

# NORTH CAROLINA COMPETENCY GOALS

## Physics: Grades 9-12

### Correlation to CORD's *Physics in Context*

Competency	Correlation to PIC
<b>COMPETENCY GOAL 1: The learner will develop abilities necessary to do and understand scientific inquiry.</b>	
1.01 Identify questions and problems that can be answered through scientific investigations.	Embedded throughout student text and lab manual
1.02 Design and conduct scientific investigations to answer questions about the physical world.	
<ul style="list-style-type: none"> <li>• Create testable hypotheses.</li> </ul>	Embedded throughout lab manual
<ul style="list-style-type: none"> <li>• Identify variables.</li> </ul>	Embedded throughout student text and lab manual
<ul style="list-style-type: none"> <li>• Use a control or comparison group when appropriate.</li> </ul>	Embedded throughout lab manual
<ul style="list-style-type: none"> <li>• Select and use appropriate measurement tools.</li> </ul>	Embedded throughout lab manual
<ul style="list-style-type: none"> <li>• Collect and record data.</li> </ul>	Embedded throughout lab manual
<ul style="list-style-type: none"> <li>• Organize data into charts and graphs.</li> </ul>	Lab 1.1, Lab 2.1, Lab 3.1, Lab 3.3, Lab 3.4, Lab 4.2, Lab 5.2, Lab 9.2, Lab 10.1, Lab 10.2
<ul style="list-style-type: none"> <li>• Analyze and interpret data.</li> </ul>	Embedded throughout student text and lab manual
<ul style="list-style-type: none"> <li>• Communicate findings.</li> </ul>	Embedded throughout student text and lab manual
1.03 Formulate and revise scientific explanations and models using logic and evidence to:	
<ul style="list-style-type: none"> <li>• Explain observations.</li> </ul>	Embedded throughout student text and lab manual
<ul style="list-style-type: none"> <li>• Make inferences and predictions.</li> </ul>	Embedded throughout student text and lab manual
<ul style="list-style-type: none"> <li>• Explain the relationship between evidence and explanation.</li> </ul>	Embedded throughout student text and lab manual
1.04 Apply safety procedures in the laboratory and in field studies:	
<ul style="list-style-type: none"> <li>• recognize and avoid potential hazards.</li> </ul>	Lab SF 4, Lab SF 5, Lab SF 6, Lab SF 7
<ul style="list-style-type: none"> <li>• safely manipulate materials and equipment needed for scientific investigations.</li> </ul>	Lab SF 4, Lab SF 5, Lab SF 6, Lab SF 7

Competency	Correlation to PIC
1.05 Analyze reports of scientific investigations of physical phenomena from an informed scientifically literate viewpoint including considerations of:	
<ul style="list-style-type: none"> <li>Adequacy of experimental controls.</li> </ul>	Embedded throughout student text and lab manual
<ul style="list-style-type: none"> <li>Replication of findings.</li> </ul>	Embedded throughout student text and lab manual
<ul style="list-style-type: none"> <li>Alternative interpretations of the data.</li> </ul>	Embedded throughout student text and lab manual
<b>COMPETENCY GOAL 2: The learner will build an understanding of linear motion.</b>	
2.01 Analyze velocity as a rate of change of position:	
<ul style="list-style-type: none"> <li>Average velocity.</li> </ul>	122-128
<ul style="list-style-type: none"> <li>Instantaneous velocity.</li> </ul>	130
2.02 Compare and contrast as scalar and vector quantities:	
<ul style="list-style-type: none"> <li>Speed and velocity.</li> </ul>	125-127
<ul style="list-style-type: none"> <li>Distance and displacement.</li> </ul>	126
2.03 Analyze acceleration as rate of change in velocity.	128-131
2.04 Using graphical and mathematical tools, design and conduct investigations of linear motion and the relationships among:	
<ul style="list-style-type: none"> <li>Position.</li> </ul>	Lab 3.1, 6.1
<ul style="list-style-type: none"> <li>Average velocity.</li> </ul>	Lab 3.1, 6.1
<ul style="list-style-type: none"> <li>Instantaneous velocity</li> </ul>	Lab 3.1
<ul style="list-style-type: none"> <li>Acceleration.</li> </ul>	Lab 3.1
<ul style="list-style-type: none"> <li>Time.</li> </ul>	Lab 3.1, 6.1
<b>COMPETENCY GOAL 3: The learner will build an understanding of two-dimensional motion including circular motion.</b>	
3.01 Analyze and evaluate projectile motion in a defined frame of reference.	www.learningincontext.com Chapter 3.1 link
3.02 Design and conduct investigations of two-dimensional motion of objects.	24, 136
3.03 Analyze and evaluate independence of the vector components of projectile motion.	www.learningincontext.com Chapter 3.1 link
3.04 Evaluate, measure, and analyze circular motion.	89-90, 126, 131-135, 137, 232-237, 240-242, 471, Lab 7.2
3.05 Analyze and evaluate the nature of centripetal forces.	471, Lab 7.2
3.06 Investigate, evaluate and analyze the relationship among:	
<ul style="list-style-type: none"> <li>Centripetal force.</li> </ul>	Lab 7.2
<ul style="list-style-type: none"> <li>Centripetal acceleration.</li> </ul>	471, Lab 7.2
<ul style="list-style-type: none"> <li>Mass.</li> </ul>	232-237, 240-242, 339-350, Lab 7.2
<ul style="list-style-type: none"> <li>Velocity.</li> </ul>	131-134, 137, 233, 232-237, 240-242, 339-350, 471, Lab 7.2
<ul style="list-style-type: none"> <li>Radius.</li> </ul>	232-237, 240-242, 131-134, 137, 339-350, 471, Lab 7.2
<b>COMPETENCY GOAL 4: The learner will develop an understanding of forces and Newton's Laws of Motion.</b>	
4.01 Determine that an object will continue in its state of motion unless acted upon by a net outside force (Newton's First Law of Motion, The Law of Inertia).	12, 17, 23-24

