

# PHYSICAL SCIENCE

MR. CRAIG RADUE

2007

HOLT PHYSICAL SCIENCE C 2004

Wisconsin Lutheran Lab Manual

Wiscoscience.com

***PURPOSE: THE PURPOSE OF THIS PHYSICAL SCIENCE COURSE IS TO LEARN FROM A SCRIPTURAL VIEWPOINT MAN'S INTERPRETATION OF GOD'S CREATION, ESPECIALLY AS IT RELATES TO ENERGY, MATTER, THE REACTION OF MATTER, AND ITS MOTION.***

## **OUTCOMES:**

- 1. DEMONSTRATE AN UNDERSTANDING OF THE BLESSING SCIENCE AND ITS UNDERSTANDING PLAYS IN THE LIVES OF A CHRISTIAN**
- 2. USE AND DEMONSTRATE A KNOWLEDGE OF SCIENTIFIC AND MATHEMATICAL APPLICATIONS IN SCIENCE**
- 3. PREPARE FOR FUTURE SCIENCE COARSES AND TESTING**
- 4. DEMONSTRATE A KNOWLEDGE AND SKILL IN USING SCIENTIFIC EQUIPMENT.**
- 5. DEMONSTRATE KNOWLEDGE OF MEASURE AND REALITY.**
- 6. CREATE AND EXPLAIN MODELS THAT DEMONSTRATE SCIENTIFIC IDEAS.**
- 7. SHOW AN ABILITY TO WORK BOTH INDEPENDENTLY AND COOPERATIVELY IN A LAB SETTING**

## PHYSICAL SCIENCE A COURSE OUTLINE

### **UNIT 1**

#### **MEASUREMENT AND SAFETY**

MEASURE INTERPRET AND LEARN THE SI SYSTEM

PERFORM EXPERIMENTS ACCORDING TO ACCEPTED SCIENTIFIC METHOD

LEARN, DRAW, AND INTERPRET GRAPH DATA

INTERPOLATION

EXTRAPOLATION

ANALYZE SIG FIGS

PERFORM CONVERSION FACTORS

*TEXT Chapter 1 pp.2-28, 828-832 1-2 WEEKS*

Lab Manual Chapter 1

*SCHOOL OUTCOMES 4,6,2*

*DEPARTMENT 1.1, 1.2, 3.1,3.2,4.1, 4.2*

*STATE C12.3, C12.4*

### **UNIT 2**

#### **ENERGY AND MOTION**

DESCRIBE CALCULATE, AND GRAPH VELOCITY AND ACCELERATION

INTRODUCE VECTORS

ANALYZE THE EFFECTS OF GRAVITY

COMPARE AND CONTRAST THE LAWS OF MOTION

ANALYZE CIRCULAR MOTION  
ANALYZE THE RELATION BETWEEN ENERGY, WORK, HEAT, TEMPERATURE AND GASES  
CONSTRUCT AND DEMONSTRATE PRACTICAL CONCEPTS AND SYSTEMS THAT USE HEAT  
MAKE, DRAW AND EXPLAIN SIMPLE AND COMPOUND MACHINES

*TEXT chapters 10 – 13 pp.316 – 446 5-7 WEEKS*

Lab Manual Chapters 2-4

*SCHOOL OUTCOMES 2, 4*

*DEPARTMENT 2.1, 2.2, 3.1, 3.2, 4.2*

*STATE A12.5, B12.4, C12.3, C12.5, G12.2, H12.6*

### **UNIT 3**

#### **ELECTRICITY**

ANALYZE, DRAW, AND CONSTRUCT VARIOUS CIRCUITS  
DESIGN CIRCUITS TO MEET CERTAIN SPECIFICATIONS  
DEMONSTRATE STATIC ELECTRICITY  
ANALYZE OHMS LAW AND SHOW AN UNDERSTANDING  
CALCULATE POWER AND COST OF USING VARIOUS APPLIANCES

