

# INTRODUCTION TO SCIENCE 2007-2008

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HOLT PHYSICAL SCIENCE C 2004

Wisconsin Lutheran Lab Manual

***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 INDEPENDENLY AND COOPERATIVELY IN A LAB SETTING**

## 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  
REVIEW CONVERSION FACTORS  
CONSTRUCT MEASURING DEVICES  
SHAMPOO LAB

*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  
ANALYZE THE EFFECTS OF GRAVITY  
COMPARE AND CONTRAST THE LAWS OF MOTION  
ANALYZE CIRCULAR MOTION  
ANALYZE RELATION BETWEEN ENERGY, WORK, HEAT, TEMPERATURE  
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

1. Measurement labs
  - a. Lab 1-1 Measure and graphs
  - b. Lab 1-2 Construction of ruler
  - c. Density
    - i. Lab 1-3 Solids
    - ii. Lab 1-4 Liquids

##### Outcomes

SCHOOL 2, 4, 6

DEPARTMENT 3.1, 1.1, 1.2

STATE C12.3, C12.4

2. Speed and Acceleration
  - a. Lab 2-1 Paper airplane
  - b. 2<sup>nd</sup> Law
    - i. Lab 2-2 Constant force change mass
    - ii. Lab 2-3 Constant mass change force
  - c. Lab 2-4 Down hill racer
  - d. Momentum
    - i. Lab 2-5 Mass and momentum
    - ii. Lab 2-6 Momentum and vectors

##### Outcomes

SCHOOL 2, 4

DEPARTMENT 2.1,3.1,3.2

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

3. Energy
  - a. Law of Conservation –
    - i. Lab 3-1 Pendulum
    - ii. Lab 3-2 Bouncing Ball
  - b. Lab 3-3 Specific heat
  - c. Lab 3-4 Convection

##### Outcomes

SCHOOL 2, 4

DEPARTMENT 2.1,3.1,3.2

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

4. Simple Machines
  - a. Levers
    - i. Lab 4-1 Class of Lever
    - ii. Lab 4-2 Mass of Coin
  - b. Lab 4-3 Pulley
  - c. Lab 4-4 Inclined Plane
  - d. Lab 4-5 Screw
  - e. Lab 4-7 Power Lab

Outcomes

SCHOOL 2, 4  
DEPARTMENT 2.1,3.1,3.2  
STATE A12.5, B12.4, C12.3, C12.5, G12.2, H12.6

5. Electricity
  - a. Lab 5-1 Static Electricity
  - b. Lab 5-2 Build and Measure a circuit
  - c. Lab 5-3 Mystery Boxes
  - d. Lab 5-4 To light or not to light
  - e. Lab 5-5 Using Electricity
  - f. Lab 5-6 Wire a house
  - g. Lab 5-7 Design a Circuit

Outcomes

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

6. Classification of Matter
  - a. Lab 6-1 Physical and Chemical Changes
  - b. Lab 6-2 Atomic Nature BB lab
  - c. Lab 6-3 Ionization Energy and Periodic Table

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

7. Chemical Bonds
  - a. Lab 7-1 Build a Model of an Atom
  - b. Lab 7-2 Covalent and Ionic Bonds
  - c. Lab 7-3 Flame test
  - d. Lab 7-4 Build organic Models
  - e. Lab 7-5 Alcohol and Organic Acids
  - f. Lab 7-6 Prepare an Alloy

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

8. Solutions

- a. Lab 8-1 Boiling points of Solutions
9. Chemical reactions
- a. Lab 9-1 Single replacement reactions
  - b. Lab 9-2 Non metal reactions
  - c. Lab 9-3 Double replacement reactions
  - d. Lab 9-4 Catalyst reactions
  - e. Lab 9-5 pH testing of Solutions
  - f. Lab 9-6 Acid Base Titration
  - g. Lab 9-7 Finding Molarity

**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

10. Waves

- a. Lab 10-1 Frequency of Sound
- b. Lab 10-2 Musical Scale
- c. Lab 10-3 Refraction of Light
- d. Lab 10-4 Reflection of Light
- e. Lab 10-5 Focal point

**Outcomes**

SCHOOL 2, 4

DEPARTMENT 3.1, 4.2

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

**PROJECTS**

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

SHAMPOO CONSUMER REPORT LAB  
 ROLLING BUGGY  
 SINK AND FLOAT  
 ASPRIN LAB  
 STRENGTH COMPARISON  
 COST ANALYSIS

**INSTRUCTIONAL STRATEGIES**

LECTURE/DEMONSTRATIONS 35%

LAB WORK 25%

REPORTS 5%

PROBLEM SOLVING 20%

VIDEO 10%

REVIEWS 5

**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

## Appendix- Science Department Outcomes

### DEPARTMENT

#### Unit 1

- 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

#### 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
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- 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

#### 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

### 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

## 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

## TWELFTH GRADE

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### Performance Standards

By the end of **grade twelve**, students will:

A.12.1 Apply\* the underlying themes\* of science to develop defensible visions of the future

A.12.2 Show\* how conflicting assumptions about science themes\* lead to different opinions and decisions about evolution\*, health, population, longevity, education, and use of resources, and show\* how these opinions and decisions have diverse effects on an individual, a community, and a country, both now and in the future

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.12.4 Construct\* arguments that show\* how conflicting models\* and explanations\* of events can start with similar evidence\*

