

GCSE Physics Sequence of Learning (SoL)

P1 Conservation and dissipation of energy				
Lesson Number	Key Question/ Lesson Title	Learning Objective(s)	Key Words/ Concepts	Homework
1	Lesson 1 – Changes in energy stores	- Describe a wide range of energy stores in different contexts. - Describe changes in energy stores in terms of the process that causes the change. - Describe the changes in how energy is stored in a changing system.	Energy stores	KS3 Educake Retrieval Homework
2	Lesson 2 – Conservation of energy	- Apply the law of conservation of energy in straightforward situations. - Describe some examples of closed systems and the changes to energy stores within them. Describe the energy changes in a range of experiments and account for energy dissipation to the surroundings.	Conservation of energy , Closed systems , Energy dissipation	
3	Lesson 3 – Energy and work	- Describe the action of frictional forces on objects and the associated heating effect. - Use the equation for work done to calculate distances or size of forces. - Use repeat values and calculate a mean to reduce the effect of random errors.	Work, Frictional forces, Random errors	
4	Lesson 4 – Gravitational potential energy stores	- Describe the effect of a different gravitational field strength on the gravitational potential energy store changes of a system. - Calculate the gravitational potential energy store of a system using the mass, gravitational field strength, and height. - Identify the measurements needed and determine the change in energy in the gravitational potential store of an object.	Gravitational potential energy, Gravitational field strength	
5	Lesson 5 – Kinetic energy and elastic energy stores	- Calculate the kinetic energy store of an object. - Calculate the elastic potential energy store of a stretched spring. - Calculate energy changes involving elastic potential and kinetic energy stores.	Kinetic energy, Elastic potential energy	Educake Retrieval Homework
6	Lesson 6 – Energy dissipation	- Analyse energy changes to identify useful and less useful energy transfers. - Describe energy dissipation and how this reduces the capacity of a system to do work. - Investigate the factors that affect frictional forces commenting on the precision of the results.	Energy dissipation, Useful energy, less useful energy, Frictional forces	
7	Lesson 7 – Energy and efficiency	- Calculate the efficiency of a range of energy transfers. - Explain ways of reducing unwanted energy transfers. - Identify measurements needed to find the efficiency of a process.	Efficiency	
8	Lesson 8 – Electrical appliances	- Describe the energy transfers carried out by electrical devices. - Describe why electrical appliances are useful. - Describe the processes that waste energy in electrical devices.	Electrical appliances, Energy transfers	Educake Retrieval Homework
9	Lesson 9 – Energy and power	- Calculate the power of an appliance. - Calculate the efficiency of an appliance from power ratings. - Identify the more powerful device from data.	Power, Efficiency	
	REVISION LESSON			
	ASSESSMENT LESSON			Revision HW due
	FEEDBACK LESSON			

P2 Energy transfer by heating				
Lesson Number	Key Question/ Lesson Title	Learning Objective(s)	Key Words/ Concepts	Homework

1	Lesson 1 – Energy transfer by conduction	- Analyse data to compare the thermal conductivity of materials. - Describe how the rate of cooling of a building depends on thermal conductivity and thickness of the materials used. - Design a fair test to investigate the effectiveness of different insulators.	Thermal conductivity, Insulators, Conduction	Educake Retrieval Homework
2	Lesson 2s – Specific heat capacity	- Describe what specific heat capacity is. - Calculate the change in thermal energy when there is a temperature change. - Measure the specific heat capacity of a material and find a mean value.	Specific heat capacity, Thermal energy	
3	Lesson 2b – Specific heat capacity RP	- Describe what specific heat capacity is. - Calculate the change in thermal energy when there is a temperature change. - Measure the specific heat capacity of a material and find a mean value.	Specific heat capacity, Thermal energy	
4	Lesson 3a – Heating and insulating buildings	Describe how some design features used to reduce energy dissipation from a homework assignment. Compare home improvement features in terms of payback time.	Energy dissipation, Payback time	Educake Retrieval Homework
5	Lesson 3b – Heating and insulating buildings	Describe how some design features used to reduce energy dissipation from a homework assignment. Compare home improvement features in terms of payback time.	Energy dissipation, Payback time	
	REVISION LESSON			
	ASSESSMENT LESSON			Revision HW due
	FEEDBACK LESSON			

