HASTINGS HIGH SCHOOL

YEAR 11 EXAMINATION GUIDE 2017-19

Subject	TRIPLE SCIENCE Physics
Course code	AQA GCSE PHYSICS 8463
Website address	http://www.aqa.org.uk/subjects/science/gcse/physics-8463
Provisional examination dates	Paper 1: Topics 1–4: Energy, Electricity, Particle model of matter, Atomic structure. 22nd May 2019 Paper 2: Topics 5–8: Forces, Waves, Magnetism and Electromagnetism, Space physics. 14th June 2019
GCSE grade type awarded	9-1 (New 2016 Specification)
Coursework	There is no coursework but students are tested on 10 key practical investigations completed during the course in both examination papers.
Paper 1 **Paper 2**	**Paper 1**: Written exam: 1 hour 45 minutes Foundation and Higher Tiers 100 marks 50% of GCSE **Paper 2:** Written exam: 1 hour 45 minutes Foundation and Higher Tier 100 marks 50% of GCSE *Multiple choice, structured, closed short answer and open response style questions will be given in the examinations.* *40% of the Physics examinations as a minimum will be Mathematically based questions.*
Extra Support	The class will use past papers extensively throughout the course. We will focus on the extended style questions and the mathematical requirements of the course. Students have also been provided with a Required Practical Handbook.
Revision book	CGP Revision Guide ISBN: 978 1 78294 558 1
Useful websites	http://www.hastings.leics.sch.uk/gcse-support/

KNOWLEDGE GAPS ANALYSIS

Topic	CGP Page	Notes
Unit 1 Energy	11-23	
P4.1.1 Energy changes in a System		
Define a system as an object or group of objects and state examples of changes in the way energy is stored in a system	11	
Describe how all the energy changes involved in an energy transfer and calculate relative changes in energy when the heat, work done or flow of charge in a system changes	11	
Use calculations to show on a common scale how energy in a system is redistributed	11	
Calculate the kinetic energy of an object by recalling and applying the equation: ***[$E_k = ½mv^2$]***	12	
Calculate the amount of elastic potential energy stored in a stretched spring by applying, but not recalling, the equation: ***[$E_e = ½ke^2$]***	12	
Calculate the amount of gravitational potential energy gained by an object raised above ground level by recalling and applying, the equation: ***[$E_e = mgh$]***	12	
Calculate the amount of energy stored in or released from a system as its temperature changes by applying, but not recalling, the equation: ***[$\Delta E = mc\Delta\theta$]***	13	
Define the term 'specific heat capacity'	13	
Define power as the rate at which energy is transferred or the rate at which work is done and the watt as an energy transfer of 1 joule per second	14	
Calculate power by recalling and applying the ***equations:*** ***[P = E/t & P = W/t]***	14	
Explain, using examples, how two systems transferring the same amount of energy can differ in power output due to the time taken	14	

Topic	CGP Page	Notes
P4.1.2 Conservation and dissipation of Energy		
State that energy can be transferred usefully, stored or dissipated, but cannot be created or destroyed and so the total energy in a system does not change	14	
Explain that only some of the energy in a system is usefully transferred, with the rest 'wasted', giving examples of how this wasted energy can be reduced	14	
Explain ways of reducing unwanted energy transfers and the relationship between thermal conductivity and energy transferred	15	
Describe how the rate of cooling of a building is affected by the thickness and thermal conductivity of its walls	15/ 16	
Calculate efficiency by recalling and applying the equation: ***[efficiency = useful power output / total power input]***	17	
HT ONLY: Suggest and explain ways to increase the efficiency of an intended energy transfer	16	
P4.1.3 National and Global Energy Resources		
List the main renewable and non-renewable energy resources and define what a renewable energy resource is	18	
Compare ways that different energy resources are used, including uses in transport, electricity generation and heating	19	
Explain why some energy resources are more reliable than others, explaining patterns and trends in their use	18/ 19/ 21/ 22	
Evaluate the use of different energy resources, taking into account any ethical and environmental issues which may arise	18/ 19/ 21/ 22	
Justify the use of energy resources, with reference to both environmental issues and the limitations imposed by political, social, ethical or economic considerations	22	

