LONGSANDS ACADEMY
Astrea Academy Trust
INSPIRING BEYOND MEASURE

Knowledge Organiser

Physics Separate

GCSE Physics Separate AQA

Physics Separate
GCSE AQA

YEAR 10 & 11

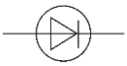
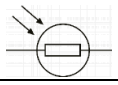
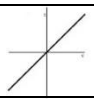
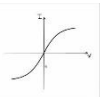
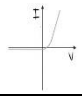
2023-2025

NAME: _____

TUTOR GROUP: _____

1.1	**Energy Part 1**	What is a gravitational energy store?	Energy an object has because it is above the Earth's surface
1.2		What is the formula for gravitational energy?	$E_{GP} = mgh$ (gravitational energy = mass x gravitational field strength x height)
1.3		What is a kinetic energy store?	Energy an object has because it is moving
1.4		What is the formula for kinetic energy?	$E_k = ½ mv^2$ (kinetic energy = 0.5 x mass x velocity x velocity)
1.5		What is a chemical energy store?	Energy stored because of the chemical composition of the material: food, fuel and batteries
1.6		What is an elastic energy store?	Energy stored by an object because it has been stretched or squashed
1.7		What is a thermal energy store?	Energy stored by an object because it is warm (the kinetic energy store of its particles)
1.8		What is specific heat capacity?	The energy needed to raise the temperature of 1Kg of a substance by 1°C
1.9		What does the principle of conservation of energy tell us?	Energy can never be created or destroyed
1.10		What is a system?	An object or group of objects
1.11		What is a closed system?	A system which energy cannot leave or enter
1.12		What is dissipation?	When energy spreads out into less useful stores, usually increasing the thermal store of the surroundings
2.1	**Energy Part 2**	What is power?	Rate of energy transfer
2.2		Wat is the formula for power?	P = E/t Power = energy/time
2.3		What is the unit for energy?	J (joules)
2.4		What is the unit for power?	W (watts)
2.5		What two factors affect the rate of thermal energy transfer?	Thermal conductivity of material, thickness of material
2.6		Give two ways of reducing unwanted energy transfers	Thermal insulation of heated buildings; lubrication of moving parts
2.7		What is thermal conductivity?	The rate at which a material conducts heat
2.8		What is the formula for efficiency?	Useful energy out/total energy in Useful power out/total power in
2.9		What is a renewable energy resource	An energy resource that is constantly replenished at a rate that means our use of it will not cause it to run out
2.10		Name the 4 non-renewable energy resources	Coal, oil gas (fossil fuels), nuclear
2.11		Name 4 renewable energy resources	Solar, wind, hydroelectric, biofuels
2.12		(HT) Describe 2 ways of increasing efficiency	Reduce unwanted energy transfers e.g. by lubricating moving parts or insulating to reduce unwanted heat transfers

3.1	**Electricity Part 1**	What is current?	The rate of flow of change
3.2		What is needed for current to flow?	A potential difference and a closed circuit
3.3		What formula links current, charge and time?	Q = I t Charge = current x time
3.4		What is the unit of charge?	C (coulombs)
3.5		What is the unit of current?	A (amps)
3.6		What is resistance?	The opposition of the flow of current
3.7		What is the unit of resistance?	Ω (ohms)
3.8		What is the unit of potential difference?	V (volts)
3.9		What formula links potential difference, current and resistance?	V = IR Potential difference = current x resistance
3.10		How do we measure current?	With an ammeter in series
3.11		How do we measure potential difference?	With a voltmeter in parallel
3.12		How do we find resistance of a component or circuit?	Find the current and potential difference, then use the formula V = IR
4.1	**Electricity Part 2**	What is the difference between series and parallel?	Components in series are on the same loop of the circuit; components in parallel are on separate loops
4.2		What happens to current in series?	Stays the same
4.3		What happens to current in parallel?	Splits up, then recombines
4.4		What happens to potential difference in series?	Total p.d. is split across the components
4.5		What happens to potential difference in parallel?	Stays the same
4.6		What happens to resistance in series?	Total resistance is the sum of the resistances of all the components
4.7		What happens to resistance in parallel?	Total resistance is lower than the resistance of the component with the smallest resistance
4.8		What is the difference between direct current (DC) and alternating current (AC)?	In DC, the charges move continuously in one direction. In AC, charges continuously change direction (p.d. is continuously changed direction)
4.9		Describe 3 features of UK mains electricity	230V, AC, 50Hz
4.10		In a 3-core cable, what are the features of the live wire?	Alternates its potential difference from maximum +325V to -325V, 50 times per second
4.11		In a 3-core cable, what are the features of the neutral wire?	Potential difference = 0V – completes the circuit between the appliance and the local substation
4.12		In a 3-core cable, what are the features of the earth wire?	Potential difference = 0V – only carries current in the event of a fault