*TEXT chapter 16 pp. 528-554 2-3 WEEKS*

Lab Manual Chapter 5

*SCHOOL OUTCOMES 4,6*

*DEPARTMENT 2.1, 2.2, 3.2, 4.1, 4.2*

*STATE B12.4, C12.3, C12.4, D12.11, G12.1*

### **UNIT 4**

#### **THE NATURE OF MATTER**

ANALYZE AND DIFFERENTIATE BETWEEN STATES OF MATTER  
RECOGNIZE AND DIFFERENTIATE COMPOUNDS AND MIXTURES  
DRAW AND IDENTIFY STRUCTURE OF THE ATOM  
USE THE PERIODIC TABLE TO INTERPRET DATA  
IDENTIFY TYPES OF BONDING  
WRITE AND INTERPRET CHEMICAL FORMULAS  
ORALLY REPORT/ MODEL THE VARIOUS ELEMENTS  
MODEL AND DRAW ORGANIC COMPOUNDS  
ANALYZE THE USES OF MANMADE MATERIAL

*TEXT Chapters 2-5 pp 26 - 174 7-8 WEEKS*

Lab Manual chapters 6 – 7

*SCHOOL OUTCOMES 4, 6*

*DEPARTMENT 2.1, 2.2, 3.1, 3.2, 4.1, 4.2*

*STATE D12.1, D12.5, D12.3, D12.4, C12.6, B12.4, C12.7, D12.12*

### **UNIT 5**

#### **INTERACTIONS OF MATTER**

RECOGNIZE AND NAME THE VARIOUS TYPES OF SOLUTIONS  
ANALYZE HOW SOLUTE CHANGES A SOLVENT  
RECOGNIZE NAME AND SOLVE 5 TYPES OF EQUATIONS  
DIFFERENTIATE ACIDS BASES AND SALTS  
WRITE AND PERFORM A NEUTRALIZATION REACTION  
TITRATION

*TEXT Chapters 6-8 pp 182- 246 7- 9 WEEKS*

Lab Manual Chapters 8-9

*SCHOOL OUTCOMES 2, 3, 4, 6*

*DEPARTMENT 2.1, 2.2, 3.1, 4.1, 4.2, 4.3*

*STATE A12.3, A12.5, A12.7, C12.2, C12.3, C12.4, D12.5, D12.6, D12.11*

## **UNIT 6**

### **WAVES LIGHT SOUND**

COMPARE AND CONTRAST THE ELECTROMAGNETIC SPECTRUM

COMPARE, CONTRASTED DRAW TRANSVERSE AND COMPRESSIONAL WAVES

COMPARE CONTRAST, AND DRAW CONCAVE AND CONVEX MIRRORS AND LENSES

*TEXT Chapters 14-15 pp 452- 520 2-3 WEEKS*

Lab Manual chapter 10

*SCHOOL OUTCOMES 2, 4*

*DEPARTMENT 2.1, 2.2, 3.1, 4.2*

*STATE D12.3, D12.9, D12.11*

### **Lab Manual**

#### **Table of Contents**

Lab numbering corresponds to chapters in the Holt, Science Spectrum - Physical Science textbook, 2004.