P3 Energy resources				
Lesson Number	Key Question/ Lesson Title	Learning Objective(s)	Key Words/ Concepts	Homework
1	Lesson 1 – Energy demands	- Describe how different fuels are used for transport, heating, and generating electricity. - Describe how power stations use fuels to generate electricity. - Explain patterns in our use of energy resources.	Fuels, Power stations, Energy resources	Educake Retrieval Homework
2	Lesson 2 – Energy from wind and water	- Describe how water and wind can be a source of energy. - Describe advantages and disadvantages of hydroelectricity, wind, wave, and tidal power. - Suggest the most appropriate energy resource to use in a range of scenarios.	Hydroelectricity, Wind power, Wave power, Tidal power	
3	Lesson 3 – Power from the Sun and the Earth	- Plan an investigation into how the area of solar cell exposed affects voltage output. - Describe the advantages and disadvantages of using solar energy. - Describe how geothermal energy can be used as an energy resource and its advantages and disadvantages.	Solar energy, Geothermal energy	
4	Lesson 4 – Energy and the environment	- Describe the damage to the environment caused by burning fossil fuels. - Describe the advantages and disadvantages of nuclear power. - Evaluate the use of different energy resources.	Fossil fuels, nuclear power, Energy resources	Educake Retrieval Homework
5	Lesson 5 – Big energy issues	- Describe how different energy resources are used to meet variation in demand. - Compare the costs of different energy resources. - Explain why the use of energy resources is changing.	Energy resources	
	REVISION LESSON			
	ASSESSMENT LESSON			Revision HW due
	FEEDBACK LESSON			

P4 Electric circuits

Lesson Number	Key Question/ Lesson Title	Learning Objective(s)	Key Words/ Concepts	Homework
1	Lesson 1 – Electrical charges and fields (Physics only)	- Use the concept of electric fields to explain why charged objects interact. - Describe evidence that forces between charged objects act a distance. - Describe how objects become negatively or positively charged in terms of electron transfer.	Electric fields, Charged objects, Electron transfer	Educake Retrieval Homework
2	Lesson 2 –Current and charge	- Draw and interpret simple circuit diagrams. - Describe what current is and how it is measured. - Calculate the charge flow by a steady current in each time. - Construct an electrical circuit and accurately measure the current.	Circuit diagrams, Current, Charge flow	
3	Lesson 3a – Potential difference and resistance	- Use the equation that links potential difference, energy transferred, and charge to calculate potential difference. Calculate the resistance of a component. - Describe how the resistance of thermistors and LDRs changes. - Measure the effect of changing the length of a wire on its resistance in a controlled experiment.	Potential difference, Resistance, Thermistors, LDRs	
4	Lesson 3b – Potential difference and resistance Required practical	- Use the equation that links potential difference, energy transferred, and charge to calculate potential difference. - Calculate the resistance of a component. - Describe how the resistance of thermistors and LDRs changes. - Measure the effect of changing the length of a wire on its resistance in a controlled experiment.	Potential difference, Resistance, Thermistors, LDRs	Educake Retrieval Homework
5	Lesson 4a – Component characteristics	- Using positive and negative axes and choosing suitable scales to plot I-V graphs for components. - Describe how the resistance of resistors, diodes, and filament lamps changes. - Explain how you can identify an ohmic conductor from it's I-V graph.	I-V graphs, Resistors, Diodes, Filament lamps, Ohmic conductor	
6	Lesson 4b – Component characteristics Required practical	- Using positive and negative axes and choosing suitable scales to plot I-V graphs for components. - Describe how the resistance of resistors, diodes, and filament lamps changes. - Explain how you can identify an ohmic conductor from it's I-V graph.	I-V graphs, Resistors, Diodes, Filament lamps, Ohmic conductor	
7	Lesson 5 – Series circuits	- State that the current in any part of a series circuit is the same. - Investigate and describe how potential difference across components in series relates to potential difference of the power supply. - Calculate the total resistances of two resistors in series and explain why total resistance increases.	Series circuit, Current, Potential difference, Resistance	
8	Lesson 6 – Parallel circuits	- State that the total current in a parallel circuit is the sum of the current through each loop of the circuit. - Investigate the effect of adding resistors in parallel on the size of the current in a circuit and explain why total resistance is less. - Measure the p.d. across parallel circuits and explain any discrepancies.	Parallel circuit, Current, Resistance, p.d. (potential difference)	Educake Retrieval Homework
	REVISION LESSON			
	ASSESSMENT LESSON			Revision HW due
	FEEDBACK LESSON			

P5 Electricity in the home				
Lesson Number	Key Question/ Lesson Title	Learning Objective(s)	Key Words/ Concepts	Homework
1	Lesson 1 – Alternating current	- Describe the characteristics of the UK mains supply. - Describe the difference between direct and alternating voltage. - Explain why the National Grid is an efficient system to transfer energy.	UK mains supply, Direct voltage, Alternating voltage, National Grid	Educake Retrieval Homework

