VCE Physics

Exam Planner

Your guide for exam goal-setting, preparation and success.

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Subject: Physics

EXAM DATE ....

GOAL ....

Topic: How do things move without contact?	Do I have it in my notes?	Note-making deadline	Memorising deadline
Describe gravitation, magnetism and electricity using a field model			
Investigate and compare theoretically and practically gravitational, magnetic and electric fields, including directions and shapes of fields, attractive and repulsive fields, and the existence of dipoles and monopoles			
Investigate and compare theoretically and practically gravitational fields and electrical fields about a point mass or charge (positive or negative) with reference to:			
– The direction of the field			
– The shape of the field			
– The use of the inverse square law to determine the magnitude of the field			
– Potential energy changes (qualitative) associated with a point mass or charge moving in the field			
Investigate and apply theoretically and practically a vector field model to magnetic phenomena, including shapes and directions of fields produced by bar magnets, and by current-carrying wires, loops and solenoids			
Identify fields as static or changing, and as uniform or non-uniform.			
Analyse the use of an electric field to accelerate a charge, including:			
– Electric field and electric force concepts: $E = k\frac{Q}{r^2}$ and $F = k\frac{q_1 q_2}{r^2}$			
– Potential energy changes in a uniform electric field: $w = qV$, $E = \frac{V}{d}$			
– The magnitude of the force on a charged particle due to a uniform electric field: $F = qE$			

Analyse the use of a magnetic field to change the path of a charged particle, including:			
- The magnitude and direction of the force applied to an electron beam by a magnetic field: F = qvB, in cases where the directions of v and B are perpendicular or parallel			
– The radius of the path followed by a low-velocity electron in a magnetic field: $qvB = \frac{mv^2}{r}$			
Analyse the use of gravitational fields to accelerate mass, including:			
– Gravitational field and gravitational force concepts: $g = G\frac{M}{r^2}$ and $F_g = G\frac{M_1M_2}{r^2}$			
– Potential energy changes in a uniform gravitational field: Eg = $E_g = m_g\Delta h$			
– The change in gravitational potential energy from area under a force-distance graph and area under a field-distance graph multiplied by mass.			
Apply the concepts of force due to gravity, F_g, and normal reaction force, F_N, including satellites in orbit where the orbits are assumed to be uniform and circular			
Model satellite motion (artificial, Moon, planet) as uniform circular orbital motion: $a = \frac{v^2}{r} = \frac{4\pi^2 r}{T^2}$			
Describe the interaction of two fields, allowing that electric charges, magnetic poles and current carrying conductors can either attract or repel, whereas masses only attract each other			
Investigate and analyse theoretically and practically the force on a current carrying conductor due to an external magnetic field, $F = nIlB$, where the directions of *I* and *B* are either perpendicular or parallel to each other			
Investigate and analyse theoretically and practically the operation of simple DC motors consisting of one coil, containing a number of loops of wire, which is free to rotate about an axis in a uniform magnetic field and including the use of a split ring commutator			
Model the acceleration of particles in a particle accelerator (limited to linear acceleration by a uniform electric field and direction change by a uniform magnetic field).			

Topic: How are fields used to move to electrical energy?	Do I have it in my notes?	Note-making deadline	Memorising deadline
Calculate magnetic flux when the magnetic field is perpendicular to the area, and describe the qualitative effect of differing angles between the area and the field: $\phi_B = B_{\perp}A$			
Investigate and analyse theoretically and practically the generation of electromotive force (emf) including - AC voltage and calculations using induced emf: $\varepsilon = -N\frac{\Delta\phi_B}{\Delta_t}$, with reference to:			
– Rate of change of magnetic flux			
– Number of loops through which the flux passes			
– Direction of induced emf in a coil			
Explain the production of DC voltage in DC generators and AC voltage in alternators, including the use of split ring commutators and slip rings respectively.			
Compare sinusoidal AC voltages produced as a result of the uniform rotation of a loop in a constant magnetic field with reference to frequency, period, amplitude, peak-to-peak voltage ($V_{(p-p)}$) and peak-to-peak current ($I_{(p-p)}$)			
Compare alternating voltage expressed as the root-mean-square (rms) to a constant DC voltage developing the same power in a resistive component			
Convert between rms, peak and peak-to-peak values of voltage and current			
Analyse transformer action with reference to electromagnetic induction for an ideal transformer: $\frac{N_1}{N_2} = \frac{V_1}{V_2} = \frac{I_1}{I_2}$			
Analyse the supply of power by considering transmission losses across transmission lines			
Identify the advantage of the use of AC power as a domestic power supply			