#### 1. Measurement Labs

Activity 1-1 Labware

Lab 1-1 Measurements and Graphs

Lab 1-2 Significant Figures

Lab 1-3 Measuring Decathlon

#### Outcomes

SCHOOL 2, 4, 6

DEPARTMENT 3.1, 1.1, 1.2

STATE C12.3, C12.4

#### 2. Matter

Lab 2-1 Density of Solids

Lab 2-2 Density of Liquids

Lab 2-3 Physical and Chemical Changes

#### Outcomes

SCHOOL 2, 4, 6

DEPARTMENT 3.1, 1.1, 1.2

STATE C12.3, C12.4

#### 3. States of Matter

Lab 3-1 States of Matter

#### Outcomes

SCHOOL 2, 4, 6

DEPARTMENT 3.1, 1.1, 1.2

STATE C12.3, C12.4

4. Atoms and the Periodic Table

Lab 4-1 BB Lab

Lab 4-2 Ionization Energy

Outcomes

SCHOOL 4, 6

DEPARTMENT 3.1, 4.1

STATE D12.1, D12.5, D12.3, D12.4, C12.6, B12.4, C12.7, D12.12

5. Structures of Matter

Lab 5-1 Model of a Molecule

Lab 5-2 Ionic and Covalent Bonds

Lab 5-3 Flame Test

Lab 5-4 Organic Models

Lab 5-5 Alcohol and Organic Acids

Outcomes

SCHOOL 4, 6

DEPARTMENT 3.1, 4.1, 4.2

STATE D12.1, D12.5, D12.3, D12.4, C12.6, B12.4, C12.7, D12.12

6. Chemical Reactions

Lab 6-1 Single Replacement

Lab 6-2 Non-metal Reactions

Lab 6-3 Double Replacement

Lab 6-4 Catalyst Reaction

Outcomes

SCHOOL 2, 3, 4, 6

DEPARTMENT 2.1, 3.1, 4.1, 4.2, 4.3

STATE A12.3, A12.5, A12.7, C12.2, C12.3, C12.4, D12.5, D12.6, D12.11

7. Solutions

Lab 7-1 Prepare an Alloy

Lab 7-2 Boiling Points of Solutions

Lab 7-3 Solution Writing

Outcomes

SCHOOL 2, 3, 4, 6

DEPARTMENT 2.1, 3.1, 4.1, 4.2, 4.3

STATE A12.3, A12.5, A12.7, C12.2, C12.3, C12.4, D12.5, D12.6, D12.11

8. Acids, Bases, and Salts

Lab 8-1 pH

Lab 8-2 Acid – Base Titration

Lab 8-3 Aspirin Lab

Outcomes

SCHOOL 2, 3, 4, 6

DEPARTMENT 2.1, 3.1, 4.1, 4.2, 4.3

STATE A12.3, A12.5, A12.7, C12.2, C12.3, C12.4, D12.5, D12.6, D12.11

9. Nuclear Changes (no labs)

10. Motion

Lab 10-1 Speed

Lab 10-2 Friction

Outcomes

SCHOOL 2, 4

DEPARTMENT 2.1, 3.1, 3.2

STATE A12.5, B12.4, C12.3, C12.5, G12.2, H12.6

11. Forces

Lab 11-1 Constant Force, Changing Mass

Lab 11-2 Constant Mass, Changing Force

Lab 11-3 Downhill Racer

Lab 11-4 Momentum

Lab 11-5 Momentum and Mass

Outcomes

SCHOOL 2, 4

DEPARTMENT 2.1, 3.1, 3.2

STATE A12.5, B12.4, C12.3, C12.5, G12.2, H12.6

12. Work and Energy

Lab 12-1 Class of Lever

Lab 12-2 Mass of Coin

Lab 12-3 Pulley

Lab 12-4 Inclined Plane

Lab 12-5 Screws

Lab 12-6 Balloon Popper

Lab 12-7 Power Lab

Lab 12-8 Swinging Stopper (Pendulum)

Lab 12-9 Bouncing Ball

Outcomes

SCHOOL 2, 4

DEPARTMENT 2.1, 3.1, 3.2

STATE A12.5, B12.4, C12.3, C12.5, G12.2, H12.6

13. Heat and Temperature

Lab 13-1 Convection

Lab 13-2 Specific Heat

Outcomes

SCHOOL 2, 4

DEPARTMENT 2.1, 3.1, 3.2

STATE A12.5, B12.4, C12.3, C12.5, G12.2, H12.6

14. Waves (no labs)

15. Sound and Light

Lab 15-1 Frequency of Sound

Lab 15-2 Musical Scale Lab

Lab 15-3 Refraction of Light  
Lab 15-4 Reflection of Light  
Lab 15-5 Focal Point

Outcomes

SCHOOL 2, 4  
DEPARTMENT 3.1, 4.2  
STATE D12.3, D12.9, D12.11

16. Electricity

Lab 16-1 Static Electricity  
Lab 16-2 Conductors and Insulators  
Lab 16-3 Build and Measure Circuits  
Lab 16-4 Mystery Boxes  
Lab 16-5 To Light or Not  
Lab 16-6 Using Electricity