5.1	**Electricity Part 3**	Why is the live wire dangerous even when the switch in a mains circuit is open?	Because it is at a very high p.d. compared to earth, so that is a person touched it they would be electrocuted as current flowed through them to earth
5.2		What formula links power, potential difference and current?	P = VI Power = potential difference x current
5.3		What formula links power, current and resistance?	$P = I^2R$ Power = current x current x resistance
5.4		How is electrical power transferred in the national grid?	At very high potential difference between power stations and consumers, then stepped down to 230V before use
5.5		Why is transferring electrical power at a very high potential difference across long distances an efficient method?	Because power lost due to heating is proportional to I^2, a higher p.d. means a lower I and therefore less power lost
5.6		What is this component? 	Diode
5.7		What is this component? 	LDR
5.8		What is this component? 	Thermistor
5.9		What component does this graph show? 	Ohmic conductor
5.10		What component does this graph show? 	Filament lamp
5.11		What component does this graph show? 	Diode
5.12		Why does resistance increase in series, but decrease in parallel?	Resistors in series must have the total p.d. shared between them, so current through each is lower. Adding more resistors in parallel draws more current as each has the same pd across it
6.1	**Particle Model**	What is the formula for density?	Density = mass/volume
6.2		Explain the differences in density between solids, liquids and gasses	Solids have the highest density (in general) because the particles are closely packed and have little space in between them. Gasses are the least dense as there is a lot of space between the particles
6.3		What is the name for the state change from solid to liquid?	Melting
6.4		What is the name for the state change from liquid to gas?	Evaporating/boiling
6.5		What is the name of the state change from gas to liquid?	Condensing

6.6	**Particle Model**	What is the name for the state change from liquid to solid?	Freezing
6.7		What is the name for the state change from solid to gas?	Sublimation
6.8		What happens to mass during a state change?	Remains constant
6.9		What happens to the energy store of a system when you heat it?	It increases
6.10		What two things can happen when you heat a system?	Its temperature can increase, or its state can change
6.11		What is the difference between specific heat capacity and specific latent heat?	Specific heat capacity describes thermal energy being used to increase temperature (kinetic energy of particles) whereas latent heat describes thermal energy being used to change the state of a substance (increase the potential energy of particles)
6.12		How does increasing the temperature of a gas at constant volume affect the pressure of the gas?	Pressure will increase
7.1	**Atomic Structure Part 1**	Describe the structure of the atom	Positively charged nucleus surrounded by negatively charged electrons
7.2		Where is almost all the mass of the atom?	In the nucleus
7.3		How does the radius of the nucleus compare to the radius of the atom?	The nucleus is much much smaller than the atom
7.4		What is the nucleus of the atom composed of?	Protons and neutrons
7.5		What do all nuclei of atoms of the same element have in common?	Number of protons
7.6		How can atoms of the same element differ in mass?	By having different numbers of neutrons
7.7		What was the plum-pudding model of the atom?	An early model of the atom where the atom was a ball of positive charge with negative electrons scattered throughout
7.8		Why was the plum-pudding model of the atom proposed?	Because electrons had been discovered and were known to be smaller than atoms and to have a negative charge
7.9		What was the nuclear model of the atom?	The model that was proposed after the plum-pudding model, with atoms having a small positively charged nucleus surrounded by negative electrons
7.10		Why was the nuclear model of the atom proposed?	Because the alpha-particle scattering experiment produced evidence that could not be explained by the plum-pudding model
7.11		How are electrons arranged around the atomic nucleus?	Orbit at fixed distances
7.12		What happens to an atom's electrons when electromagnetic radiation is absorbed or emitted?	Distance from the nucleus may change or outer electrons may be knocked out of the atom

