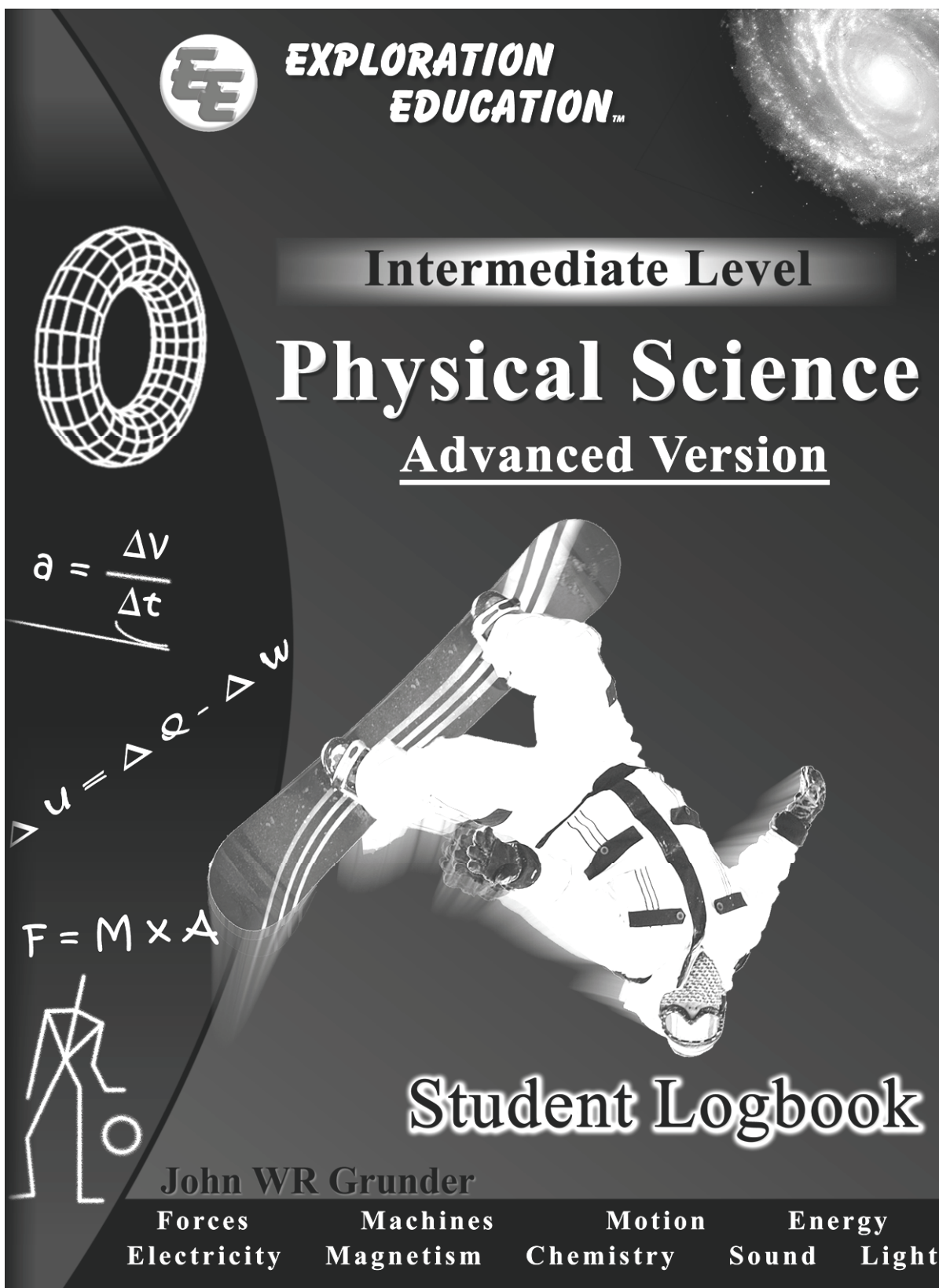


PLEASE NOTE: The following show a few example pages from the student logbook. They include one complete chapter from the forces unit and several pages from the chemistry unit. We also included one example page from the index/glossary found in the back of the student logbook.