Outcomes

SCHOOL OUTCOMES 4, 6  
DEPARTMENT 3.2, 4.1  
STATE B12.4, C12.3, C12.4, D12.11, G12.1

17. Magnetism (no labs)

*Acknowledgments*

*Labs in this book have been adapted from the following:*

Science Spectrum- Physical Science Holt publishers 2004

Super Sensational Science, Sally Ride Academy Presented by Larry Scheckel 1997

Merrill Physical Science Glencoe 1993

Physical Science Prentice Hall 1988

Conceptual Physics Addison-Wesley 1987

*Contributors*

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Science Department Head Mr. Mike Sebald*

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Mr. Matthew Bilitz

Mr. Craig Radue

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**PROJECTS**

VARIOUS PROJECTS USED TO SHOW SKILL MAY INCLUDE BUT ARE NOT LIMITED TO

ROLLING BUGGY  
PROJECTILE LAUNCHER  
ASPRIN LAB  
STRENGTH COMPARISON  
COST ANALYSIS

#### **INSTRUCTIONAL STRATEGIES**

LECTURE 25%  
LAB WORK 25%  
REPORTS 5%  
PROBLEM SOLVING 20%  
VIDEO 10%  
REVIEWS 15%

#### **GRADING**

50% Lab and homework  
50% Test and projects

#### **SEMESTER GRADE**

1\3- 1<sup>ST</sup> (3<sup>RD</sup>) QUARTER  
1\3 - 2<sup>ND</sup> (4<sup>TH</sup>) QUARTER  
1\3 -EXAM

## **STUDENT RESPONSIBILITIES**

BE TO CLASS ON TIME.

**COMPLETE ASSIGNMENTS ON TIME**----- FAILURE TO DO SO WILL RESULT IN AN "F" FOR THAT WORK.  
WORK TURNED IN LATE (AFTER CLASS BEGINS) CAN ONLY RECEIVE 50% CREDIT AND WILL BE RECORDED AS LATE.  
ANY LATE ASSIGNMENTS MUST BE TURNED IN BY THE LATE ASSIGNMENT DATE

RESPECT THE PROPERTY OF TEACHER AND STUDENTS.

FOLLOW DIRECTIONS AND SAFETY PROCEDURES.

USE [wiscoscience.com](http://wiscoscience.com) TO CHECK FOR MISSING ASSIGNMENTS.

BRING BOOK AND ALL NEEDED MATERIALS TO CLASS--- WHICH INCLUDES A PEN, A CALCULATOR, AND *STUDENT PLANNER*.

**DO NOT** TAKE AWAY THE OPPORTUNITY FOR SOMEONE ELSE TO LEARN.

### **Replacement Costs 2007**

Item	Replacement cost
Balance	\$75.00
Beaker	\$5.00
Burette	\$40.00
DMM	\$80.00
Glass Stir Rod	\$1.00
Graduated Cylinder	\$5.00
Power Source	\$120.00
Ruler	\$0.50
Test Tube	\$0.75
Thermometer	\$5.00
Pulley	\$ 7.50

If you break an item because of carelessness, misuse or accident, you will be required to pay the replacement cost. If it breaks during normal use, you will not.

## **Appendix**

### **Physical Science**

Craig Radue

#### Unit 1

##### DEPARTMENT

- 1.1 Utilize Scripture as a means of evaluating scientific discoveries and technologies
- 1.2 Apply God's Word as it relates to science issues
- 3.1 Use the scientific method to investigate relationships in order to draw conclusions and make and defend predictions and recommendations
- 3.2 Use scientific knowledge to investigate the natural world, to solve problems, and to make informed decisions
- 4.1 Research, evaluate, and use scientific information from a variety of sources
- 4.2 Contribute both independently of and cooperatively with their peers

##### STATE

C.12.3 Evaluate\* the data collected during an investigation\*, critique the data-collection procedures and results, and suggest ways to make any needed improvements

C.12.4 During investigations\*, choose the best data-collection procedures and materials available, use them competently, and calculate the degree of precision of the resulting data

#### Unit 2

- 2.1 Express an understanding of the major concepts and principles of science and related technologies