2	Lesson 2 – Cables and plugs	- Describe the functions of the three wires in a three-core cable. - Describe why a short circuit inside a device presents a hazard. - Discuss the choices of materials used in cables and plugs in terms of their physical and electrical properties.	Three-core cable, short circuit, Cables, Plugs	
3	Lesson 3 – Electrical power and potential difference	- Calculate energy transferred by a device in a set time using its power rating. - Calculate the power of electrical devices using potential difference and current. - Calculate the power loss by heating using resistance and current.	Power rating, Potential difference, Current, Power loss, Resistance	
4	Lesson 4 – Electrical currents and energy transfer	- Describe how work is done when charge moves through a circuit. - Calculate the energy transferred by electrical work. - Describe the changes in energy stores of different appliances.	Electrical work, Energy transfers	Educake Retrieval Homework
5	Lesson 5 – Appliances and efficiency	- Calculate the energy transferred by an appliance using the power rating and time it is on for. - Calculate the useful output power of an appliance using efficiency equation. - Calculate energy transferred to an appliance using the current, potential difference, and time.	Power rating, Efficiency, Current, Potential difference	
	REVISION LESSON			
	ASSESSMENT LESSON			Revision HW due
	FEEDBACK LESSON			

P6 Molecules and matter				
Lesson Number	Key Question/ Lesson Title	Learning Objective(s)	Key Words/ Concepts	Homework
1	Lesson 1a – Density	- Explain what density means. - Calculate the density of materials. - Determine the density of a range of solids and liquids.	Density	Educake Retrieval Homework
2	Lesson 1b – Density Required practical	- Explain what density means. - Calculate the density of materials. - Determine the density of a range of solids and liquids.	Density	
3	Lesson 2 – States of matter	- Use the particle model to explain the difference in density of solid, liquid, and gases. - Describe the changes in behaviour of the particles in a material during changes of state. - Describe how mass is conserved during a change of state.	Particle model , Density , Changes of state , Mass conservation	
4	Lesson 3 – Changes of state	- Identify melting or boiling points on a heating or cooling graph. - Describe how the melting points and boiling points of a substance can be changed. - Use the term ‘latent heat’ to describe the energy gained by a substance during heating for which there is no change in temperature.	Melting points , Boiling points , Latent heat , Changes of state	
5	Lesson 4 – Internal energy	- Describe how the internal energy is the sum of the all the kinetic and potential energies of the particles in the system. - Describe how heating causes either a change in temperature or a change in state. - Describe how the behaviour of particles changes as the energy of a system increases.	Internal energy , Kinetic energy , Potential energy , Temperature , Changes of state	Educake Retrieval Homework
6	Lesson 5 – Specific latent heat	- Describe specific latent heat in terms of energy changes that occur in a change of state. - Calculate the energy required for a change of state using data. - Describe the difference between specific heat capacity and specific latent heat.	Specific latent heat , Energy changes , Changes of state , Specific heat capacity	
7	Lesson 6 – Gas pressure and temperature	Explain how a gas can exert a pressure.	Gas pressure , Temperature , Particles	

		- Describe the relationship between an increase in the temperature of a fixed volume of a gas and the increase in pressure of the gas. - Describe the behaviour of particles in a gas as the gas is heated.		
8	Lesson 7 – Gas pressure and volume	- Explain in terms of particle behaviour why the pressure of a fixed mass of gas decreases when its volume increases. - Use the relationship $pV = \text{constant}$ to calculate the change in pressure after a change in volume. - Explain why the temperature of a gas increases when it is compressed.	Gas pressure , Volume , $pV = \text{constant}$, Compressed	
	REVISION LESSON			
	ASSESSMENT LESSON			Revision HW due
	FEEDBACK LESSON			