Topic: How fast can things go?	Do I have it in my notes?	Note-making deadline	Memorising deadline
Investigate and apply theoretically and practically Newton's three laws of motion in situations where two or more coplanar forces act along a straight line and in two dimensions			
Investigate and analyse theoretically and practically the uniform circular motion of an object moving in a horizontal plane: $\left(F_{net} = \frac{mv^2}{r}\right)$, including:			
– A vehicle moving around a circular road			
– A vehicle moving around a banked track			
– An object on the end of a string			
Model natural and artificial satellite motion as uniform circular motion			
Investigate and apply theoretically Newton's second law to circular motion in a vertical plane (forces at the highest and lowest positions only)			
Investigate and analyse theoretically and practically the motion of projectiles near Earth's surface, including a qualitative description of the effects of air resistance			
Investigate and apply theoretically and practically the laws of energy and momentum conservation in isolated systems in one dimension.			
Describe Einstein's two postulates for his theory of special relativity that:			
– The laws of physics are the same in all inertial (non-accelerated) frames of reference			
– The speed of light has a constant value for all observers regardless of their motion or the motion of the source			
Compare Einstein's theory of special relativity with the principles of classical physics			
Describe proper time (T_0) as the time interval between two events in a reference frame where the two events occur at the same point in space			
Describe proper length (L_0) as the length that is measured in the frame of reference in which objects are at rest			

Model mathematically time dilation and length contraction at speeds approaching c using the equations: $t = t_0\gamma$ and where $\gamma = \left(1 - \frac{v^2}{c^2}\right)^{-\frac{1}{2}}$			
Explain why muons can reach Earth even though their half-lives would suggest that they should decay in the outer atmosphere.			
Investigate and analyse theoretically and practically impulse in an isolated system for collisions between objects moving in a straight line: $F\Delta t = m\Delta v$			
Investigate and apply theoretically and practically the concept of work done by a constant force using:			
– Work done = constant force × distance moved in direction of net force			
– Work done = area under force-distance graph			
Analyse transformations of energy between kinetic energy, strain potential energy, gravitational potential energy and energy dissipated to the environment (considered as a combination of heat, sound and deformation of material):			
– Kinetic energy at low speeds: $E_k = \frac{1}{2}mv^2$; elastic and inelastic collisions with reference to conservation of kinetic energy			
– Strain potential energy: area under force-distance graph including ideal springs obeying Hooke's Law: $E_s = \frac{1}{2}k\Delta x^2$			
– Gravitational potential energy: $E_g = mg\Delta h$ or from area under a force-distance graph and area under a field-distance graph multiplied by mass			
Interpret Einstein's prediction by showing that the total 'mass-energy' of an object is given by: $E_{t_0t} = E_k + E_0 = \gamma mc^2$ where $E_0 = mc^2$, and where kinetic energy can be calculated by: $E_k = (\gamma - 1)mc^2$			
Describe how matter is converted to energy by nuclear fusion in the Sun, which leads to its mass decreasing and the emission of electromagnetic radiation.			

Topic: How can waves explain the behaviour of light?	Do I have it in my notes?	Note-making deadline	Memorising deadline
Explain a wave as the transmission of energy through a medium without the net transfer of matter			
Distinguish between transverse and longitudinal waves			
Identify the amplitude, wavelength, period and frequency of waves			
Calculate the wavelength, frequency, period and speed of travel of waves using: $v = f\lambda = \frac{\lambda}{t}$			
Investigate and analyse theoretically constructive and destructive interference from two sources with reference to coherent waves and path difference: $n\lambda$ and $\left(n - \frac{1}{2}\right)\lambda$respectively			
Explain qualitatively the Doppler effect			
Explain resonance as the superposition of a travelling wave and its reflection, and with reference to a forced oscillation matching the natural frequency of vibration			
Analyse the formation of standing waves in strings fixed at one or both ends			
Investigate and explain theoretically and practically diffraction as the directional spread of various frequencies with reference to different gap width or obstacle size, including the qualitative effect of changing the $\frac{\lambda}{w}$ ratio.			
Describe light as an electromagnetic wave which is produced by the acceleration of charges, which in turn produces changing electric fields and associated changing magnetic fields			
Identify that all electromagnetic waves travel at the same speed, C, in a vacuum			
Compare the wavelength and frequencies of different regions of the electromagnetic spectrum, including radio, microwave, infrared, visible, ultraviolet, x-ray and gamma, and identify the distinct uses each has in society			
Explain polarisation of visible light and its relation to a transverse wave mode			
Investigate and analyse theoretically and practically the behaviour of waves including:			

