



Exploration Education's

Advanced Physical Science

Table of Contents

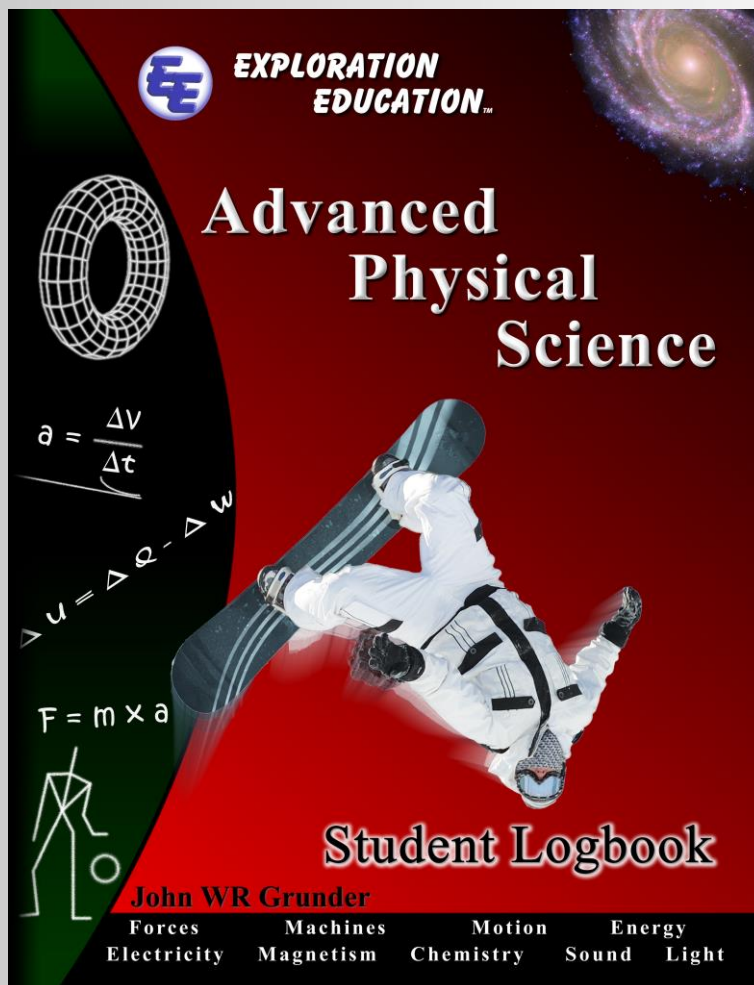




Table of Contents



Overview

<i>Getting started</i>	I
<i>Using the interactive student text (computer)</i>	I
<i>Overview</i>	I
<i>Tools and supplies</i>	II
<i>Safety</i>	II



Section I

Forces & Motion

Chapters one to five

Chapter 1
Science and Forces

- 1.1 *Science and the Scientific Method*
Activity: scientific method worksheet/ build electric racer part 1
- 1.2 *Forces*
Experiment: force/build the electric racer part 2
- 1.3 *Push, Pull, and Newtons*
Activity: forces and the racer
- 1.4 *Forces: Direction, Magnitude and Cumulative Effect*
-- vector diagrams
- 1.5 *Forces in Construction*
-- build the glider

Chapter 2
Forces in our World

- 2.1 *Gravity*
Experiment: gravity's effect on objects
- 2.2 *Friction*
Experiment: racer with and without friction
- 2.3 *Friction of fluids*
Experiment: air as a fluid
- 2.4 *Fluid Dynamics*
-- fluid flow and Bernoulli's principle
- 2.5 *Bernoulli's Principle and Angle of Attack*
-- Air pressure, wing position and fine tuning the glider

Chapter 3
Mass, Inertia, Speed and Velocity

- 3.1 *Mass and Inertia*
Experiment: inertia and the racer
- 3.2 *Force, Mass and Acceleration: Newton's 2nd Law*
Experiment: mass and acceleration
- 3.3 *Speed and Velocity*
Experiment: velocity
- 3.4 *Speed, Velocity, and Displacement*
-- speed and velocity calculations
- 3.5 *Displacement, Speed, and Distance*
-- determine the velocity of the racer and glider

