NOTTINGHAM BRITISH SCHOOL – CURRICULUM DEVELOPMENT 2019

Year 10 Physics

STRAND	October Assessment	December Assessment	March Assessment	June Assessment	Age Related Expectation By the end of the year every student will be able to ….
General Physics	*Units and quantities:* Describe and list base quantities and know their correct units of measurement Units conversions Understand use Scientific notation and significant figures *Making Measurements of length and time* Use and describe the use of rules and measuring cylinders to find a length or a volume • Use and describe the use of clocks and devices, both analogue and digital, for measuring an interval of time • Obtain an average value for a small distance and for a short interval of time by	**Pressure** • Recall and use the equation p = F/A • Relate pressure to force and area, using appropriate examples • Recall and use the equation p = hρg • Describe the simple mercury barometer and its use in measuring atmospheric pressure • Relate (without calculation) the pressure beneath a liquid surface to depth and to density, using appropriate examples • Use and describe the use of a manometer *Energy, work and power* Energy resources • Describe how electricity or other useful forms of energy may be obtained from: – chemical	Measurement of temperature • Appreciate how a physical property that varies with temperature may be used for the measurement of temperature, and state examples of such properties • Recognise the need for and identify fixed points • Describe and explain the structure and action of liquid-in-glass thermometers • Demonstrate understanding of sensitivity, range and linearity • Describe the structure of a thermocouple and show understanding of its use as a thermometer for measuring high temperatures and those that vary rapidly • Describe and explain how the structure of a liquid-in-glass thermometer relates to its sensitivity, range and linearity Thermal capacity (heat capacity) • Relate a rise in the temperature of a body to an increase in its internal energy	*Electrical quantities* *Electric charge and electric fields* • State that there are positive and negative charges • State that unlike charges attract and that like charges repel • Describe simple experiments to show the production and detection of electrostatic charges • State that charging a body involves the addition or removal of electrons • Distinguish between electrical conductors and insulators and give typical examples • State that charge is measured in coulombs • State that the direction of an electric field at a point is the direction of the force on a positive charge at that point • Describe an electric field as a region in which an	***AO1 Knowledge with understanding*** Students should be able to demonstrate knowledge and understanding of: • scientific phenomena, facts, laws, definitions, concepts and theories • scientific vocabulary, terminology and conventions (including symbols, quantities and units) • scientific instruments and apparatus, including techniques of operation and aspects of safety • scientific and technological applications with their social, economic and environmental implications. Subject

	measuring multiples (including the period of a pendulum) • Understand that a micrometer and screw gauge and Vernier calipers are used to measure very small distances. <u>*Scalars and vectors*</u> • Understand that vectors have a magnitude and direction • Demonstrate an understanding of the difference between scalars and vectors and give common examples • Determine graphically the resultant of two vectors <u>*Mass and weight*</u> • Show familiarity with the idea of the mass of a body • State that weight is a gravitational force • Distinguish between mass and weight	energy stored in fuel – water, including the energy stored in waves, in tides, and in water behind hydroelectric dams – geothermal resources – nuclear fission – heat and light from the Sun (solar cells and panels) – wind • Give advantages and disadvantages of each method in terms of renewability, cost, reliability, scale and environmental impact • Show a qualitative understanding of efficiency • Understand that the Sun is the source of energy for all our energy resources except geothermal, nuclear and tidal • Show an understanding that energy is released by nuclear fusion in the Sun • Identify changes in kinetic, gravitational potential, chemical, elastic (strain), nuclear and internal energy that have occurred as a result of an event or process • Recognise that energy is transferred during events and processes, including examples of transfer by forces (mechanical working), by electrical currents (electrical working), by heating and by waves	• Show an understanding of what is meant by the thermal capacity of a body Supplement • Give a simple molecular account of an increase in internal energy • Recall and use the equation thermal capacity = mc • Define specific heat capacity • Describe an experiment to measure the specific heat capacity of a substance • Recall and use the equation change in energy = mcΔT <u>*General wave properties*</u> Demonstrate understanding that waves transfer energy without transferring matter • Describe what is meant by wave motion as illustrated by vibration in ropes and springs and by experiments using water waves • Use the term wavefront • Give the meaning of speed, frequency, wavelength and amplitude • Distinguish between transverse and longitudinal waves and give suitable examples • Describe how waves can undergo: – reflection at a plane surface – refraction due to a change of speed – diffraction through a narrow gap • Describe the use of water waves to demonstrate	electric charge experiences a force • Describe simple field patterns, including the field around a point charge, the field around a charged conducting sphere and the field between two parallel plates (not including end effects) • Give an account of charging by induction • Recall and use a simple electron model to distinguish between conductors and insulators <u>*Electrical circuits, components and symbols*</u> Circuit diagrams • Draw and interpret circuit diagrams containing sources, switches, resistors (fixed and variable), heaters, thermistors, light-dependent resistors, lamps, ammeters, voltmeters, galvanometers, magnetising coils, transformers, bells, fuses and relays • Draw and interpret circuit diagrams containing diodes <u>*Current*</u>	content defines the factual material that candidates may be required to recall and explain. Candidates will also be asked questions which require them to apply this material to unfamiliar contexts and to apply knowledge from one area of the syllabus to another. <u>***AO2 Handling information and problem solving***</u> Students should be able, in words or using other written forms of presentation (i.e. symbolic, graphical and numerical), to: • locate, select, organise and present information from a variety of sources • translate information from one form to another • manipulate numerical and other data • use information to identify patterns,

