

## Physics Objectives

<b>Science of Physics</b> The student will be able to:	<b>LPS Standard</b>	<b>State Standard</b>	<b>Text Pages</b>
1. define the study of physics and identify activities and fields in the areas of physics.		12.8.2	4-5
2. describe and implement the steps of the scientific method.	12.2.1a	12.1.2	6-9
3. understand the fundamental units of the metric system and perform conversions using scientific notation.		12.1.2f 12.1.3a	10-14
4. distinguish between accuracy and precision in measurement and how to minimize errors in reading instruments (parallax).	12.2.1b	12.1.3c	15
5. perform calculations using measurements and round the answer to the correct number of significant digits.	12.2.1b	12.1.3	16-19
6. interpret data in tables and graphs and recognize equations that summarize the data presented.	12.2.1b	12.1.3	20-22
7. use dimensional analysis to check the validity of an expression.		12.1.2d	22-24

<b>Motion and Forces</b> The student will be able to:	<b>LPS Standard</b>	<b>State Standard</b>	<b>Text Pages</b>
1. describe motion in terms of frame of reference, displacement, time, and velocity.	12.2.1c	12.3.4a	40-46
2. solve problems involving displacement, time, and velocity.	12.2.1c	12.1.3d 12.3.4a	40-46
3. interpret graphs depicting position vs time, and velocity vs time.	12.2.1b 12.2.1c	12.1.2c	45-46
4. distinguish between average and instantaneous velocity.	12.2.1c	12.3.4a	43-46
5. define acceleration and distinguish between instantaneous, uniform, and average acceleration.	12.2.1c	12.3.4a	48-52
6. solve problems involving velocity, displacement, time, and acceleration	12.2.1c	12.3.4a	53-57 63-64
7. understand that all freely falling objects uniformly accelerate at the same rate due to gravity.	12.2.1e	12.3.4b	60-62
8. know the difference between scalar and vector quantities.		12.1.2	84-87
9. solve problems involving vector quantities graphically and mathematically.		12.3.4	88-96
10. describe projectile motion and solve problems in two dimensions.	12.2.1e	12.1.2b	98-104
11. understand Newton's 3 Laws of Motion and use them to solve problems involving force, mass, and acceleration.	12.2.1d	12.1.1a 12.3.4a	124-148
12. distinguish between weight and mass.	12.2.1d	12.3.4b	141
13. define friction and solve problems involving kinetic and static friction.	12.2.1d 12.2.1g	12.1.1a 12.3.4	142-147

14. relate air resistance to a falling objects terminal speed.	12.2.1d 12.2.1g	12.1.1a 12.3.4a	148
15. relate the key contributions of early scientists to the study of physics.		12.8.3	164-165
16. define work, power, and energy, and solve problems involving these concepts.	12.2.2a 12.2.2b	12.3.5b	168-188
17. define potential energy, kinetic energy, and the Work-Kinetic Energy Theorem.	12.2.2a	12.1.1a 12.3.5b	172-180
18. solve problems involving potential energy, kinetic energy, and the Work-Kinetic Energy Theorem.	12.2.2a	12.1.1a 12.1.2a 12.3.5b	172-180
19. state the Law of Conservation of Energy, recognize the forms energy can take, and solve problems using conservation of energy.	12.2.2b	12.3.5a	181-186
20. define momentum in terms of an objects mass and velocity.	12.2.1d	12.3.5a	208-209
21. define impulse and how the momentum of an object can change in terms of force and time.	12.2.1d	12.1.1a 12.3.4	210-211
22. solve problems using the Impulse-Momentum Theorem.		12.1.1a 12.3.4	210-214
23. state the Law of Conservation of Momentum and use it to solve problems involving the interaction between two objects.	12.2.1d	12.1.1a 12.3.4	215-220
24. describe circular motion and solve problems using centripetal force and centripetal acceleration.		12.3.4	253-262
25. solve problems using Newton's Universal law of Gravitation.	12.2.1e	12.3.4b	263-265

<b>Thermodynamics and Heat</b> The student will be able to:	<b>LPS Standard</b>	<b>State Standard</b>	<b>Text Pages</b>
1. define temperature and the temperature scales.	12.2.3a	12.1.2a	358-362
2. relate temperature to the kinetic energy of atoms and molecules, and the effect it has on the expansion of matter.		12.1.2a 12.3.5b	358-361
3. define specific heat, heat of fusion, and heat of vaporization.	12.2.3a 12.2.3b	12.3.5	371-379
4. describe energy transfer by conduction, convection, and radiation.	12.2.3a 12.2.3b	12.3.5c	383-385
5. state the 1 <sup>st</sup> and 2 <sup>nd</sup> Law of Thermodynamics.		12.3.5b,d	409-423
6. define entropy.		12.3.5d	425-429

