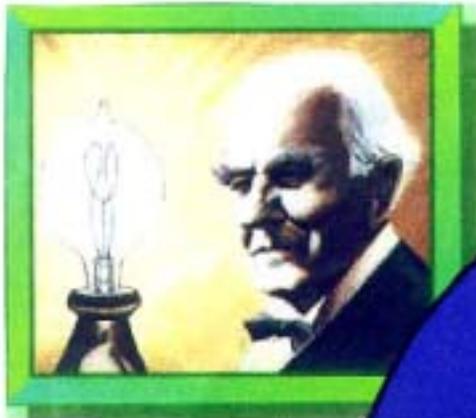


# WATTS UP? - JOLTS & VOLTS

An Integrated, Interdisciplinary unit about ELECTRICITY  
For grades 9<sup>th</sup> through 12<sup>th</sup>

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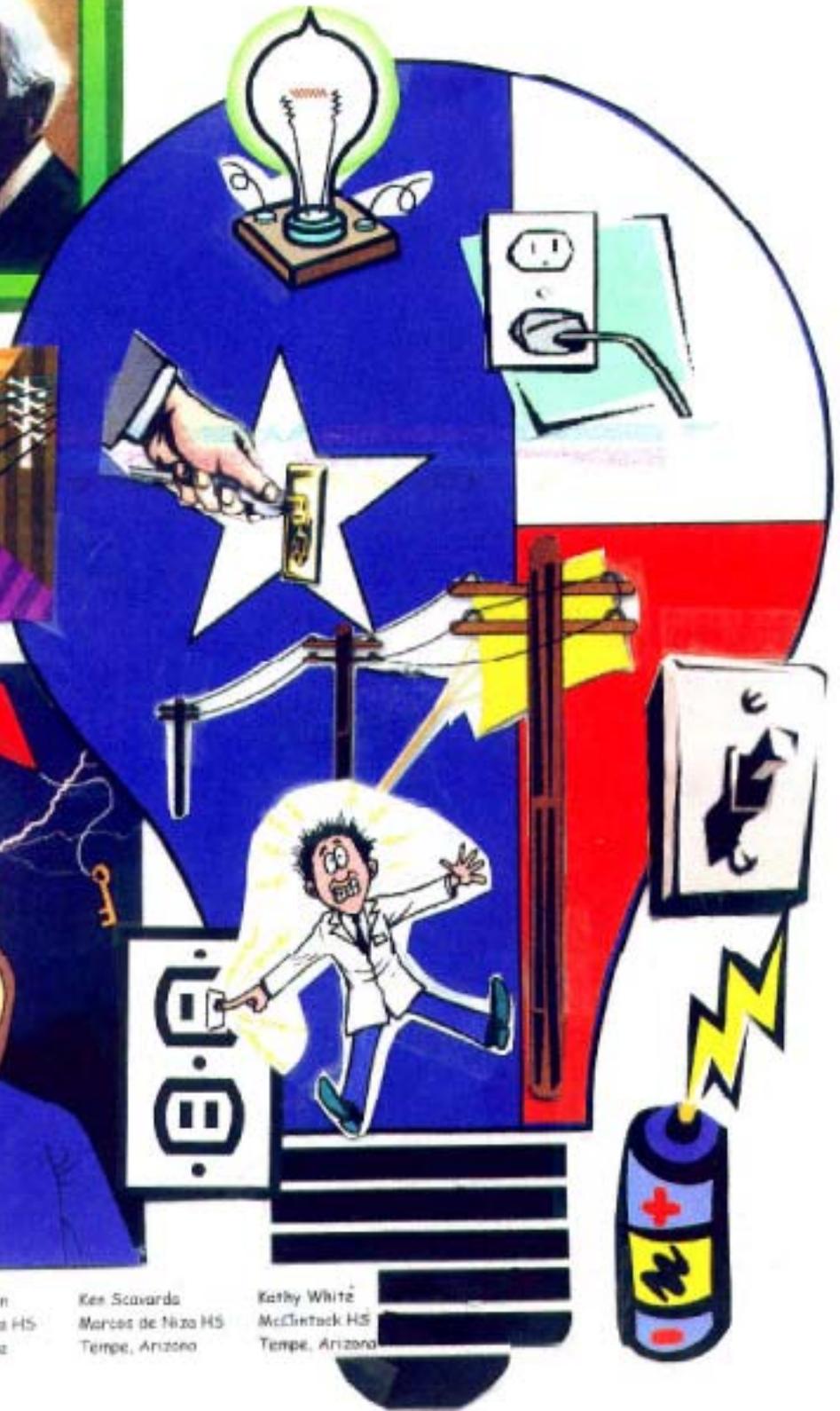


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**Unit Title:**  
**Watts Up? - Jolts & Volts**

**OVERVIEW**

I. **CONTENT:** (Why is this unit important? What are the essential concepts in this unit?)

The content includes the principles of electricity and the application of these principles to the understanding of electricity.

II. **PROCESS:** (How are the thinking skills developed?)

Thinking skills will be developed through lab activities, group discussions, research projects, hands on activities, music, arts, literature, historical records and step-by-step problem solving strategies.

III. **PRODUCT:** (What will kids do/know as a result of this unit?)

Students will understand the nature of electricity and how it is produced.

Students will recognize sources of electricity and how it is used.

Students will have an understanding of the history of electricity and its contribution to progress.

Students will be able to solve Ohm's Law problems and calculate electric power and electrical costs.

Students will understand circuitry and the safety issues involved in using electric current.

**Unit Overview: Alignment with  
National/State/District Pupil Performance Standards**

Benchmark 1: Student will be able to describe the historical development of electricity and its impact on industry, transportation, communication, the medical field, electric power generation and recreation.

Benchmark 2: The students will be able to understand and apply the principles of direct and alternating current, Ohm's Law and circuitry.

Benchmark 3: The students will recognize the cause and effect of the use and production of electricity on society and the environment

Benchmark 4: The students will learn the importance of sharing their knowledge using a variety of methods and teamwork to arrive at logical solutions to scientific issues involving electricity.

**I-SEARCH INDEPENDENT RESEARCH PROJECTS  
FOR GIFTED AND TALENTED STUDENTS**

1. **PARADOXES:**

It is common knowledge that electrical energy produced by nuclear power plants is inherently dangerous. However fossil fuel plants pollute the environment and deplete our natural resources  
Prepare an oral defense of nuclear power generations.

2. **ATTRIBUTES:**

Symbols are used in electrical circuit diagrams to represent different devices. These symbols are universally used and need to be recognized by those working in this field.  
Prepare a set of overhead transparencies depicting and defining electrical symbols

3. **ANALOGIES:**

Electricity and water flow in much the same way.

Build a model that shows the analogies between electrical current, voltage, resistance and capacitance and flow of water.

4. **DISCREPANCIES:**

Current research in electric technology has been toward super conductivity and super conductors.

Product: Create a large-scale drawing showing progress so far on this research.

5. PROVOCATIVE QUESTIONS:

All electricity is carried on wires. Research done has shown electricity can travel through the air. However we presently do not have a way to meter this usage by volume.

Idea: Compile a pictorial view of what you feel this meter would look like and how we could direct electric current through it.

6. EXAMPLES OF CHANGE:

In days of past the day began at sun up and ended at sun down. In today's society we can operate 24 hours a day.