	• Recall and use the equation W = mg • Demonstrate understanding that weights (and hence masses) may be compared using a balance • Demonstrate an understanding that mass is a property that 'resists' change in motion • Describe, and use the concept of, weight as the effect of a gravitational field on a mass *Density* • Recall and use the equation ρ = m/V • Describe an experiment to determine the density of a liquid and of a regularly shaped solid and make the necessary calculation • Describe the determination of the density of an irregularly shaped solid by the	• Apply the principle of conservation of energy to simple examples • Recall and use the equations: efficiency = useful energy output/ energy input × 100% efficiency = useful power output power/ input × 100% Work • Demonstrate understanding that work done = energy transferred • Relate (without calculation) work done to the magnitude of a force and the distance moved in the direction of the force • Recall and use W = Fd = ΔE Power • Relate (without calculation) power to work done and time taken, using appropriate examples • Recall and use the equation P = ΔE/t in simple systems *Thermal physics* Sates of matter and molecular model	reflection, refraction and diffraction Supplement • Recall and use the equation v = f λ • Describe how wavelength and gap size affects diffraction through a gap • Describe how wavelength affects diffraction at an edge *Sound waves* Describe the production of sound by vibrating sources • Describe the longitudinal nature of sound waves • State that the approximate range of audible frequencies for a healthy human ear is 20Hz to 20000Hz • Show an understanding of the term ultrasound • Show an understanding that a medium is needed to transmit sound waves • Describe an experiment to determine the speed of sound in air • Relate the loudness and pitch of sound waves to amplitude and frequency • Describe how the reflection of sound may produce an echo • Describe compression and rarefaction • State typical values of the speed of sound in gases, liquids and solids *Electromagnetic spectrum*	• State that current is related to the flow of charge • Use and describe the use of an ammeter, both analogue and digital • State that current in metals is due to a flow of electrons • Show understanding that a current is a rate of flow of charge and recall and use the equation I = Q/t • Distinguish between the direction of flow of electrons and conventional current *Electromotive force* • State that the electromotive force (e.m.f.) of an electrical source of energy is measured in volts • Show understanding that e.m.f. is defined in terms of energy supplied by a source in driving charge round a complete circuit *Potential difference* • State that the potential difference (p.d.) across a circuit component is measured in volts • Use and describe the use of a voltmeter, both analogue and digital Supplement • Recall that 1V is equivalent to 1J/C 4.2.5 *Resistance* • State that resistance = p.d./ current and	report trends and draw inferences • present reasoned explanations for phenomena, patterns and relationships • make predictions and hypotheses • solve problems, including some of a quantitative nature. Questions testing these skills may be based on information that is unfamiliar to candidates, requiring them to apply the principles and concepts from the syllabus to a new situation, in a logical, deductive way. ***AO3 Experimental skills and investigation*** Students should be able to: • demonstrate knowledge of how to safely use techniques, apparatus and materials (including