Topic	CGP Page	Notes
Unit 2 Electricity	24-37	
P4.2.1 Current, potential difference and resistance		
Draw and interpret circuit diagrams, including all common circuit symbols	24/ 28/ 29	
Define electric current as the rate of flow of electrical charge around a closed circuit	24	
Calculate charge and current by recalling and applying the formula: ***[Q = It]***	24	
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	24	
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	25	
Calculate current, potential difference or resistance by recalling and applying the equation: ***[V = IR]***	25	
Define an ohmic conductor	25	
Explain the resistance of components such as lamps, diodes, thermistors and LDRs and sketch/interpret IV graphs of their characteristic electrical behaviour	25/ 26/ 27	
Explain how to measure the resistance of a component by drawing an appropriate circuit diagram using correct circuit symbols	25	
P.4.2.2 Series and Parallel circuits		
Show by calculation and explanation that components in series have the same current passing through them	28	
Show by calculation and explanation that components connected in parallel have the same the potential difference across each of them	29	
Calculate the total resistance of two components in series as the sum of the resistance of each component using the equation: ***[$R_{total} = R_1 + R_2$]***	28	

Topic	CGP Page	Notes
Explain qualitatively why adding resistors in series increases the total resistance whilst adding resistors in parallel decreases the total resistance	28/ 29	
Solve problems for circuits which include resistors in series using the concept of equivalent resistance	28/ 30	
P4.2.3 Domestic uses and safety		
Explain the difference between direct and alternating voltage and current, stating what UK mains is	31	
Identify and describe the function of each wire in a three-core cable connected to the mains	31	
State that the potential difference between the live wire and earth (0 V) is about 230 V and that both neutral wires and our bodies are at, or close to, earth potential (0 V)	31	
Explain that a live wire may be dangerous even when a switch in the mains circuit is open by explaining the danger of providing any connection between the live wire and earth	31	
P4.2.4 Energy Transfers		
Explain how the power transfer in any circuit device is related to the potential difference across it and the current through it	32	
Calculate power by recalling and applying the equations: ***[P = VI]*** and ***[$P = I^2 R$]***	33	
Describe how appliances transfer energy to the kinetic energy of motors or the thermal energy of heating devices	32/ 33	
Calculate and explain the amount of energy transferred by electrical work by recalling and applying the equations: ***[E = Pt]*** and ***[E = QV]***	32/ 33	
Explain how the power of a circuit device is related to the potential difference across it, the current through it and the energy transferred over a given time.	32	
Describe, with examples, the relationship between the power ratings for domestic electrical appliances and the changes in stored energy when they are in use	32/ 33	
Identify the National Grid as a system of cables and transformers linking power stations to consumers	34	

Topic	CGP Page	Notes
Explain why the National Grid system is an efficient way to transfer energy, with reference to change in potential difference reducing current	34	
P4.2.5 Static Electricity		
Describe the production of static electricity by the rubbing of insulating surfaces	35	
Describe evidence that charged objects exert forces of attraction or repulsion on one another when not in contact	35	
Explain how the transfer of electrons between objects can explain the phenomenon of static electricity, including how insulators are charged and sparks are created	35	
Draw the electric field pattern for an isolated charged sphere	36	
Explain the concept of an electric field and the decrease in its strength as the distance from it increases	36	
Explain how the concept of an electric field helps to Explain the non-contact force between charged objects as well as other electrostatic phenomena such as sparking	36	