Project: Make a power point or poster board presentation of how life has improved or how it has hurt us.

7. EXAMPLES OF HABIT:

Many people have a bad habit of using electrical appliances and tools

Produce a comic strip presentation show the hazards combining of water and electricity.

8. ORGANIZED RANDOM SEARCH:

Thomas Edison used many different filaments in the invention of this light bulb. The filament is important and the material it is produced is important.

Project: Produce a drawing of a light bulb and list in order what you feel to be the order of importance of each product needed.

9. SKILLS OF SEARCH:

The telephone is one of the most important devices known to man.

Project: Produce a series of advertisements to show the changes and developments that the telephone has undergone in its timeline.

10. TOLERANCE FOR AMBIGUITY:

Electricity is a very powerful and totally invisible.

Product: Create a drawing showing what life would be like if electricity was like water and we could see it, taste it and smell it.

11. INTUITIVE EXPRESSION:

Electricity can affect your health. Many people feel that electricity can change moods.

List ways that electricity can help or hinder your mood.

12. ADJUSTMENT TO DEVELOPMENT:

Real Estate values can dramatically go down if high current Electrical lines go up near your house.

Why does this happen. Is it purely aesthetics or are there health reasons.

13. STUDY CREATIVE PEOPLE AND PROCESS:

Thomas Edison has been credited for many inventions. He is most widely known for his invention of the light bulb.

Make a poster or PowerPoint presentation showing his other inventions that were directly related to electricity.

14. EVALUATE SITUATIONS:

Many people have been injured or have died from electric shock.

Project: Make a list of all deaths by accident or forces of nature and rate electricity in that list.

15. CREATIVE READING SKILL:

Read any article on electricity's impact on society.

Project: Why do you feel some people still refuse to use this technology?

16. CREATIVE LISTENING SKILL:

Jumping a dead battery in a car is a very dangerous procedure. Many people have been seriously hurt doing this.

Project: With a mock cars and 2 mock batteries explain to classmate the proper way to connect jumper cables and the proper order to install and

Remove them. Do this like you are explaining it on the phone.

17. CREATIVE WRITING SKILL:

Same as 16 but develop a short instruction manual in place of the phone.

18. VISUALIZATION SKILL:

Direct Current flows in the direction of negative to positive.

Project: Make a drawing showing the flow of electricity in a DC series circuit that includes 2 lights and 1 switch.

Project: Make a drawing showing the flow of electricity in a DC parallel circuit that includes 2 lights and 1 switch.

**CRITICAL THINKING SKILLS – ACADEMIC  
ANALYZING HUMAN ACTIVITIES! (AHA!)**

STATE STANDARD # 2SC-P3 STUDENTS WILL BE ABLE TO describe the sources, applications and values involved in using electricity.

ESSENTIAL QUESTION: How does the Universal Theme of Producing, Exchanging and Distributing create mastery learning of essential concepts in this unit?

1. PRODUCING, EXCHANGING, AND DISTRIBUTING [ECONOMICS]

KNOWLEDGE:

Anticipatory Set: Turn off lights. Use candlelight to write a paragraph.

Students will: Write a paragraph describing life today without electricity.

COMPREHENSION:

Design a table, chart or diagram illustrating the pros and cons of each source of electrical energy (ex wind, geothermal, solar, nuclear fission and fusion, hydroelectric and fossil fuels).

APPLICATION:

Anticipatory Set: Remove batteries from CD player and discuss what would make the CD work.

Students will; work in teams of 3-4 and research one of the sources of electricity. Write a 1-page report of the information and audio-visual aid to present to the class.

Class/team product One-page report to present to class.

Multicultural and/or ESL and/or Bilingual Link: Show video clip “For Richer For Poorer” depicting a typical day in the life of the Amish

Mathematics/Science Link and/or Humanities Link: Audio-visual presentation and report.

School-to-Career/Tech Prep Link: Understand jobs related to energy production.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

Anticipatory Set: Clip from E.R. electric paddles to the heart:

Students will: work in small groups. Students will compile a list of 6 to 10 technological advances made in your lifetime. Categorize them into groups: transportation, entertainment, medical, recreation, communication, industry and personal contact.

Class/team/individual product

INDIVIDUAL JOURNAL ASSIGNMENT:

Describe a typical day in your life without using any electricity.

HOMELINK:

What power company do you use? What is the source of your electricity?

STATE STANDARD # 2SC-34 STUDENTS WILL BE ABLE TO Discuss the past, present and future impact of electricity on transportation

ESSENTIAL QUESTION: How does the Universal Theme of Transportation create mastery learning of essential concepts in this unit?

2. TRANSPORTATION (Book, The Electric Car and the Burden of History, by David A Kirch)

KNOWLEDGE:

Anticipatory Set: Show film clip” Back To The Future Part 1” (when lightening starts the car to return to the present), or clip from “Back To The Future Part II” (last scene with the elevated train).

Students will: Describe the history of alternative fuel vehicles to include electric cars, electric railways, and solar powered vehicles.

COMPREHENSION:

Construct a timeline for the development of alternative fuel vehicles.

APPLICATION:

Anticipatory Set Show film clip” Back To The Future Part 1” (where fusion is used to power a car)

Students will: make a pictorial display of timeline (i.e. poster, computer generated design, drawing)

Class/team product: Completed timeline

Multicultural and/or ESL and/or Bilingual Link: Compare United States mass transportation system to the Euro rail System in Europe.

School-to-Career/Tech Prep Link: Guest speakers from Universal Technical Institute, Salt River Project, General Motors, or Honda discussing the topic of electric cars.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

Anticipatory set: Show film clip from “Galaxy Quest” (when they use the transporter)

Students will: Group discussion question - What will transportation look like 25 years from now?

Class/team/individual product

INDIVIDUAL JOURNAL ASSIGNMENT:

Do you see electric cars being competitive in the racing world?

(i.e. Nascar, Indy 500)

HOMELINK:

Discuss with your family the pros and cons of buying an electric car.

STATE STANDARD # 2SC-P4 STUDENTS WILL BE ABLE TO discuss the past, present and future role of electrical communication

ESSENTIAL QUESTION: How does the Universal Theme of Communications create mastery learning

of essential concepts in this unit?

3. COMMUNICATIONS (<http://people.clemson.edu/pammack/lec122/elecint.htm>)

KNOWLEDGE:

Anticipatory Set: Put a six-word sentence on the board in Morris Code. Have students translate (provide an incentive)

Students will: Describe the role of electricity in the development of communication systems

COMPREHENSION:

Construct a timeline for communication systems from pony express to e-mail.

APPLICATION:

Anticipatory Set: Clips from Mission Impossible and Get Smart showing electronic forms of communication

Students will: Make a pictorial display of their timeline.

Multicultural and/or ESL and/or Bilingual Link: Uses International Morris Code to send a message to a classmate.

Mathematics/Science Link and/or Humanities Link: Read story about The Pony Express.

School-to-Career/Tech Prep Link: Bring in a team from local telephone company (Qwest or Cox Cable).

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

Anticipatory set: Show film clip from “Powder” depicting telepathic communication

Students will: discuss and explain what communication systems will look like 25 years from now.

Class/team/individual product

INDIVIDUAL JOURNAL ASSIGNMENT –

How would your life be affected if you had no telephone?

