changing, and the impact of this on global warming ❑ 4.7.3i Describe some biological consequences of global warming	❑ 4.7.3a Describe what biodiversity is, why it is important, and how human activities affect it ❑ 4.7.3d Describe how humans reduce the amount of land available for other animals and plants ❑ 4.7.3f Describe what deforestation is and why it has occurred in tropical areas
SKILLS & APPLICATION				

EGGLESCLIFFE SCHOOL AND SIXTH FORM COLLEGE

CRUCIAL KNOWLEDGE

What I will know and understand this term

This term in Biology (Combined Science) we will be learning about:

	Grade 7-9	Grade 5-6	Grade 4	Grade 1-3
KNOWLEDGE	❑ 4.5.2d Explain how features of the nervous system are adapted to their function, including a reflex arc (inc all types of neurone and the synapse) ❑ 4.5.3f Explain how glucagon interacts with insulin to control blood glucose levels in the body ❑ 4.5.3k Describe the effect of ADH on the permeability of the kidney tubules & explain how the water level in the body is controlled by ADH ❑ 4.5.3q Explain how hormones are used to treat infertility, inc the steps in IVF ❑ 4.5.3t Explain the roles of thyroxine & adrenaline in the body as negative feedback systems	❑ 4.5.1b Describe the common features of all control systems ❑ 4.5.3d Explain what type 1 and type 2 diabetes are & how they are treated ❑ 4.5.3i Recall that protein digestion leads to excess amino acids inside the body & describe what happens to these ❑ 4.5.3l Describe how kidney failure can be treated by organ transplant or dialysis & recall the basic principles of dialysis ❑ 4.5.3n Describe the roles of the hormones involved in the menstrual cycle (FSH, LH & oestrogen) ❑ 4.5.3o Explain how the different hormones interact to control the menstrual cycle & ovulation ❑ 4.5.3s Describe the functions of adrenaline & thyroxine in the body & recall where they are produced	❑ 4.5.2b Describe how information passes through the nervous system ❑ 4.5.2c Describe what happens in a reflex action and why reflex actions are important ❑ 4.5.3c Describe the body's response when blood glucose concentration is too high ❑ 4.5.3e Describe the body's response when blood glucose concentration is too low ❑ 4.5.3h Describe the consequences of losing or gaining too much water for body cells ❑ 4.5.3j Describe how the kidneys produce urine ❑ 4.5.3p Describe how fertility can be controlled by hormonal and non-hormonal methods of contraception (giving specific examples from the spec)	❑ 4.5.1a Describe what homeostasis is & why it is important stating specific examples from the human body ❑ 4.5.2a State the function of the nervous system & name its important components ❑ 4.5.3a Describe the endocrine system, including the location of the pituitary, pancreas, thyroid, adrenal gland, ovary & testis & the role of hormones ❑ 4.5.3b State that blood glucose concentration is monitored and controlled by the pancreas ❑ 4.5.3g Describe how water, ions & urea are lost from the body ❑ 4.5.3m Describe what happens at puberty in males and females, inc knowledge of reproductive hormones
SKILLS & APPLICATION		❑ 4.5.3r Evaluate the risks and benefits of fertility treatments		❑ 4.5.2e RP7: plan and carry out an investigation into the effect of a factor on human reaction time

AUTUMN TERM YEAR 11

EGGLESCLIFFE SCHOOL AND SIXTH FORM COLLEGE

CRUCIAL KNOWLEDGE

What I will know and understand this term

This term in Chemistry (Combined Science) we will be learning about 4.3 Quantitative Chemistry:

	Grade 7-9	Grade 5-6	Grade 4	Grade 1-3
KNOWLEDGE	❑ 4.3.2a State that chemical amounts are measured in moles (mol) and explain what a mol is with reference to relative formula mass and Avogadro's constant ❑ 4.3.2e Explain the effect of limiting the quantity of a reactant on the amount of products in terms of moles or masses in grams ❑ 4.3.2g Explain how the mass of a solute and the volume of a solution is related to the concentration of the solution	❑ 4.3.1e Explain observed changes of mass during chemical reactions in non-enclosed systems using the particle model when given the balanced symbol equation ❑ 4.3.1f Explain why whenever a measurement is made there is always some uncertainty about the result obtained	❑ 4.3.1b Explain the use of the multipliers in equations in normal script before a formula and in subscript within a formula	❑ 4.3.1a State that mass is conserved and explain why, including describing balanced equations in terms of conservation of mass
SKILLS & APPLICATION	❑ 4.3.2f Calculate the mass of solute in a given volume of solution of known concentration in terms of mass per given volume of solution	❑ 4.3.2b Use the relative formula mass of a substance to calculate the number of moles in a given mass of the substance ❑ 4.3.2c Calculate the masses of reactants and products when given a balanced symbol equation ❑ 4.3.2d Use moles to write a balanced equation when given the masses of reactants and products (inc changing the subject of the equation)	❑ 4.3.1d Calculate the relative formula masses of reactants and products to prove that mass is conserved in a balanced chemical equation	❑ 4.3.1c Describe what the relative formula mass (Mr) of a compound is and calculate the relative formula mass of a compound, given its formula

EGGLESCLIFFE SCHOOL AND SIXTH FORM COLLEGE

CRUCIAL KNOWLEDGE

What I will know and understand this term

This term in Chemistry (Combined Science) we will be learning about:

	Grade 7-9	Grade 5-6	Grade 4	Grade 1-3
KNOWLEDGE	❑ 4.6.2d Explain that the position of equilibrium depends on the conditions of the reaction and the equilibrium will change to counteract any changes to conditions ❑ 4.6.2e Explain and predict the effect of a change in concentration of reactants or products, temperature, or pressure of gases on the equilibrium position of a reaction	❑ 4.6.1g Describe the role of a catalyst in a chemical reaction and state that enzymes are catalysts in biological systems ❑ 4.6.2b Explain that, for reversible reactions, if a reaction is endothermic in one direction, it is exothermic in the other direction ❑ 4.6.2c Describe the State of dynamic equilibrium of a reaction as the point when the forward and reverse reactions occur at exactly the same rate	❑ 4.6.1f Use collision theory to explain changes in the rate of reaction, including discussing activation energy ❑ 4.6.2a Explain what a reversible reaction is, including how the direction can be changed and represent it using symbols: A + B ⇌ C + D	❑ 4.6.1d Describe how different factors affect the rate of a chemical reaction, including the concentration, pressure, surface area, temperature and presence of catalysts
SKILLS & APPLICATION	❑ 4.6.1c Calculate the gradient of a tangent to the curve on the graph and use this as a measure of the rate of reaction	❑ 4.6.1b Draw and interpret rates graphs and use the tangent to the graph as a measure of the rate of reaction ❑ 4.6.1h Draw and interpret reaction profiles for catalysed reactions	❑ 4.6.1a Calculate the rate of a chemical reaction over time, using either quantity of reactant used or the quantity of product formed, measured in g/s, cm3/s or mol/s	❑ 4.6.1e RP5: Investigate how changes in concentration affect the rates of reactions by a method involving measuring the volume of a gas produced, change in colour or turbidity

EGGLESCLIFFE SCHOOL AND SIXTH FORM COLLEGE

CRUCIAL KNOWLEDGE

What I will know and understand this term

This term in Chemistry (Combined Science) we will be learning about:

	Grade 7-9	Grade 5-6	Grade 4	Grade 1-3
KNOWLEDGE		❑ 4.7.1f Describe the process of cracking and state that the products of cracking include alkanes and alkenes and describe the test for alkenes	❑ 4.7.1c Describe the process of fractional distillation, state the names & uses of fuels that are produced from crude oil by fractional distillation	❑ 4.7.1a Describe what crude oil is & where it comes from, including the basic composition of crude oil & the general chemical formula for the alkanes ❑ 4.7.1b State the names of the first four members of the alkanes & recognise substances as alkanes from their formulae
SKILLS & APPLICATION	❑ 4.7.1g Balance chemical equations as examples of cracking when given the formulae of the reactants and products	❑ 4.7.1e Describe and write balanced chemical equations for the complete combustion of hydrocarbon fuels ❑ 4.7.1h Explain why cracking is useful and why modern life depends on the uses of hydrocarbons	❑ 4.7.1d Describe trends in the properties of hydrocarbons, including bpt, viscosity and flammability & explain how they are used as fuels	