2.2 Analyze opinions and statements set forth by others

3.1 Use the scientific method to investigate relationships in order to draw conclusions and make and defend predictions and recommendations

3.2 Use scientific knowledge to investigate the natural world, to solve problems, and to make informed decisions

4.2 Contribute both independently of and cooperatively with their peers

STATE

A.12.5 Show\* how the ideas and themes\* of science can be used to make real-life decisions about careers, work places, life-styles, and use of resources

B.12.4 Show\* how basic research and applied research contribute to new discoveries, inventions, and applications

C.12.3 Evaluate\* the data collected during an investigation\*, critique the data-collection procedures and results, and suggest ways to make any needed improvements

C.12.5 Use the explanations\* and models\* found in the earth and space, life and environmental, and physical sciences to develop likely explanations\* for the results of their investigations\*

G.12.2 Design, build, evaluate, and revise models\* and explanations related to the earth and space, life and environmental, and physical sciences

H.12.6 Evaluate\* data and sources of information when using scientific information to make decisions

### Unit 3

2.1 Express an understanding of the major concepts and principles of science and related technologies

2.2 Analyze opinions and statements set forth by others

3.2 Use scientific knowledge to investigate the natural world, to solve problems, and to make informed decisions

4.1 Research, evaluate, and use scientific information from a variety of sources

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STATE

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C.12.4 During investigations\*, choose the best data-collection procedures and materials available, use them competently, and calculate the degree of precision of the resulting data

D.12.11 Using the science themes\*, explain\* common occurrences in the physical world

G.12.1 Identify\* personal interests in science and technology, implications that these interests might have for future education, and decisions to be considered

#### Unit 4

2.1 Express an understanding of the major concepts and principles of science and related technologies

2.2 Analyze opinions and statements set forth by others

3.1 Use the scientific method to investigate relationships in order to draw conclusions and make and defend predictions and recommendations

3.2 Use scientific knowledge to investigate the natural world, to solve problems, and to make informed decisions

4.1 Research, evaluate, and use scientific information from a variety of sources

4.2 Contribute both independently of and cooperatively with their peers

#### STATE

D.12.1 Describe\* atomic structure and the properties of atoms, molecules, and matter during physical and chemical interactions\*

D.12.3 Explain\* exchanges of energy\* in chemical interactions\* and exchange of mass and energy in atomic/nuclear reactions

D.12.4 Explain\* how substances, both simple and complex, interact\* with one another to produce new substances

D.12.5 Identify\* patterns in chemical and physical properties and use them to predict\* likely chemical and physical changes and interactions

C.12.6 Present the results of investigations\* to groups concerned with the issues, explaining\* the meaning and implications of the results, and answering questions in terms the audience can understand

B.12.4 Show\* how basic research and applied research contribute to new discoveries, inventions, and applications

C.12.7 Evaluate\* articles and reports in the popular press, in scientific journals, on television, and on the Internet, using criteria related to accuracy, degree of error, sampling, treatment of data, and other standards of experimental design

D12.2 Explain\* the forces that hold the atom together and illustrate\* how nuclear interactions\* change the atom

## Unit 5

- 2.1 Express an understanding of the major concepts and principles of science and related technologies
- 2.2 Analyze opinions and statements set forth by others
- 3.1 Use the scientific method to investigate relationships in order to draw conclusions and make and defend predictions and recommendations
- 3.2 Use scientific knowledge to investigate the natural world, to solve problems, and to make informed decisions
- 4.1 Research, evaluate, and use scientific information from a variety of sources
- 4.2 Contribute both independently of and cooperatively with their peers

### STATE

A.12.3 Give examples that show\* how partial systems\*, models\*, and explanations\* are used to give quick and reasonable solutions that are accurate enough for basic needs

A.12.5 Show\* how the ideas and themes\* of science can be used to make real-life decisions about careers, work places, life-styles, and use of resources

C.12.2 Identify\* issues from an area of science study, write questions that could be investigated\*, review previous research on these questions, and design and conduct responsible and safe investigations to help answer the questions

C.12.3 Evaluate\* the data collected during an investigation\*, critique the data-collection procedures and results, and suggest ways to make any needed improvements

