AQA GCSE **– Physics** – Paper 2 Learning Pathway

Equations you need to learn for paper 2:

$W = m\ g$	$M = F\ d$	$F = K\ e$	$s = v\ t$	$v = f\ \lambda$
$F = m\ a$	$p = m\ v$	$W = m\ g$	$P = \frac{F}{A}$	$a = \frac{\Delta v}{t}$

Learning objectives for paper 2:

P8	Forces in Balance		Revised	Understood
P8.1	Vectors and scalars	State what Displacement is. State that a Scalar is a quantity with magnitude only. State that a vector is a quantity with magnitude and direction. Describe how vectors can be represented using scale drawings.		
P8.2	Forces between objects	State what a force can do and its unit. State what a contact force is and give examples. State Newton's third law and apply this to situations.		
P8.3	Resultant forces	State what a resultant for is. Describe the motion of an object with a resultant for acting. Calculate the resultant force along a line.		
P8.4	Moments at work	State the equation for moments. Calculate the moment of a force. Describe how to increase or decrease the moment of a force.		
P8.5	More about levers and gears	Explain how gears can leavers transmit the rotational effects of forces. Calculate the moment from a gear or leaver system.		
P8.6	Centre of mass	State what the centre of mass of an object is. Describe an experiment to find the centre of mass of an object.		
P8.7	Moments and equilibrium	State the principle of moments. Calculate the forces or distances for an object in equilibrium.		
P8.8	The parallelogram of forces	Draw scale drawings to find the resultant force of two forces. Use of either nose to tail drawings or the parallelogram of forces.		
P8.9	Resolution of forces	State that a force can be resolved into 2 perpendicular forces. Use scale drawings to resolve a single force into 2 perpendicular components.		
P9	Motion			
P9.1	Speed and distance-time graphs	State and use the equation for velocity of an object. Identify the motion of an object from a distance-time graph. Calculate the speed of an object from a d-t graph using the gradient.		
P9.2	Velocity and acceleration	State the difference between speed and velocity. State and use the equation for acceleration. Define acceleration.		
P9.3	More about velocity time graphs	Identify the motion of an object from the velocity-time graph. Calculate the acceleration of an object from the gradient of a v-t graph. Calculate the displacement of an object from a v-t graph.		
P9.4	Analysing motion graphs	Calculate the speed of an object from a d-t graph using the gradient. Calculate the acceleration of an object from the gradient of a v-t graph. Calculate the displacement of an object from a v-t graph.		
P10	Force and motion			
P10.1	Force and acceleration	State and use Newton's 2nd law, F=ma. Describe an experiment into the relationship between force and acceleration. State what is meant by the inertia and the inertial mass of an object.		
P10.2	Weight and terminal velocity	Explain the difference between mass and weight. Describe the motion of an object as it goes from stationary to terminal velocity. Explain what happens to the resultant force on an object as it goes from stationary to a terminal velocity.		
P10.3	Forces and braking	Describe the forces that act against a moving object. State what the thinking, braking and stopping distances are for a vehicle. Describe what factors affects the thinking, braking and stopping distances for a vehicle.		
P10.4	Momentum	State and use the equation for momentum. State the principle of the conservation of momentum. Explain what a closed system is.		

P10.5	Using conservation of momentum	Use the conservation of momentum to find the velocity of an object after a collision. Use the conservation of momentum to find the velocity of an object after an explosion.		
P10.6	Impact forces	State what factors affect the impact force during a collision. Calculate the impact force on an object. Explain how the impact force can be reduced.		
P10.7	Safety first	Describe how different objects are designed to reduce impact forces. Explain how a crumple zone reduced the impact force on a person.		
P10.8	Forces and elasticity	State Hooke's law as F=ke. Describe an experiment to investigate the spring constant of an object. Explain what is meant by the terms elastic, limit of proportionality, permanent deformation, elastic limit.		
P11	Force and pressure			
P11.1	Pressure and surfaces	Define pressure as force per unit area. Use the pressure equation to calculate pressure, force or area. Describe the pressure in different situations.		
P11.2	Pressure in a liquid at rest	State that the force from a liquid is perpendicular to the surface. Use the equation for pressure in a column of liquid and state the units of pressure. Explain why the pressure in colour increases as the height or fluid above it increase or density increases.		
P11.3	Atmospheric pressure	Describe what happens to the atmospheric pressure and density as altitude increases. Explain why atmospheric pressure decreases with altitude.		
P11.4	Upthrust and floatation	Explain what causes upthrust. Describe the factors that affect if an object floats or sinks.		
P12	Wave properties			
P12.1	The nature of waves	Define what a wave is. Define what a longitudinal wave is and give examples. Define what a transverse wave is and give examples. Identify area of compression and rarefaction in a longitudinal wave.		
P12.2	The properties of waves	Describe wave motion in terms of amplitude, wavelength, frequency and period. Define amplitude of a wave. Use the equation for frequency and time period to calculate either. Define the frequency of a wave. Describe a method to find the speed, frequency and wavelength of ripples in a ripple tank.		
P12.3	Reflection and refraction	Describe what reflection is. Describe what refraction is with reference to the change in speed of a wave between two mediums. Construct a ray diagram to show refraction at the boundary between two mediums.		
P12.4	More about waves	Describe an experiment to find the speed, frequency and wavelength of waves on a string. Describe a method to find the speed of sound in air.		
P12.5	Sound waves	Explain what a sound wave is. Describe what affects the loudness to a sound wave. Describe how wavelength, frequency and wave speed change with medium.		
P12.6	The uses of ultrasound	Define ultrasound and give the range of human hearing. Explain the use of sound and ultrasound in medical scanning. Calculate the depth of an object or boundary in echo location.		
P12.7	Seismic waves	State what a seismic wave is. Describe how seismic waves are formed and the properties of primary and secondary waves. Explain how seismic waves are used to determine the structure of the Earth.		
P13	Electromagnetic waves			
P13.1	The electromagnetic spectrum	State the parts of the electromagnetic spectrum. State and use the equation for the speed of a wave. State which part of the EM spectrum we can detect with our eyes.		
P13.2	Light, infrared, microwaves, and radio waves	Describe the properties of white light. State uses of infrared, microwaves, and radio waves. Describe an experiment into the emission of infra-red radiation from different surfaces.		
P13.3	Communications	Describe how radio waves are formed by oscillations in a electrical circuit. Describe how radio waves can produce alternating currents with the same frequency. Explain how the properties of light, infrared, microwaves, and radio waves make them suitable for an application		
P13.4	Ultraviolet waves, x-rays, and gamma rays	State what Ionising radiation is. Describe the uses of ultraviolet, x-rays, and gamma rays. Explain why ultraviolet waves, x-rays, and gamma rays are dangerous.		
P13.5	X-rays in medicine	Explain how x-rays can be used in medical imaging. Describe what is meant by a radiation dose. Explain the use of x-rays in treating cancer.		

