

<p>CC4A Translational Motion</p> <ul style="list-style-type: none"> • Units and dimensions • Vectors, components • Vector addition • Speed, velocity (average and instantaneous) • Acceleration 	<p>PHY 201</p> <p>PHY201 does not cover items in heat, temperature, kinetic theory, and thermodynamics.</p>	1
<p>CC4A Equilibrium</p> <ul style="list-style-type: none"> • Concept of force, units • Analysis of forces acting on an object • Newton's First Law of Motion, inertia • Torques, lever arms 	<p>PHY 201 & CHM 124, 420, 451</p> <p>PHY201 does not cover items in heat, temperature, kinetic theory, and thermodynamics.</p>	
<p>CC4A Work (PHY)</p> <ul style="list-style-type: none"> • Derived units, sign conventions • Mechanical advantage • Work Kinetic Energy Theorem 	<p>PHY 201 & CHM 123</p> <p>PHY201 does not cover items in heat, temperature, kinetic theory, and thermodynamics.</p>	
<p>CC4A Energy</p> <ul style="list-style-type: none"> • Kinetic Energy: $KE = \frac{1}{2} mv^2$; units • Potential Energy <ul style="list-style-type: none"> ○ $PE = mgh$ (gravitational, local) ○ $PE = \frac{1}{2} kx^2$ (spring) • Conservation of energy • Conservative forces • Power, units 	<p>PHY 201 & CHM 123</p> <p>PHY201 does not cover items in heat, temperature, kinetic theory, and thermodynamics.</p>	
<p>CC4B Fluids</p> <ul style="list-style-type: none"> • Density, specific gravity • Buoyancy, Archimedes' Principle • Hydrostatic pressure <ul style="list-style-type: none"> ○ Pascal's Law ○ Hydrostatic pressure; $P = \rho gh$ (pressure versus depth) • Viscosity: Poiseuille Flow • Continuity equation ($A \cdot v = \text{constant}$) • Concept of turbulence at high velocities • Surface tension • Bernoulli's equation • Venturi effect, pitot tube 	<p>PHY 201</p> <p>PHY201 does not cover items in heat, temperature, kinetic theory, and thermodynamics..</p>	
<p>CC4B Gas Phase</p> <ul style="list-style-type: none"> • Absolute temperature, (K) Kelvin Scale • Pressure, simple mercury barometer • Molar volume at 0°C and 1 atm = 22.4 L/mol • Ideal gas <ul style="list-style-type: none"> ○ Definition ○ Ideal Gas Law: $PV = nRT$ ○ Boyle's Law: $PV = \text{constant}$ ○ Charles' Law: $V/T = \text{constant}$ 	<p>CHM 123</p>	

<ul style="list-style-type: none"> ○ Avogadro's Law: $V/n = \text{constant}$ • Kinetic Molecular Theory of Gases <ul style="list-style-type: none"> ○ Heat capacity at constant volume and at constant pressure (PHY) ○ Boltzmann's Constant (PHY) • Deviation of real gas behavior from Ideal Gas Law <ul style="list-style-type: none"> ○ Qualitative ○ Quantitative (Van der Waals' Equation) • Partial pressure, mole fraction • Dalton's Law relating partial pressure to composition 	2
CC4C Electrostatics <ul style="list-style-type: none"> • Charge, conductors, charge conservation • Insulators • Electric field \mathbf{E} <ul style="list-style-type: none"> ○ Field lines ○ Field due to charge distribution • Potential difference, absolute potential at point in space 	PHY 202
CC4C Circuit Elements <ul style="list-style-type: none"> • Current $I = \Delta Q/\Delta t$, sign conventions, units • Electromotive force, voltage • Resistance <ul style="list-style-type: none"> ○ Ohm's Law: $I = V/R$ ○ Resistors in series ○ Resistors in parallel ○ Resistivity: $\rho = R \cdot A/L$ • Capacitance <ul style="list-style-type: none"> ○ Parallel plate capacitor ○ Energy of charged capacitor ○ Capacitors in series ○ Capacitors in parallel ○ Dielectrics • Conductivity <ul style="list-style-type: none"> ○ Metallic ○ Electrolytic • Meters 	PHY 202
CC4D Sound <ul style="list-style-type: none"> • Production of sound • Relative speed of sound in solids, liquids, and gases • Intensity of sound, decibel units, log scale • Attenuation (Damping) • Doppler Effect: moving sound source or observer, reflection of sound from a moving object • Pitch • Resonance in pipes and strings • Ultrasound • Shock waves 	PHY 202