Competency	Correlation to PIC
4.02 Assess, measure and calculate the conditions required to maintain a body in a state of static equilibrium.	9-14, 24, 173-174
4.03 Assess, measure, and calculate the relationship among the force acting on a body, the mass of the body, and the nature of the acceleration produced (Newton's Second Law of Motion).	173-174, 328-332, 341-344, 349
4.04 Analyze and mathematically describe forces as interactions between bodies (Newton's Third Law of Motion).	332-338
4.05 Assess the independence of the vector components of forces.	8-16
4.06 Investigate, measure, and analyze the nature and magnitude of frictional forces.	170-199
4.07 Assess and calculate the nature and magnitude of gravitational forces (Newton's Law of Universal Gravitation).	47-49, 52-53, 183
<b>COMPETENCY GOAL 5: The learner will build an understanding of impulse and momentum.</b>	
5.01 Assess the vector nature of momentum and its relation to the mass and velocity of an object.	326-330, 333-338, Lab 7.2
5.02 Compare and contrast impulse and momentum.	330-332, 337-338, 343-349
5.03 Analyze the factors required to produce a change in momentum.	328-332, 337
5.04 Analyze one-dimensional interactions between objects and recognize that the total momentum is conserved in both collision and recoil situations.	333-337
5.05 Assess real world applications of the impulse and momentum, including but not limited to, sports and transportation.	324-350, Lab 7.2
<b>COMPETENCY GOAL 6: The learner will develop an understanding of energy as the ability to cause change.</b>	
6.01 Investigate and analyze energy storage and transfer mechanisms:	
• Gravitational potential energy.	244-247, 253, 258-259
• Elastic potential energy.	248-251, 260
• Thermal energy.	69-79, 157-165, 216-226, 277-294
• Kinetic energy.	230-242, 253
6.02 Analyze, evaluate, and apply the principle of conservation of energy.	251-253, 259-261
6.03 Analyze, evaluate, and measure the transfer of energy by a force.	
• Work.	84-117, 238-239
• Power.	296-323
6.04 Design and conduct investigations of:	
• Mechanical energy.	236-237, 239, 247, Lab 5.2, Lab 6.1, Lab 6.2
• Power.	Lab 6.1, Lab 6.2
<b>COMPETENCY GOAL 7: The learner will develop an understanding of wave motion and the wave nature of sound and light.</b>	
7.01 Analyze, investigate, and evaluate the relationship among the characteristics of waves:	
• Wavelength.	357-358, 364-366, 423, Lab 8.2
• Frequency.	358-360, 364-366, Lab 8.1, Lab 8.2
• Period.	358-360, 364-366, Lab 8.1
• Amplitude.	356-357, 364-366
7.02 Describe the behavior of waves in various media.	360-362
7.03 Analyze the behavior of waves at boundaries between media:	
• Reflection, including the Law of Reflection.	427-433, 446-447, Lab 10.1
• Refraction, including Snell's Law.	434-449, Lab 10.2
7.04 Analyze the relationship between the phenomena of interference and the	369-382, 450-467

Competency	Correlation to PIC
principle of superposition.	
7.05 Analyze the frequency and wavelength of sound produced by a moving source (the Doppler Effect).	www.learningincontext.com Chapter 8.1 link
<b>COMPETENCY GOAL 8: The learner will build an understanding of static electricity and direct current electrical circuits.</b>	
8.01 Analyze the nature of electrical charges.	
<ul style="list-style-type: none"> <li>• Investigate the electrical charging of objects due to transfer of charge.</li> </ul>	49-50, 107-111
<ul style="list-style-type: none"> <li>• Investigate the conservation of electric charge.</li> </ul>	50
<ul style="list-style-type: none"> <li>• Analyze the relationship among force, charge and distance summarized in Coulomb's law.</li> </ul>	51-53, Lab 1.3
8.02 Analyze and measure the relationship among potential difference, current, and resistance in a direct current circuit.	202-206, 212-215, 316-322, Lab 3.3
8.03 Analyze and measure the relationship among current, voltage, and resistance in circuits.	
<ul style="list-style-type: none"> <li>• Series.</li> </ul>	207-208, 213, Lab 1.3, Lab 4.3
<ul style="list-style-type: none"> <li>• Parallel.</li> </ul>	209-211, 213, Lab 4.3
<ul style="list-style-type: none"> <li>• Series-parallel combinations.</li> </ul>	www.learningincontext.com Chapter 4.3 link
8.04 Analyze and measure the nature of power in an electrical circuit.	316-322, Lab 6.3