Table of Contents continued

Chapter 4 Forces in Motion

- 4.1 *Action and Reaction: Newtons 3rd Law of Motion*
Experiment: action and reaction
- 4.2 *Centripetal Force*
Experiment: the racer in motion
- 4.3 *Lubricants, Heat and Wear*
Experiment: wet and dry lubricants
- 4.4 *Graphing Motion*
-- linear and nonlinear slopes
- 4.5 *Graphing Analysis*
-- graphing the glide ratio of the glider

Chapter 5 Pressure, Density, and Buoyancy

- 5.1 *Pressure*
Experiment: water pressure and height
- 5.2 *Density and Buoyancy*
Experiment: determine the density of different objects
- 5.3 *Vocabulary and Section Review Quizzes*
-- chapters 1 - 5
- 5.4 *Buoyant Forces*
-- a deeper look
- 5.5 *Buoyancy*
-- building the steam boat



Section II

Machines and Energy

Chapters six to nine

Chapter 6 Measurement, Work & Power

- 6.1 *Measurement*
Activity: measuring activity
- 6.2 *Work*
Experiment: work and the racer
- 6.3 *Power*
Activity: power and the racer
- 6.4 *Hydrometers*
-- construct hydrometer, specific gravity
- 6.5 *Experiment Design and Fluid Density*
-- design experiment to test fluids density

Chapter 7 Machines

- 7.1 *Machines*
Experiment: machines and pulleys
- 7.2 *Levers and Fulcrums*
Experiment: levers and fulcrum points
- 7.3 *Inclined Planes, Ramps & Wedges*
Experiment: inclined planes and ramps
- 7.4 *Machines, Heat Exchange, and Heat Engines*
-- heat transfer and its ability to do work
- 7.5 *Heat Engines continued*
-- understanding the steam boat

Table of Contents continued

Chapter 8 Compound Machines	8.1 Compound Machines <i>Activity: compound machines worksheet</i>
	8.2 Gears, Pulleys, and Power <i>Experiment: pulley ratios</i>
	8.3 Special Gears and Pulleys <i>Experiment: fixed and movable pulleys</i>
	8.4 Earth, Moon, Sun and Space <i>-- the machinery of the solar system</i>
	8.5 Prepare for Quarter Exam <i>-- organize and begin studying for exam</i>

Chapter 9 Energy & its Forms	9.1 Kinetic, Potential, & Forms of Energy <i>Activity: worksheet/potential & Kinetic</i>
	9.2 Conservation of Energy <i>Experiment: energy conservation</i>
	9.3 Vocabulary and Section Review Quizzes <i>-- chapters 6 - 9</i>
	9.4 Flight and the Wright Brothers <i>-- finish studying for the exam</i>
	9.5 Quarter Exam



Section III

Electricity

Chapters ten to fourteen

Chapter 10 Electricity, Electrons, & Current	10.1 Electricity, Atoms, and Electrons <i>Activity: build circuit – part 1</i>
	10.2 Electrical Currents and Batteries <i>Activity: current worksheet/build circuit part 2</i>
	10.3 Voltage and Safety <i>Activity: voltage worksheet/test the circuit</i>
	10.4 Electrical Engineering <i>-- electricity and construction</i>
	10.5 Electricity and House Construction <i>-- build the house part 1 NOTE: This lesson takes LONGER than average</i>
Chapter 11 Static Electricity, Conductors, & Insulators	11.1 Static Electricity <i>Experiment: static hair</i>
	11.2 Opposites Attract/ likes Repel <i>Experiment: repelling balloons</i>
	11.3 Conductors and Insulators <i>Experiment: determine materials conductivity or insulating properties</i>
	11.4 Induction <i>-- no contact attraction</i>
	11.5 Static Shocks and House Construction <i>-- build the house part 2 NOTE: This lesson takes LONGER than average</i>