P14	Light			
P14.1	Reflection of light	Construct a ray diagram for the reflection of light. Label the angle to incidence, reflection, and normal on a ray diagram. Describe the relationship between the angle of incidence and angle of reflection.		
P14.2	Refraction of light	Describe how to carry out an investigation into refraction at a boundary between 2 media. Construct a wave front diagram to show refraction.		
P14.3	Light and colour	Describe what specular and diffuse reflection are. Describe how colour filters work by absorbing and transmitting certain wavelengths. Explain how the colour of an objects is determined by what colours are absorbed or reflected by the surface.		
P14.4	Lenses	Describe what convex and concave lenses are. Identify the principal axis, principal focus and focal length for a lens. Calculate the magnification of a lens from the image and object height.		
P14.5	Using lenses	Construct a ray diagram for a convex lens. Construct a ray diagram for a concave lens. Describe the image formed by a lens, e.g. virtual, diminished, inverted.		
P15	Electromagnetism			
P15.1	Magnetic fields	Describe the attraction and repulsion between link and unlike poles. Describe the difference between permanent and induced magnets. State what a magnetic field is. Explain how to plot and draw the magnetic field lines of a bar magnet. Explain how the behaviour of a compass is related to the core of the Earth.		
P15.2	Magnetic fields of electric currents	State that a current carrying wire causes a magnetic field and describe its shape. State what a solenoid is. Describe the shape and strength of a magnetic field around a solenoid. Explain how to increase the strength of a magnetic field around a solenoid.		
P15.3	Electromagnets in devices	Explain how electromagnets are used in circuit breakers, bells, and relays. Interpret diagrams of electromagnetic devices to explain how they work.		
P15.4	The motor effect	State and use Flemings left hand rule. Use the equation for the force on a current carrying wire in a magnetic field. Explain how a motor works. Explain how the speed of a motor can be increased. Explain how a loudspeaker works.		
P15.5	The generator effect	Explain how a potential difference can be included in a wire. Describe the factors that affect the size and direction of the induced potential difference/induced current. Apply the principles of the generator effect in different contexts.		
P15.6	The alternating current generator	Explain how the generator effect is used in an alternator to generate AC and in a dynamo to generate DC. Draw and interpret graphs of potential difference generated against time. Explain how a microphone works.		
P15.7	Transformers	Explain what a transformer is. Explain how a transformer works in terms of alternating current. Explain the difference between a step up and step down transformer and how the ratio of potential differences across the two coils depends on the ration of the number of turns.		
P15.8	Transformers in action	Calculate the current drawn from a supply in order to provide a particular power output. Use the equation linking potential difference and number of turns of the primary and secondary coils. Explain the advantages of transmission at high potential differences.		
P16	Space			
P16.1	Formation of the solar system	Describe the formation of the sun. Explain why the sun is stable due to the equilibrium between the gravitational pull inwards and the pressure due to fusion outwards.		
P16.2	The life history of a star	Describe the life cycle of a star the size of the Sun. Describe the life cycle of a star much more massive than the Sun. Explain how the fusion process in stars leads to the formation of new elements.		
P16.3	Planets, satellites, and orbits	Describe the similarities and difference between planets, moons, and artificial satellites. Explain for circular orbits the direction of the force of gravity and how it can lead to changing velocity but unchanged speed. Explain how for a stable orbit the radius must change if the speed changes.		
P16.4	The expanding Universe	Describe what the red-shift of light is. Describe the relationship between the red-shift of galaxies with their motion and distance. Explain how the red-shift of distant galaxies provides evidence for an expanding universe.		
P16.5	The beginning and future of the Universe	Describe the Big Bang theory. Explain what evidence supports the big bang theory. Understand that there are still parts of the Universe that are not understood such as dark matter and dark energy.		