Physical Science – Advanced Version Student Logbook

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Forces & Motion

Chapters 1 - 5



Overview

We interact with our world every day and much of that interaction involves forces. In this section you will learn what the different types of forces are, how they affect us, and how they can be used.

After completing this section the student should be able to:

- Utilize critical thinking skills using the scientific method as they conduct experiments.
- Demonstrate effective technical writing skills as they develop a hypothesis and theory during the experimentation process.
- Explain what different types of forces are and their effects on our world.
- Explain how speed, acceleration, and velocity are related yet different.
- Explain who Isaac Newton was and Newton's three laws of motion.
- Demonstrate an understanding of the scientific principles and vocabulary taught in this section.

Vocabulary

- ♦ *Force*
- ♦ *Friction*
- ♦ *Scientific Method*
- ♦ *Observation*
- ♦ *Hypothesis*
- ♦ *Theory*
- ♦ *Elastic Force*
- ♦ *Lubricant*
- ♦ *Fluids*
- ♦ *Gravity*
- ♦ *Mass*
- ♦ *Galileo*
- ♦ *Centripetal*
- ♦ *Pressure*
- ♦ *Buoyancy*
- ♦ *Inertia*
- ♦ *Speed*
- ♦ *Acceleration*
- ♦ *Action/reaction*
- ♦ *Velocity*

Chapter 3.1 Mass and Inertia

Lesson

Read this chapter and answer the questions on EE's computer program, then record your answers below.

1. Which of the following statements are true about Mass.
 - a. Mass is how much an object weighs.
 - b. Mass is how much potential energy an object has.
 - c. Mass is the amount of "stuff" an object is made of.
 - d. Mass changes depending on if you are on the earth or on the moon.

2. Which statements are true about inertia?
 - a. Inertia is the tendency of objects to resist a change in motion.
 - b. Inertia is Newton's first law of motion.
 - c. If inertia did not exist, we would not have to wear seatbelts.
 - d. Inertia only affects heavy objects.

Experiment

Go through this chapter's experiment instructions on EE's computer program, then conduct the experiment yourself, filling in the appropriate spaces below.

Observation When an object is in motion, it seems to keep going in one direction unless something stops or changes its direction.

Hypothesis What will happen to a small object on the front of the Racer when the Racer stops suddenly?
(best guess)

Experiment A. What happened?

Theory If you were to make up a theory regarding the penny going forward even though the Racer stopped, what would it be? How does this relate to people in cars that do not have seat belts on?

Chapter 3.2 Force, Mass, & Acceleration

Lesson

Read this chapter and answer the questions on EE's computer program, then record your answers below.

1. Which statements are true about Newton's second law of motion?

- a. Force = Mass x Acceleration.
- b. All objects require the same effort to get them moving.
- c. A moving object with a large mass takes more force to slow than a moving object with a small mass.

Experiment

Go through this chapter's experiment instructions on EE's computer program, then conduct the experiment yourself, filling in the appropriate spaces below.

Observation It seems that when two similar sized bicyclists start pedaling their bikes at the same time, the person with the lighter bicycle can get "up to speed" quicker than the person with the heavier bicycle.

Hypothesis If we time how long it takes the Racer to go twice around its circular track, first by itself, and (best guess) then with a weight on it, which one will be faster?

Experiment

Time for two laps without the battery _____.

Time for two laps with the battery _____.

A. Which accelerated faster? The lighter car (no battery) or the heavier car?

Theory What is your theory on why it went faster without the battery than with? Remember the principles of mass and acceleration.

Chapter 3.3 Speed and Velocity

Lesson

Read this chapter and answer the questions on EE's computer program, then record your answers below.