Topic	CGP Page	Notes
Unit 3 Particle model of matter	38-42	
P4.3.1 Changes of state and particle model		
Calculate the density of a material by recalling and applying the equation: [ρ = m/V]	38	
Recognise/draw simple diagrams to model the difference between solids, liquids and gases	39	
Use the particle model to explain the properties of different states of matter and differences in the density of materials	39	
Recall and describe the names of the processes by which substances change state	39	
Use the particle model to explain why a change of state is reversible and affects the properties of a substance, but not its mass	39	
P4.3.2 Internal energy and energy transfers		
State that the internal energy of a system is stored in the atoms and molecules that make up the system	40	
Explain that internal energy is the total kinetic energy and potential energy of all the particles in a system	39	
Calculate the change in thermal energy by applying but not recalling the equation ***[ΔE =m c Δθ]***	13	
Calculate the specific latent heat of fusion/vaporisation by applying, but not recalling, the equation: ***[E = mL]***	40	
Interpret and draw heating and cooling graphs that include changes of state	40	
Distinguish between specific heat capacity and specific latent heat	13/ 40	
P4.3.3 Particle model and pressure		
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	39/ 41	
Explain, with reference to the particle model, the effect of changing the temperature of a gas held at constant volume on its pressure	41	

Topic	CGP Page	Notes
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	41	
Explain, with reference to the particle model, how increasing the volume in which a gas is contained can lead to a decrease in pressure when the temperature is constant	41	
Calculate the pressure for a fixed mass of gas held at a constant temperature by applying, but not recalling, the equation: **[pV = constant]**	41	
Explain how work done on an enclosed gas can lead to an increase in the temperature of the gas, as in a bicycle pump	41	

Topic	CGP Page	Notes
Unit 4 Atomic structure	43-50	
P4.4.1 Atoms and isotopes		
Describe the basic structure of an atom and how the distance of the charged particles vary with the absorption or emission of electromagnetic radiation	43	
Define electrons, neutrons, protons, isotopes and ions	43	
Relate differences between isotopes to differences in conventional representations of their identities, charges and masses	44	
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)	43	
P.4.4.2 Atoms and nuclear radiation		
Describe and apply the idea that the activity of a radioactive source is the rate at which its unstable nuclei decay, measured in Becquerel (Bq) by a Geiger-Muller tube	44/45	
Describe the penetration through materials, the range in air and the ionising power for alpha particles, beta particles and gamma rays	44	
Apply knowledge of the uses of radiation to evaluate the best sources of radiation to use in a given situation	48	
Use the names and symbols of common nuclei and particles to complete balanced nuclear equations, by balancing the atomic numbers and mass numbers	45	
Define half-life of a radioactive isotope	46	
HT ONLY: Determine the half-life of a radioactive isotope from given information and calculate the net decline, expressed as a ratio, in a radioactive emission after a given number of half-lives	46	
Compare the hazards associated with contamination and irradiation and outline suitable precautions taken to protect against any hazard the radioactive sources may present	48	

Topic	CGP Page	Notes
Discuss the importance of publishing the findings of studies into the effects of radiation on humans and sharing findings with other scientists so that they can be checked by peer review	2	
P4.4.3 Hazards and uses of radioactive emissions and back ground radiation		
State, giving examples, that background radiation is caused by natural and man-made sources and that the level of radiation may be affected by occupation and/or location	47	
Explain the relationship between the instability and half-life of radioactive isotopes and why the hazards associated with radioactive material differ according to the half-life involved	46	
Describe and evaluate the uses of nuclear radiation in exploration of internal organs and controlling or destroying unwanted tissue	48	
Evaluate the perceived risks of using nuclear radiation in relation to given data and consequences	48	
Describe nuclear fission	49	
Draw/interpret diagrams representing nuclear fission and how a chain reaction may occur	49	
Describe nuclear fusion	49	

