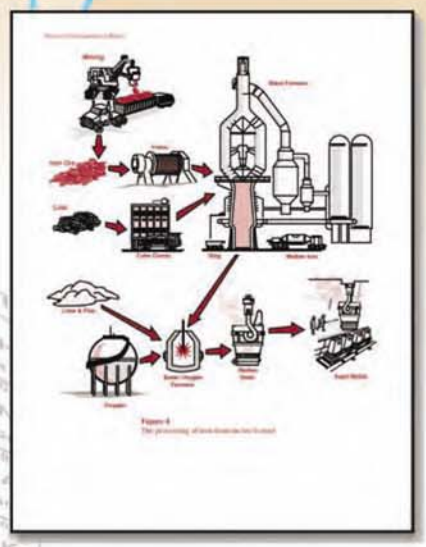
MATERIAL SCIENCE TECHNOLOGY

- Pre-engineering
- Materials and Processes
- Applied Science



ENERGY CONCEPTS, INC. ECi

What is Material Science Technology?

Material Science Technology is a contextual learning course from Energy Concepts, Inc., that is comprised of five units. Together, these units form a one year course ideally suited for Tech Prep and other School-To-Work initiatives.

Through a combination of questioning, observing, creating, experimenting, and building projects, students are motivated to learn about materials and their properties. They develop useful skills and proficiencies by using actual equipment and materials that are found throughout the industry.

Each unit covers one of the basic categories of materials. Beginning with the foundation for the course, the Solids unit, you may choose which units meet your needs. Material Science Technology is currently being taught in an increasing number of schools throughout the United States.

The units that form this course are:

1. **Solids**
2. **Metals**
3. **Ceramics**
4. **Polymers**
5. **Composites**

Why Material Science Technology?

A goal of the course is to provide students with the necessary skills to enable them to compete in today's competitive job market. The development and use of materials will continue to be responsible for many jobs in the work force. The demand for faster, stronger, and more economical materials fuel a surge in Material Science related jobs.

The Material Science Technology course is ideal for providing students with a practical science education and giving them hands-on experience demanded by industry.

Energy Concepts' Material Science Technology (MST) Development

In response to numerous requests from instructors who wanted to implement a material science program, ECI developed a complete laboratory system for MST. The curriculum and equipment for this course has been thoughtfully designed and packaged to make this unique program practical for implementation in your school.

ECI's MST course consists of a colorful, comprehensive lab text, a helpful tip-filled instructor's guide, and a convenient and easy to follow student journal. All required materials are supplied, and smaller equipment is packaged in convenient, easy to inventory die cut storage foam.

For over 40 years, ECI has consistently been a leader in providing complete, comprehensive systems for applied science to high schools, tech centers, and colleges. This standard of excellence continues with Material Science Technology. Our technical staff is available to provide solutions or answer any questions via a toll-free phone call.

The Material Science Technology curriculum was first initiated by Pacific Northwest National Laboratory in Richland, Washington, under support from the U.S. Department of Energy.

The Material Science Technology course consists of five individual areas of study. Each text manual comes with a summary, glossary, appendix, and index. A brief outline of each unit is listed below.

Solids

Chapter 1 System Familiarization and Safety
Chapter 2 Introduction to Materials
Chapter 3 Characteristics of Solids
Chapter 4 Mechanical Properties and Reactivity

Metals

Chapter 1 System Familiarization and Safety
Chapter 2 What Are Metals?
Chapter 3 Historical Development of Metals
Chapter 4 Alloys
Chapter 5 Altering the Mechanical Properties of Metals
Chapter 6 Testing and Manufacturing Processes

Ceramics

Chapter 1 System Familiarization and Safety
Chapter 2 Ceramics and Their Characteristics
Chapter 3 Glass-The Special Ceramic
Chapter 4 Properties of Glass
Chapter 5 Ceramic Manufacturing Processes

