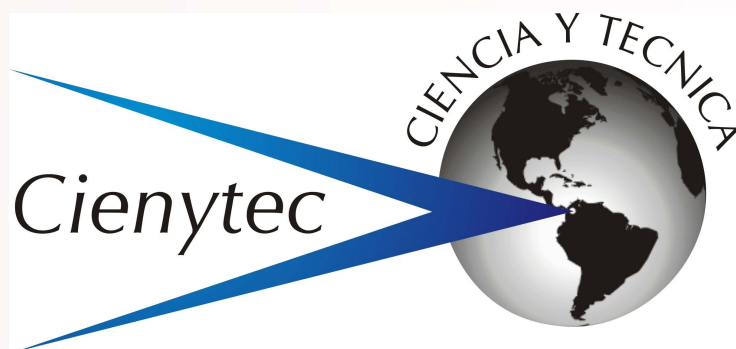


Programa de estudios de física

Distribuido en Colombia por:



Topic #1: Measurements and Uncertainties - 5 Hours for Both SL and HL			VRLab Academy Experiment
Subtopic	Subtopic Number	Points to Understand	<u>Measurements and Failure Experiments</u>
Measurements in physics	1,1	• Fundamental and derived SI units • Scientific notation and metric multipliers • Significant figures • Orders of magnitude • Estimation	
Uncertainties and errors	1,2	• Random and systematic errors • Absolute, fractional and percentage uncertainties • Error bars • Uncertainty of gradient and intercepts	
Vectors and scalars	1,3	• Vector and scalar quantities • Combination and resolution of vectors	

Topic #2: Mechanics - 22 Hours for Both SL and HL			VRLab Academy Experiment
Subtopic	Subtopic Number	Points to Understand	
Motion	2,1	- Distance and displacement - Speed and velocity - Acceleration - Graphs describing motion - Equations of motion for uniform acceleration - Projectile motion - Fluid resistance and terminal speed	<u>Air Table Experiment</u>
Forces	2,2	- Objects as point particles - Free-body diagrams - Translational equilibrium - Newton's laws of motion - Solid friction	<u>Balistic Pendulum and Projectile Motion Experiment</u>
Work, energy and power	2,3	- Kinetic energy - Gravitational potential energy - Elastic potential energy - Work done as energy transfer - Power as rate of energy transfer - Principle of conservation of energy - Efficiency	<u>Air Track Experiment</u>
Momentum and impulse	2,4	- Newton's second law expressed in terms of rate of change of momentum - Impulse and force–time graphs - Conservation of linear momentum - Elastic collisions, inelastic collisions and explosions	

Topic #3: Thermal Physics - 11 Hours for Both SL and HL			VRLab Academy Experiment
Subtopic	Subtopic Number	Points to Understand	<u>Ideal Gas Laws Experiment</u>
Thermal concepts	3,1	• Molecular theory of solids, liquids and gases • Temperature and absolute temperature • Internal energy • Specific heat capacity • Phase change • Specific latent heat	
Modelling a gas	3,2	• Pressure • Equation of state for an ideal gas • Kinetic model of an ideal gas • Mole, molar mass and the Avogadro constant • Differences between real and ideal gases	

Topic #4: Waves - 15 Hours for Both SL and HL			VRLab Academy Experiment
Subtopic	Subtopic Number	Points to Understand	<i><u>Young Experiment Set</u></i> <i><u>Ripple Tank Experiment</u></i>
Oscillations	4,1	• Simple harmonic oscillations • Time period, frequency, amplitude, displacement and phase difference • Conditions for simple harmonic motion	
Travelling waves	4,2	• Travelling waves • Wavelength, frequency, period and wave speed • Transverse and longitudinal waves • The nature of electromagnetic waves • The nature of sound waves	
Wave characteristics	4,3	• Wavefronts and rays • Amplitude and intensity • Superposition • Polarization	
Wave behaviour	4,4	• Reflection and refraction • Snell's law, critical angle and total internal reflection • Diffraction through a single-slit and around objects • Interference patterns • Double-slit interference • Path difference	
Wave behaviour	4,4	• Reflection and refraction • Snell's law, critical angle and total internal reflection • Diffraction through a single-slit and around objects • Double-slit interference • Path difference	
Standing waves	4,5	• The nature of standing waves • Boundary conditions • Nodes and antinodes	

Topic #5: Electricity and Magnetism - 15 Hours for Both SL and HL			VRLab Academy Experiment
Subtopic	Subtopic Number	Points to Understand	<u>Basic Electricity Experiment</u> <u>Current Balance Experiment</u>
Electric fields	5,1	• Charge • Electric field • Coulomb's law • Electric current • Direct current (dc) • Potential difference	
Heating effect of electric currents	5,2	• Circuit diagrams • Kirchhoff's circuit laws • Heating effect of current and its consequences • Resistance expressed as $R = V/I$ • Ohm's law • Resistivity • Power dissipation	
Electric cells	5,3	• Cells • Internal resistance • Secondary cells • Terminal potential difference • Electromotive force (emf)	
Magnetic effects of electric currents	5,4	• Magnetic fields • Magnetic force	

Topic #6: Circular Motion and Gravitation - 5 Hours for Both SL and HL			VRLab Academy Experiment
Subtopic	Subtopic Number	Points to Understand	<u>Free Fall Experiment</u> <u>Angular Velocity and Acceleration Experiment</u>
Circular motion	6,1	- Period, frequency, angular displacement and angular velocity - Centripetal force - Centripetal acceleration	
Newton's law of gravitation	6,2	- Newton's law of gravitation - Gravitational field strength	

Topic #7: Atomic, Nuclear and Particle Physics - 14 Hours for Both SL and HL			VRLab Academy Experiment
Subtopic	Subtopic Number	Points to Understand	Geiger Experiments
Discrete energy and radioactivity	7,1	- Discrete energy and discrete energy levels - Transitions between energy levels - Radioactive decay - Fundamental forces and their properties - Alpha particles, beta particles and gamma rays	
The structure of matter	7,2	Half-life	

Topic #8: Energy Production - 8 Hours for Both SL and HL			VRLab Academy Experiment
Subtopic	Subtopic Number	Points to Understand	<i>Renewable and Nonrenewable Energy Experiments</i>
Energy sources	8,1	• Specific energy and energy density of fuel sources • Sankey diagrams • Primary energy sources • Electricity as a secondary and versatile form of energy • Renewable and non-renewable energy sources	
Thermal energy transfer	8,2	• Conduction, convection and thermal radiation • Black-body radiation • Albedo and emissivity • The solar constant • The greenhouse effect • Energy balance in the Earth surface–atmosphere system	