EGGLESCLIFFE SCHOOL AND SIXTH FORM COLLEGE

CRUCIAL KNOWLEDGE

What I will know and understand this term

This term in Chemistry (Combined Science) we will be learning about:

	Grade 7-9	Grade 5-6	Grade 4	Grade 1-3
KNOWLEDGE	❑ 4.1.2j Describe the reactivity and properties of group 1 alkali metals with reference to their electron arrangement and predict their reactions ❑ 4.1.2k Describe the properties of Gp 7 halogens and how they relate to their electron arrangement, including trends in molecular mass, mpt, bpt and reactivity	❑ 4.1.1h Describe how the atomic model has changed over time due to new experimental evidence, inc discovery of the atom and scattering experiments (inc the work of James Chadwick) ❑ 4.1.1m Describe isotopes as atoms of the same element with different numbers of neutrons ❑ 4.1.2c Explain why elements in the same group have similar properties and how to use the periodic table to predict the reactivity of elements ❑ 4.1.2e Explain the creation & attributes of Mendeleev's periodic table ❑ 4.1.2i Describe the properties of noble gases, including bpt, predict trends down the group and describe how their properties depend on the outer shell of electrons	❑ 4.1.1i Describe the difference between the plum pudding model of the atom and the nuclear model of the atom ❑ 4.1.1p Describe how electrons fill energy levels in atoms, and represent the electron structure of elements using diagrams and numbers ❑ 4.1.2b Describe how elements with similar properties are placed in the periodic table ❑ 4.1.2d Describe the early attempts to classify elements ❑ 4.1.2g Explain how the atomic structure of metals and non-metals relates to their position in the periodic table ❑ 4.1.2h Describe nobel gases (group 0) & explain their lack of reactivity ❑ 4.1.2l Describe the reactions of group 7 halogens with metals and non-metals	❑ 4.1.2a Recall how the elements in the periodic table are arranged ❑ 4.1.2f Identify metals and non-metals on the periodic table, compare and contrast their properties
SKILLS & APPLICATION				

EGGLESCLIFFE SCHOOL AND SIXTH FORM COLLEGE

CRUCIAL KNOWLEDGE

What I will know and understand this term

This term in Chemistry (Combined Science) we will be learning about:

	Grade 7-9	Grade 5-6	Grade 4	Grade 1-3
KNOWLEDGE	❑ 4.2.1d Describe the limitations of using dot and cross, ball and stick, two and three-dimensional diagrams to represent a giant ionic structure ❑ 4.2.2c Discuss the limitations of particle theory ❑ 4.2.2l Describe the structure of fullerenes & their uses, including Buckminsterfullerene & carbon nanotubes	❑ 4.2.1c Describe the structure of ionic compounds, including the electrostatic forces of attraction, and represent ionic compounds using dot and cross diagrams ❑ 4.2.1g Represent covalent bonds between small molecules, repeating units of polymers and parts of giant covalent structures using diagrams ❑ 4.2.2g Explain how the structure of polymers affects their properties ❑ 4.2.2h Explain how the structure of giant covalent structures affects their properties ❑ 4.2.2j Explain why alloys are harder than pure metals in terms of the layers of atoms ❑ 4.2.2k Explain the properties of graphite, diamond and graphene in terms of their structure and bonding	❑ 4.2.1f Describe covalent bonds & identify different types of covalently bonded substances, small molecules, large molecules & giant covalent structures ❑ 4.2.1b Describe how some ions have the electronic structure of a gas 0 element & how charges of ions relate to its group number ❑ 4.2.2e Explain how the structure of ionic compounds affects their properties, including mpt, bpt & conduction of electricity (sodium chloride only) ❑ 4.2.2f Explain how the structure of small molecules affects their properties ❑ 4.2.2i Explain how the structure of metals & alloys affects their properties, including explaining why they are good conductors	❑ 4.2.1a Describe the three main types of bonds: ionic, covalent and metallic bonds in terms of electrostatic forces and the transfer or sharing of electrons ❑ 4.2.1j Describe the arrangement of atoms and electrons in metallic bonds and draw diagrams the bonding in metals ❑ 4.2.2a Name the three states of matter, identify them from a simple model and state which changes of state happen at melting and boiling points ❑ 4.2.2b Explain changes of state using particle theory and describe factors that affect the melting and boiling point of a substance ❑ 4.2.2d Recall what (s), (l), (g) and (aq) mean when used in chemical equations and be able to use them appropriately
SKILLS & APPLICATION		❑ 4.2.1e Work out the empirical formula of an ionic compound from a given model or diagram that shows the ions in the structure ❑ 4.2.1h Draw dot and cross diagrams for the molecules of hydrogen, chlorine, oxygen, nitrogen, hydrogen chloride, water, ammonia and methane	❑ 4.2.1i Deduce the molecular formula of a substance from a given model or diagram in these forms showing the atoms and bonds in the molecule	