Polymers

Chapter 1 System Familiarization and Safety
Chapter 2 Chemistry of Polymers
Chapter 3 Copolymers and Elastomers
Chapter 4 Engineering Polymers
Chapter 5 Manufacturing Polymers

Composites

Chapter 1 System Familiarization and Safety
Chapter 2 Composites
Chapter 3 Wood and Concrete
Chapter 4 Fiber Reinforced Composites
Chapter 5 Manufacturing Processes

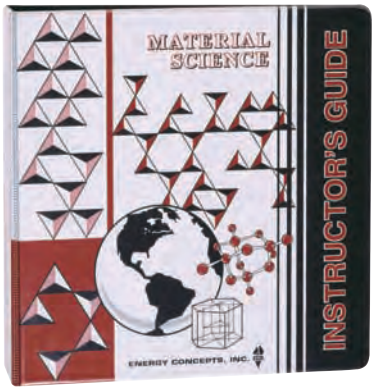
Student Lab Text

ECI's Laboratory Manual is designed to help the student develop a thorough understanding of the subject matter. Clearly written and professionally illustrated, the manual provides the most specific laboratory setup and easy-to-use procedures available.

Two-color highlighting is used to aid the student. With its loose-leaf design, it always stays open to the selected page. This feature allows instructors to easily photocopy individual sheets as desired.

More than 40 years of experience in producing technical training systems is reflected in the courseware quality. ECI lab manuals are carefully researched to assure that each experiment provides relevant, meaningful knowledge.

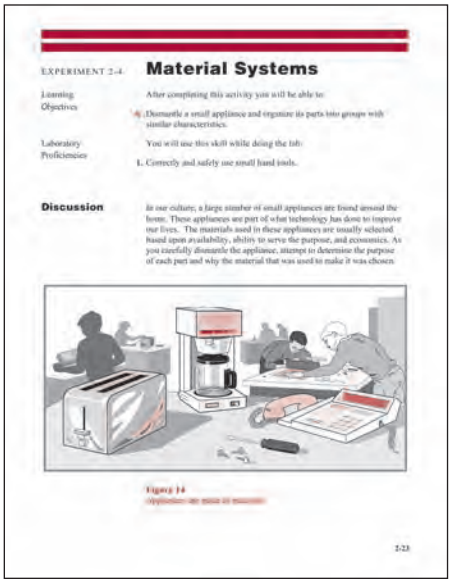
Instructor's Guide



A comprehensive Instructor's Guide is included to provide coordination and efficient equipment utilization. It contains scheduling guides, helpful hints and tips, and demonstrations. The Instructor's Guide includes sample data, expected results, and answers for easy comparison to each student's results.

Student Journal

A clear, easy to follow format for students' interpretations and answers is available. The flexible design allows for expansion with additional journal notes when needed. The layout of the journal encourages greater comprehension on the students' part and allows for a permanent record for future reference.


EXPERIMENT 2-4

Material Systems

Learning Objectives

After completing this activity you will be able to:

4. Dismantle a small appliance and organize its parts into groups with similar characteristics.

Laboratory Proficiencies

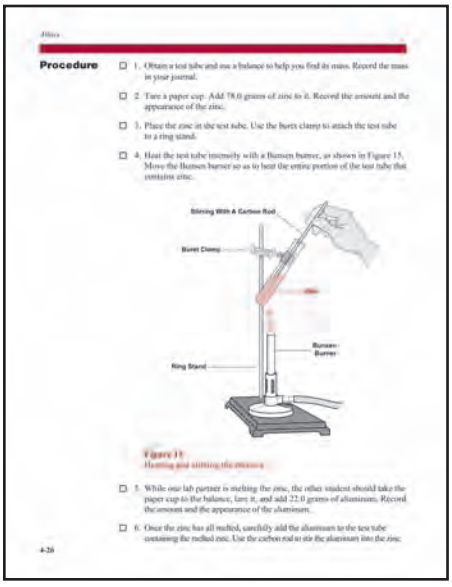
You will use this skill while doing the lab:

1. Correctly and safely use small hand tools.

Discussion

In our culture, a large number of small appliances are found around the home. These appliances are part of what technology has done to improve our lives. The materials used in these appliances are usually selected based upon availability, ability to serve the purpose, and economics. As you carefully dismantle the appliance, attempt to determine the purpose of each part and why the material that was used to make it was chosen.

