The University of Tokyo, Komaba
Graduate School of Arts and Sciences, College of Arts and Sciences

PEAK Programs in English at Komaba

Expected background knowledge in Physics for students on the PEAK Environmental Sciences course

✘ - no coverage	L - very limited coverage	P - partial coverage	O - optional topic	✔ - covered

Subject	Coverage in common school examination systems				
	GCSE	IB Standard	SAT	A-level	IB Higher
1. Mechanics - motion and force					
a) Description of motion Velocity and acceleration, Free fall	✔	✔	✔	✔	✔
b) Various forces Gravity, Frictional force, Normal force, Tension, Elastic force, Force exerted by liquid or gas	P	✔	✔	✔	✔
c) Equilibrium of forces Resultant and resolution of forces, Equilibrium of forces Rigid bodies - Torque, Resultant forces, Coupling of forces, Equilibrium of rigid bodies, Center of mass	P	P	✔	✔	P
d) Laws of motion Newton's laws of motion, Unit of force and equation of motion, Systems of units and dimensions	L	✔	✔	✔	✔
e) Motion in the presence of friction and air resistance Static friction force, Kinetic friction force, Air resistance and terminal velocity	P	P	✔	✔	✔
2. Energy and momentum					
a) Work and kinetic energy Principle of work, power, kinetic energy	✔	✔	✔	✔	✔
b) Potential energy Potential energy due to gravity, due to elastic force	L	✔	✔	✔	✔
c) Conservation of mechanical energy	✔	✔	✔	✔	✔
d) Momentum and impulse Momentum and impulse, Law of conservation of momentum	P	✔	✔	✔	✔
e) Collision and fission Coefficient of restitution, Elastic collision, Inelastic collision	✘	✘	✔	P	P
3. Thermodynamics					
a) Temperature and heat Temperature, Heat quantity and heat capacity, Specific heat, Conservation of heat quantity	P	✔	✔	✔	✔
b) Internal energy Melting point, Boiling point, Heat of fusion, Heat of evaporation, Latent heat, Heat and work, The first law of thermodynamics	✘	✔	✔	✔	✔
c) Properties of gases Boyle's law, Charles' law, ideal gas equation	✘	✔	✔	✔	✔
d) Conversion and conservation of various kinds of energy Conversion and conservation of energy, Irreversible change	P	P	✔	✔	✔
4. Waves - properties of waves					
a) Propagation of waves Medium, Wave source, Waveform, Period, Amplitude, Wave length, Wave velocity, Transverse and longitudinal waves	P	✔	✔	✔	✔
b) Superposition principle and interference Superposition principle, Interference, Standing / traveling waves	✘	✔	✔	✔	✔
c) Reflection, refraction, and diffraction of waves Huygens' principle, Law of reflection, Law of refraction, Refractive index, Diffraction	✘	✔	✔	✔	✔
d) Sound waves. Propagation of sound Speed, Reflection, Refraction, Diffraction, Interference, Beats	P	P	✔	✔	✔

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Subject	Coverage in common school examination systems				
	GCSE	IB Standard	SAT	A-level	IB Higher
5. Waves - Light					
a) Properties of light Various lights(visible light, white light, monochromatic light, light and color), Speed of light, Wavelength	✔	O	✔	✔	O
b) Reflection and refraction of light Reflection and refraction, Total reflection, Scattering of light, Lenses, Real and virtual images	P	O	✔	✔	O
c) Diffraction and interference of light Diffraction, Young's experiment(interference fringes, bright and dark lines), Diffraction grating	✘	O	✔	✔	O
d) Dispersion and polarization of light Dispersion of light, Spectrum.	✘	O	✔	✔	O
6. Electric current					
Electric current Electric current and electrons, Resistance, Ohm's law, Joule's heat, Electric power, Electric energy, Series and parallel connections of resistors, Ammeter, Voltmeter	P	✔	✔	✔	✔

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