P7 Radioactivity				
Lesson Number	Key Question/ Lesson Title	Learning Objective(s)	Key Words/ Concepts	Homework
1	Lesson 1 – Atoms and radiation	- Describe what is meant by radioactive decay. - Describe what is meant by the count-rate. - Describe alpha, beta, and gamma radiation.	Radioactive decay , Count-rate , Alpha radiation , Beta radiation , Gamma radiation	Educake Retrieval Homework
2	Lesson 2 – The discovery of the nucleus	- Describe the plum pudding, the nuclear, and the Bohr model of the atom. - Explain how alpha scattering experiment led to the nuclear model of the atom. - Describe how scientists decided there was a positively charged particle called the proton in the nucleus.	Plum pudding model , Nuclear model , Bohr model , Alpha scattering experiment , Proton , Nucleus	
3	Lesson 3 – Changes in the nucleus	- Determine the number of protons, electrons, and neutrons in an isotope by using nuclear notation. - Describe the changes to nuclei after either, alpha, beta, or gamma decay. - Complete decay equations for alpha and beta decay.	Protons , Electrons , Neutrons , Isotope , Alpha decay , Beta decay , Gamma decay	
4	Lesson 4 – More about alpha, beta, and gamma radiation	- Describe the different penetrating powers of alpha, beta, and gamma radiation through materials and their range in air. - Describe the difference between contamination and irradiation. - Apply understanding of the properties of alpha, beta, and gamma radiation to evaluate the best source for a particular use.	Penetrating powers , Contamination , Irradiation , Alpha radiation , Beta radiation , Gamma radiation	
5	Lesson 5 – Activity and half-life	- Explain why the activity of a radioactive sample decreases with time. - Find the ratio of a sample remaining after a given number of half-lives. (HT) - Determine the half-life of a sample from given data.	Activity , Half-life	Educake Retrieval Homework
6	Lesson 6 – Nuclear radiation in medicine	- Describe how nuclear radiation is used to explore organs or destroy unwanted tissue. - Explain how half-life affects the hazard of a particular radioactive isotope. - Describe sources of background radiation.	Nuclear radiation , Half-life , Radioactive isotope , Background radiation	
7	Lesson 7 – Nuclear fission	- Distinguish between induced fission and spontaneous fission. - Describe nuclear fission. - Describe how a chain reaction is controlled in a nuclear power station and what happens if the chain reaction is uncontrolled.	Induced fission , Spontaneous fission , Nuclear fission , Chain reaction , Nuclear power station	
8	Lesson 8 – Nuclear fusion	- Describe nuclear fusion. - Explain why nuclear fusion releases energy. - Describe the conditions needed for fusion.	Nuclear fusion	
9	Lesson 9 – Nuclear issues	- Describe how location and or occupation can affect your radiation dose. - Compare the risks and damage associated with alpha, beta, and gamma radiation inside and outside the body. - Discuss the difficulties associated with the handling and storage of nuclear waste.	Radiation dose , Alpha radiation , Beta radiation , Gamma radiation , Nuclear waste	Educake Retrieval Homework

	REVISION LESSON			
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P8 Forces in balance				
Lesson Number	Key Question/ Lesson Title	Learning Objective(s)	Key Words/ Concepts	Homework
1	Lesson 1 – Vectors and scalars	- Explain the difference between distance and displacement. - Draw a scale diagram to represent a single vector. - Categorise a wide range of quantities as either a vector or a scalar.	Distance , Displacement , Vector , Scalar	Educake Retrieval Homework
2	Lesson 2 – Forces between objects	- Describe how forces arise. - Describe contact and non-contact forces. - Identify and describe Newton's Third Law pairs of forces in different situations.	Forces , Contact forces , Non-contact forces , Newton's Third Law	
3	Lesson 3 – Resultant forces	- Describe the effect of zero resultant forces on the motion of moving and stationary objects. - Describe the effect of non-zero resultant forces on the motion of moving and stationary objects. - Draw free body diagrams for objects where resultant force is zero and non-zero.	Resultant forces , Free body diagrams	
4	Lesson 4 – Moments at work	- Describe what the moment of a force measures. - Perform calculations involving moments, including rearrangement of the equation. - Describe levers in action.	Moment of a force , Levers	
5	Lesson 5 – More about levers and gears	- Describe the action of levers being used as force multipliers. - Describe the action of a pair of gears in terms of increasing or decreasing the moment of a force. - Investigate the action of a set of two gears.	Force multipliers , Levers , Gears	Educake Retrieval Homework
6	Lesson 6 – Moments and equilibrium	- Use calculation of moments to determine if a seesaw is in equilibrium. - Apply the principle of moments to a balanced object to determine an unknown force or distance. - Design a method and use calculations to find the weight of an object.	Moments , Equilibrium , Principle of moments , Weight	
7	Lesson 7 – The parallelogram of forces (HT only)	- Use vector diagrams drawn to scale to find the resultant of two forces acting at right angles to each other. - Use the parallelogram of forces to find the resultant of two forces acting at an angle. - Draw a vector diagram for recorded measurements.	Vector diagrams , Resultant of two forces , Parallelogram of forces	
8	Lesson 8 – Resolution of forces (HT only)	- Draw a scale diagram to resolve a single force into two perpendicular components. - Determine if an object is in equilibrium by considering the horizontal and vertical forces. - Investigate the effect of increasing the weight of an object on a slope on the component of the weight acting along the slope.	Resolution of forces , Scale diagram , Components , Equilibrium , Weight	
	REVISION LESSON			
	ASSESSMENT LESSON			Revision HW due
	FEEDBACK LESSON			

P9 Motion				
Lesson Number	Key Question/ Lesson Title	Learning Objective(s)	Key Words/ Concepts	Homework