8.1	**Atomic Structure Part 2**	What is ionisation?	An atom is turned I to an ion (charged particle) by the loss or gain of an electron
8.2		Name the 3 ways an unstable nucleus may become more stable	By emitting an alpha particle, beta particle, or neutron
8.3		What is an alpha particle made of?	2 protons and 2 neutrons
8.4		What is the mass of an alpha particle?	4
8.5		What is the charge (proton number) of an alpha particle?	2
8.6		What are the two symbols for alpha particles?	${}^{4}_{2}\alpha ; {}^{4}_{2}He$
8.7		What is a beta particle made of?	A fast-moving electron
8.8		What is the mass of a beta particle?	0
8.9		What is the charge of a beta particle?	-1
8.10		What are the two symbols for beta particles?	${}^{0}_{-1}\beta ; {}^{0}_{-1}e$
8.11		How is the nucleus affected by the emission of an alpha particle?	Mass decreases by 4, atomic (proton) number decreases by 2
8.12		How is the nucleus affected by the emission of a beta particle?	Mass stays the same, atomic (proton) number increases by 1
9.1	**Atomic Structure Part 3**	How is the nucleus affected by the emission of a gamma wave?	There is no change to mass number or atomic number
9.2		What are the 2 definitions of half-life?	The time taken for the number of nuclei to halve; the time taken for the activity to reduce by half
9.3		How is half-life related to the random nature of radioactive decay?	Because radioactive nuclei exist in huge numbers, predictions can be made about overall activity despite individual decays being unpredictable
9.4		How do the penetration properties of alpha particles, beta particles and gamma waves compare?	Gamma waves are the most penetrating, beta in the middle, and alpha the least penetrating
9.5		What is the difference between contamination and irradiation?	In contamination a radioactive material is transferred to the object in question. In irradiation, no radioactive material is transferred: the object experiences radiation from a source separate from it
9.6		What ae the hazards from contamination?	Risk of ionisation until the radioactive material has been removed/activity has decreased sufficiently
9.7		What are the hazards from irradiation?	Risk of ionisation while irradiation is happening but no increased risk afterwards
9.8		What happens to the activity of a radioactive source over time?	It reduces according to its half-life but never gets to zero
9.9		How does the half-life affect the risk from a radioactive source?	The shorter the half-life, the faster the risk will decrease

9.10	**Atomic Structure Part 3**	What is a gamma wave?	An electromagnetic wave (no mass or charge) sometimes given out by a nucleus after emitting a particle
9.11		In atomic notation, what is represented by these symbols? 	X = element Y = atomic mass Z = atomic number (number of protons)
9.12		What is the relationship between scientific theory and evidence?	When new evidence is discovered, theories change to fit the evidence
10.1	**Forces Part 1**	What is a vector quantity?	A quantity with magnitude and direction
10.2		Give 2 examples of vector quantities	Displacement, velocity
10.3		What is a scalar quantity?	A quantity with magnitude only
10.4		Give 2 examples of scalar quantities	Distance, speed
10.5		What is a typical speed for walking?	1.5m/s
10.6		What is a typical speed for running?	5m/s
10.7		What is a typical speed for cycling?	7m/s
10.8		What is a typical speed for a car?	13-30m/s
10.9		What formula relates speed, distance and time?	Speed = distance/time v = s/t
10.10		What is velocity?	Speed and direction; rate of change of displacement
10.11		What is acceleration?	Rate of change of velocity
10.12		What is represented by the enclosed area in a velocity-time graph?	Distance travelled
11.1	**Forces Part 2**	What formula links velocity, time and acceleration?	a = Δv/t Acceleration = change in velocity/time
11.2		(HT) What re the characteristics of speed and velocity in a circular orbit?	Constant speed, changing velocity
11.3		State Newton's first law of motion	If there is no resultant force on an object, it will continue with a constant velocity if moving or remain at rest if stationary
11.4		What does Newton's first law tell us about objects moving with uniform velocity?	The resultant force on the object must be zero
11.5		What does Newton's first law tell us about objects moving with changing speed or direction?	There must be a resultant force on the object
11.6		State Newton's second law of motion	F = ma Force = mass x acceleration
11.7		(HT) What is inertial mass	A measure of how difficult it is to change the velocity of an object: the ratio of force over acceleration
11.8		State Newton's third law	Every force is paired with an equal and opposite reaction force
11.9		(HT) What is momentum?	The quantity of motion of a moving object: the product of mass and velocity