Figure 1-1


Procedure

☐ 1. Obtain a test tube and use a balance to help you find its mass. Record the mass in your journal.

☐ 2. Tare a paper cup. Add 78.0 grams of zinc to it. Record the amount and the appearance of the zinc.

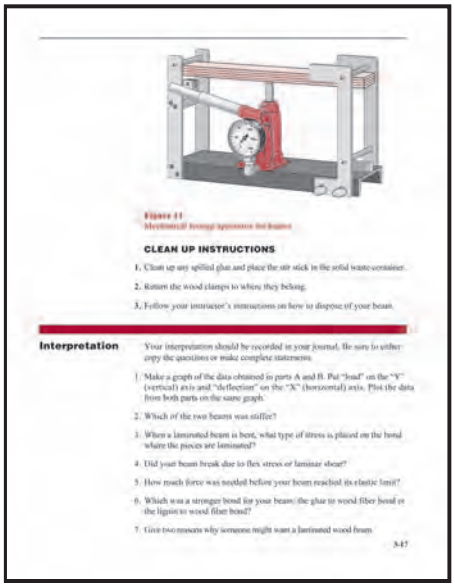
☐ 3. Place the zinc in the test tube. Use the buret clamp to attach the test tube to a ring stand.

☐ 4. Heat the test tube intensely with a Bunsen burner, as shown in Figure 15. Move the Bunsen burner so as to heat the entire portion of the test tube that contains zinc.

Figure 1-1

☐ 5. While one lab partner is melting the zinc, the other student should take the paper cup to the balance, tare it, and add 22.0 grams of aluminum. Record the amount and the appearance of the aluminum.

☐ 6. Once the zinc has all melted, carefully add the aluminum to the test tube containing the melted zinc. Use the carbon rod to stir the aluminum into the zinc.



Energy Concepts, Inc., provides all of the materials, tools and equipment necessary for each unit. The experiments shown here are a sample of the experiments, creations, and scientific tests found in this course.

Solids

Students complete a portion of the “Formation of Solids” lab in the Solids unit. In this experiment, students learn how an element may form more than one type of crystalline structure.

Metals

In this experiment, students make an alloy and cast a metal using a mold. A rolling mill is also shown. This product is utilized in the “Rolling a Coin” lab.

Ceramics

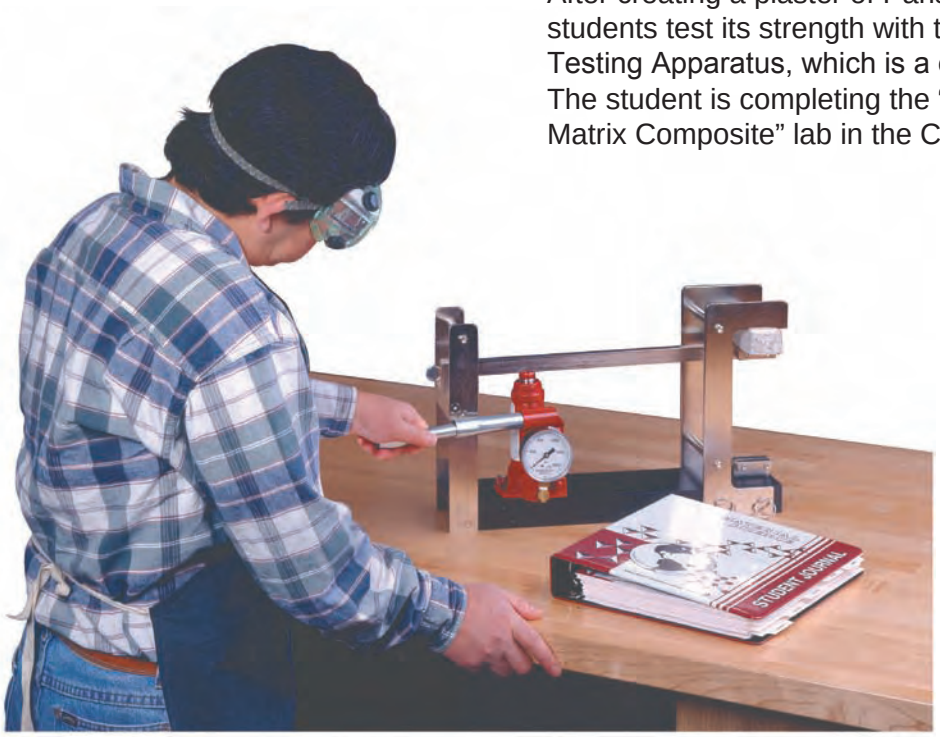
A glass grinder is used to form the shapes needed for students, stained glass project. The students then use the soldering iron to solder the stained glass pieces together with the copper foil. This is part of the “Stained Glass Project” in the Ceramics unit.