AUTUMN TERM YEAR 10

EGGLESCLIFFE SCHOOL AND SIXTH FORM COLLEGE

CRUCIAL KNOWLEDGE

What I will know and understand this term

This term in Physics (Combined Science) we will be learning about:

	Grade 7-9	Grade 5-6	Grade 4	Grade 1-3
KNOWLEDGE	❑ 4.3.3b Explain, with reference to the particle model, the effect of changing the temperature of a gas held at constant volume on its pressure	❑ 4.3.2f Distinguish between specific heat capacity and specific latent heat ❑ 4.3.3a Explain why the molecules of a gas are in constant random motion and that the higher the temperature of a gas, the greater the particles' average kinetic energy	❑ 4.3.1c Use the particle model to explain the properties of different states of matter and differences in the density of materials ❑ 4.3.1f Use the particle model to explain why a change of state is reversible and affects the properties of a substance, but not its mass ❑ 4.3.2b Explain that internal energy is the total kinetic energy and potential energy of all the particles in a system	❑ 4.3.1b Recognise/draw simple diagrams to model the difference between solids, liquids and gases ❑ 4.3.1e Recall and describe the names of the processes by which substances change state ❑ 4.3.2a State that the internal energy of a system is stored in the atoms and molecules that make up the system
SKILLS & APPLICATION	❑ 4.3.3c Calculate the change in the pressure of a gas or the volume of a gas (a fixed mass held at constant temperature) when either the pressure or volume is increased or decreased	❑ 4.3.2d Calculate the specific latent heat of fusion/vaporisation by applying, but not recalling, the equation: [E = mL] ❑ 4.3.2e Interpret and draw heating and cooling graphs that include changes of state	❑ 4.3.1d Required practical 5: use appropriate apparatus to make and record the measurements needed to determine the densities of regular and irregular solid objects and liquids ❑ 4.3.2c Calculate the change in thermal energy by applying but not recalling the equation [$\Delta E = m\ c\ \Delta\theta$]	❑ 4.3.1a Calculate the density of a material by recalling and applying the equation: [$\rho = m/V$]

EGGLESCLIFFE SCHOOL AND SIXTH FORM COLLEGE

CRUCIAL KNOWLEDGE

What I will know and understand this term

This term in Physics (Combined Science) we will be learning about:

	Grade 7-9	Grade 5-6	Grade 4	Grade 1-3
KNOWLEDGE	❑ 4.2.2d. Explain qualitatively why adding resistors in series increases the total resistance whilst adding resistors in parallel decreases the total resistance	❑ 4.2.1d. Explain that current is caused by a source of potential difference and it has the same value at any point in a single closed loop of a circuit ❑ 4.2.1i. Explain the resistance of components such as lamps, diodes, thermistors and LDRs and sketch/interpret IV graphs of their characteristic electrical behaviour	❑ 4.2.1e. Describe and apply the idea that the greater the resistance of a component, the smaller the current for a given potential difference (p.d.) across the component	❑ 4.2.1a. Draw and interpret circuit diagrams, including all common circuit symbols ❑ 4.2.1b. Define electric current as the rate of flow of electrical charge around a closed circuit ❑ 4.2.1h. Define an ohmic conductor
SKILLS & APPLICATION	❑ 4.2.2e. Solve problems for circuits which include resistors in series using the concept of equivalent resistance	❑ 4.2.1j. Explain how to measure the resistance of a component by drawing an appropriate circuit diagram using correct circuit symbols ❑ 4.2.2a. Show by calculation and explanation that components in series have the same current passing through them ❑ 4.2.2b. Show by calculation and explanation that components connected in parallel have the same the potential difference across each of them	❑ 4.2.1c. Calculate charge and current by recalling and applying the formula: [Q = It] ❑ 4.2.1f. Calculate current, potential difference or resistance by recalling and applying the equation: [V = IR] ❑ 4.2.1k. RP4: use circuit diagrams to construct appropriate circuits to investigate the I–V characteristics of a variety of circuit elements	❑ 4.2.1g. RP3: Use circuit diagrams to set up and check circuits to investigate the factors affecting the resistance of electrical circuits ❑ 4.2.2c. Calculate the total resistance of two components in series as the sum of the resistance of each component using the equation: [$R_{total} = R_1 + R_2$]

EGGLESCLIFFE SCHOOL AND SIXTH FORM COLLEGE

CRUCIAL KNOWLEDGE

What I will know and understand this term

This term in Physics (Combined Science) we will be learning about:

	Grade 7-9	Grade 5-6	Grade 4	Grade 1-3
KNOWLEDGE	❑ 4.5.3b 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	❑ 4.5.1h Describe examples of the forces acting on an isolated object or system ❑ 4.5.2d Explain why work done against the frictional forces acting on an object causes a rise in the temperature of the object ❑ 4.5.3e Explain why a change in the shape of an object only happens when more than one force is applied	❑ 4.5.1c Describe the interaction between two objects and the force produced on each as a vector ❑ 4.5.1f Represent the weight of an object as acting at a single point which is referred to as the object's 'centre of mass' ❑ 4.5.2b Describe what a joule is and state what the joule is derived from ❑ 4.5.3c Describe the difference between elastic deformation and inelastic deformation caused by stretching forces	❑ 4.5.1a Identify and describe scalar quantities and vector quantities ❑ 4.5.1b Identify and give examples of forces as contact or non-contact forces ❑ 4.5.1d Describe weight and explain that its magnitude at a point depends on the gravitational field strength ❑ 4.5.3a Describe examples of the forces involved in stretching, bending or compressing an object
SKILLS & APPLICATION	❑ 4.5.1j Use free body diagrams and accurate vector diagrams to scale, to resolve multiple forces and show magnitude and direction of the resultant ❑ 4.5.1k Use vector diagrams to illustrate resolution of forces, equilibrium situations and determine the resultant of two forces, to include both magnitude and direction	❑ 4.5.1i Use free body diagrams to qualitatively describe examples where several forces act on an object and explain how that leads to a single resultant force or no force ❑ 4.5.3f Describe and interpret data from an investigation to explain possible causes of a linear and non-linear relationship between force and extension ❑ 4.5.3g Calculate work done in stretching (or compressing) a spring (up to the limit of proportionality) by applying, but not recalling, the equation: [$E_e = \frac{1}{2}ke^2$]	❑ 4.5.1e Calculate weight by recalling and using the equation: [W = mg] ❑ 4.5.2a Describe energy transfers involved when work is done and calculate the work done by recalling and using the equation: [W = Fs] ❑ 4.5.3d Describe the extension of an elastic object below the limit of proportionality and calculate it by recalling and applying the equation: [F = ke]	❑ 4.5.1g Calculate the resultant of two forces that act in a straight line ❑ 4.5.2c Convert between newton-metres and joules. ❑ 4.5.3h RP6: Investigate the relationship between force and extension for a spring.