HOMELINK:

Ask family - What is the most advanced form of communication to date?

STATE STANDARD # 3SC-P4 STUDENTS WILL BE ABLE TO Relate the production of electricity to the conservation of resources and the environment.

ESSENTIAL QUESTION: How does the Universal Theme of Protecting and Conserving create mastery learning of essential concepts in this unit?

4. PROTECTING AND CONSERVING

KNOWLEDGE:

Anticipatory Set: Show film clip from “Silkwood” or “The China Syndrome” (depicting the possible effects of nuclear power on humanity).

Students will: Distinguish between renewable and non-renewable resources in relation to the production of electricity and the resulting impact on the environment.

COMPREHENSION:

Make a table identifying those sources of electricity that are renewable and those that are not renewable describe how each impacts the environment Identify how each impacts the environment.

APPLICATION:

Anticipatory Set: Watch film clips of “The China Syndrome” and “Independence Day” (when they were

discussing using a nuclear bomb)

Students will: Work in groups, using the Internet to answer questions such as: how nuclear waste has been disposed of in the past, present. Design a plan for the future disposal of nuclear wastes.

Class/team product

Multicultural and/or ESL and/or Bilingual Link: What safety features are used in other countries dealing with nuclear energy?

Mathematics/Science Link and/or Humanities Link: Write your own ending to “The China Syndrome”

School-to-Career/Tech Prep Link: Guest speakers from local businesses discussing career outlook, job descriptions and education needed in the energy field.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

Anticipatory set: Show clips from “Artificial Intelligence”. (Robots looking for parts)

Students will: work in groups, doing research to discover the contents of a wet cell car battery and a dry cell battery. Find out what happens to those materials when they go to the dump. Find out if the materials are able to be recycled.

INDIVIDUAL JOURNAL ASSIGNMENT:

How should we as a society dispose of nuclear waste?

HOMELINK:

What type of materials does your family discard that may be harmful to the environment?

STATE STANDARD # 5SC-P6 STUDENTS WILL BE ABLE TO Recognize the power of electricity as friend or foe.

ESSENTIAL QUESTION: How does the Universal Theme of Providing Education create mastery learning of essential concepts in this unit?

5. PROVIDING EDUCATION (Provide students with handbook from electric company.)

KNOWLEDGE:

Anticipatory Set: Film clip of movie, “What Women want?” (When he is electrocuted)(Clip when Mel Gibson is electrocuted)

Students will: Describe the invisible force of electricity as a friend or foe.

COMPREHENSION:

Identify techniques for the safe handling of electricity.

APPLICATION:

Anticipatory Set Film clip from “Home Improvement” (self injury) or” Christmas Vacation:” (cat biting the wire)

Students will: make a poster illustrating safe electrical practices.

Class/team product

Multicultural and/or ESL and/or Bilingual Link: Add pictures or drawings to your poster to make it useful in any language.

Mathematics/Science Link and/or Humanities Link: Create a rap song about electrical safety.

School-to-Career/Tech Prep Link: Guest Speaker: Lineman from Power Company to discuss safety near electricity.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

Anticipatory set: Show clip end of movie “Powder” (end of movie where boy is hit by lightning)

Students will: Research and explain why some people is killed when struck by lightening and some live.

INDIVIDUAL JOURNAL ASSIGNMENT:

What would you do if someone in your family were electrocuted?

HOMELINK:

Do a home safety audit. “Is Your Home Safe?”

STATE STANDARD # 2SC-3p STUDENTS WILL BE ABLE TO Explain cordless technology.

ESSENTIAL QUESTION: How does the Universal Theme of Making and Using Tools and/or Technology create mastery learning of essential concepts in this unit?

6. MAKING AND USING TOOLS AND/OR TECHNOLOGY (Magazines and catalogs)

KNOWLEDGE:

Anticipatory Set: Video clip “Honey I Shrunk The Kids” (shrinking machine) or “Star Wars” (fighting with light sabers)

Students will: Describe the value of cordless technology

COMPREHENSION:

List 20 cordless items (that used to have cords) and list the advantages of those cordless tools.

APPLICATION:

Anticipatory Set: Show clip from, “The Thomas Crown Affair” or “Mission Impossible” (showing hi tech tools)

Students will: Work in teams to invent a new product that can be cordless.

Class/team product: Students will describe it to the class and explain the advantages of your new product over the old.

Multicultural and/or ESL and/or Bilingual Link: write or explain how cordless technology might improve life in a non-industrial country.

Mathematics/Science Link and/or Humanities Link: Write a jingle advertising your cordless product.

School-to-Career/Tech Prep Link: guest speakers from Carpenters or Apprentice Programs to discuss how construction sites have changed with technology. Have speaker bring construction demo tools to show students.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

Anticipatory set: Show film clip from “Home Improvement” (Tim Taylor improving a tool)

Students will: work in small groups to research the changes in batteries that have made cordless technology successful.

INDIVIDUAL JOURNAL ASSIGNMENT:

Write a paragraph describing which power tool is most like your personality.

HOMELINK:

How many cordless appliances do you have around your home? What would you like to have in your home that is cordless?

STATE STANDARD 3SC-P1 STUDENTS WILL BE ABLE TO Describe the role of electricity in recreation

ESSENTIAL QUESTION: How does the Universal Theme of Providing Recreation create mastery learning of essential concepts in this unit?

7. PROVIDING RECREATION

KNOWLEDGE:

Anticipatory Set Show film clip “Roller Coaster”:

Students will: Give examples of the role of electricity in recreational activities

COMPREHENSION:

List recreational toys and activities that use electricity.

APPLICATION:

Anticipatory Set: Students participate in car races and electric car races.

Students will: work in groups to design a marketing campaign for a recreational device. To include: a jingle, a poster (Ad), cost, etc.

Class/team product

Multicultural and/or ESL and/or Bilingual Link: Research other forms of recreation in different countries.

Mathematics/Science Link and/or Humanities Link: Write a jingle or song for their advertising campaign

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

Anticipatory set: Show film clip from “City Slickers” (when cell phone goes off and electric coffee grinder causes a stampede.)

Students will: describe what would be necessary to camp in the wilderness for a week where there is no commercial electricity.

INDIVIDUAL JOURNAL ASSIGNMENT:

How would your recreational activities be different without electric power?

HOMELINK:

What type of electrical recreational (items) do you have in your home?

STATE STANDARD # 3SC-P3 STUDENTS WILL BE ABLE TO describe the role of U.S government in regulation and distribution of electricity from power plants.

ESSENTIAL QUESTION: How does the Universal Theme of Organizing and Governing create mastery learning of essential concepts in this unit?

8. ORGANIZING AND GOVERNING

KNOWLEDGE:

Anticipatory Set: Show film clip from “Black Out” (dealing with the 1977 New York City black out.) and “Ocean 11” (machine shuts down Las Vegas)

Students will: Identify examples of electrical energy being wasted.

COMPREHENSION:

Students will describe the effects of poor management of electricity.

APPLICATION:

Anticipatory Set: Situation; due to energy shortages at 2:00 today there will be a 24-hour brown out. How will this affect your life in the next 24 hours?

Students will: use Internet to investigate how 3 cities in 3 different states in the United States obtain electrical energy. Find out the rate of power usage.

