

## Canada Physics Standards Correlation

Common Framework of Science Learning Outcomes, K to 12  
Grade 11-12 Physics

	Physics for Scientists and Engineers	Principles of Physics	Conceptual Physics
<b>Force, motion, and work</b>			
<i>It is expected that students will...</i>			
<b>325-5</b> use vectors to represent force, velocity, and acceleration	Chapter 3	Chapter 3	Chapter 3
<b>325-6</b> analyse quantitatively the horizontal and vertical motion of a projectile	4.8 - 4.17, 4.19 - 4.21	4.7 - 4.16, 4.18 - 4.20	4.3 - 4.12, 4.13
<b>325-7</b> identify the frame of reference for a given motion	4.22	4.21	4.14
<b>325-8</b> apply Newton's laws of motion to explain inertia, the relationship between force, mass, and acceleration, and the interaction of forces between two objects	Chapter 5	Chapter 5	Chapter 5
<b>325-9</b> analyse quantitatively the relationships among force, distance, and work	7.1 - 7.6	7.1 - 7.4	6.1 - 6.2
<b>325-10</b> analyse quantitatively the relationships among work, time, and power	7.15, 7.19	7.12, 7.16	6.9, 6.13
<b>325-11</b> analyse quantitatively two-dimensional motion in a horizontal plane and a vertical plane	Chapter 4	Chapter 4	Chapter 4
<b>325-12</b> describe uniform circular motion, using algebraic and vector analysis	Chapter 9	Chapter 9	Chapter 8
<b>325-13</b> explain quantitatively circular motion using Newton's laws	9.7, 9.10	9.6, 9.9	8.5
<b>Energy and momentum</b>			
<i>It is expected that students will...</i>			
<b>326-1</b> analyse quantitatively the relationships among mass, height, speed, and heat energy using the law of conservation of energy	Chapter 7	Chapter 7	Chapter 6
<b>326-2</b> apply quantitatively Newton's laws of motion to impulse and momentum	8.2, 8.8	8.2, 8.7	7.2, 7.6
<b>326-3</b> apply quantitatively the laws of conservation of momentum to one- and two-dimensional collisions and explosions	8.7, 8.9 - 8.13, 8.16 - 8.18, 8.21	8.6, 8.8 - 8.12, 8.15 - 8.17, 8.19	7.5, 7.7 - 7.10, 7.12

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<b>326-4</b> determine which laws of conservation of energy or momentum are best used to solve particular real-life situations involving elastic and inelastic collisions	Chapter 7 Chapter 8	Chapter 7 Chapter 8	Chapter 6 Chapter 7
<b>326-5</b> describe quantitatively mechanical energy as the sum of kinetic and potential energies	7.22	7.19	6.16
<b>326-6</b> analyse quantitatively problems related to kinematics and dynamics using the mechanical energy concept	7.14, 7.23 - 7.25	7.11, 7.20 - 7.22	6.8, 6.17 - 6.19
<b>326-7</b> analyse common energy transformation situations using the work-energy theorem	7.9 - 7.14	7.7 - 7.11	6.5 - 6.8
<b>326-8</b> determine the per cent efficiency of energy transformations	22.1	22.1	21.1
<b>326-9</b> apply quantitatively the law of conservation of mass and energy, using Einstein's mass-energy equivalence	41.23 - 41.26	40.16 - 40.19	35.12
<b>Waves</b>			
<i>It is expected that students will...</i>			
<b>327-1</b> describe the characteristics of longitudinal and transverse waves	16.2	16.2	15.2
<b>327-2</b> apply the wave equation to explain and predict the behaviour of waves	16.12 - 16.18	16.11 - 16.15	15.10
<b>327-3</b> explain quantitatively the relationships between displacement, velocity, time, and acceleration for simple harmonic motion	15.2 - 15.12	15.2 - 15.11	14.2 - 14.8
<b>327-4</b> explain quantitatively the relationship between potential and kinetic energies of a mass in simple harmonic motion	15.20 - 15.24	15.18 - 15.21	n/a
<b>327-5</b> compare and describe the properties of electromagnetic radiation and sound	Chapter 17 Chapter 35	Chapter 17 Chapter 34	Chapter 16 Chapter 30
<b>327-6</b> describe how sound and electromagnetic radiation, as forms of energy, are produced and transmitted	17.1 35.2	17.1 34.2	16.1 30.2
<b>327-7</b> apply the laws of reflection and the laws of refraction to predict wave behaviour	Chapter 36 Chapter 37	Chapter 35 Chapter 36	Chapter 31 Chapter 32