EGGLESCLIFFE SCHOOL AND SIXTH FORM COLLEGE

CRUCIAL KNOWLEDGE

What I will know and understand this term

This term in Physics (Combined Science) we will be learning about:

	Grade 7-9	Grade 5-6	Grade 4	Grade 1-3
KNOWLEDGE	❑ 4.5.6.1g.Explain qualitatively, with examples, that motion in a circle involves constant speed but changing velocity ❑ 4.5.6.2g Describe what inertia is and give a definition ❑ 4.5.6.2t Explain how a braking force applied to the wheel does work to reduce the vehicle's kinetic energy and increases the temperature of the brakes ❑ 4.5.62u Explain and apply the idea that a greater braking force causes a larger deceleration and explain how this might be dangerous for drivers	❑ 4.5.6.1f Explain the vector–scalar distinction as it applies to displacement, distance, velocity and speed ❑ 4.5.6.1j Describe an object which is slowing down as having a negative acceleration & estimate the magnitude of everyday accelerations ❑ 4.5.6.2d Explain the motion of an object moving with a uniform velocity & identify that forces must be in effect if its velocity is changing, by stating and applying Newton's First Law ❑ 4.5.6.2v Estimate the forces involved in the deceleration of road vehicles	❑ 4.5.6.1b Express a displacement in terms of both the magnitude and direction ❑ 4.5.6.2e Define and apply Newton's second law relating to the acceleration of an object ❑ 4.5.6.2n: Evaluate the effect of various factors on thinking distance based on given data ❑ 4.5.6.2s Explain how the braking distance of a vehicle can be affected by different factors, including implications for road safety ❑ 4.5.6.2h Estimate the speed, accelerations and forces of large vehicles involved in everyday road transport	❑ 4.5.6.1a Define distance and displacement & explain why they are scalar or vector quantities ❑ 4.5.6.1c Explain that the speed at which a person can walk, run or cycle depends on a number of factors & recall some typical speeds for walking, running, cycling ❑ 4.5.6.2k Describe factors that can affect a driver's reaction time ❑ 4.5.6.2q State typical reaction times & describe how reaction time (and therefore stopping distance) can be affected by different factors
SKILLS & APPLICATION	❑ 4.5.6.1m Interpret enclosed areas in velocity–time graphs to determine distance travelled (or displacement) ❑ 4.5.6.1n Measure, when appropriate, the area under a velocity– time graph by counting squares ❑ 4.5.6.1o Apply, but not recall, the equation: [$v^2 - u^2 = 2as$] ❑ 4.5.6.2r Explain methods used to measure human reaction times and take, interpret and evaluate measurements of the reaction times of students	❑ 4.5.6.1k Calculate the average acceleration of an object by recalling and applying the equation: [$a = \Delta v/t$] ❑ 4.5.6.1l Represent motion using velocity–time graphs, finding the acceleration from its gradient & distance travelled from the area underneath ❑ 4.5.6.2j Apply Newton's Third Law to examples of equilibrium situations ❑ 4.5.6.2m Interpret and evaluate measurements from simple methods to measure the different reaction times of students	❑ 4.5.6.1h Represent an object moving along a straight line using a distance-time graph, describing its motion and calculating its speed from the graph's gradient ❑ 4.5.6.1i Draw distance–time graphs from measurements & extract and interpret lines and slopes of distance–time graphs ❑ 4.5.6.2i RP7: Investigate the effect of varying the force on the acceleration of an object of constant mass& the effect of varying the mass of an object on the acceleration	❑ 4.5.6.1d Make measurements of distance and time & then calculate speeds of objects & calculating average speed for non-uniform motion ❑ 4.5.6.1e Explain why the speed of wind and of sound through air varies & calculate speed by recalling and applying the equation: [s = v t] ❑ 4.5.6.2f Recall and apply the equation: [F = ma] ❑ 4.5.6.2l Explain methods used to measure human reaction times and recall typical results

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