Class/team product: Class will rank the cities from highest to lowest in power consumption

Multicultural and/or ESL and/or Bilingual Link: Use Internet to find energy production and consumption in Canada or Mexico.

Mathematics/Science Link and/or Humanities Link: Write a news article on the cause and effect of the brown out that occurred yesterday in Tempe, Arizona

School-to-Career/Tech Prep Link: Guest Speaker from EPA

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

Anticipatory set: Show film clips “Die Hard 2” (when the lights at the airport went out) and clip from “Where Were You When The Lights Went Out?”

Students will: Research how utility companies manage electricity supply and demands

INDIVIDUAL JOURNAL ASSIGNMENT:

Identify ways you could conserve energy

HOMELINK:

Develop a plan with your family on how you could reduce energy consumption in your own home.

STATE STANDARD # 3SC-P1 STUDENTS WILL BE ABLE TO. Discuss the pros and cons of life support systems

ESSENTIAL QUESTION: How do the Universal Theme of Moral, Ethical and Spiritual Behavior create mastery learning of essential concepts in this unit?

9. MORAL, ETHICAL AND SPIRITUAL BEHAVIOR

KNOWLEDGE:

Anticipatory Set: Show film clip from “Young Frankenstein” (starting him up) and film clip from ER (putting someone on life support system)

Students will: Describe the electrical and medical devices used to sustain life.

COMPREHENSION:

List the medical devices used to assist or replace the function of specific body parts.

APPLICATION:

Anticipatory Set: Film clip from “The Doctor” and “Who’s Life Is It anyway” 1981

Students will: Debate the pros and cons of life support systems

Multicultural and/or ESL and/or Bilingual Link: research using the Internet information on how other cultures and/or religions view life support systems.

Mathematics/Science Link and/or Humanities Link: Read an article about John Kervorkian and his view on life supporting systems.

School-to-Career/Tech Prep Link: Guest Speakers, (Lawyer and Hospital Administrator) to discuss the legal ramifications of life support systems

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

Anticipatory set: Film clip from “Flatliners” 1990

Students will: research the difference between clinical death and brain death

Class/team/individual product

INDIVIDUAL JOURNAL ASSIGNMENT:

Write a living will.

HOMELINK:

Ask your parents: If the situation arises would they want to be kept on a life support system?

STATE STANDARD # 3SC-P4 STUDENTS WILL BE ABLE TO \_\_\_\_\_ describe how the modern power producing devices/structures have affected the aesthetics of our landscape.

ESSENTIAL QUESTION: How does the Universal Theme of Aesthetic needs create mastery learning of essential concepts in this unit?

10. AESTHETIC NEEDS

KNOWLEDGE:

Anticipatory Set: Show slides of nuclear plant, hydroelectric dam, wind turbine farms, solar power, geothermal energy, coal burning, and generating station.

Students will: describe the structures involved in each of the power producing plants.

COMPREHENSION:

Describe how the aesthetics of each power generating stations can be improved.

APPLICATION:

Anticipatory Set: Video clip (Fugitive) jumping off the Hoover Dam

Students will: use the Internet to research the location of each of the types of power producing plants in the Southwest (California, Nevada, Utah, and Arizona)

Class/team product

Multicultural and/or ESL and/or Bilingual Link: What type of power plants are found in Mexico and Canada?

Mathematics/Science Link and/or Humanities Link: Draw your plan to improve on the appearance of any power producing facility.

School-to-Career/Tech Prep Link: Invite guest speaker from Governors office or an Environmentalist.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

Anticipatory set: Film clip “Las Vegas Vacation”

Students will: describe how neon lighting affects the aesthetics of a city

Class/team/individual product

INDIVIDUAL JOURNAL ASSIGNMENT:

Your local nuclear power plant has 5 years left of life expectancy. Write a letter to your congressman convincing him/her as to the direction your state should go to produce power but maintain the beauty of the surroundings

STATE STANDARD # 2SC-P4 STUDENTS WILL BE ABLE TO Discuss the historical milestones and development of electricity in the 1800's.

ESSENTIAL QUESTION: How does the discipline/sub-discipline of \_\_\_\_\_ relate to mastery learning of \_\_\_\_\_?

11. History

KNOWLEDGE:

Anticipatory Set: Film clip, "Ben Franklin"

Students will: be able to describe the contributions of Ben Franklin, Faraday and Thomas Edison in the area of electricity

COMPREHENSION:

List several inventions utilizing electricity that were major contributions in the 1800's and are still used today.

APPLICATION:

Anticipatory Set: Demonstration; 2 identical lamps with same size and watt light bulb. Break the glass in the bulb. Turn them on, one at a time in a darkened room.

Students will: Use the Internet or library to research the construction of a light bulb. Write a hypothesis to explain why the broken bulb went out and the whole bulb did not.

Multicultural and/or ESL and/or Bilingual Link: Make a timeline for electrical milestones in the 18<sup>th</sup> century in Europe.

Mathematics/Science Link and/or Humanities Link: Read letter from Ben Franklin

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

Anticipatory set: Show the Video "The Wizard of Menlo Park"

Students will: Research and discuss the impact of the electric light bulb during the Industrial Revolution.

INDIVIDUAL JOURNAL ASSIGNMENT:

Describe your thoughts and feelings if you were Ben Franklin and had just traveled in a time machine to present time.

HOMELINK:

Discuss the advancements made in electricity during your parent's lifetime.

STATE STANDARD # 5SC-P3 STUDENTS WILL BE ABLE TO describe the cause and effect of electric charge.

ESSENTIAL QUESTION: How does the discipline/sub-discipline of \_\_\_\_\_ relate to mastery learning of \_\_\_\_\_?

12. Basics of Electricity (Chem- Phys Text)

KNOWLEDGE:

Anticipatory Set: Video clip “Powder” in the classroom with Vandegraaff generator.

Students will: with Vandegraaff generator describe how electric charge is related to atomic structure, forces and static electricity.

COMPREHENSION:

Explain how and why lightening occurs.

APPLICATION:

Anticipatory Set: Show demonstration of Vandegraaff generator.

Students will: work in groups. Lab activity with electroscopes.

Class/team product Explain what is happening to the leaves in an electroscope when either a negatively charged rubber rod or a positively charged glass rod makes contact.

Multicultural and/or ESL and/or Bilingual Link: Look up and find the number of lightening strikes by continent

Mathematics/Science Link and/or Humanities Link: Song “It’s Electric” by Marcia Griffith

School-to-Career/Tech Prep Link: guest speaker, Meteorologist or a University of Arizona Lightning Center

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

Anticipatory set: use Vandegraaff generator with paper clip to simulate lightening rod.

Students will: Draw diagrams showing how lightening rods prevent the build up of electric charge.

Class/team/individual product

INDIVIDUAL JOURNAL ASSIGNMENT:

What would you do if you were hiking and were caught in an electric storm?

HOMELINK:

Ask family, what are some safety precautions that should be taken inside your home during a lightening storm?

STATE STANDARD # 5SC-P3 STUDENTS WILL BE ABLE TO Relate electric current, voltage and resistance to Ohm’s Law.

ESSENTIAL QUESTION: How does the discipline/sub-discipline of \_\_\_\_\_ relate to mastery learning of \_\_\_\_\_?