Table of Contents continued

Chapter 12 Circuits & Resistors	12.1 <i>Electrical Circuits</i> <i>Activity: open and closed circuits</i>
	12.2 <i>Series and Parallel Circuits</i> <i>Experiment: series and parallel</i>
	12.3 <i>Resistors</i> <i>Experiment: resistance of pencil lead</i>
	12.4 <i>House Wiring</i> <i>-- alternating current, voltage, and wire gauge</i>
	12.5 <i>Wiring the Mini House</i> <i>-- build the mini house part 3</i>
Chapter 13 Resistance, Voltage, & Switches	13.1 <i>Resistance and Series/Parallel Circuits</i> <i>Experiment: determine resistance of parallel vs. series circuit</i>
	13.2 <i>Voltage and Batteries</i> <i>Experiment: determine the effect of batteries in parallel vs. series</i>
	13.3 <i>Switches</i> <i>Activity: build a switch</i>
	13.4 <i>Ohm's Law and LED Lights</i> <i>-- how LED lights work</i>
	13.5 <i>The Mini-house and Ohm's Law</i> <i>-- determine resistance of LED lights</i>
Chapter 14 Fuses & Sources of Electricity	14.1 <i>Fuses -- ADULT SUPERVISION REQUIRED</i> <i>Experiment: steel wool as a fuse</i>
	14.2 <i>Sources of electricity</i> <i>Activity: sources of electricity worksheet</i>
	14.3 <i>Vocabulary and Section Review Quizzes</i> <i>-- chapters 10 - 14</i>
	14.4 <i>Electrolytes and Ions</i> <i>-- electric current and solutions</i>
	14.5 <i>Electrolytic Solutions</i> <i>-- ions, sodium, electrolytes</i>



Section IV

Magnetism

Chapters fifteen to eighteen

Chapter 15 Magnets, Poles & Fields	15.1 <i>Magnets</i> <i>Activity: magnetic attraction</i>
	15.2 <i>North and South Poles</i> <i>Experiment: opposites attract</i>
	15.3 <i>Magnetic Fields</i> <i>Activity: invisible fields</i>
	15.4 <i>Earth's Poles, Axis, and Seasons</i> <i>-- Kepler's laws and the planets</i>
	15.5 <i>Seasons and the Mini House</i> <i>-- optimizing heating and cooling</i>

Table of Contents continued

Chapter 16	16.1 <i>Compass</i> <i>Activity: build a compass</i>
Compasses, Mapping, & Electromagnets	16.2 <i>Mapping and magnets</i> <i>Activity: mapping</i>
	16.3 <i>Electromagnets</i> <i>Experiment: build and experiment with an electromagnet</i>
	16.4 <i>Electromagnets</i> <i>-- a deeper look</i>
	16.5 <i>Experiment Challenge</i> <i>-- build a better electromagnet</i>
	Chapter 17
Magnets, Motors & Generators	17.2 <i>Generators and motors</i> <i>Activity: worksheet/build motor part 2</i>
	17.3 <i>Magnets and Motors</i> <i>Activity: magnetic field and the motor</i>
	17.4 <i>Navigating the Solar System</i> <i>-- size and shape of the solar system and planets</i>
	17.5 <i>Prepare for Quarter Exam</i> <i>-- organize and begin studying for exam</i>
	Chapter 18
Motors & DC Current	18.2 <i>Uses of Motors</i> <i>Activity: build motor attachment</i>
	18.3 <i>Vocabulary and Section Review Quizzes</i> <i>-- chapters 15 - 18</i>
	18.4 <i>Space Travel</i> <i>-- finish studying for exam</i>
	18.5 <i>Quarter Exam</i>



Section V

Chemistry: matter

Chapters nineteen to twenty two

Chapter 19	19.1 <i>Chemistry and Matter</i> <i>Activity: build balance scale part 1</i>
Chemistry & Matter	19.2 <i>Classifying Matter</i> <i>Activity: worksheet/build balance scale part 2</i>
	19.3 <i>Scales: Types and Uses</i> <i>Activity: build balance scale part 3</i>
	19.4 <i>Matter, Stars, Planets & Asteroids</i> <i>-- make up of the solar system</i>
	19.5 <i>The Solar System</i> <i>-- just how big is it?</i>