1. Which of the following statements best describes what a reference point is?
 - a. moving object
 - b. moving object that is used to describe a non-moving object
 - c. non-moving object that is used to describe a moving object
 - d. non-moving object
2. Which of the following is true about speed?
 - a. To measure speed you need a reference point
 - b. Speed is always fast.
 - c. Speed = distance traveled divided by the time it took.
3. Which is the best definition of velocity?
 - a. Velocity is the speed of an object.
 - b. Velocity is the speed of an object in a certain direction.
 - c. Velocity is the speed of an object in a certain direction for a certain amount of time.

Experiment

Go through this chapter's experiment instructions on EE's computer program, then conduct the experiment yourself, filling in the appropriate spaces below.

Observation When an object moves in a certain direction at a constant speed, we can measure its velocity (speed in a certain direction).

Hypothesis If you point your Racer in the direction the sun rises and run it for 20 feet, what do you think its **(best guess)** velocity will be? Make your best guess on how many miles/hour (speed) your Racer will go and which direction (if pointing toward the rising sun).

Continued on next page

Chapter 3.3 continued

Experiment How long did it take?

Results: _____ seconds

A. Now you will figure out the speed and velocity of your car. Put the time (in seconds) into the formula below to figure out the speed of your car. Note: the .068 figure is needed to convert feet per second into miles per hour.

$$\frac{.68 \times \# \text{ of feet (20)}}{\text{Time it took in seconds}} = \frac{13.6}{\text{_____ seconds}} = \text{_____ miles/hour}$$

B. Now, state the velocity of your car scientifically. For example, "The Racer was traveling due south at 1.2 miles/hour. (*Where does the sun rise? North, East, South or West? If you pointed your car toward where the sun rises, then that will help determine which direction it was going.*)

Theory What would your theory be about all moving objects? Do all moving objects have a velocity? (This should be a simple statement.)



Chapter 3.4 Speed, Velocity and Displacement

Read this chapter and answer the questions below.

Lesson Questions

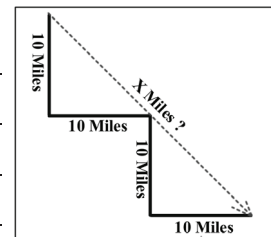
$$\text{Speed} = \frac{\Delta d}{\Delta t}$$

1. How would you "say" (in a sentence) the following formula?

2. What are the three things needed in order to find the average speed of a car?

3. What is the difference between distance and displacement?

Extra Credit: Using math, figure what the displacement is ("X") in the following figure?
(Hint: Pythagorean theorem)



In your own words

Explain why a car can have a speed of 60 miles per hour, but a velocity of only 30 miles per hour (in a given direction)?

Chapter 3.5 Lab write-up

Read through this chapter's pictorial experiment instructions in EE's computer program and then conduct the experiment filling out the following write-up as you go.

Name: _____

Date: _____

Title

In a few words, write a title that describes what you are aiming to determine with this experiment.

Objective

Why are you conducting this experiment?

Hypothesis

What do you think the results will be when you conduct this experiment?

Materials

Go through EE's experiment instructions and write down the items will you need in order to conduct this experiment?

1. _____	6. _____
2. _____	7. _____
3. _____	8. _____
4. _____	9. _____
5. _____	10. _____

SECTION
V

Chemistry

Chapters 19 - 22



Overview

Chemistry involves anything we can see, touch, or smell. In this section you will learn what matter is and how we can measure and classify it. You will also learn about elements and the periodic table, chemical bonds, and heat transfer.

After completing this section the student should be able to:

- **Demonstrate an understanding of what matter is, how it is classified, and how it can be measured.**
- **Explain what elements are and the purpose of the periodic table.**
- **Know the makeup of atoms and molecules.**
- **Demonstrate an understanding of the scientific principles and vocabulary taught in this section.**

Vocabulary

- ♦ *Matter*
- ♦ *Chemistry*
- ♦ *Classify*
- ♦ *Mass*
- ♦ *Elements*
- ♦ *Periodic table*
- ♦ *Atom*
- ♦ *Conduction*
- ♦ *Convection*
- ♦ *Physical properties*
- ♦ *Chemical properties*
- ♦ *Metals*
- ♦ *Alloy*
- ♦ *Molecular bonds*

Chapter 22.4 Thermal Transfer and Change of Phase

Read this chapter and answer the questions below.