13. Flow of Electricity (Chem-Phys Text)

KNOWLEDGE:

Anticipatory Set: Use Vandegraaff generator and see how many students can be used to pass electric current.

Students will: Define and identify the units for amperage, voltage and resistance and use them to manipulate Ohm’s Law.

COMPREHENSION:

Students will use Ohm’s Law to solve for volts, amps and ohms.

APPLICATION:

Anticipatory Set: Use students to (represent currents) carrying different amounts of books (representing voltage) demonstrate the relationship between current and voltage.

Students will: Complete a worksheet solving Ohm's Law exercises

Multicultural and/or ESL and/or Bilingual Link: Write a paragraph about each of the men responsible for the following terms: voltage, watts, ohms and amperes.

Mathematics/Science Link and/or Humanities Link: Learn the lyrics to "Do Watt Ditty"

School-to-Career/Tech Prep Link: guest speaker (electrician)

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

Anticipatory set: Listen to "Math Sucks" by Jimmy Buffet

Students will: Describe the relationship between thickness of wire and resistance. Use different size hoses with water pressure to determine resistance and flow.

Class/team/individual product

INDIVIDUAL JOURNAL ASSIGNMENT:

Discuss the various meanings of the word "resistance"

HOMELINK:

Ask your family- What is the difference between different wattages in light bulbs? How do you think the use of different types of wattages would affect your electric bill?

STATE STANDARD # 5SC-P5 STUDENTS WILL BE ABLE TO describe how batteries produce direct current.

ESSENTIAL QUESTION: How does the discipline/sub-discipline of \_\_\_\_\_ relate to mastery learning of \_\_\_\_\_?

14. Direct Current (Chem-Phys book)

KNOWLEDGE:

Anticipatory Set: Relay race; two teams compete. 1<sup>st</sup> team to have all its members go from negative location to positive location wins.

Students will: Describe how electrochemical cells produce DC current.

COMPREHENSION:

Draw a diagram of a dry and wet cell battery and show the direction of the flow of electrons.

APPLICATION:

Anticipatory Set: Video clip of "Energizer Bunny" commercial or "Sears Diehard Battery" commercial.

Students will: Utilize 2 equal length wires of equal gauges and several acidic fruits. Make 2 different kinds of batteries to light the flashlight bulb.

Mathematics/Science Link and/or Humanities Link: Add two verses to Bart Simpson's song, "Mama Took The Batteries"

School-to-Career/Tech Prep Link: Invite speaker from Audio Express to explain hi-tech stereo systems for cars.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

Anticipatory set: Song. "High Voltage" or "Electric Current"

Students will: Make batteries and use same length wires but with different gauge copper wires. Compare and contrast the results with lab #1. Write a conclusion related to current resistance

Class/team/individual product

INDIVIDUAL JOURNAL ASSIGNMENT:

Describe the type of audio system you would like to have in your car.

Determine modifications you would need to make and the cost involved.

HOMELINK:

Discuss with family, how they store and dispose of batteries

STATE STANDARD # 5SC-P6 STUDENTS WILL BE ABLE TO Describe alternating current its production and use.

ESSENTIAL QUESTION: How does the discipline/sub-discipline of \_\_\_\_\_ relate to mastery learning of \_\_\_\_\_?

15. Alternating Current (Chem-Phys Text)

KNOWLEDGE:

Anticipatory Set: Relay race, two teams each with two lines (use students walking/ running to the opposite line and back in order to demonstrate alternating current. 1st team to have all members' trade lines wins.

Students will: be able to describe an AC current and how a generator works to produce electricity

COMPREHENSION:

Explain the role of electromagnetisms in the generation of alternating current

APPLICATION:

Anticipatory Set: Film clip, "Powder" (when spoons are collected in lunchroom.

Students will: participate in lab. Repeat Faraday and Oersted's experiments on electricity and magnetism.

Mathematics/Science Link and/or Humanities Link: Teach dance "Electric Slide"

School-to-Career/Tech Prep Link: guest speaker from Arizona Builders Alliance (Electrician)

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

Anticipatory set: Video clip "The Edge" (making a compass from a needle and a leaf)

Students will: Identify the sources of energy needed to turn the electromagnet of a generator in an electric power plant.

INDIVIDUAL JOURNAL ASSIGNMENT:

If you wanted to build a cabin in a non-developed area and had a generator, how would you produce the mechanical energy to power it?

HOMELINK:

Discuss with family the possibility of ET really having electrical power. How much electricity can your body take?

STATE STANDARD # 5 SC-P6 STUDENTS WILL BE ABLE TO Describe the difference between series and parallel circuits and their application.

ESSENTIAL QUESTION: How does the discipline/sub-discipline of \_\_\_\_\_ relate to mastery

learning of \_\_\_\_\_ ?

16. Circuits (Chem-Phys book)

KNOWLEDGE:

Anticipatory Set: Video clip; “Christmas Vacation” (show Christmas decorations on the house)

Students will: Distinguish between series and parallel circuits and how voltage, amp and resistance are calculated in each type of circuit.

COMPREHENSION:

Students will be able to give examples of objects wired with series circuits and examples of objects wired with parallel circuitry

APPLICATION:

Anticipatory Set: Film clip from “Short Circuit”

Student’s will, use “D” batteries, wire and flash light bulbs to complete lab activity constructing series and parallel circuits

Class/team product

Multicultural and/or ESL and/or Bilingual Link: Research the differences in electric output in different countries (Mexico, Europe, Asia) . What would you need to do in order to use your electrical devices (i.e. hair dryer, curling iron) in another country?

School-to-Career/Tech Prep Link: Invite a guest speaker from Arizona Builders Alliance or another technical trade.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

Anticipatory set: Video clip from “Mission Impossible” (rewiring for a break in) and “Sliver” (hotel wired with cameras)

Students will: be able to solve for volts, amps, and ohms on a worksheet with diagrams

INDIVIDUAL JOURNAL ASSIGNMENT:

Just because we have the capability to tap into communications systems electronically. Do we have the right?

HOMELINK:

Discuss with your family where the circuit breaker box is at your home.

STATE STANDARD #5 SC-P5 STUDENTS WILL BE ABLE TO explain how electric power is calculated and purchased.

ESSENTIAL QUESTION: How does the discipline/sub-discipline of \_\_\_\_\_ relate to mastery learning of \_\_\_\_\_ ?

17. Electric Power (Chem-Phys Text)

KNOWLEDGE:

Anticipatory Set: Film clip “Back To The Future” (I need gigawatts)

Students will: define watts, electric power. They will calculate power and the cost of electric power

COMPREHENSION:

Solve power problems and be able to interpret a typical electric bill

**APPLICATION:**

Anticipatory Set: Show film clip “Apollo 13” (when they did not have enough power to get back to earth)

Students will: find the volts and amps on 10 appliances at their home and calculate the amount of power (in kilowatts) that they use, and then calculate the cost to run these appliances for one hour at 9cents per hour

Multicultural and/or ESL and/or Bilingual Link: Research on Internet the cost to consumers for electrical power in another country.