11.10	**Forces Part 2**	(HT) What is the formula for momentum?	ρ = mv momentum = mass x velocity
11.11		(HT) What happens to momentum in collisions?	It is conserved: total momentum before the collision = total momentum after the collision
11.12		What dangers are caused by large decelerations in events such as car crashes?	Large forces on passenger can lead to serious injury
12.1	**Forces Part 3**	What is a typical human reaction time?	0.25s
12.2		Describe 2 ways of measuring reaction time	Dropping a ruler and catching it, computerised tests involving pressing a button in response to seeing something on the screen – time recorded by the computer
12.3		What is stopping distance?	The total distance travelled by a car during the time between the driver seeing the hazard and the car coming to a rest
12.4		What is thinking distance?	The distance travelled by the car while the driver reacts to the hazard
12.5		What is braking distance?	The distance travelled by the car while the brakes do work on the wheels to bring them to a stop
12.6		What factors affect thinking distance?	Speed, alcohol, drugs, tiredness, distractions
12.7		What factors affect stopping distance?	Speed, condition of the road, weather conditions, condition of tyres, condition of brakes
12.8		What are the units of velocity?	m/s metres per second
12.9		What are the units of acceleration?	m/s^2 metres per second per second
12.10		What are the units of force?	N (newtons)
12.11		What are the units of displacement?	m (metres)
12.12		(HT) What are the units of momentum?	kgm/s (kilograms-metres per second)
13.1	**Forces Part 4**	Name 3 non-contact forces	Gravity, electrostatic, magnetism
13.2		Name 2 contact forces	Friction, the normal contact force
13.3		What is weight?	The force of an object due to its mass in a gravitational field
13.4		What is the unit of weight?	N (newtons)
13.5		What formula related weight, mass and gravitational field strength?	W = mg Weight = mass x gravitational field strength
13.6		What conditions must occur for an object to be bent, compressed or stretched?	More than one force must be applied
13.7		What is the difference between elastic and inelastic deformation?	Elastic deformation: the object will return to its original size and shape Inelastic deformation: the object will not return to its original size and shape

13.8	**Forces Part 4**	What is 'work done'?	The energy transferred when a force is used to move an object across a distance
13.9		What formula relates work done, force and distance?	W = fd Work done = force x distance
13.10		What is 1 newton-metre equivalent to?	1 joule
13.11		What is a typical speed for a train?	56m/s
13.12		What is a typical speed for a plane?	250m/s
14.1	**Waves Part 1**	What is the amplitude of a wave?	The maximum displacement of a point on a wave from its undisturbed position
14.2		What is the wavelength of a wave?	The distance across one complete wave cycle
14.3		What is the time period of a wave?	The time for one complete wave cycle to pass a point
14.4		What is the frequency of a wave?	The number of wave cycles to pass a point per second
14.5		What formula links wave velocity, frequency and wavelength?	v = fλ Velocity = frequency x wavelength
14.6		What are the features of transverse waves?	The wave travels at right angles to the direction of oscillations
14.7		What are the features of longitudinal waves?	The wave travels parallel to the direction of oscillations
14.8		Give an example of transverse waves	Ripples on water
14.9		Give an example of longitudinal waves	Sound waves
14.10		Describe evidence for the fact that ripples on water transfer energy but not matter	An object floating on water will bob up and down but will not move across when a wave travels across the water
14.11		Describe evidence for the fact that sound waves in air transfer energy but not matter	A helium balloon will move side-to-side but will not travel across when a sound wave travels through the air
14.12		What is the unit for wavelength?	m (metres)
15.1	**Waves Part 2**	Name the 7 groups in the electromagnetic spectrum	Radio, microwaves, infra-red, visible, ultraviolet, X-rays, gamma rays
15.2		Which part of the electromagnetic spectrum can our eyes detect?	Visible (light)
15.3		Which part of the electromagnetic spectrum has the longest wavelength/lowest frequency?	Radio
15.4		Which part of the electromagnetic spectrum has the shortest wavelength/highest frequency?	Gamma
15.5		(HT) What 4 things can happen when a wave interacts with matter?	Absorption, transmission, reflection, refraction
15.6		(HT) What 2 things does the interaction of a wave with matter depend on?	The material and the frequency of the wave
15.7		(HT) What causes refraction?	Changes to a wave's velocity in different media
15.8		(HT) What happens to wave fronts when a wave travels from a less dense to a more dense medium?	They get closer together