Polymers

A hydraulic press is used to compress a heated acrylic cube. After reheating, the cube exhibits “memory” of its original shape. This is a portion of the “Memory in Polymers” lab in the Polymers unit. The hydraulic press is also used for demonstrations in the Metals and Composites units.

Composites

After creating a plaster of Paris bar, the students test its strength with the Mechanical Testing Apparatus, which is a destructive test. The student is completing the “Plaster of Paris Matrix Composite” lab in the Composites unit.



COMPLETE LABORATORY EQUIPMENT

Laboratory Furniture

ECI's modular design lab furniture allows a wide range of custom configurations. From free-standing, island-style workstations with convenient storage bases to mobile units, this versatile lab furniture fits beautifully into every lab.

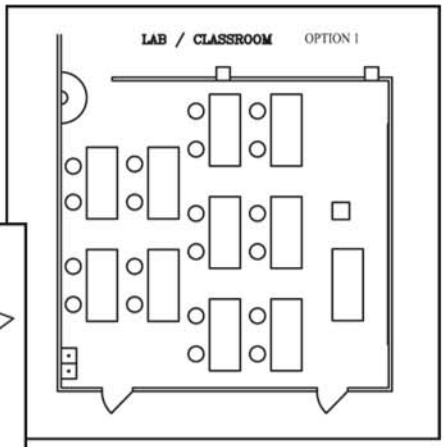
ECI lab furniture is constructed with fine craftsmanship. Durable high-quality materials (no particle board) and rugged hardware ensure that it will stand up to years of use in the most demanding classrooms. A variety of wood grains and color combinations are available.

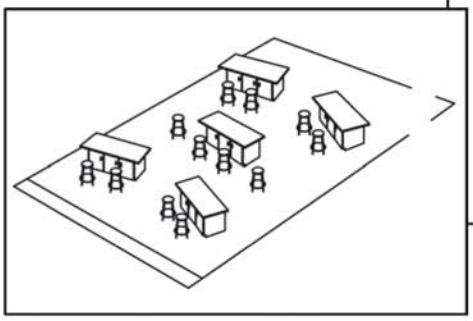
Function always follows form with ECI lab furniture. Die-cut foam storage tray inserts organize your equipment and assist in component inventory. And each drawer and door has its own key lock to provide added inventory control during and after class.

Complete Customer Service

Our experienced salespeople will help you with your purchasing needs by providing budgetary pricing and detail bid specification. They can even provide a total turnkey operation including equipment, storage benches, blueprint layouts, and isometric drawings of your new laboratory.

ECI also supports your purchase by providing instructor training and equipment orientation, initial inventory of equipment, and a toll-free telephone number for technical support from our competent engineers.





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