Mathematics/Science Link and/or Humanities Link: Write a cheer about power

School-to-Career/Tech Prep Link: guest speaker from Power Company to discuss how they access power usage in the home to help reduce power usage

**HIGHER ORDER THINKING SKILLS (H.O.T.S.):**

Anticipatory set: Show video clip” War Games” (introducing computer Joshua and discuss it’s power needs)

Students will: Compare and contrast the cost of electricity on a December and July electric bill. Calculate how much it would cost to run 10 appliances for one hour at both of those rates.

**INDIVIDUAL JOURNAL ASSIGNMENT:**

Discuss who you think are the top users of electricity in your city. Do you as a community member have any input as to energy conservation and if so what would you do?

**HOMELINK:**

Discuss with family ways to reduce monthly electric bill

**MORAL/ETHICAL/SPIRITUAL  
REASONING AND DILEMMAS**

**TEN ETHICAL DILEMMAS**

ESSENTIAL QUESTION: How does the content of this unit reflect character education through Moral and Ethical dilemmas?

1. Producing, Exchanging, and Distributing [Economics]

ESSENTIAL QUESTION: How does the Human Activity of Producing, Exchanging and Distributing create moral/ethical dilemmas?

DILEMMA: You own a mutual fund that is very profitable. You are also a member of the city council that is faced with the decision of shutting down the local power plant. The city intends to develop alternative means of electric power. You are considered the swing vote. A vote of “no” would allow you to keep making lots of money but would not be in the best interest of the community. What is your vote?

2. Transportation

ESSENTIAL QUESTION: How does the Human Activity of Transportation create moral/ethical dilemmas?

DILEMMA: You are an active lobbyist for clean air in your community. You have been instrumental in developing laws for clean air. You need to buy a new vehicle. Should you buy a gas powered vehicle

fully loaded or a smaller simpler electric car? Both of equal cost

### 3. Communications

ESSENTIAL QUESTION: How does the Human Activity of Communications create moral/ethical dilemmas?

DILEMMA: People of all walks of life own cell phones. They are used day and night and at any location. Many people feel that this is an infringement on the privacy and safety of the public. Should laws be enacted to restrict the use of cell phones in cars and public places?

### 4. Protecting and Conserving

ESSENTIAL QUESTION: How does the Human Activity of Protecting and Conserving create moral/ethical dilemmas?

DILEMMA: You just bought a home in a very nice and friendly neighborhood. There is a long standing tradition of decorating your house during the holiday season. Everyone participates, putting on elaborate displays. People come from miles around to view the beautiful lights. Your family is extremely energy and budget conscience. You believe lights are a waste of money and energy. Will you be one of the crowds to keep the peace or play "Scrooge" during the holidays?

### 5. Providing Education

ESSENTIAL QUESTION: How does the Human Activity of Providing Education create moral/ethical dilemmas?

DILEMMA: Your next-door neighbor whom you do not get along with is digging a hole in his backyard for hot tub. You know he is digging in an area where there are electrical lines that may potentially be dangerous. Do you educate him or let him discover them himself.

### 6. Making and Using Tools and/or Technology

ESSENTIAL QUESTION: How does the Human Activity of Making and Using Tools and/or Technology create moral/ethical dilemmas?

DILEMMA: You are a sales person for an air conditioning firm. You have the opportunity to sell a large number of air conditioners to a school. You have two types of units to sell. (A) is a very efficient but costly model. (B) is not as efficient but is a much cheaper model. (B) will also be discontinued within the next year. You stand to make the most money if you sell (B). What is your decision?

### 7. Providing Recreation

ESSENTIAL QUESTION: How does the Human Activity of Providing Recreation create moral/ethical dilemmas?

DILEMMA: Human nature has evolved to the place where we have put huge demands on electrical devices for our fun. You and your family are preparing a camping trip. Your 14-year-old daughter is not looking forward to the trip. She has insisted that the family camp somewhere she can use her hair dryer and curling iron. She can make life miserable for everyone, but it is important that the family be together. Do you look for a camping spot in the wilderness or go to the nearest KOA campground?

### 8. Organizing and Governing

ESSENTIAL QUESTION: How does the Human Activity of Organizing and Governing create moral/ethical dilemmas?

DILEMMA: You have purchase a brand new home. You know that the electric meter is not working properly because your electric bill is much to low. Do you inform your local electric company or wait until they come out to find the problem?

### 9. Moral, Ethical and Spiritual Behavior

ESSENTIAL QUESTION: How does the Human Activity of Moral, Ethical and Spiritual Behavior create moral/ethical dilemmas?

DILEMMA: You just finished building your dream home. You have heard from reliable sources that a transforming sub-station will be built across the street within the next few years. You put your house up for sale. Do you disclose to the new owners?

### 10. Aesthetic Needs

ESSENTIAL QUESTION: How does the Human Activity of Aesthetic Needs create moral/ethical dilemmas?

DILEMMA: Ken and his family just bought a beautiful new home. Because they are an energy conscience family they want to put in solar panels. The homeowners association has strict rules governing the aesthetic beauty of the neighborhood. Putting in solar panels will probably result in a legal battle with the homeowners association. You are serious about the potential savings in energy costs by putting in the solar panels.

## **PRODUCTIVE THINKING SKILLS DIVERGENT/CREATIVE THINKING**

### 1. BRAINSTORM MODEL

#### A. BRAINSTORM ALL OF THE \_\_\_\_\_:

- AHA #1. Electrical things in your house that make things easier
- AHA #2. Advantages and disadvantages of electrical powered vehicles
- AHA #3. Ways your can communicate electronically
- AHA #4. Ways electricity production can affect the environment
- AHA #5. Movies that have electricity in them.
- AHA #6. Ways that cords on appliances can create safety
- AHA #7. Different electrical devices used on a baseball field

#### B. BRAINSTORM AS MANY \_\_\_\_\_ AS YOU CAN THINK OF.

- AHA #8. Ways to interrupt electrical power
- AHA #9. Life support machines
- AHA #10. Aesthetic features on your school campus
- AHA #11. Ways to generate light
- AHA #12. Ways to get hurt by electricity
- AHA #13. Conductors of electricity
- AHA #14. Different types of batteries

#### C. HOW MANY WAYS CAN YOU COME UP WITH TO?

- AHA #15. Use electrical currents in musical instruments
- AHA #16. Define the word circuit
- AHA #17. Use the word power

### 2. VIEWPOINT MODEL (Human or Animate) (Use Cultural Literacy Terms)

#### A. HOW WOULD \_\_\_\_\_ LOOK TO A (N) \_\_\_\_\_?

- |                              |                   |
|------------------------------|-------------------|
| AHA #1. Light                | candle            |
| AHA #2. Synthesizer          | Beethoven         |
| AHA #3. Subway               | pony express      |
| AHA #4. Nuclear power dump   | naturalist        |
| AHA #5. Electrical outlet    | a pioneer settler |
| AHA #6. Electric power saw   | Noah (Arc)        |
| AHA #7. Karchner Cavern tour | caveman           |
| AHA #8. Las Vegas            | Tarzan            |

B. WHAT WOULD A \_\_\_\_\_ MEAN FROM THE VIEWPOINT OF A (N)?

AHA #9. Dialysis machine	kidney
AHA #10. Hydroelectric dam	fish
AHA #11. radio tube	Shawky
AHA #12. Lightning bolt	Ben Franklin
AHA #13. circuit	George S. Ohm
AHA #14. Calculator	16 <sup>th</sup> century mathematician
AHA #15. Computer driven telescope	Galileo
AHA #16. Microwave oven	Laura Ingalls Wilder
AHA #17. Power point	Michelangelo