<b>Wave Mechanics</b> The student will be able to:	<b>LPS Standard</b>	<b>State Standard</b>	<b>Text Pages</b>
1. explain the conditions of simple harmonic motion.			438-445
2. calculate the period and frequency of an object moving with simple harmonic motion.		12.3.6c	446-451
3. distinguish between longitudinal and transverse waves and describe the components of each.	12.2.3f	12.1.2a	452-456
4. describe how waves transfer energy.	12.2.3f	12.3.6a	458
5. understand constructive and destructive interference.	12.2.3f	12.1.2a 12.3.6a	459-465

<b>Sound and Light</b> The student will be able to:	<b>LPS Standard</b>	<b>State Standard</b>	<b>Text Pages</b>
1. describe the nature of sound waves and solve problems relating to frequency, wavelength, and velocity.	12.2.1f 12.2.3f	12.1.2d 12.3.6c	480-483
2. define the Doppler effect and identify some of its applications.		12.1.2a	485-486
3. relate physical properties of sound waves to intensity and resonance.		12.3.6a	487-493
4. understand standing waves and fundamental frequency in open and closed pipes.			494-503
5. recognize that light is an electromagnetic wave with a wide range of wavelengths.	12.2.3f	12.3.6b,d	520-521
6. state the speed of light and solve problems involving light.	12.2.3f	12.1.3a,d	522
7. describe how the brightness of a light source is affected by distance.	12.2.3f	12.1.3e 12.3.6a	525
8. state the Law of Reflection.	12.2.3f		526-529
9. describe images formed by plane and curved mirror.		12.1.2a	525-542
10. solve problems regarding image location and size.		12.1.2b	530-542 568-576
11. describe the formation of color by adding light, or subtracting with pigments and dyes.			543-545
12. describe polarization of light.	12.2.3f		546-548
13. define refraction, state Snell's Law, and solve problems using Snell's Law.	12.2.3f	12.1.2b	562-567
14. draw ray and image diagrams for mirrors and lenses.		12.1.2a	530-539 570-575
15. describe images formed by curved lenses.		12.1.2a	568-575
16. explain the operation of optical instruments.		12.6.2b	541-542 578-579
17. predict whether light will be refracted, or undergo total internal reflection.		12.1.2a,d	580-585
18. calculate the wavelength of light from double slit interference patterns.		12.1.2b	598-603
19. define diffraction and diffraction grating.			604-612

<b>Electricity and Magnetism</b> The student will be able to:	<b>LPS Standard</b>	<b>State Standard</b>	<b>Text Pages</b>
1. know the two types of electrical charges and how to place charges on an object.	12.2.3c	12.3.4c	628-633
2. know Coulomb's Law of Electrostatics and use it to solve problems in electrostatics.		12.3.4c	634-636
3. describe the forces between charges.		12.3.4c	637-642
4. define an electric field and know how to measure it.	12.2.3c	12.1.2a 12.3.4d	643-647
5. solve problems involving electric fields, forces, and charge.		12.1.2b 12.3.4d	643-647
6. describe where a charge resides on solid and hollow conductors, and recognize the relationship between conductor shape and field strength.	12.2.3c	12.3.4d	648-652
7. discern between electrical potential energy and electrical potential difference.			666-675
8. define the electrical potential difference in terms of work done in moving a unit test charge.		12.3.4d	670-674
9. solve problems involving electrical potential.	12.2.3c 12.2.3d		666-675
10. define capacitance, describe the principles of capacitance, and solve capacitance problems.		12.3.4c	676-681
11. define electric current and the ampere.	12.2.3d		694-699
12. write Ohm's Law and use it to solve problems involving resistance, potential difference, and current.	12.2.1f 12.2.3d	12.1.3d	700-707
13. define electric power and use it to explain how heaters convert electrical energy to thermal energy.	12.2.3d	12.1.3d	708-710
14. describe how public energy use is measured and solve problems involving the use and cost of electrical energy.		12.7.3	711-712
15. describe and draw a series and parallel circuit.		12.1.2a	730-745
16. calculate current, voltage drops, and resistance in series and parallel.		12.1.2b	736-750
17. summarize the properties of magnets and magnetic fields.	12.2.3e	12.3.4d	766-769
18. describe the field around a current carrying wire.		12.3.4d	770
19. explain how a changing magnetic field can produce an electric current.		12.3.4d 12.3.6d	794-802

**Textbook:** *Holt Physics*, Serway & Faughn, Holt, Rinehart & Winston, 2002