15.9	**Waves Part 2**	(HT) How can radio waves be produced by a circuit?	Alternating p.d. causes electrons in the circuit to oscillate, emitting radio waves
15.10		(HT) What happens when radio waves are absorbed by a wire in a circuit?	Electrons in the circuit absorb the waves and oscillate, producing an alternating current
15.11		Describe two ways that atoms can produce electromagnetic waves	Changes in the nucleus (oscillating proton) or changes to electrons (changing distance from nucleus)
15.12		Describe two ways that atoms can be affected by absorbing electromagnetic waves	Electrons can be moved to different distances from the nucleus, or they can be knocked out and the atom becomes ionised
16.1	**Waves Part 3**	State a use of radio waves	Television and radio communication
16.2		State 2 uses of microwaves	Satellite communication (including mobile phones), cooking
16.3		State three uses of infra-red waves	Night-vision cameras, remote controls, cooking
16.4		State a use of visible light	Fibre optics
16.5		State 3 uses of ultra-violet light	Fluorescent light bulbs, tanning beds, counterfeit note detection
16.6		State 2 uses of X-rays	X-ray photography for medical diagnosis, security scans for airport luggage
16.7		State 2 uses of gamma waves	Radiotherapy, sterilising medical equipment
16.8		What factors affect the frequency of an electromagnetic wave?	The type of charged particle oscillating; the frequency of the oscillation
16.9		Give 2 examples of electromagnetic waves transferring energy from emitter to absorber	Energy is transferred from the sun (emitter) via visible light ot the earth (absorber); energy is transferred from an X-ray machine (emitter) via X-rays to bones and photographic plate (absorbers)
16.10		What are the hazards from UV waves?	Aging of the skin, ionisation in cells can lead to skin cancer
16.11		What are the hazards from X-rays and gamma rays?	Ionisation in cells can lead to cancer
16.12		What 3 things do all electromagnetic waves have in common?	They are all transverse waves, they all travel at the same speed in a vacuum, they all transfer energy from emitter to absorber

17.1	**Magnetism and Electromagnetism**	Describe the force between like poles	Repels
17.2		Describe the force between unlike poles	Attracts
17.3		What is a permanent magnet?	A magnet that creates its own magnetic field
17.4		What is an induced magnet?	An object that has a magnetic field due to being in the magnetic field of another magnet
17.5		What direction does a magnetic field always act in?	From north to south
17.6		Where is a magnetic field strongest?	Next to the poles of the magnet
17.7		What happens to the strength of a magnetic field as you move further from the magnet?	It decreases
17.8		How do magnetic compasses provide evidence that the Earth's core must be magnetic?	The compass needle always points North, indicating that it is aligning itself with a magnetic field from the Earth
17.9		What is the magnetic field like around a current carrying wire?	Circular around the wire
17.10		What factors affect the strength of a magnetic field due to a current carrying wire?	Strength of the current, distance from the wire
17.11		How does a solenoid enhance the magnetic field due to a current-carrying wire?	When a current carrying wire is wrapped around an iron core, the iron becomes an induced magnet, and its field combines with that of a wire
17.12		How does an electric motor work?	The force of a current carrying wire in a magnetic field pushes one side of a coil down and the other side up
18.1	**Forces**	What formula relates force, pressure and area?	Pressure = force/area
18.2		Describe the force on a surface caused by the pressure in a fluid	Normal (at right angles) to the surface
18.3		Describe a simple model for the Earth's atmosphere	Assuming a constant density of air at different altitudes, pressure decreases with increasing altitude
18.4		Why does the Earth's atmospheric pressure vary with height above the surface?	The higher the altitude, the lower the weight of air pressing down
18.5		(HT) Why does pressure in a liquid vary with depth?	The greater the depth, the higher the total weight of liquid pressing down
18.6		(HT) Why does pressure in a liquid vary with density?	The higher the density, the higher the total weight of liquid pressing down
18.7		(HT) What causes upthrust?	An object in water displaces water. Because water pressure is greater at the bottom of the object than the top, the resultant force is the upthrust
18.8		(HT) What factors determine whether an object will float or sink?	If upthrust is equal to weight, the object will float. If upthrust is less than weight, the object will sink
18.9		(HT) Give the formula for calculating the pressure of a liquid at a certain depth	$P = \rho hg$ pressure = density x height x gravitational field strength