C. HOW WOULD Thomas Edison VIEW THIS?

1. Nuclear energy
2. Neon signs
3. Camcorders
4. Computers
5. DVD's
6. Pacemakers

3. INVOLVEMENT MODEL (Personification/Inanimate object brought to life)

A. HOW WOULD YOU FEEL IF YOU WERE?

- AHA #1. A tree in an electrical storm  
AHA #2. A floppy disc in a computer hard drive  
AHA #3. A car battery on a battery charge  
AHA #4. A cow in the field next to Chernobyl Russia  
AHA # 5. Frayed electric cord  
AHA #6. Cordless drill without a battery  
AHA #7. A roller coaster in a theme park

B. IF YOU WERE A \_\_\_\_\_ WHAT WOULD YOU (SEE, TASTE, SMELL, FEEL, etc.)?

AHA #8. Post office	feel about E-mail
AHA #9. Fish	turbine in an electric turbine
AHA #10. Heart	defibulated
AHA# 11. Light bulb	feel to be turned on
AHA #12. Battery	feel to be recharged
AHA #13. Electron	feel about wire travel
AHA #14. Power switch	electric chair

C. YOU ARE A. DESCRIBE HOW IT FEELS.

- AHA #15. Electromagnet  
AHA #16. Electrons in an electric current  
AHA #17. Transformer

4. CONSCIOUS SELF-DECEIT MODEL

A. SUPPOSE \_\_\_\_\_ WHAT \_\_\_\_\_?

AHA #1. A new type of electric energy	what kind would you be
AHA #2. Internal combustion circuit	electric car
AHA #3. Juliet had a cell phone	would change
AHA #4. Bird	wind turbine
AHA #5. Fuses	power energy surge
AHA #6. Cordless phone	smoke signals
AHA #7. Canoe	would you think about a jet ski
AHA #8. Stop light	feel about cars
AHA #9. Eyeball	feels about a laser

- B. YOU CAN \_\_\_\_\_ WHAT \_\_\_\_\_?
- |   |                          |
|---|--------------------------|
| AHA #10. Redesign a power plant             | would it look like       |
| AHA #11. Construct a battery                | would it look like       |
| AHA #12. Buy lightening rod for home        | place would it be        |
| AHA #13. Write manual on electric safety    | what would you include   |
| AHA #14. Design a long lasting battery      | would it look like       |
| AHA #15. Deliver electricity to any culture | culture would be first   |
| AHA #16. Change wire size                   | effect would it have     |
| AHA #17. Lower the cost of electricity      | would you have to change |

5. FORCED ASSOCIATION MODEL (Use cultural literacy terms here)

- A. HOW IS \_\_\_\_\_ LIKE \_\_\_\_\_?

- |                             |                      |
|-----------------------------|----------------------|
| AHA #1. Electricity         | perfume              |
| AHA #2. Batteries           | time machine         |
| AHA #3. Power line          | cell phone           |
| AHA #4. Greenpeace          | a battery            |
| AHA #5. Student             | computer database    |
| AHA #6 Palm pilot           | human brain          |
| AHA #7. All terrain vehicle | information highways |

- B. GET IDEAS FROM \_\_\_\_\_ TO IMPROVE \_\_\_\_\_.

- |                      |                     |
|----------------------|---------------------|
| AHA #8. Politician   | safety              |
| AHA #9. Amish        | energy conservation |
| AHA #10. Nursery     | nuclear power plant |
| AHA #11. Paul Revere | Communication       |
| AHA #12. Beavers     | dams                |
| AHA #13 Chef's       | temperature control |
| AHA #14. Salmon      | current resistance  |

- C. I ONLY KNOW ABOUT \_\_\_\_\_ EXPLAIN \_\_\_\_\_ TO ME.

- |                          |                      |
|--------------------------|----------------------|
| AHA #15. taking turns    | alternating currents |
| AHA #16 short circuits   | circuit breakers     |
| AHA #17. Electric drills | power saws           |

6. REORGANIZATION/SYNECTICS MODEL

- A. WHAT WOULD HAPPEN IF \_\_\_\_\_?

- AHA #1. Electricity were available only 12 hours a day  
 AHA #2. All cars had to be electric  
 AHA #3. There was no telephones  
 AHA #4. There were no laws governing power plants  
 AHA #5. All electrical appliances came with no instructions  
 AHA #6. Batteries were illegal  
 AHA #7. Amusement parks had no electricity

- B. SUPPOSE \_\_\_\_\_ (HAPPENED)WHAT WOULD BE THE CONSEQUENCES?

- AHA #8. Your neighboring power plant had a meltdown  
 AHA #9. There was no such thing as DNR (Do Not Resusitate)  
 AHA #10. There were no resources to generate electrical energy  
 AHA #11. No one invented the light bulb  
 AHA #12. There were no lightening rods at Cape Canaveral  
 AHA #13. There were no fuses or circuit breakers in your home  
 AHA #14. The batteries of your CD player cost \$60.00

- C. WHAT WOULD HAPPEN IF THERE WERE NO \_\_\_\_\_?

- AHA #15. Electrical power in the hospital
- AHA #16. Parallel circuitry
- AHA #17. Governmental controls of electricity costs

### CULTURAL LITERACY

Students must meaningfully use these terms to: (1) spell correctly, (2) use correctly in a sentence, and (3) use a metaphor. Use E.D. Hirsch's, *The Core Knowledge Series* (i.e. *What Your Third Grader Needs to Know*) and your textbooks.

**Dates:**

October 19, 1752	1826
1752	1831
1753	1837
1800	1947
1821	

**Names/Proper Names:**

Tim Allen	Ben Franklin
Alexander Graham Bell	Michael Faraday
Thomas Edison	Samuel B. Morse

**Ideas/ Phrases:**

- “The Electric Slide”
- “Lightning never strikes twice in the same place”
- “Electricity never strikes twice in the same place”
- “Opposites attract”
- “Static electricity”
- “Light saber”
- “Necessity is the mother of invention”
- “I’ll drop you a line”

**TERMS:**

Aesthetic	alternating current (ac)
Alternating voltage	amperage
Amplifier	anode
Appliance	bar graph
Breaker box	brownout
Cathode	cell phone
Charge	charged
Circuit breaker	conductor
Current	diode
Electric field	electric system
Electricity	electromagnet
Electromagnetic force	electromagnetic induction
Electromagnetism	energy
Entrance cable/service	entrance conductors
Flow chart	fossil fuel
Duel	fuse
Generate	generate station
Generator	gig watt
Ground	hertz
Hydroelectric	incandescence
Invention	jumper cables
Kilovolt	kilowatt
Kilowatt-hour	light bulb
Lightning arrestor	linear

Megawatt	microwave
Milestone	mobile
Negative pole	neon sign
Nuclear energy	nuclear regulatory commission (NRC)
Open circuit	operating costs
Overload	pole-mounted transformer
Positive tool	radiation
Relay	secondary circuit
Semi-conductor	short circuit
Smoke detector	solar energy
Solar heating	superconductivity
Switching station	technician
Three Mile Island	transformer
Turbine	volt
Voltage	watt
Windmill	