1	Lesson 1 – Speed and distance–time graphs	- Use and rearrange the speed equation to determine either speed, distance, or time. - Use the gradients of distance–time graphs to calculate the speeds of objects. - Describe the motion of an object by interpreting distance–time graphs.	Speed , Distance–time graphs , Gradients	Educake Retrieval Homework
2	Lesson 2 – Velocity and acceleration	- Explain with examples why an object moving in a circle has constant speed but changing velocity. - Calculate the acceleration of an object using the change in velocity and time. - Estimate values for everyday accelerations, such as a car slowing down to stop with help.	Velocity , Acceleration , Constant speed	
3	Lesson 3 – More about velocity–time graphs	- Use the gradient of a velocity–time graph to determine the acceleration. - Calculate the distance travelled using information taken from a velocity–time graph for one section of motion. - Use a series of repeat measurements to find an accurate measurement of the acceleration of a moving object.	Velocity–time graphs , Acceleration , Distance travelled	
4	Lesson 4 – Analysing motion graphs	- Calculate speed, acceleration, and distance travelled from data taken from motion graphs. Draw a tangent to determine the speed at that point on a distance–time graph of an accelerating object. - Use the equation $v^2 - u^2 = 2as$ in calculations where the initial or final velocity is zero.	Motion graphs , Speed , Acceleration , Distance travelled , Tangent , $v^2 - u^2 = 2as$	
	REVISION LESSON			
	ASSESSMENT LESSON			Revision HW due
	FEEDBACK LESSON			

P10 Force and motion				
Lesson Number	Key Question/ Lesson Title	Learning Objective(s)	Key Words/ Concepts	Homework
1	Lesson 1a – Force and acceleration	- Use and rearrange the $F=ma$ equation to find the resultant force acting on an object, its mass, or its acceleration. - Explain motion in terms of inertia. (HT) - Combine separate experimental conclusions of how resultant force affects the acceleration of a mass to form an overall conclusion.	$F=ma$, Resultant force , Mass , Acceleration , Inertia	Educake Retrieval Homework
2	Lesson 1v – Force and acceleration Required practical	- Use and rearrange the $F=ma$ equation to find the resultant force acting on an object, its mass, or its acceleration. - Explain motion in terms of inertia. (HT) - Combine separate experimental conclusions of how resultant force affects the acceleration of a mass to form an overall conclusion.	$F=ma$, Resultant force , Mass , Acceleration , Inertia	
3	Lesson 2 – Weight and terminal velocity	- Calculate the weight of objects using their mass and the gravitational field strength. - Apply the concept of balanced forces to explain why an object falling through a fluid will reach a terminal velocity. - Investigate the relationship between the mass of an object and the terminal velocity.	Weight , Mass , Gravitational field strength , Balanced forces , Terminal velocity	
4	Lesson 3 – Forces and braking	- Describe the factors which affect thinking distance and braking distance. - Explain the dangers of large decelerations. - Determine the thinking distance using reaction time and initial velocity.	Thinking distance , Braking distance , Decelerations , Reaction time , Initial velocity	Educake Retrieval Homework
5	Lesson 4 – Momentum (HT only)	- Recall and use the equation $p=mv$ to find the momentum of an object. - Describe how the principle of conservation of momentum can be used to predict the velocities of objects after a collision.	$p=mv$, Momentum , Conservation of momentum , Collisions	

		Explain how your observations of explosions confirm the conservation of momentum.		
6	Lesson 5 – Using conservation of momentum (HT only)	- Apply the law of conservation of momentum to find velocities of objects after impacts. - Determine the momentum before and after collision using results. - Evaluate data collected to verify the law of conservation of momentum.	Conservation of momentum , Velocities , Impacts	
7	Lesson 6 – Impact forces (HT only)	- Describe how the impact force changes when the change in momentum occurs over an increased impact time. - Calculate the impact force using the change in momentum and the time of impact. - Show how the equations for resultant force and acceleration combine to give the relationship impact force is equal to rate of change of momentum.	Impact force , Change in momentum , Time of impact , Resultant force , Acceleration	
8	Lesson 7 – Safety first (HT only)	- Explain the operation of some safety features of a car in simple terms. - Explain how one of your safety features reduces impact force.	Safety features , Impact force	
9	Lesson 8 – Forces and elasticity	- Compare materials in terms of elastic and non-elastic behaviour. - Calculate the force required to cause a given extension (or compression) in a spring using the spring constant. - Use the gradient of a force–extension graph to determine the spring constant of a spring.	Elastic behaviour , Non-elastic behaviour , Spring constant , Force–extension graph	Educake Retrieval Homework
10	Lesson 8 – Forces and elasticity Required practical	- Compare materials in terms of elastic and non-elastic behaviour. - Calculate the force required to cause a given extension (or compression) in a spring using the spring constant. - Use the gradient of a force–extension graph to determine the spring constant of a spring.	Elastic behaviour , Non-elastic behaviour , Spring constant , Force–extension graph	
	REVISION LESSON			
	ASSESSMENT LESSON			Revision HW due
	FEEDBACK LESSON			