	method of displacement • Predict whether an object will float based on density data *Motion* • Define speed and calculate average speed from total distance total time • Plot and interpret a speed–time graph or a distance–time graph • Recognise from the shape of a speed–time graph when a body is – at rest – moving with constant speed – moving with changing speed • Calculate speed from the gradient of a distance–time graph • Distinguish between speed and velocity • Calculate the area under a speed–time graph to work out the distance travelled for	• Describe qualitatively the molecular structure of solids, liquids and gases in terms of the arrangement, separation and motion of the molecules • Relate the properties of solids, liquids and gases to the forces and distances between molecules and to the motion of the molecules • Interpret the temperature of a gas in terms of the motion of its molecules • Describe qualitatively the pressure of a gas in terms of the motion of its molecules Explain pressure in terms of the change of momentum of the particles striking the walls creating a force • Show an appreciation that massive particles may be moved by light, fast-moving molecules • Show an understanding of the random motion of particles in a suspension as evidence for the kinetic molecular model of matter • Describe this motion (sometimes known as Brownian motion) in terms of random molecular bombardment *Evaporation*	Describe the main features of the electromagnetic spectrum in order of wavelength • State that all electromagnetic waves travel with the same high speed in a vacuum • Describe typical properties and uses of radiations in all the different regions of the electromagnetic spectrum including: – radio and television communications (radio waves) – satellite television and telephones (microwaves) – electrical appliances, remote controllers for televisions and intruder alarms (infrared) – medicine and security (X-rays) • Demonstrate an awareness of safety issues regarding the use of microwaves and X-rays Supplement • State that the speed of electromagnetic waves in a vacuum is 3.0 × 108m/s and is approximately the same in air *Light* Reflection of light • Describe the formation of an optical image by a plane mirror, and give its characteristics • Recall and use the law angle of incidence = angle of reflection Supplement • Recall that the image in a plane mirror is virtual	understand qualitatively how changes in p.d. or resistance affect current • Recall and use the equation R = V/ I • Describe an experiment to determine resistance using a voltmeter and an ammeter • Relate (without calculation) the resistance of a wire to its length and to its diameter • Sketch and explain the current–voltage characteristic of an ohmic resistor and a filament lamp • Recall and use quantitatively the proportionality between resistance and length, and the inverse proportionality between resistance and crosssectional area of a wire *Series and parallel circuits* • Understand that the current at every point in a series circuit is the same • Give the combined resistance of two or more resistors in series • State that, for a parallel circuit, the current from the source is larger than the current in each branch	following a sequence of instructions where appropriate) • plan experiments and investigations • make and record observations, measurements and estimates • interpret and evaluate experimental observations and data

	motion with constant acceleration • Demonstrate understanding that acceleration and deceleration are related to changing speed including qualitative analysis of the gradient of a speed–time graph • Define and calculate acceleration using change of velocity / time taken • Calculate acceleration from the gradient of a speed–time graph • Recognise linear motion for which the acceleration is constant • Recognise motion for which the acceleration is not constant • Understand deceleration as a negative acceleration *Force and their effects on motion* • Define forces and identify their types	• Describe evaporation in terms of the escape of more-energetic molecules from the surface of a liquid • Relate evaporation to the consequent cooling of the liquid Differentiate between evaporation and bioling • Demonstrate an understanding of how temperature, surface area and draught over a surface influence evaporation • Explain the cooling of a body in contact with an evaporating liquid *Thermal processes* Conduction • Describe experiments to demonstrate the properties of good and bad thermal conductors • Give a simple molecular account of conduction in solids including lattice vibration and transfer by electrons Convection • Recognise convection as an important method of thermal transfer in fluids • Relate convection in fluids to density changes and describe	• Perform simple constructions, measurements and calculations for reflection by plane mirrors *Refraction of light* • Describe an experimental demonstration of the refraction of light • Use the terminology for the angle of incidence i and angle of refraction r and describe the passage of light through parallel-sided transparent material • Give the meaning of critical angle • Describe internal and total internal reflection Supplement • Recall and use the definition of refractive index n in terms of speed • Recall and use the equation sin i sin r = n • Recall and use n = 1 sin c • Describe and explain the action of optical fibres particularly in medicine and communications technology *Dispersion of light* • Give a qualitative account of the dispersion of light as shown by the action on light of a glass prism including the seven colours of the spectrum in their correct order Supplement • Recall that light of a single frequency is described as monochromatic	• State that the combined resistance of two resistors in parallel is less than that of either resistor by itself • State the advantages of connecting lamps in parallel in a lighting circuit Supplement • Calculate the combined e.m.f. of several sources in series • Recall and use the fact that the sum of the p.d.s across the components in a series circuit is equal to the total p.d. across the supply • Recall and use the fact that the current from the source is the sum of the currents in the separate branches of a parallel circuit • Calculate the effective resistance of two resistors in parallel Electrical working • Understand that electric circuits transfer energy from the battery or power source to the circuit components then into the surroundings • Recall and use the equations P = IV and E = IVt	