Topic	CGP Page	Notes
Unit 5 Forces	51-72	
P4.5.1 Forces and their interactions		
Identify and describe scalar quantities and vector quantities	51	
Identify and give examples of forces as contact or non-contact forces	51	
Describe the interaction between two objects and the force produced on each as a vector	51	
Describe weight and explain that its magnitude at a point depends on the gravitational field strength	52	
Calculate weight by recalling and using the equation: ***[W = mg]***	52	
Represent the weight of an object as acting at a single point which is referred to as the object's 'centre of mass'	52	
Calculate the resultant of two forces that act in a straight line	53	
HT ONLY: describe examples of the forces acting on an isolated object or system	54	
HT ONLY: 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	54	
HT ONLY: Use free body diagrams and accurate vector diagrams to scale, to resolve multiple forces and show magnitude and direction of the resultant	53/ 54	
HT ONLY: Use vector diagrams to illustrate resolution of forces, equilibrium situations and determine the resultant of two forces, to include both magnitude and direction	54	
P5.4.2 Work done and energy transfer		
Describe energy transfers involved when work is done and calculate the work done by recalling and using the equation: *[W = Fs]*	53	
Describe what a joule is and state what the joule is derived from	53	
Convert between newton-metres and joules.	53	
Explain why work done against the frictional forces acting on an object causes a rise in the temperature of the object	53/ 39	

Topic	CGP Page	Notes
P4.5.3 Forces and elasticity		
Describe examples of the forces involved in stretching, bending or compressing an object	55	
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	55	
Describe the difference between elastic deformation and inelastic deformation caused by stretching forces	55	
Describe the extension of an elastic object below the limit of proportionality and calculate it by recalling and applying the equation: ***[F = ke]***	56	
Explain why a change in the shape of an object only happens when more than one force is applied	55/ 56	
Describe and interpret data from an investigation to explain possible causes of a linear and non-linear relationship between force and extension	55/ 56	
Calculate work done in stretching (or compressing) a spring (up to the limit of proportionality) by applying, but not recalling, the equation: ***[$E_e = ½ke^2$]***	56	
P4.5.4 Moments, gears and levers		
State that a body in equilibrium must experience equal sums of clockwise and anticlockwise moments, recall and apply the equation: ***[M = Fd]***	57	
Apply the idea that a body in equilibrium experiences an equal total of clockwise and anti-clockwise moments about any pivot	57	
Explain why the distance, d, must be taken as the perpendicular distance from the line of action of the force to the pivot	57	
Explain how levers and gears transmit the rotational effects of forces	57	
P4.5.5 Pressure and pressure differences in fluids		
Describe a fluid as either a liquid or a gas and explain that the pressure in a fluid causes a force to act at right angles (normal) to the surface of its container	58	
Recall and apply the equation: ***[p = F/A]***	58	

Topic	CGP Page	Notes
HT ONLY: Explain why the pressure at a point in a fluid increases with the height of the column of fluid above and calculate differences in pressure in a liquid by applying ***[p = h ρ g]***	58	
HT ONLY: Describe upthrust an object and explain why the density of the fluid has an effect on the upthrust experienced by an object submerged in it	58/ 59	
HT ONLY: Explain why an object floats or sinks, with reference to its weight, volume and the upthrust it experiences	58/ 59	
Describe a simple model of the Earth's atmosphere and of atmospheric pressure, explaining why atmospheric pressure varies with height above a surface	59	
P4.5.6 Forces and motion		
Define distance and displacement and explain why they are scalar or vector quantities	60	
Express a displacement in terms of both the magnitude and direction	60	
Explain that the speed at which a person can walk, run or cycle depends on a number of factors and recall some typical speeds for walking, running, cycling	60	
Make measurements of distance and time and then calculate speeds of objects in calculating average speed for non-uniform motion	60	
Explain why the speed of wind and of sound through air varies and calculate speed by recalling and applying the equation: ***[s = v t]***	60	
Explain the vector–scalar distinction as it applies to displacement, distance, velocity and speed	60/ 51	
HT ONLY: Explain qualitatively, with examples, that motion in a circle involves constant speed but changing velocity	101	
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	62	
Draw distance–time graphs from measurements and extract and interpret lines and slopes of distance–time graphs,	62	