<p>CC4D Light, Electromagnetic Radiation</p> <ul style="list-style-type: none"> • Concept of Interference; Young Double-slit Experiment • Thin films, diffraction grating, single-slit diffraction • Other diffraction phenomena, X-ray diffraction • Polarization of light • Circular polarization • Properties of electromagnetic radiation <ul style="list-style-type: none"> ○ Velocity equals constant c, <i>in vacuo</i> ○ Electromagnetic radiation consists of perpendicularly oscillating electric and magnetic fields; direction of propagation is perpendicular to both • Classification of electromagnetic spectrum, photon energy $E = (hf)$ • Visual spectrum, color 	PHY 202 & CHM 123	3
<p>CC4D Geometrical Optics</p> <ul style="list-style-type: none"> • Reflection from plane surface: angle of incidence equals angle of reflection • Refraction, refractive index n, Snell's law: $n_1 \sin \theta_1 = n_2 \sin \theta_2$ • Dispersion, change of index of refraction with wavelength • Conditions for total internal reflection • Spherical mirrors <ul style="list-style-type: none"> ○ Center of curvature ○ Focal length ○ Real and virtual images • Thin lenses <ul style="list-style-type: none"> ○ Converging and diverging lenses ○ Use of formula $1/p + 1/q = 1/f$, with sign conventions ○ Lens strength, diopters • Combination of lenses • Lens aberration • Optical Instruments, including the human eye 	PHY 202	
<p>CC4E Atomic Nucleus</p> <ul style="list-style-type: none"> • Atomic number, atomic weight • Neutrons, protons, isotopes • Nuclear forces, binding energy • Radioactive decay <ul style="list-style-type: none"> ○ α, β, γ decay ○ Half-life, exponential decay, semi-log plots • Mass spectrometer 	CHM 123	
<p>CC4E Electronic Structure</p> <ul style="list-style-type: none"> • Orbital structure of hydrogen atom, principal quantum number n, number of electrons per orbital (GC) • Ground state, excited states 	PHY 202 & CHM 123 PHY202 does not cover items in nuclear physics.	

<ul style="list-style-type: none"> • Absorption and emission line spectra • Use of Pauli Exclusion Principle • Conventional notation for electronic structure (GC) • Bohr atom • Effective nuclear charge (GC) • Photoelectric effect 		4
<p>CC5E Energy Changes in Chemical Reactions - Thermochemistry, Thermodynamics</p> <ul style="list-style-type: none"> • Thermodynamic system – state function • Zeroth Law – concept of temperature • First Law: $\Delta E = Q - W$ (conservation of energy) • Second Law – concept of entropy <ul style="list-style-type: none"> ○ Entropy as a measure of “disorder” ○ Relative entropy for gas, liquid, and crystal states • Measurement of heat changes (calorimetry), heat capacity, specific heat • Heat transfer – conduction, convection, radiation (PHY) • Endothermic/exothermic reactions (GC) <ul style="list-style-type: none"> ○ Enthalpy, H, and standard heats of reaction and formation ○ Hess' Law of Heat Summation • Bond dissociation energy as related to heats of formation (GC) • Free energy: G (GC) • Spontaneous reactions and ΔG° (GC) • Coefficient of expansion (PHY) • Heat of fusion, heat of vaporization • Phase diagram: pressure and temperature 	CHM 123, 124	