Lesson Questions

1. How would you "say" the following: $\Delta U = \Delta Q - \Delta W$

2. What is thermal equilibrium?

3. What does "change of phase" mean?

In your own words

Explain what a "flash point" is and give an example.

Chapter 22.5 Lab write-up

Read through this chapter's pictorial experiment instructions in EE's computer program and then conduct the experiment filling out the following write-up as you go.

Name: _____

Date: _____

Title

In a few words, write a title that describes what you are aiming to determine with this experiment.

Objective

Why are you conducting this experiment?

Hypothesis

What do you think the results will be when you conduct this experiment?

Materials

Go through EE's experiment instructions and write down the items will you need in order to conduct this experiment?

1. _____	6. _____
2. _____	7. _____
3. _____	8. _____
4. _____	9. _____
5. _____	10. _____

R - 1.2 Index with definitions (glossary)

Proteins 24.4

Organic polymers made up of amino acids

Proton 10.1

The positively charged subatomic particles found in the nucleus of an atom

Pulley 8.2, 8.3

A simple machine consisting of a wheel with a groove in it allowing a rope (string, wire, etc...) to be pulled over it

Rack and pinion gear 8.3

A gear and toothed rack combination that changes rotary motion into linear motion

Radar 17.1

Uses an electromagnetic radio wave to locate objects

Radiation 22.4

The transfer of radiant thermal energy given off by one object and absorbed by another.

Reference point 3.3, 3.4, 3.5

A reference point is a non-moving object that is used to describe a moving object. Or in mapping, a stationary point that all measurements and directions are measured from

Reflection: diffused 34.2

A rough, broken-up reflection

Reflection: regular 34.2

A very smooth (exact image) type of reflection

Refraction 34.3

The bending of light by an object (like water)

Resistor 12.3

A substance that resists the push of electricity through it, but still allows the electricity to flow

Resonance 29.4, 29.5

The increase in amplitude of a systems natural frequency when the system is exposed to the same repeated vibrational force

Rockets 26.2

A vehicle that is self-propelled consisting of a combustion chamber and exhaust nozzle that operates by the rapid expansion of gases (combustion) generating an overall forward thrust

Salts 24.3

A product formed by combining acids with bases

Satellite 8.1

An object that orbits another object is a satellite

Scales: weight 19.3

Weight scales help us determine the weight and mass of objects

Science 1.1

Simply put, science is exploring the amazing world around us in an effort to discover and increase our understanding of how it works

Scientific method, 1.1, 3.5, 6.5

A method of conducting science that usually includes an observation, hypothesis, experiment, and theory

Series circuit 12.2

A circuit that only has one path for the electricity to flow

Shadow 33.3

The area of darkness that is caused when light is blocked by an object

Solar eclipse 34.4

When the moon is between the sun and the earth

Solar system 8.4

The solar system consists of our sun and everything that travels (orbits) around it.

Solution 23.1

A special type of mixture when one substance dissolves evenly throughout another substance

Sonar 30.3

A device that sends out high-frequency sounds to locate objects. Also known as echo location

Sound 28.1

Sounds are made when an object moves back and forth very rapidly (vibrates)

Sound intensity 30.2

The measure of how loud or soft a sound is

Sound medium 29.3

A substance that carries a sound wave

Sound waves 29.2

Sound travels in longitudinal waves -- waves that move back and forth

Sound: percussion instruments 31.1

Percussion instruments produce a sound by being hit or shaken

Sound: stringed instruments 31.1

Stringed instruments make a sound by vibrating a string

Sound: wind instruments 31.1

Wind instruments make a sound by vibrating a column of air inside a tube

Specific gravity 6.4

the density of a substance compared to water

Spectrum (light) 35.1

The bands of color in light

Speed 3.3, 3.4, 3.5

Speed equals the distance traveled divided by the amount of time it took

Speed of sound 30.1

Sound travels at different speeds depending on the medium

Spring tide 8.4

A strong tide that happens when the sun and moon are