Topic	CGP Page	Notes
Describe an object which is slowing down as having a negative acceleration and estimate the magnitude of everyday accelerations	61	
Calculate the average acceleration of an object by recalling and applying the equation: ***[a = Δv/t]***	61	
Represent motion using velocity–time graphs, finding the acceleration from its gradient and distance travelled from the area underneath	62	
HT ONLY: Interpret enclosed areas in velocity–time graphs to determine distance travelled (or displacement)	62	
HT ONLY: Measure, when appropriate, the area under a velocity– time graph by counting square	62	
Apply, but not recall, the equation: ***[$v^2 – u^2 = 2as$]***	61	
Draw and interpret velocity-time graphs for objects that reach terminal velocity	62	
Interpret and explain the changing motion of an object in terms of the forces acting on it	64	
Explain how an object falling from rest through a fluid due to gravity reaches its terminal velocity	64	
Explain the motion of an object moving with a uniform velocity and identify that forces must be in effect if its velocity is changing, by stating and applying Newton's First Law	64	
Define and apply Newton's second law relating to the acceleration of an object	64	
Recall and apply the equation: ***[F = ma]***	64	
HT ONLY: Describe what inertia is and give a definition	65	
Estimate the speed, accelerations and forces of large vehicles involved in everyday road transport	64	
Apply Newton's Third Law to examples of equilibrium situations	65	
Describe factors that can effect a drivers reations time	67/ 68	
Explain methods used to measure human reaction times and recall typical results	67/ 68	
Interpret and evaluate measurements from simple methods to measure the different reaction times of students	68	

Topic	CGP Page	Notes
Evaluate the effect of various factors on thinking distance based on given data	67/ 69	
Estimate the distance required for an emergency stop in a vehicle over a range of typical speeds	67/ 69	
Interpret graphs relating speed to stopping distance for a range of vehicles	69	
State typical reaction times and describe how reaction time (and therefore stopping distance) can be affected by different factors	69	
Explain methods used to measure human reaction times and take, interpret and evaluate measurements of the reaction times of students	68	
Explain how the braking distance of a vehicle can be affected by different factors, including implications for road safety	67/ 69	
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	67/ 69	
Explain and apply the idea that a greater braking force causes a larger deceleration and explain how this might be dangerous for drivers	67/ 69	
HT ONLY: Estimate the forces involved in the deceleration of road vehicles	69	
P4.5.7 Momentum		
HT ONLY: Calculate momentum by recalling and applying the equation: ***[p = mv]***	70/ 71	
HT ONLY: Explain and apply the idea that, in a closed system, the total momentum before an event is equal to the total momentum after the event	70/ 71	
HT ONLY: Describe examples of momentum in a collision	70/ 71	
HT ONLY: Complete conservation of momentum calculations involving two objects	70/ 71	
HT ONLY: Explain that when a force acts on an object that is moving, or able to move, a change in momentum occurs	70/ 71	
HT ONLY: Calculate a force applied to an object, or the change in momentum it causes, by applying but not recalling the equation: ***[F = m Δv / Δt]***	70/ 71	

Topic	CGP Page	Notes
HT ONLY: Explain that an increased force delivers an increased rate of change of momentum	70/ 71	
HT ONLY: Apply the idea of rate of change of momentum to explain safety features such as air bags, seat belts, helmets and cushioned surfaces	70/ 71	