	• Understand friction as the force between two surfaces which impedes motion and results in heating and recognise air resistance as a form of friction • Describe the ways in which a force may change the motion of a body • Find the resultant of two or more forces acting along the same line • Recognise that if there is no resultant force on a body it either remains at rest or continues at constant speed in a straight line • Recall and use the relationship between force, mass and acceleration (including the direction), F = ma • State that the acceleration of free fall for a body near to the Earth is constant	experiments to illustrate convection <u>Radiation</u> • Identify infrared radiation as part of the electromagnetic spectrum • Recognise that thermal energy transfer by radiation does not require a medium • Describe the effect of surface colour (black or white) and texture (dull or shiny) on the emission, absorption and reflection of radiation Supplement • Describe experiments to show the properties of good and bad emitters and good and bad absorbers of infrared radiation • Show understanding that the amount of radiation emitted also depends on the surface temperature and surface area of a body <u>*Thermal properties and temperature*</u> *Thermal expansion of solids, liquids and gases* • Describe qualitatively the thermal expansion of solids, liquids, and gases at constant pressure • Identify and explain some of the everyday applications and consequences of thermal expansion	<u>*Thin converging lens*</u> • Describe the action of a thin converging lens on a beam of light • Use the terms principal focus and focal length • Draw ray diagrams for the formation of a real image by a single lens • Describe the nature of an image using the terms enlarged/same size/diminished and upright/ inverted • Draw and use ray diagrams for the formation of a virtual image by a single lens • Use and describe the use of a single lens as a magnifying glass • Show understanding of the terms real image and virtual image		

	• Describe qualitatively the motion of bodies falling in a uniform gravitational field with and without air resistance (including reference to terminal velocity) • Describe qualitatively motion in a circular path due to a perpendicular force. *Momentum* • Understand the concepts of momentum and impulse • Recall and use the equation momentum = mass × velocity, p = mv • Recall and use the equation for impulse Ft = mv – mu • Apply the principle of the conservation of momentum to solve simple problems in one dimension *Forces and their effects (change in shape and dimensions)* • State Hooke's Law and recall and use the	• Explain, in terms of the motion and arrangement of molecules, the relative order of the magnitude of the expansion of solids, liquids and gases Measurement of temperature • Appreciate how a physical property that varies with temperature may be used for the measurement of temperature, and state examples of such properties • Recognise the need for and identify fixed points • Describe and explain the structure and action of liquid-in-glass thermometers • Demonstrate understanding of sensitivity, range and linearity • Describe the structure of a thermocouple and show understanding of its use as a thermometer for measuring high temperatures and those that vary rapidly • Describe and explain how the structure of a liquid-in-glass thermometer relates to its sensitivity, range and linearity Thermal capacity (heat capacity) • Relate a rise in the temperature of a body to an increase in its internal energy • Show an understanding of what is meant by the thermal capacity of a body Supplement			

	expression F = kx, where k is the spring constant • Recognise the significance of the 'limit of proportionality' for an extension–load graph <u>Turning effect of a force (Moment)</u> • Describe the moment of a force as a measure of its turning effect and give everyday examples • Understand that increasing force or distance from the pivot increases the moment of a force • Calculate moment using the product force × perpendicular distance from the pivot • Apply the principle of moments to the balancing of a beam about a pivot • Apply the principle of moments to different situations <u>*Conditions for equilibrium*</u>	• Give a simple molecular account of an increase in internal energy • Recall and use the equation thermal capacity = mc • Define specific heat capacity • Describe an experiment to measure the specific heat capacity of a substance • Recall and use the equation change in energy = mcΔT			

	• Recognise that, when there is no resultant force and no resultant turning effect, a system is in equilibrium *Centre of mass* •Perform and describe an experiment to determine the position of the centre of mass of a plane lamina • Describe qualitatively the effect of the position of the centre of mass on the stability of simple objects ***Assessment for learning*** • Weekly quick quiz (20 min) • End of Chapter test (every 6-8 lessons) • Practise answering past exam paper questions • Self assessment • Peer assessment • End of half term test	***Assessment for learning*** • Weekly quick quiz (20 min) • End of Chapter test (every 6-8 lessons) • Practise answering past exam paper questions • • Self assessment • Peer assessment	***Assessment for learning*** • Weekly quick quiz (20 min) • End of Chapter test (every 6-8 lessons) • Practise answering past exam paper questions • Self assessment • Peer assessment • End of half term test	***Assessment for learning*** • Weekly quick quiz (20 min) • End of Chapter test (every 6-8 lessons) • Practise answering past exam paper questions • Self assessment • Peer assessment • End of half term test	

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