Personalised Learning Checklists AQA Physics Paper 2

Topic	Student Checklist	R	A	G
AQA Physics (8463) Topics P4.5. Forces				
4.5.1 Forces and their interactions	Identify and describe scalar quantities and vector quantities			
	Identify and give examples of forces as contact or non-contact forces			
	Describe the interaction between two objects and the force produced on each as a vector			
	Describe weight and explain that its magnitude at a point depends on the gravitational field strength			
	Calculate weight by using the equation: *[W = mg]*			
	Represent the weight of an object as acting at a single point which is referred to as the object's 'centre of mass'			
	Calculate the resultant of two forces that act in a straight line			
4.5.2 Work done and energy	Describe energy transfers involved when work is done and calculate the work done by using the equation: *[W = Fs]*			
	Describe what a joule is and state what the joule is derived from			
	Convert between newton-metres and joules.			
	Explain why work done against the frictional forces acting on an object causes a rise in the temperature of the object			
4.5.3 Forces and elasticity	Describe examples of the forces involved in stretching, bending or compressing an object			
	Explain why, to change the shape of an object (by stretching, bending or compressing), more than one force has to be applied – this is limited to stationary objects only			
	Describe the difference between elastic deformation and inelastic deformation caused by stretching forces			
	Describe the extension of an elastic object below the limit of proportionality and calculate it by applying the equation: *[F = ke]*			
	Explain why a change in the shape of an object only happens when more than one force is applied			
	Describe and interpret data from an investigation to explain possible causes of a linear and non-linear relationship between force and extension			
	Calculate work done in stretching (or compressing) a spring (up to the limit of proportionality) by applying, but not recalling, the equation: *[E_e= ½ke^2]*			
	Required practical 6: *investigate the relationship between force and extension for a spring.*			
4.5.4 Moments, levers and gears	*PHY ONLY: State that a body in equilibrium must experience equal sums of clockwise and anticlockwise moments, apply the equation: [M = Fd]*			
	PHY ONLY: Apply the idea that a body in equilibrium experiences an equal total of clockwise and anti-clockwise moments about any pivot			
	PHY ONLY: Explain why the distance, d, must be taken as the perpendicular distance from the line of action of the force to the pivot			
	PHY ONLY: Explain how levers and gears transmit the rotational effects of forces			

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4.5.5 Pressure and pressure differences in fluid	*PHY ONLY: Describe a fluid as either a liquid or a gas and explain that the pressure in a fluid causes a force to act at right angles (normal) to the surface of its container*			
	PHY ONLY: Apply the equation: [p = F/A]			
	PHY ONLY: Describe a simple model of the Earth's atmosphere and of atmospheric pressure, explaining why atmospheric pressure varies with height above a surface			
4.5.6 Forces and motion	Define distance and displacement and explain why they are scalar or vector quantities			
	Express a displacement in terms of both the magnitude and direction			
	Explain that the speed at which a person can walk, run or cycle depends on a number of factors and recall some typical speeds for walking, running, cycling			
	Make measurements of distance and time and then calculate speeds of objects in calculating average speed for non-uniform motion			
	Explain why the speed of wind and of sound through air varies and calculate speed by applying the equation: *[s = v t]*			
	Explain the vector–scalar distinction as it applies to displacement, distance, velocity and speed			
	Represent an object moving along a straight line using a distance-time graph, describing its motion and calculating its speed from the graph's gradient			
	Draw distance–time graphs from measurements and extract and interpret lines and slopes of distance–time graphs,			
	Describe an object which is slowing down as having a negative acceleration and estimate the magnitude of everyday accelerations			
	Calculate the average acceleration of an object by applying the equation: *[a = Δv/t]*			
	Represent motion using velocity–time graphs, finding the acceleration from its gradient and distance travelled from the area underneath			
	Apply, but not recall, the equation: *[v² − u² = 2as]*			
	PHY ONLY: Draw and interpret velocity-time graphs for objects that reach terminal velocity			
	PHY ONLY: Interpret and explain the changing motion of an object in terms of the forces acting on it			
	PHY ONLY: Explain how an object falling from rest through a fluid due to gravity reaches its terminal velocity			
	Explain the motion of an object moving with a uniform velocity and identify that forces must be in effect if its velocity is changing, by stating and applying Newton's First Law			
	Define and apply Newton's second law relating to the acceleration of an object			
	Apply the equation: *[F = ma]*			
	HT ONLY: Describe what inertia is and give a definition			
	Estimate the speed, accelerations and forces of large vehicles involved in everyday road transport			
	***Required practical 7:** investigate the effect of varying the force on the acceleration of an object of constant mass, and the effect of varying the mass of an object on the acceleration*			

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		R	A	G
Apply Newton's Third Law to examples of equilibrium situations				
Describe factors that can affect a driver's reaction time				
Explain methods used to measure human reaction times and recall typical results				
Interpret and evaluate measurements from simple methods to measure the different reaction times of students				
Evaluate the effect of various factors on thinking distance based on given data				
PHY ONLY: Estimate the distance required for an emergency stop in a vehicle over a range of typical speeds				
PHY ONLY: Interpret graphs relating speed to stopping distance for a range of vehicles				
State typical reaction times and describe how reaction time (and therefore stopping distance) can be affected by different factors				
Explain methods used to measure human reaction times and take, interpret and evaluate measurements of the reaction times of students				
Explain how the braking distance of a vehicle can be affected by different factors, including implications for road safety				
Explain how a braking force applied to the wheel does work to reduce the vehicle's kinetic energy and increases the temperature of the brakes				
Explain and apply the idea that a greater braking force causes a larger deceleration and explain how this might be dangerous for drivers				
HT ONLY: Estimate the forces involved in the deceleration of road vehicles				