Table of Contents continued

Chapter 20 Mass, Elements, & the Periodic Table

- 20.1 *Mass*
Activity: determining the mass of objects
- 20.2 *Elements and the Periodic Table*
Experiment: elements
- 20.3 *Atoms and Molecules -- ADULT SUPERVISION REQUIRED*
Experiment: separating H₂O into hydrogen and oxygen
- 20.4 *Elements, Carbon, and Hydrocarbons*
-- carbon and molecular bonds
- 20.5 *Hydrocarbons and Candles*
-- carbon build-up

Chapter 21 Molecules & Movement

- 21.1 *Movement of Molecules*
Experiment: expanding balloon
- 21.2 *Conduction and Convection*
Experiment: convection
- 21.3 *Thermodynamics – heat transfer -- ADULT SUPERVISION REQUIRED*
Experiment: Flame proof balloon
- 21.4 *1st Law of Thermodynamics*
-- heat and energy: reactions giving off heat
- 21.5 *The 1st law and the Steamboat*
-- diagramming

Chapter 22 Physical & Chemical Properties

- 22.1 *Physical versus Chemical Properties*
Activity: determine the properties of materials
- 22.2 *Metals*
Experiment: metals and conductivity
- 22.3 *Vocabulary and Section Review Quizzes*
-- chapters 19 - 22
- 22.4 *Thermal Transfer*
-- change of phase
- 22.5 *Change of Phase and Thermal Transfer*
-- digging deeper



Section VI

Mixtures & Compounds

Chapters twenty three to twenty seven

Chapter 23 Mixtures & Molecules

- 23.1 *Mixtures: solutions and suspensions*
Experiment: solutions – salt and flour
- 23.2 *Separating Mixtures*
Experiment: separating ink
- 23.3 *Miniature Images*
Act: scanning microscopes
- 23.4 *Working Fluids*
-- thermal expansion
- 23.5 *Heat Transfer*
-- working fluids and the steam engine

Table of Contents continued

Chapter 24 Compounds, pH & Salts	24.1 <i>Compounds</i> <i>Activity: worksheet – compounds vs. mixtures</i>
	24.2 <i>Acids and bases</i> <i>Activity: pH – litmus paper</i>
	24.3 <i>Salts</i> <i>Experiment: salt and water</i>
	24.4 <i>Compounds, Molecules, and Living Organisms</i> <i>-- proteins, lipids, nucleic acids</i>
	24.5 <i>Fats, Fuel, and Color</i> <i>-- a deeper look</i>
Chapter 25 Crystals & Chemical Bonds	25.1 <i>Crystals</i> <i>Experiment: growing crystals</i>
	25.2 <i>Chemical Bonds</i> <i>Activity: chemical bonds of sodium bicarbonate</i>
	25.3 <i>Conservation of Matter</i> <i>Experiment: conservation of matter</i>
	25.4 <i>Covalent and Ionic Bonds</i> <i>-- chemical bonds: a deeper look</i>
	25.5 <i>Exploring Chemical Bonding</i> <i>-- covalent and ionic</i>
Chapter 26 Chemical Reactions	26.1 <i>Types of Chemical Reactions</i> <i>Activity: worksheet/build rocket part 1</i>
	26.2 <i>Rockets</i> <i>Activity: build rocket part 2</i>
	26.3 <i>Rocket Launches</i> <i>Activity: testing the rocket</i>
	26.4 <i>Polymer Chemistry</i> <i>-- polymers</i>
	26.5 <i>Prepare for Quarter Exam</i> <i>-- organize and begin studying for exam</i>
Chapter 27 The Results of Reactions	27.1 <i>Chemical Reactions</i> <i>Experiment: chemical reactions and the rocket</i>
	27.2 <i>Products of Chemical Reactions</i> <i>Experiment: what products does the rocket reaction produce?</i>
	27.3 <i>Vocabulary and Section Review Quizzes</i> <i>-- chapters 23 - 27</i>
	27.4 <i>Polymer Chemistry Applied</i> <i>-- finish studying for the exam</i>
	27.5 <i>Quarter Exam</i>