18.10	**Forces**	What is the moment of a force?	The turning effect of a force
18.11		What formula links moment, force and distance from pivot?	Moment = force x distance from pivot
18.12		How do levers and gears transmit the rotational effect of forces?	The applied force is at a greater distance from the pivot than the force it has to overcome. The moment with a shorter distance means the force is multiplied
19.1	**Waves**	(HT) Why can humans only hear a limited range of frequencies?	The conversion of sound waves to vibrations of solids only works over a limited frequency range
19.2		(HT) How does echo-sounding, including ultrasonography and seismic wave detection, allow us to investigate unobservable structures?	Vibrational waves are reflected and absorbed differently by different materials and so can give us information about structures we can't see
19.3		How are frequency, speed and wavelength affected when sound travels from one medium to another?	When a soundwave travels from one medium to another, its frequency remains constant, but its speed may change, causing its wavelength to change
19.4		State 2 similarities between convex and concave lenses	Both have a focal length; both work by refracting light
19.5		What is the difference between convex and concave lenses?	A convex lens makes parallel lines converge to a focus; a concave lens makes parallel rays diverge (spread out)
19.6		How is colour related to differential absorption?	A coloured object, e.g. red, absorbs all wavelengths of light, except the wavelength of that colour (e.g. red)
19.7		How is colour related to differential transmission?	A coloured filter, e.g. green, transmits only light of that wavelength (e.g. green) and absorbs all other wavelengths
19.8		What is the difference between specular and diffuse reflection?	Specular reflection occurs on a smooth surface like a mirror: parallel rays are reflected in a single direction. Diffuse reflection occurs on a rough surface: parallel rays are scattered in different directions
19.9		How does the temperature of an object affect the intensity of the radiation it gives out?	The higher the temperature, the higher the intensity
19.10		How does the temperature of an object affect the frequency of the radiation it gives out?	The higher the temperature, the higher the intensity of all frequencies, and the higher the peak of the frequency
19.11		(HT) How does absorption and emission of radiation affect the temperature of an object?	If absorption is higher than emission, the object's temperature increases
19.12		(HT) What factors determine the temperature of the Earth?	The rate radiation from the Sun is absorbed, the amount of radiation reflected, and the amount of radiation radiated into space

20.1	**Static Electricity/Particle Model of Matter**	How is static electricity generated by rubbing surfaces?	Electrons are transferred from one surface to the other
20.2		How is sparking caused by rubbing surfaces?	If the electric field between too oppositely charged objects is strong enough, electrons are pulled out of air molecules by the field. These electrons hit other air molecules, knocking electrons out of them, causing a sudden flow of electrons between the two charged objects
20.3		What is an electric field?	The space around a charged object where another recharged object experiences an electrostatic force
20.4		Describe an experiment to show the force between two objects with opposite charge	The space around a charged object where another charged object experiences an electrostatic force
20.5		Describe an experiment to show the force between two charged objects with the same charge	Suspend the two charged objects from a string and bring them together: they will move towards each other due to the attractive force between them
20.6		Why does the electrostatic force between two charged objects get stronger when the distance between them decreases?	The field is stronger closer to the object
20.7		Is the electrostatic force contact or non-contact?	Non-contact
20.8		Why does the transfer of electrons lead to electrostatic effects?	Electrons have a negative charge, so a build up of electrons on a surface gives it a negative charge while a loss of electrons from a surface gives it a positive charge
20.9		How does a gas' pressure affect its volume at constant temperature?	If the pressure is increases, volume will increase (expansion). If the pressure is decreased, volume will decrease (compression)
20.10		(HT) How can doing work on a gas increase its temperature?	Work is done to overcome the force caused by the pressure of the gas – energy is transferred to the gas' internal store, raising its temperature
20.11		If temperature is kept constant, but volume is increased, what will happen to a gas' pressure?	It will decrease
20.12		If temperature is kept constant, but volume is decreased, what will happen to a gas' pressure?	It will increase