- Refraction using Snell's Law: $\mathrm{s\ in}(\theta_1) = n_2 \ \sin(\theta_2) = n_1 v_1 = n_2 v_2$			
- Total internal reflection and critical angle including applications: $n_1 \sin(\theta_c) = n_2 \sin(90°)$			
Investigate and explain theoretically and practically colour dispersion in prisms and lenses with reference to refraction of the components of white light as they pass from one medium to another			
Explain the results of Young's double slit experiment with reference to:			
- Evidence for the wave-like nature of light			
- Constructive and destructive interference of coherent waves in terms of path differences: nλ and $\left(n - \frac{1}{2}\right)\lambda$ respectively			
- Effect of wavelength, distance of screen and slit separation on interference patterns: $\Delta x = \frac{\lambda L}{d}$			

Topic: How are light and matter similar?	Do I have it in my notes?	Note-making deadline	Memorising deadline
Investigate and describe theoretically and practically the effects of varying the width of a gap or diameter of an obstacle on the diffraction pattern produced by light and apply this to limitations of imaging using light			
Analyse the photoelectric effect with reference to:			
– Evidence for the particle-like nature of light			
- Experimental data in the form of graphs of photocurrent versus electrode potential, and of kinetic energy of electrons versus frequency			
- Kinetic energy of emitted photoelectrons: = hf –, using energy units of joule and electron-volt			
-Effects of intensity of incident irradiation on the emission of photoelectrons			
Describe the limitation of the wave model of light in explaining experimental results related to the photoelectric effect.			

Interpret electron diffraction patterns as evidence for the wave-like nature of matter		
Distinguish between the diffraction patterns produced by photons and electrons		
Calculate the de Broglie wavelength of matter: $\lambda = \frac{h}{p}$		
Compare the momentum of photons and of matter of the same wavelength including calculations using: $p = \frac{h}{\lambda}$		
Explain the production of atomic absorption and emission line spectra, including those from metal vapour lamps		
Interpret spectra and calculate the energy of absorbed or emitted photons: $\Delta E = hf$		
analyse the absorption of photons by atoms, with reference to:		
– The change in energy levels of the atom due to electrons changing state		
– The frequency and wavelength of emitted photons: $E = hf = \frac{hc}{\lambda}$		
Describe the quantised states of the atom with reference to electrons forming standing waves, and explain this as evidence for the dual nature of matter		
Interpret the single photon/electron double slit experiment as evidence for the dual nature of light/matter		
Explain how diffraction from a single slit experiment can be used to illustrate Heisenberg's uncertainty principle		
Explain why classical laws of physics are not appropriate to model motion at very small scales.		
Compare the production of light in lasers, synchrotrons, LEDs and incandescent lights.		

Topic: Practical investigation	Do I have it in my notes?	Note-making deadline	Memorising deadline
Independent, dependent and controlled variables			
The physics concepts specific to the investigation and their significance, including definitions of key terms, and physics representations			
The characteristics of scientific research methodologies and techniques of primary qualitative and quantitative data collection relevant to the selected investigation, including experiments (gravity, magnetism, electricity, Newton’s laws of motion, waves) and/or the construction and evaluation of a device; precision, accuracy, reliability and validity of data; and the identification of, and distinction between, uncertainty and error			
Identification and application of relevant health and safety guidelines			
Methods of organising, analysing and evaluating primary data to identify patterns and relationships including sources of uncertainty and error, and limitations of data and methodologies			
Models and theories, and their use in organising and understanding observed phenomena and physics concepts including their limitations			
The nature of evidence that supports or refutes a hypothesis, model or theory			
The key findings of the analysis and evaluation of the investigation and their relationship to concepts associated with waves, fields and/or motion			
The conventions of scientific report writing and / or scientific poster presentation, including physics terminology and representations, symbols, equations and formulas, units of measurement, significant figures, standard abbreviations and acknowledgment of references.			

Practice Schedule

PRACTICE EXAM	DEADLINE
Practice Exam 1	
Practice Exam 2	
Practice Exam 3	
Practice Exam 4	
Practice Exam 5	
EXAM DATE:	

Congratulations!

You're ready! Now relax and think about how good it will feel leaving the exam room knowing the hard work has paid off. Congratulations and good luck (not that you need it)!

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