P11 Force and pressure				
Lesson Number	Key Question/ Lesson Title	Learning Objective(s)	Key Words/ Concepts	Homework
1	Lesson 1 – Pressure and surfaces	- Describe the effect on the pressure of changing the area of contact or weight acting on a surface. - Use the equation for pressure to determine pressure, area, or force. - Describe how pressure in fluids causes a force perpendicular to the surface.	Pressure , Area of contact , Weight , Fluids	Educake Retrieval Homework
2	Lesson 2 – Pressure in a liquid at rest (HT only)	- Explain why liquid pressure increases with depth and density. - Calculate the pressure at a point in a liquid using $p=h\rho g$.	Liquid pressure , Depth , Density , $p=h\rho g$	
3	Lesson 3 – Atmospheric pressure	- Describe what causes atmospheric pressure. Describe a simple model of the Earth's atmosphere. - Explain why atmospheric pressure varies with height.	Atmospheric pressure , Earth's atmosphere	
4	Lesson 4 – Upthrust and flotation (HT only)	- Explain why there is an upwards force. - Describe the relationship between upthrust and weight for floating and submerged objects. - Investigate the factors that affect whether an object will float or sink.	Upwards force , Upthrust , Weight , Floating , Submerged	
	REVISION LESSON			
	ASSESSMENT LESSON			Revision HW due
	FEEDBACK LESSON			

P12 Wave properties

Lesson Number	Key Question/ Lesson Title	Learning Objective(s)	Key Words/ Concepts	Homework
1	Lesson 1 – The nature of waves	- Describe evidence that for both sound and ripples on water it is the wave that travels and not the air or water. - Compare transverse and longitudinal waves in terms of direction of vibration and propagation. - Compare electromagnetic and mechanical waves.	Waves , Sound , Ripples , Transverse waves , Longitudinal waves , Electromagnetic waves , Mechanical waves	Educake Retrieval Homework
2	Lesson 2 – The properties of waves	- Describe the motion of a wave using the terms frequency, wavelength, amplitude, and period. - Calculate the speed, frequency, or wavelength of a wave using the wave equation. - Describe how to measure the speed of a wave in water.	Frequency , Wavelength , Amplitude , Period , Wave speed , Wave equation	
3	Lesson 3 – Reflection and refraction (HT only)	- Describe reflection and refraction of waves. - Describe refraction as being caused by the change in velocity of the waves in the different substances. - Describe how whether a wave is transmitted, reflected, absorbed, or refracted depends on both the substance and the wavelength of the wave.	Reflection , Refraction , Velocity , Transmitted , Absorbed	
4	Lesson 4 – More about waves	- Describe how to measure the frequency and wavelength of a wave on a string to determine the speed of the wave. - Describe how sound waves are created and how they move through air. - Describe how to accurately measure the speed of sound in air.	Frequency , Wavelength , Wave speed , Sound waves	
5	Lesson 4 – More about waves Required practical	- Describe how to measure the frequency and wavelength of a wave on a string to determine the speed of the wave. - Describe how sound waves are created and how they move through air. - Describe how to accurately measure the speed of sound in air.	Frequency , Wavelength , Wave speed , Sound waves	Educake Retrieval Homework
6	Lesson 5 – Sound waves (HT only)	- Outline the structure of the human ear in terms of transfer of waves and vibrations. - Explain why the human ear has a limited range of frequencies it can detect. - Describe how high frequency sound waves can be used to measure depths of seabed.	Sound waves , Human ear , Frequencies	
7	Lesson 6 – The uses of ultrasound (HT only)	- Explain what is meant by ultrasound. - Describe how the partial reflection of ultrasound at a boundary between two substances is used to form an image. - Describe how reflections of an ultrasound pulse can be used to detect a flaw in a metal bar.	Ultrasound , Partial reflection , Image formation , Ultrasound pulse	
8	Lesson 7 – Seismic waves (HT only)	- Describe the internal structure of the Earth. - Compare the properties of P and S waves. - Describe how P and S waves provide evidence for the structure of the Earth.	Seismic waves , P waves , S waves , Earth structure	
	REVISION LESSON			
	ASSESSMENT LESSON			Revision HW due
	FEEDBACK LESSON			

P13 Electromagnetic waves				
Lesson Number	Key Question/ Lesson Title	Learning Objective(s)	Key Words/ Concepts	Homework
1	Lesson 1 – The electromagnetic spectrum	Describe how electromagnetic (EM) waves transfer energy from a source to an absorber with examples.	Electromagnetic (EM) waves , Wavelength , Frequency , Electromagnetic spectrum	Educake Retrieval Homework