Table of Contents continued



Section VII

Sound

Chapters twenty eight to thirty one

Chapter 28

Sound

- 28.1 *Sound*
Activity: build the guitar part 1
- 28.2 *Energy and Sound*
Experiment: vibration test/ build the guitar part 2
- 28.3 *Tone*
Activity: tone worksheet/build the guitar part 3
- 28.4 *Sound Energy*
-- a deeper look
- 28.5 *Sound and the Steam Boat*
-- determine why the steam boat "pops"

Chapter 29

Pitch & Sound Waves

- 29.1 *Pitch*
Activity: tune the guitar
- 29.2 *Sound Waves*
Experiment: sound waves and vibration
- 29.3 *Mediums of Sound*
Experiment: tuning fork
- 29.4 *Resonance*
-- vibration and amplitude
- 29.5 *Resonating Glass*
-- resonance and pitch

Chapter 30

Speed & Direction of Sound

- 30.1 *Speed of Sound*
Activity: clapping and the speed of sound
- 30.2 *Sound Intensity: loud and soft sounds*
Experiment: loud, soft, and vibrations
- 30.3 *Echoes and Absorption*
Experiment: test materials ability to reflect sound
- 30.4 *Acoustical Engineering*
-- sound and design
- 30.5 *Roof and Ceiling Design*
-- build the mini-house's roof

Chapter 31

Electricity & Sound

- 31.1 *Musical Instruments*
Activity: make a "band"
- 31.2 *Electrical Signals and Sound*
Activity: worksheet -- how a phone works
- 31.3 *Vocabulary and Section Review Quizzes*
-- chapters 28 - 31
- 31.4 *Vibration, Heat, and Light*
-- light, heat and thermals
- 31.5 *Thermals and the Glider*
-- riding the thermals

Table of Contents continued



Section VIII

Light

Chapters thirty two to thirty six

Chapter 32	32.1 Light <i>Activity: light worksheet/build solar fan part 1</i>
Light & Photons	32.2 Photons and Solar Energy <i>Activity: build solar fan part 2</i>
	32.3 How Light Travels <i>Experiment: traveling light</i>
	32.4 Thermal Energy and Temperature <i>-- joules and calories</i>
	32.5 Thermal Energy and the Steam Boat <i>-- comparing thermal energy</i>
	Chapter 33
Light Sources & their Effects	33.2 Spreading & Scattering Light <i>Experiment: scattering light</i>
	33.3 Shadows <i>Activity: make and use a sundial</i>
	33.4 Light Intensity <i>-- lumens and lux</i>
	33.5 Experiment Challenge <i>-- solar fan as an intensity tester</i>
	Chapter 34
Reflecting & Bending Light	34.2 Reflection <i>Experiment: reflection</i>
	34.3 Refraction: bending light <i>Experiment: bending light</i>
	34.4 Light, Shadows, Moon & Earth <i>-- reflections and eclipse</i>
	34.5 House Placement and Energy Conservation <i>-- placement of the mini house</i>
	Chapter 35
Colors, Prisms, & Types of Lights	35.2 Types of Light <i>Activity: identifying light</i>
	35.3 Other uses of Light <i>Activity: uses of light worksheet</i>
	35.4 Light, Heat, and Reflection <i>-- roof insulation and the mini-house</i>
	35.5 Prepare for Quarter Exam <i>-- organize and begin studying for exam</i>

Table of Contents continued

Chapter 36

Optics

- 36.1** *Optics: how the eye works*
Experiment: lingering light
- 36.2** *Optics and the Brain*
Activity: spin machine
- 36.3** *Vocabulary and Section Review Quizzes*
-- chapters 32 - 36
- 36.4** *Summarize and Organize*
-- finish studying for the exam
- 36.5** *Quarter Exam*



Resources

R – 1.1 **Project Templates**

- Project template: racer, motor, and balance scale*
- Project template: measuring (rulers)*
- Project template: rocket*
- Project template: guitar*
- Project template: steamboat*
- Project template: mini house*
- Project template: sundial*

R – 1.2 **Index/glossary**

- Index with definitions (glossary)*