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AQA Physics (8463) Topics P4.6. Waves			
Topic / **Student Checklist**	**R**	**A**	**G**
Describe waves as either transverse or longitudinal, defining these waves in terms of the direction of their oscillation and energy transfer and giving examples of each			
Define waves as transfers of energy from one place to another, carrying information			
Define amplitude, wavelength, frequency, period and wave speed and Identify them where appropriate on diagrams			
State examples of methods of measuring wave speeds in different media and Identify the suitability of apparatus of measuring frequency and wavelength			
Calculate wave speed, frequency or wavelength by applying, the equation: *[v = f λ]* *and* calculate wave period by applying the equation: *[T = 1/f]*			
Identify amplitude and wavelength from given diagrams			
Describe a method to measure the speed of sound waves in air			
Describe a method to measure the speed of ripples on a water surface			
PHY ONLY: Demonstrate how changes in velocity, frequency and wavelength are inter-related in the transmission of sound waves from one medium to another			
Required practical 8: make observations to identify the suitability of apparatus to measure the frequency, wavelength and speed of waves in a ripple tank and waves in a solid			
PHY ONLY: Discuss the importance of understanding both mechanical and electromagnetic waves by giving examples, such as designing comfortable and safe structures and technologies			
PHY ONLY: Describe a wave's ability to be reflected, absorbed or transmitted at the boundary between two different materials			
PHY ONLY: Draw the reflection of a wave at a surface by constructing ray diagrams			
Required practical 9 (physics only): investigate the reflection of light by different types of surface and the refraction of light by different substances.			

(Topic label (vertical): 4.6.1 Waves in air, fluids and solids)

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		R	A	G
	Describe what electromagnetic waves are and explain how they are grouped			
	List the groups of electromagnetic waves in order of wavelength			
	Explain that because our eyes only detect a limited range of electromagnetic waves, they can only detect visible light			
4.6.2 Electromagnetic waves				
	Illustrate the refraction of a wave at the boundary between two different media by constructing ray diagrams			
	Required practical activity 10: investigate how the amount of infrared radiation absorbed or radiated by a surface depends on the nature of that surface.			
	Explain that changes in atoms and the nuclei of atoms can result in electromagnetic waves being generated or absorbed over a wide frequency range			
	State examples of the dangers of each group of electromagnetic radiation and discuss the effects of radiation as depending on the type of radiation and the size of the dose			
	State examples of the uses of each group of electromagnetic radiation, explaining why each type of electromagnetic wave is suitable for its applications			
	PHY ONLY: State that a lens forms an image by refracting light and that the distance from the lens to the principal focus is called the focal length			
	PHY ONLY: Explain that images produced by a convex lens can be either real or virtual, but those produced by a concave lens are always virtual			
	PHY ONLY: Construct ray diagrams for both convex and concave lenses			
	PHY ONLY: Calculate magnification as a ratio with no units by applying, but not recalling, the formula: [magnification = image height / object height]			
	PHY ONLY: Explain how the colour of an object is related to the differential absorption, transmission and reflection of different wavelengths of light by the object			
	PHY ONLY: Describe the effect of viewing objects through filters or the effect on light of passing through filters and the difference between transparency and translucency			
	PHY ONLY: Explain why an opaque object has a particular colour, with reference to the wavelengths emitted			
	PHY ONLY: State that all bodies, no matter what temperature, emit and absorb infrared radiation and that the hotter the body, the more infrared radiation it radiates in a given time			
	PHY ONLY: Describe a perfect black body as an object that absorbs all the radiation incident on it and explain why it is the best possible emitter			
	PHY ONLY: Explain why when the temperature is increased, the intensity of every wavelength of radiation emitted increases, but the intensity of the shorter wavelengths increases more rapidly			

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AQA Physics (8463) Topics P4.7. Magnetism and electromagnetism		R	A	G
TOPIC	**Student Checklist**	**R**	**A**	**G**
4.7.1 Permanent and induced magnetism, magnetic forces and fields	Describe the attraction and repulsion between unlike and like poles of permanent magnets and explain the difference between permanent and induced magnets			
	Draw the magnetic field pattern of a bar magnet, showing how field strength and direction are indicated and change from one point to another			
	Explain how the behaviour of a magnetic compass is related to evidence that the core of the Earth must be magnetic			
	Describe how to plot the magnetic field pattern of a magnet using a compass			
4.7.2 The motor effect	State examples of how the magnetic effect of a current can be demonstrated and explain how a solenoid arrangement can increase the magnetic effect of the current			
	Draw the magnetic field pattern for a straight wire carrying a current and for a solenoid (showing the direction of the field)			
	PHY ONLY: Interpret diagrams of electromagnetic devices in order to explain how they work			

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AQA Physics (8463) from 2016 Topics P4.8. Space physics				
TOPIC	**Student Checklist**	**R**	**A**	**G**
4.8.1 Solar system; stability of orbital motions; satellites	*PHY ONLY: List the types of body that make up the solar system and describe our solar system as part of a galaxy*			
	PHY ONLY: Explain how stars are formed			
	PHY ONLY: Describe the life cycle of a star the size of the Sun and of a star which is much more massive than the Sun			
	PHY ONLY: Explain how fusion processes lead to the formation of new elements and how supernovas have allowed heavy elements to appear in later solar systems			
4.8.2 Red-shift	*PHY ONLY: Explain, qualitatively, the red-shift of light from galaxies that are receding and how this red-shift changes with distance from Earth*			
	PHY ONLY: Explain why the change of each galaxy's speed with distance is evidence of an expanding universe			
	PHY ONLY: Explain how scientists are able to use observations to arrive at theories, such as the Big Bang theory and discuss that there is still much about the universe that is not understood			