C.12.4 During investigations\*, choose the best data-collection procedures and materials available, use them competently, and calculate the degree of precision of the resulting data

D.12.5 Identify\* patterns in chemical and physical properties and use them to predict\* likely chemical and physical changes and interactions

D.12.6 Through investigations\*, identify\* the types of chemical interactions\*, including endothermic, exothermic, oxidation, photosynthesis, and acid/base reactions

D.12.11 Using the science themes\*, explain\* common occurrences in the physical world

## Unit 6

- 2.1 Express an understanding of the major concepts and principles of science and related technologies
- 2.2 Analyze opinions and statements set forth by others
- 3.1 Use the scientific method to investigate relationships in order to draw conclusions and make and defend predictions and recommendations
- 4.2 Contribute both independently of and cooperatively with their peers

### STATE

D.12.3 Explain\* exchanges of energy\* in chemical interactions\* and exchange of mass and energy in atomic/nuclear reactions

D.12.9 Describe\* models\* of light, heat, and sound and through investigations\* describe\* similarities and differences in the way these energy\* forms behave

D.12.11 Using the science themes\*, explain\* common occurrences in the physical world

## Lab Manual

1.1 Utilize Scripture as a means of evaluating scientific discoveries and technologies

1.2 Apply God's Word as it relates to science issues

2.1 Express an understanding of the major concepts and principles of science and related technologies

2.2 Analyze opinions and statements set forth by others

3.1 Use the scientific method to investigate relationships in order to draw conclusions and make and defend predictions and recommendations

3.2 Use scientific knowledge to investigate the natural world, to solve problems, and to make informed decisions

4.1 Research, evaluate, and use scientific information from a variety of sources

4.2 Contribute both independently of and cooperatively with their peers

## STATE

A.12.3 Give examples that show\* how partial systems\*, models\*, and explanations\* are used to give quick and reasonable solutions that are accurate enough for basic needs

A.12.5 Show\* how the ideas and themes\* of science can be used to make real-life decisions about careers, work places, life-styles, and use of resources

B.12.4 Show\* how basic research and applied research contribute to new discoveries, inventions, and applications

C.12.3 Evaluate\* the data collected during an investigation\*, critique the data-collection procedures and results, and suggest ways to make any needed improvements

C.12.4 During investigations\*, choose the best data-collection procedures and materials available, use them competently, and calculate the degree of precision of the resulting data

C.12.5 Use the explanations\* and models\* found in the earth and space, life and environmental, and physical sciences to develop likely explanations\* for the results of their investigations\*

C.12.6 Present the results of investigations\* to groups concerned with the issues, explaining\* the meaning and implications of the results, and answering questions in terms the audience can understand

C.12.7 Evaluate\* articles and reports in the popular press, in scientific journals, on television, and on the Internet, using criteria related to accuracy, degree of error, sampling, treatment of data, and other standards of experimental design

D.12.1 Describe\* atomic structure and the properties of atoms, molecules, and matter during physical and chemical interactions\*

D.12.2 Explain\* the forces that hold the atom together and illustrate\* how nuclear interactions\* change the atom

D.12.3 Explain\* exchanges of energy\* in chemical interactions\* and exchange of mass and energy in atomic/nuclear reactions

D.12.4 Explain\* how substances, both simple and complex, interact\* with one another to produce new substances

D.12.5 Identify\* patterns in chemical and physical properties and use them to predict\* likely chemical and physical changes and interactions

D.12.6 Through investigations\*, identify\* the types of chemical interactions\*, including endothermic, exothermic, oxidation, photosynthesis, and acid/base reactions

D.12.11 Using the science themes\*, explain\* common occurrences in the physical world

G.12.1 Identify\* personal interests in science and technology, implications that these interests might have for future education, and decisions to be considered

G.12.2 Design, build, evaluate, and revise models\* and explanations related to the earth and space, life and environmental, and physical sciences

H.12.6 Evaluate\* data and sources of information when using scientific information to make decisions

D.12.12 Using the science themes\* and knowledge of chemical, physical, atomic, and nuclear interactions\*, explain\* changes in materials, living things, earth's features, and stars