Topic	CGP Page	Notes
Unit 6 Waves	73-91	
P4.6.1 Waves in air, fluids and solids		
Describe waves as either transverse or longitudinal, defining these waves in terms of the direction of their oscillation and energy transfer and giving examples of each	73	
Define waves as transfers of energy from one place to another, carrying information	73	
Define amplitude, wavelength, frequency, period and wave speed and Identify them where appropriate on diagrams	73	
State examples of methods of measuring wave speeds in different media and Identify the suitability of apparatus of measuring frequency and wavelength	74	
Calculate wave speed, frequency or wavelength by applying, but not recalling, the equation: ***[v = f λ]***and calculate wave period by recalling and applying the equation: ***[T = 1/f]***	73	
Identify amplitude and wavelength from given diagrams	73	
Describe a method to measure the speed of sound waves in air	74	
Describe a method to measure the speed of ripples on a water surface	74	
Demonstrate how changes in velocity, frequency and wavelength are inter-related in the transmission of sound waves from one medium to another	73/ 76	
Discuss the importance of understanding both mechanical and electromagnetic waves by giving examples, such as designing comfortable and safe structures and technologies	76	
Describe a wave's ability to be reflected, absorbed or transmitted at the boundary between two different materials	75	
Draw the reflection of a wave at a surface by constructing ray diagrams	75	
HT ONLY: Describe, with examples, processes which convert wave disturbances between sound waves and vibrations in solids	75	

Topic	CGP Page	Notes
HT ONLY: Explain why such processes only work over a limited frequency range and the relevance of this to the range of human hearing, which is from 20 Hz to 20 kHz	88/ 89	
HT ONLY: Define ultrasound waves and explain how these are used to form images of internal structures in both medical and industrial imaging	88/ 89	
HT ONLY: Compare the two types of seismic wave produced by earthquakes with reference to the media they can travel in and the evidence they provide of the structure of the Earth	90	
HT ONLY: Describe how echo sounding using high frequency sound waves is used to detect objects in deep water and measure water depth	89	
P4.6.2 Electromagnetic waves		
Describe what electromagnetic waves are and explain how they are grouped	76	
List the groups of electromagnetic waves in order of wavelength	76	
Explain that because our eyes only detect a limited range of electromagnetic waves, they can only detect visible light	76	
HT ONLY: Explain how different wavelengths of electromagnetic radiation are reflected, refracted, absorbed or transmitted differently by different substances and types of surface	76/ 75	
Illustrate the refraction of a wave at the boundary between two different media by constructing ray diagrams	76	
HT ONLY: Describe what refraction is due to and illustrate this using wave front diagrams	76	
HT ONLY: Explain how radio waves can be produced by oscillations in electrical circuits, or absorbed by electrical circuits	78	
Explain that changes in atoms and the nuclei of atoms can result in electromagnetic waves being generated or absorbed over a wide frequency range	81	
State examples of the dangers of each group of electromagnetic radiation and discuss the effects of radiation as depending on the type of radiation and the size of the dose	81	

Topic	CGP Page	Notes
State examples of the uses of each group of electromagnetic radiation, explaining why each type of electromagnetic wave is suitable for its applications	79	
State that a lens forms an image by refracting light and that the distance from the lens to the principal focus is called the focal length	82	
Explain that images produced by a convex lens can be either real or virtual, but those produced by a concave lens are always virtual	82/ 83	
Construct ray diagrams for both convex and concave lenses	82/ 83	
Calculate magnification as a ratio with no units by applying, but not recalling, the formula: [magnification = image height / object height]	82/ 83	
Explain how the colour of an object is related to the differential absorption, transmission and reflection of different wavelengths of light by the object	85	
Describe the effect of viewing objects through filters or the effect on light of passing through filters and the difference between transparency and translucency	85	
Explain why an opaque object has a particular colour, with reference to the wavelengths emitted	86	
State that all bodies, no matter what temperature, emit and absorb infrared radiation and that the hotter the body, the more infrared radiation it radiates in a given time	86	
Describe a perfect black body as an object that absorbs all the radiation incident on it and explain why it is the best possible emitter	87	
Explain why when the temperature is increased, the intensity of every wavelength of radiation emitted increases, but the intensity of the shorter wavelengths increases more rapidly	87	
HT ONLY: Explain and apply the idea that the temperature of a body is related to the balance between incoming radiation absorbed and radiation emitted	87	