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<b>327-8</b> explain qualitatively and quantitatively the phenomena of wave interference, diffraction, reflection, and refraction, and the Doppler-Fizeau effect	17.14 - 17.20 Chapter 18 Chapter 36 Chapter 37 Chapter 39 Chapter 40	17.12 - 17.17 Chapter 18 Chapter 35 Chapter 36 Chapter 38 Chapter 39	16.7 - 16.8 Chapter 17 Chapter 31 Chapter 32 Chapter 34
<b>327-9</b> describe how the quantum energy concept explains black-body radiation and the photoelectric effect	42.3 42.6 - 42.7	41.3 41.6 - 41.7	36.5 - 36.6
<b>327-10</b> explain qualitatively and quantitatively the photoelectric effect	42.6 - 42.7	41.6 - 41.7	36.5 - 36.6
<b>327-11</b> summarize the evidence for the wave and particle models of light	Chapter 35 Chapter 39 Chapter 42	Chapter 34 Chapter 38 Chapter 41	Chapter 30 Chapter 34 Chapter 36
<b>Fields</b>			
<i>It is expected that students will...</i>			
<b>328-1</b> describe gravitational, electric, and magnetic fields as regions of space that affect mass and charge	13.10 Chapter 24 Chapter 30	Chapter 24 Chapter 30	Chapter 23 Chapter 28
<b>328-2</b> describe gravitational, electric, and magnetic fields by illustrating the source and directions of the lines of force	13.10, 24.4, 30.2	24.4, 30.2	23.4, 28.2
<b>328-3</b> describe electric fields in terms of like and unlike charges, and magnetic fields in terms of poles	24.4, 30.2	24.4, 30.2	23.4, 28.2
<b>328-4</b> compare Newton's universal law of gravitation and Coulomb's law, and apply both laws quantitatively	13.1 23.9 23.10 & 23.11	13.1 23.9 23.10 & 23.11	12.1 22.8 22.9 & 22.10
<b>328-5</b> analyse, qualitatively and quantitatively, the forces acting on a moving charge and on an electric current in a uniform magnetic field	Chapter 30 Chapter 31	Chapter 30 Chapter 31	Chapter 28 [currents in magnetic fields not covered]
<b>328-6</b> describe the magnetic field produced by current in both a solenoid and a long, straight conductor	31.1 31.17	31.1 31.9	n/a
<b>328-7</b> analyse, qualitatively and quantitatively, electromagnetic induction by both a changing magnetic flux and a moving conductor	32.1 - 32.5 32.7 - 32.9	32.1 - 32.5 32.7 - 32.9	29.1 - 29.5 29.7 - 29.8

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<b>328-8</b> develop and compare expressions used when measuring gravitational, electric, and magnetic fields and forces	13.10 Chapter 24 Chapter 30	Chapter 24 Chapter 30	Chapter 23 Chapter 28
<b>328-9</b> compare the way a motor and a generator function, using the principles of electromagnetism	30.27 32.17	30.26 32.14	28.19 [generators not covered]
<b>Radioactivity and modern physics</b>			
<i>It is expected that students will...</i>			
<b>329-1</b> explain quantitatively the Compton effect and the de Broglie hypothesis, using the laws of mechanics, the conservation of momentum, and the nature of light	43.1 - 43.2, 43.4	42.1 - 42.2, 42.4	37.1 - 37.2
<b>329-2</b> explain quantitatively the Bohr atomic model as a synthesis of classical and quantum concepts	42.9 - 42.11	41.9 - 41.10	36.8
<b>329-3</b> explain the relationship between the energy levels in Bohr's model, the energy difference between the levels, and the energy of the emitted photons	42.12 - 42.13	41.11 - 41.12	36.9 - 36.10
<b>329-4</b> describe the products of radioactive decay and the characteristics of alpha, beta, and gamma radiation	44.15 - 44.17	43.15 - 43.17	38.15 - 38.16
<b>329-5</b> describe sources of radioactivity in the natural and constructed environments	44.13, 44.19	43.13, 43.19	38.13
<b>329-6</b> compare and contrast qualitatively and quantitatively nuclear fission and fusion	44.13, 44.14	43.13, 43.14	38.13, 38.14
<b>329-7</b> use the quantum mechanical model to explain natural luminous phenomena	42.22	41.21	36.18