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

A.12.6 Identify\* and, using evidence\* learned or discovered, replace inaccurate personal models\* and explanations\* of science-related events

A.12.7 Re-examine the evidence\* and reasoning that led to conclusions drawn from investigations\*, using the science themes\*

B.12.1 Show\* how cultures and individuals have contributed to the development of major ideas in the earth and space, life and environmental, and physical sciences

B.12.2 Identify\* the cultural conditions that are usually present during great periods of discovery, scientific development, and invention

B.12.3 Relate\* the major themes\* of science to human progress in understanding science and the world

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

B.12.5 Explain\* how science is based on assumptions about the natural world and themes\* that describe the natural world

C.12.1 When studying science content, ask questions suggested by current social issues, scientific literature, and observations\* of phenomena, build hypotheses that might answer some of these questions, design possible investigations\*, and describe results that might emerge from such investigations

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

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

#### CHEMICAL 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

#### MOTIONS AND FORCES

D.12.7 Qualitatively and quantitatively analyze\* changes in the motion of objects and the forces that act on them and represent analytical data both algebraically and graphically

D.12.8 Understand\* the forces of gravitation, the electromagnetic force, intermolecular force, and explain\* their impact on the universal system

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

#### CONSERVATION OF ENERGY AND THE INCREASE IN DISORDER

D.12.10 Using the science themes\*, illustrate\* the law of conservation of energy\* during chemical and nuclear reactions

#### INTERACTIONS OF MATTER AND ENERGY

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

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

E. 12.1 Using the science themes\*, distinguish between internal energies\* (decay of radioactive isotopes, gravity) and external energies (sun) in the earth's systems and show\* how these sources of energy have an impact on those systems

#### GEOCHEMICAL CYCLES

E.12.2 Analyze\* the geochemical and physical cycles of the earth and use them to describe\* movements of matter

#### THE ORIGIN AND EVOLUTION OF THE EARTH SYSTEM

E.12.3 Using the science themes\*, describe\* theories of the origins and evolution\* of the universe and solar system, including the earth system\* as a part of the solar system, and relate\* these theories and their implications to geologic time on earth

E.12.4 Analyze\* the benefits, costs, and limitations of past, present, and projected use of resources and technology and explain\* the consequences to the environment

#### THE ORIGIN AND EVOLUTION OF THE UNIVERSE

E.12.5 Using the science themes\*, understand\* that the origin of the universe is not completely understood, but that there are current ideas in science that attempt to explain its origin

#### THE CELL

F.12.1 Evaluate\* the normal structures and the general and special functions\* of cells in single-celled and multiple-celled organisms

F.12.2 Understand\* how cells differentiate and how cells are regulated

#### THE MOLECULAR BASIS OF HEREDITY

F.12.3 Explain\* current scientific ideas and information about the molecular and genetic basis of heredity

F.12.4 State the relationships between functions\* of the cell and functions of the organism as related to genetics and heredity

#### BIOLOGICAL EVOLUTION\*

F.12.5 Understand\* the theory of evolution\*, natural selection, and biological classification

F.12.6. Using concepts of evolution\* and heredity, account for changes\* in species and the diversity of species, include the influence of these changes on science, e.g. breeding of plants or animals

#### THE INTERDEPENDENCE OF ORGANISMS

F.12.7 Investigate\* how organisms both cooperate and compete in ecosystems

F.12.8 Using the science themes\*, infer\* changes in ecosystems prompted by the introduction of new species, environmental conditions, chemicals, and air, water, or earth pollution

#### MATTER, ENERGY AND ORGANIZATION IN LIVING SYSTEMS

F.12.9 Using the science themes\*, investigate\* energy\* systems\* (related to food chains) to show\* how energy is stored in food (plants and animals) and how energy is released by digestion and metabolism

F.12.10 Understand\* the impact of energy\* on organisms in living systems\*

F.12.11 Investigate\* how the complexity and organization\* of organisms accommodates the need for obtaining, transforming, transporting, releasing, and eliminating the matter and energy\* used to sustain an organism

## THE BEHAVIOR OF ORGANISMS

F.12.12 Trace how the sensory and nervous systems\* of various organisms react to the internal and external environment and transmit survival or learning stimuli to cause changes in behavior or responses

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

G.12.3 Analyze\* the costs, benefits, or problems resulting from a scientific or technological innovation, including implications for the individual and the community

G.12.4 Show\* how a major scientific or technological change has had an impact on work, leisure, or the home

G.12.5 Choose a specific problem in our society, identify\* alternative scientific or technological solutions to that problem and argue it merits

H.12.1 Using the science themes\* and knowledge of the earth and space, life and environmental, and physical sciences, analyze\* the costs, risks, benefits, and consequences of a proposal concerning resource management in the community and determine the potential impact of the proposal on life in the community and the region

H.12.2 Evaluate\* proposed policy recommendations (local, state, and/or national) in science and technology for validity, evidence, reasoning, and implications, both short and long-term

H.12.3 Show\* how policy decisions in science depend on social values, ethics, beliefs, and time-frames as well as considerations of science and technology

H.12.4 Advocate a solution or combination of solutions to a problem in science or technology

H.12.5 Investigate\* how current plans or proposals concerning resource management, scientific knowledge, or technological development will have an impact on the environment, ecology, and quality of life in a community or region

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

H.12.7 When making decisions, construct a plan that includes the use of current scientific knowledge and scientific reasoning