Topic	CGP Page	Notes
HT ONLY: Describe how the temperature of the Earth as dependent on the rates of absorption and emission of radiation and draw and interpret diagrams that show this	87	

Topic	CGP Page	Notes
Unit 7 Magnetism and electromagnetism	92-99	
P4.7.1 Permanent and induced magnetism, magnetic forces		
Describe the attraction and repulsion between unlike and like poles of permanent magnets and explain the difference between permanent and induced magnets	92	
Draw the magnetic field pattern of a bar magnet, showing how field strength and direction are indicated and change from one point to another	92	
Explain how the behaviour of a magnetic compass is related to evidence that the core of the Earth must be magnetic	92	
Describe how to plot the magnetic field pattern of a magnet using a compass	92	
P4.7.2 The motor effect		
State examples of how the magnetic effect of a current can be demonstrated and explain how a solenoid arrangement can increase the magnetic effect of the current	93	
Draw the magnetic field pattern for a straight wire carrying a current and for a solenoid (showing the direction of the field)	93	
Interpret diagrams of electromagnetic devices in order to explain how they work	93/94	
HT ONLY: State and use Fleming's left-hand rule and explain what the size of the induced force depends on	94	
HT ONLY: Calculate the force on a conductor carrying a current at right angles to a magnetic field by applying, but not recalling, the equation***: [F = BIL]***	94	
HT ONLY: Explain how rotation is caused in an electric motor	95	
HT ONLY: Explain how a moving-coil loudspeaker and headphones work	95	
P4.7.3 Induced potential, transformers and the national grid		
HT ONLY: Describe the principles of the generator effect, including the direction of induced current, effects of Lenz' Law and factors that increase induced p.d.	96/97	
HT ONLY: Explain how the generator effect is used in an alternator to generate a.c. and in a dynamo to generate d.c.	96/97	
HT ONLY: Draw/interpret graphs of potential difference generated in the coil against time	97	

Topic	CGP Page	Notes
HT ONLY: Explain how a moving-coil microphone works	97	
HT ONLY: Explain how the effect of an alternating current in one coil inducing a current in another is used in transformers	96/ 98	
HT ONLY: Explain how the ratio of the potential differences across the two coils depends on the ratio of the number of turns on each	98	
HT ONLY: Apply the equation linking the p.d.s and number of turns in the two coils of a transformer to the currents and the power transfer	98	
HT ONLY: Apply but not recalling the equations: **[Vs × Is = Vp × Ip]** and **[vp / vs = np / ns]** for transformers	98	

Topic	CGP Page	Notes
Unit 8 Space physics	100-103	
P4.8.1 Solar system, stability of orbital motions, satellites		
List the types of body that make up the solar system and describe our solar system as part of a galaxy	101	
Explain how stars are formed	100	
Describe the life cycle of a star the size of the Sun and of a star which is much more massive than the Sun	100	
Explain how fusion processes lead to the formation of new elements and how supernovas have allowed heavy elements to appear in later solar systems	100	
HT ONLY: Explain that, for circular orbits, the force of gravity leads to a constantly changing velocity but unchanged speed	101	
HT ONLY: Explain that, for a stable orbit, the radius must change if the speed changes	101	
P4.8.2 Red-shift		
Explain, qualitatively, the red-shift of light from galaxies that are receding and how this red-shift changes with distance from Earth	102	
Explain why the change of each galaxy's speed with distance is evidence of an expanding universe	102	
Explain how scientists are able to use observations to arrive at theories, such as the Big Bang theory and discuss that there is still much about the universe that is not understood	102	

1. OVERVIEW OF THE COURSE

Unit	Topics	Brief summary	Notes