Physics Curriculum Bundle # 7

Title	Suggested Dates
Thermodynamics & Waves	1/5 – 1/29 (16 days)

Big Idea/Enduring Understanding	Guiding Questions
Energy can take many forms but the total energy in a system is constant. Energy spontaneously tends to flow only from being concentrated in one place to becoming diffused and spread out. Energy can be transferred from one place to another in the form of waves, which have characteristic behaviors.	How is thermal energy transferred? What is the nature of waves?

The resources included here provide teaching examples and/or meaningful learning experiences to address the District Curriculum. In order to address the TEKS to the proper depth and complexity, teachers are encouraged to use resources to the degree that they are congruent with the TEKS and research-based best practices. Teaching using only the suggested resources does not guarantee student mastery of all standards. Teachers must use professional judgment to select among these and/or other resources to teach the district curriculum.

Knowledge & Skills with Student Expectations	Specificity & Examples	Suggested Resources (Read the note above)
7 The student knows the laws of Thermodynamics. 7A Analyze and explain everyday examples that illustrate the laws of thermodynamics.	Including • Heat engines & efficiency • Describe the role of heat in phase changes • Explain thermal expansion in examples such as bridges, metallic structures of buildings, railroad tracks. • Compare and contrast alternative heating methods Such as o Heat pumps o Air conditioning o Radiant heating o Solar o Geothermal	Thermodynamics Applet – http://www.mhhe.com/physsci/physical/giambattista/thermo/thermodynamics.html Thermodynamics Simulations – http://phet.colorado.edu/new/simulations/index.php?cat=Heat_and_Thermo Heat engine simulation – http://www.uwsp.edu/physastr/kmenning/flash/AF_2202.swf Suggested Equipment – calorimeter, thermometer, specific heat specimens.
7 The student knows the laws of Thermodynamics. 7B Evaluate different methods of heat energy transfer that result in an increasing amount of disorder.	Including • Describe entropy as a measure of the degree of order/disorder • Explain the relationship between internal energy, heat, and work. • Convection, conduction, radiation • Define heat in terms of molecular motion. • Describe the concept of thermal equilibrium.	Calorimetry Lab – using the method of mixtures to measure the specific heat of an unknown substance. (phys_6_SpecificHeat) Convection simulation – http://www.kangwon.ac.kr/~sericc/sci_lab/physics/conduction/convection.html Conduction simulation –

	• Explain the importance of specific heat. • Describe the relationship between heat energy and entropy as it relates to a system and its surroundings.	http://www.kangwon.ac.kr/~sericc/sci_lab/physics/conduction/conduction.html
3 Uses critical thinking and scientific problem solving to make informed decisions. 3C Evaluate the impact of research on scientific thought, society, and the environment.	Including • Relate physics to current topics Such as: o Climate change o Perpetual motion machines o Energy Resources & Conservation	Greenhouse Effect Simulation – http://phet.colorado.edu/new/simulations/sims.php?sim=The_Greenhouse_Effect
3 Uses critical thinking and scientific problem solving to make informed decisions. 3E Research and describe the history of physics and contributions of scientists.	Such as: • Heat (Rumford, Kelvin, Clausius, Joule)	History of Physics Website – http://web.mit.edu/redingtn/www/netadv/hist.html Count Rumford's observations on the boring of cannon -- http://www.chemteam.info/Chem-History/Rumford-1798.html Joule's description of his experiments on the mechanical equivalent of heat -- http://www.chemteam.info/Chem-History/Joule-Heat-1845.html
8 The student knows the characteristics and behavior of waves. 8A Examine and describe a variety of waves propagated in various types of media and describe wave characteristics	Such as • Describe the properties of oscillation / simple harmonic motion • Describe factors that affect the period of a simple pendulum and spring-mass system • Describe pulses and periodic waves • Describe characteristics of waves Including o Velocity o Frequency o Wavelength o Amplitude o Crest/compression o Trough/rarefaction • Describe the two types of waves Including o Transverse o Longitudinal • Describe wave behaviors Such as Including o Reflection (fixed & loose end) o Refraction	Simple harmonic motion lab – comparing period of spring and pendulum to theoretical value. (phys_7_SHMBoth) Simple pendulum lab – measuring period and compare to theoretical value. (phys_7_PendulumLab) Oscillating spring-mass lab – measuring period and compare to theoretical value. Compare position, velocity, acceleration with motion detector. (phys_7_SpringLab) Standing wave lab – slinky or string finding velocity of wave by measuring wavelength and period of a wave. (phys_7_SlinkyLab) Demonstration that harmonics are integer multiples of fundamental frequency. Dan Russell's acoustics website – http://www.kettering.edu/~drussell/demos.html Suggested Equipment – springs, slinky, pendulum,

	• Describe standing waves and how they are formed	stopwatch, meter stick, motion detector, wave generator.