LONGSANDS ACADEMY
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INSPIRING BEYOND MEASURE

Knowledge Organiser

Physics Trilogy

GCSE Physics Trilogy AQA

Physics Trilogy
GCSE AQA

YEAR 10 & 11

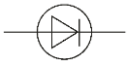
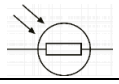
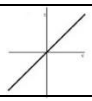
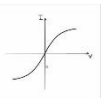
2023-2025

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^{o}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. I. 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 = OV – 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 = OV – 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	Electricity Part 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 I2, a higher pd 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 pd 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 of change from liquid to gas?	Evaporating/boiling
6.5		What is the name of the state change from gas to liquid?	Condensing
6.6		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	Particle Model	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_2He

8.7	Atomic Structure Part 2	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 ae 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 increase 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		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? $^{Y}_{Z}X$	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	Forces Part 1	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 = Δ v/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		(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	Forces Part 3	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		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?	$V = f\lambda$ 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	Waves Part 1	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		(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 (inc. 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	Waves Part 3	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		Wat 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

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