		- Identify the position of EM waves in the spectrum in order of wavelength and frequency. - Calculate the frequency and the wavelength of an electromagnetic wave.		
2	Lesson 2 – Light, infrared, microwaves, and radio waves	- Describe how light, infrared, microwaves, and radio waves are used in a variety of scenarios. - Describe how the light, infrared, microwaves, and radio waves interact with matter. - Plan an investigation into the rate of cooling due to emission of infrared radiation.	Light , Infrared , Microwaves , Radio waves , Interact with matter , Infrared radiation	
3	Lesson 2a – radio waves Required practical	- Describe how light, infrared, microwaves, and radio waves are used in a variety of scenarios. - Describe how the light, infrared, microwaves, and radio waves interact with matter. - Plan an investigation into the rate of cooling due to emission of infrared radiation.	Light , Infrared , Microwaves , Radio waves , Interact with matter , Infrared radiation	
4	Lesson 3 – Communications	- Describe how electromagnetic waves are used in communication. - Describe how radio waves are produced and detected. (HT) - Analyse data relating to the risks of using radiation for communication and draw a conclusion.	Electromagnetic waves , Communication , Radio waves , Radiation	
5	Lesson 4 – Ultraviolet waves, X-rays, and gamma rays	- Describe the ionisation of atoms in simple terms. - Describe the dangers of ultraviolet radiation. - Describe the similarities and differences between X-rays and gamma radiation.	Ionisation of atoms , Ultraviolet radiation , X-rays , Gamma radiation	Educake Retrieval Homework
6	Lesson 5 – X-rays in medicine	- Describe the factors that affect the radiation doses received by people. - Explain why X-rays are suitable for destroying cancer cells. (HT) - Describe the formation of an X-ray photograph in terms of absorption or transmission.	Radiation doses , X-rays , Cancer cells , X-ray photograph , Absorption , Transmission	
7	Lesson 6 – Infrared radiation in more detail	- Describe how the rate of emission of infrared radiation is related to the temperature of a body. - Explain how the intensity and wavelength of radiation emitted depends on the temperature of the object. - Describe the visible changes in an object's emitted radiation as its temperature is increased.	Infrared radiation , Temperature , Wavelength , Emitted radiation	
8	Lesson 7 – Infrared radiation and temperature	- Describe the heating of objects in terms of the rate of emission and absorption of radiation. - Describe the factors affecting the temperature of the Earth. - Explain how the Earth's temperature is affected by the absorption and emission of radiation.	Infrared radiation , Temperature , Emission , Absorption	
	REVISION LESSON			
	ASSESSMENT LESSON			Revision HW due
	FEEDBACK LESSON			

P14 Light				
Lesson Number	Key Question/ Lesson Title	Learning Objective(s)	Key Words/ Concepts	Homework
1	Lesson 1 – Reflection of light	- Construct accurate ray diagrams showing the reflection of light rays. - Define real and virtual images. - Draw diagrams to show reflection from smooth and rough surfaces.	Ray diagrams , Reflection of light , Real images , Virtual images , Smooth surfaces , Rough surfaces	Educake Retrieval Homework
2	Lesson 2 – Refraction of light	- Construct accurate ray diagrams showing the refraction of light rays. - Investigate the refraction of light through a glass or Perspex block.	Ray diagrams , Refraction of light	
3	Lesson 2 – Refraction of light Required practical	- Construct accurate ray diagrams showing the refraction of light rays. - Investigate the refraction of light through a glass or Perspex block.	Ray diagrams , Refraction of light	

4	Lesson 3 – Light and colour	- Explain the effect on the different wavelengths of visible light as they pass through a filter. - Describe how objects reflect different wavelengths of visible light to appear different colours (including white or black). - Determine the apparent colour of a coloured surface when illuminated by different colours of light.	Wavelengths , Visible light , Filter , Reflect , Colours	
5	Lesson 4 – Lenses	- Draw diagrams to show what happens to parallel rays of light incident on concave and convex lenses, identifying the principal focus and focal length. - Calculate the magnification of a lens based on object and image size. - Describe sources of random and systematic error when investigating convex lenses.	Concave lenses , Convex lenses , Principal focus , Focal length , Magnification , Random error , Systematic error	Educake Retrieval Homework
6	Lesson 5 – Using lenses	- Construct ray diagrams showing the formation of images by a convex lens when the object is placed at different distances. - Construct ray diagrams showing the formation of images by a concave lens. - Use ray diagrams to describe the similarities and differences between concave and convex lenses.	Ray diagrams , Convex lens , Concave lens	
	REVISION LESSON			
	ASSESSMENT LESSON			Revision HW due
	FEEDBACK LESSON			