21.1	**Atomic Structure**	Why does the hazard from a radioactive source vary with the half-life of the radioactive material?	The shorter the half-life, the faster the activity will reduce to a safe level
21.2		How does a radioactive tracer in medicine work?	The patient drinks or is injected with a solution containing a gamma source. Radiation detectors are placed next to the body and monitor how the fluid moves through the body
21.3		How are gamma beams used to treat cancer?	A narrow beam of gamma rays is directed at a tumour to destroy cancerous cells
21.4		How are radioactive implants used to treat cancer?	A permanent implant containing a gamma or beta source is placed inside the patient's body and destroys cancer cells
21.5		How does a gamma photography of internal organs work?	The patient is injected with a solution containing a gamma source, which is then absorbed by the organ. A gamma camera is placed next to the patient and receives the transmitted gamma rays which are used to build up an image of the organ
21.6		What happens in nuclear fission?	An unstable nucleus splits into two smaller nuclei and two or three neutrons. Energy is released
21.7		How is energy transferred in nuclear fission?	Energy is transferred by gamma radiation emitted by the fissioning nucleus and is also transferred to the thermal store of the fission neutrons and fragment nuclei
21.8		What radiation is emitted by nuclear fission?	Gamma radiation
21.9		How does a nuclear fission chain reaction occur?	Neutrons released from fission are absorbed by other nuclei, which become unstable and split. The process repeats
21.10		What happens in nuclear fusion	Two small nuclei fuse together to form a single larger nucleus. Energy is released
21.11		What happens to the missing mass in nuclear fusion?	It is converted to energy
21.12		What radiation is emitted by nuclear fusion?	Gamma radiation
22.1	**Space**	What are planets?	Spherical objects that orbit the Sun in circular or near circular orbits, in the same plane
22.2		What is a moon?	A natural object that orbits a planet in a circular orbit
22.3		What is an artificial satellite?	An artificial object that orbits a planet in a circular orbit

22.4	**Space**	Describe the composition of the solar system	The Sun (a star) is orbited by the 8 planets. Some of the planets are orbited by moons. Comets (frozen rocks) orbit the sun in very elliptical orbits. Dwarf planets and asteroids also orbit the Sun, mainly in between the orbits of Mars and Jupiter
22.5		(HT) For a stable orbit, what must happen to speed if radius is increased?	Speed must decrease
22.6		(HT) If the speed and radius of a satellite are not matched, what will happen?	If the satellite is too slow, it will fall to earth; if it is too fast it will fly off into space
22.7		(HT) For a circular orbit, how does the force of gravity affect the speed and velocity?	Speed remains constant; velocity is constantly changing
22.8		How was our sun formed?	Dust and gas were drawn together by gravity, eventually reaching sufficient pressure and temperature for nuclear fusion to start
22.9		Why is our sun in equilibrium?	The outward force of the radiation is balanced by the inward force from gravity
22.10		What is red shift?	The spectrum of light from stars and galaxies is shifted to longer wavelengths
22.11		What causes red shift?	A light source moving away causes the waves it emits to be stretched out to a longer wavelength
22.12		How does red shift provide evidence for the big bang model?	The more distant a galaxy is, the more red-shifted its light is. This shows all the galaxies are moving away from each other. This implies that the universe began with a single point which has been expanding ever since
23.1	**Magnetism & Electromagnetism**	(HT) What does a changing magnetic field around a conductor produce?	A potential difference that can create a current
23.2		(HT) What direction is the magnetic field around an induced current?	The opposite direction to the field that induced the current
23.3		(HT) How does an alternator work?	A rectangular coil is made to spin in a uniform magnetic field, causing an alternating current to be induced in the coil
23.4		(HT) What type of current is generated by an alternator?	Alternating current (AC)
23.5		(HT) What type of current is generated by a dynamo?	Direct current (DC)
23.6		(HT) Explain how a dynamo works	A split-ring commutator is used with an alternator to reverse the connection of the coil every half-turn, causing the output to be DC

23.7	**Magnetism & Electromagnetism**	(HT) Explain how a transformer works	Alternating current passes through the primary coil and induces an alternating magnetic field in the iron core This induces an alternating potential difference across the secondary coil
23.8		(HT) What does the ratio of potential difference in a transformer depend on?	The ratio of the number of turns on the primary and secondary coil
23.9		(HT) How does a microphone work?	Sound waves make a diaphragm vibrate – the diaphragm is attached to a coil in a magnetic field and an alternating current is induced in the coil as it vibrates
23.10		(HT) How do loudspeakers and headphones work?	An alternating current flows through a coil in a magnetic field, causing the coil to vibrate – the coil is attached to a diaphragm which vibrates and creates sound waves
23.11		(HT) Why are transformers important for transferring electrical power efficiently?	A step-up transformer increases the potential difference so that power can be transported by cables with minimal loss due to heating
23.12		(HT) How is the force on a conductor in a magnetic field used to turn a coil in an electric motor?	Because the conducting wire is in a loop, the current is flowing in opposite directions on each side of the coil – so there is a force acting up on one side of the coil and down the other – causing rotation

Knowledge Organiser

Physics Separate

GCSE Physics Separate AQA