P15 Electromagnetism				
Lesson Number	Key Question/ Lesson Title	Learning Objective(s)	Key Words/ Concepts	Homework
1	Lesson 1 – Magnetic fields	- Describe the difference between permanent magnets and induced magnets. - Explain how the behaviour of a compass is evidence for the magnetic core of the Earth. - Draw the magnetic field around a bar magnet including the direction of the magnetic field lines.	Permanent magnets , Induced magnets , Magnetic core of the Earth , Magnetic field , Magnetic field lines	Educake Retrieval Homework
2	Lesson 2 – Magnetic fields of electric currents	- Describe how the current in the wire and the distance from the wire affect the strength of the magnetic field. - Draw the magnetic field pattern (including the direction) produced by a straight wire carrying a current and for a solenoid. - Explain why coiling a wire to form a solenoid increases the strength of the magnetic field.	Current , Magnetic field strength , Solenoid	
3	Lesson 3 – Electromagnets in devices	- Study a diagram of an electromagnetic device and explain how it works. - Evaluate the quality of data collected for electromagnet investigation in terms of the precision.	Electromagnetic device , Electromagnet	
4	Lesson 4 – The motor effect (HT only)	- Apply Fleming’s left-hand rule to determine the direction of the force acting on a conductor. - Calculate the force acting on a conductor when it is placed in a magnetic field. - Explain why the coil of a motor rotates.	Fleming’s left-hand rule , Force , Conductor , Magnetic field , Motor effect	Educake Retrieval Homework
5	Lesson 5 – The generator effect (HT only)	- Describe electromagnetic induction in a wire. - Describe how to increase the size of an induced potential difference. - Explain how the direction of the induced current relates to the magnetic field.	Electromagnetic induction , Potential difference , Induced current , Magnetic field , Generator effect	
6	Lesson 6 – The alternating-current generator (HT only)	- Explain how an alternator generates a.c. - Draw potential difference against time graphs for the output of a generator, identifying peak potential difference and period of the cycle.	Alternator, a.c. (alternating current) , Potential difference against time graphs , Peak potential difference , Microphones ,	

		Describe how microphones use the generator effect and loudspeakers use the motor effect.	Loudspeakers , Motor effect , Generator effect	
7	Lesson 7 – Transformers (HT only)	- Describe the structure of a transformer. - Describe the operation of a transformer in simple terms. - Describe the difference between a step-up and a step-down transformer in terms of the number of turns on the primary and secondary coils.	Transformer , Step-up transformer , Step-down transformer , Primary coil , Secondary coil	
8	Lesson 8 – Transformers in action (HT only)	- Use the transformer equation to calculate input or output voltages for a transformer. - Use the output power to determine the primary current. - Apply transformer equations to explain the advantage of high voltage transmission.	Transformer equation , Input voltages , Output voltages , Primary current , High voltage transmission	
	REVISION LESSON			
	ASSESSMENT LESSON			Revision HW due
	FEEDBACK LESSON			

Chapter P16: Space				
Lesson Number	Key Question/ Lesson Title	Learning Objective(s)	Key Words/ Concepts	Homework
1	Lesson 1 – Formation of a star	- Describe a variety of objects within the Solar System. - Explain the role of gravitational forces at the start of a star's life cycle. - Describe the forces that are acting when a star is in its main sequence.	Solar System , Gravitational forces , Star's life cycle , Main sequence	Educake Retrieval Homework
2	Lesson 2 – The life cycle of a star	- Describe the life cycle of a star the size of the Sun. - Describe the life cycle of a more massive star. - Explain how fusion leads to the formation of new elements.	Life cycle of a star , Fusion , New elements	
3	Lesson 3 – Planets, satellites, and orbits	- Compare the orbits of planets, moons, and artificial satellites. - Explain how a satellite in a circular orbit is accelerating even when moving at a constant speed. (HT) - Describe how if the speed of an object in orbit changes the orbit must change. (HT)	Planets , Moons , Artificial satellites , Orbits , Accelerating , Constant speed	
4	Lesson 4 – The expanding Universe	- Describe how the wavelength of a wave is changed if the source of the wave is moving away from the observer. - Compare galaxies in terms of their red-shift and distance from us. - Describe how red-shift provides evidence for expansion of the Universe.	Wavelength , Galaxies , Red-shift , Expansion of the Universe	
5	Lesson 5 – The beginning and future of the Universe	- Describe the Big Bang theory. - Describe the evidence for the Big Bang theory. - Explain that there is much still to understand about the Universe.	Big Bang theory , Universe	
	REVISION LESSON			
	ASSESSMENT LESSON			Revision HW due
	FEEDBACK LESSON			