## RESOURCES

### **Bibliography – Teacher/Professional Books and Resources**

- Hirsch, E.D. Jr., Kett, J.F., & Trefil, J. (1993). *The dictionary of cultural literacy: What every American needs to know.* (revised and updated edition) Boston: Houghton Mifflin Company. (ISBN 0-395-65597-8)
- Hellemans, A. and Bunch, B. (1991). *The Timetables of Science: A Chronology of the Most Important People and Events in the History of Science.* Simon and Schuster, NY.
- Leonard, H. (1994). *This is the ultimate fake book with over 1200 songs for keyboard, vocal, guitar, and all “B” instruments.* (third edition). Milwaukee, WI; Hal Leonard Corporation. (ISBN 0-7935-2939-5)
- Sorenson, S. (2000). *Webster’s New World Student Writing Handbook.* (fourth edition) New York: Simon & Schuster, Inc.
- Strouf, J. (1997.) *The literature teacher’s book of lists.* New York: Prentice Hall (ISBN 0-876-28-554-X)

### **Bibliography – Student Books on loan from Media Center for classroom use as anticipatory sets, to read in class and/or as I-Search Projects**

- Appleby, A. (1991). *America’s all-time favorite songs; over 200 best-loved songs in one volume.* New York: Amsco Publications. (ISBN 0-8256-1239-6)
- Berger, M., Croll, C. (2001). *Switch on, Switch off.* Harper Trophy.
- Brandt, K. (1985). *Electricity.* Troll Associates.
- Cast, c. (1992). *Where Does Electricity come from?* Barrons Juveniles.
- Charlton, E., Hennick, L. (1999). *The Streetcars of New Orleans.* Pelican Publishing.
- Coughlan, J. (1994). *Green Cars: Earth-Friendly Electric Vehicles.* Children’s Press.
- Craddock, J. (2001). *VideoHound’s golden movie retriever 2002.* Detroit, MI: Visible Ink Press.
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- Glover, D. (1993). *Batteries, Bulbs and Wires.* Kingfisher. (ISBN 1856979334)
- Green, J. (2002). *The green book of songs by subject. The thematic guide to popular music.* (5<sup>th</sup> ed. Updated and expanded). Nashville, TB: Professional Desk References, Inc. (ISBN 0-939735-20-2pbk)
- Grun, B. (1991). *The timetables of history: A horizontal linkage of people and events.* (the new 3<sup>rd</sup> revised edition). New York: Simon & Schuster, Inc. (ISBN 0-671-74271-X pbk)
- Hirsch, E.D. Jr., Kett, J.F., & Trefil, J. (1988). *Cultural literacy. What every American needs to know.* New York: Vintage Books a division of Random House. (ISBN 0-394-75843-9 pbk)
- Kiebling, F., Puschmann, R., Schmieder, A. (1999). *Contact Lines for Electric Railways; Planning, Design, Implementation.*
- Kirsch, D. (2000). *The Electric Car and the Burden of History.* Rutgers University Press. (ISBN 0813528097)
- Rudy, L. (1995). *The Ben Franklin Book of Easy and Incredible Experiments.*
- John Wiley & Sons, Wood, R. (1996). *Electricity and Magnetism FUNDamentals,* McGraw-Hill.

### **Educational Films/Videos**

1. Understanding Electricity
2. Electricity
3. How Batteries Work
4. The Way Things Work
5. Current Electricity
6. Electricity: Dry Batteries and Light Bulbs
7. The Generation of Electricity
8. For all practical purposes
9. The story of Alexander Graham Bell

### **Commercial Films/Videos**

1. Home Alone
2. Back to the Future I
3. Powder
4. War Games
5. Apollo 13
6. Back to the Future II
7. The Doctor
8. Whose Life is it Anyway
9. City Slickers
10. Blackout
11. Short Circuit
12. Silkwood
13. Batman
14. China Syndrome
15. Home Improvement (TV clip)
16. Thomas Crown Affair
17. Flatliners
18. Mission Impossible
19. Roller coaster by NOVA
20. Get Smart (TV clip)
21. ER (TV clip)
22. Independence Day
23. Where were you when the lights went out?
24. The Net
25. The Last Starfighter
26. What women want
27. Star Wars
28. Ocean's eleven
29. Schoolhouse Rock: Electricity, Electricity
30. Energizer Bunny (TV commercial)
31. Young Frankenstein
32. Quest for Fire
33. Sear's DIEHARD battery commercial
34. The Edge
35. E.T.
36. Sliver
37. On Deadly Ground

### **Fiction**

1. The 20<sup>th</sup> Century Children's Book Treasury. Johnson, Tom. (1988) Schulman, Janet. (1988).
2. Frankenstein by Mary Shelly
3. What's the Big Idea Franklin? By Jean Fritz
4. The Time Machine by H. G. Wells
5. The Lightbulb by Joseph Wallace
6. The Electric Kool-Aid Kid Acid Test by Tom Wolf
7. The Master Key: An Electrical Fairytale by Frank Baum
8. Bright Lights to See by Miriam Bourne

### **Non-Fiction**

1. Energy all Around Us by Donna Bailey
2. Energy, Making it Work by Tom Johnson
3. The Light Bulb by Sharon Cosner
4. Light for the World: Edison and the Power of Electricity
5. Thomas A. Edison by V. Buranelli
6. Great Discoveries and Inventions by David Lambert
7. Alexander Graham Bell by Parker

### **Poetry**

1. Inventions by Shel Silverstein
2. The Time Machine by Christopher Schulte
3. Poems about Famous Americans by Lee Bennett Hopkins
4. Homework Machine by Shel Silverstein

### **Drama (Stage Productions)**

## 1. Frankenstein

### **Art Works**

Alchemical Bloom

[http://www.accad.ohio-state.edu/~ayoungs/fs\\_alchem.html](http://www.accad.ohio-state.edu/~ayoungs/fs_alchem.html)

Lightning Photographs

<http://www.photopixels.com/lightning>

Electrification

[http://www.smecc.org/rea\\_posters\\_artwork.htm](http://www.smecc.org/rea_posters_artwork.htm)

### **Music**

Doo-watt-diddy-diddy

Energy & motion songs

E-lec-tri-city

Battery song (Simpsons)

Electricity, electricity (schoolhouse rock)

Electric Avenue

You've got the power

The night the lights went out in Georgia

Neutron dance

Blowin in the wind

The electric slide

High voltage

Electric current song

### **RESOURCE PEOPLE/MENTORS**

Representative from Home Depot

Representative from local power company

Guest speaker from UTI (Universal Technical Institute)

Guest speaker from Salt River Project

Guest speaker from General Motor's proving ground

Representative from Honda Car Co

Representative from Qwest Communications

Representative from Cox Cable/Communications

Representative from Arizona Builders Alliance Apprenticeship program

A lineman from SRP/APS (elec/gas) company

A personal injury attorney

A hospital administrator

An environmentalist (from the Governor's office)

Meteorologist from local TV

Master electrician

Speaker from Audio Express

### **Field trips**

Visit local power company

Visit science museum

Visit cox/communications cable company

### **Other Material (CD-ROM, Laser Disc, Internet sites, etc.)**

<http://sin.fi.edu/franklin/scientist/electric.html>

<http://www.iee.org.uk/publish/faraday/faraday1.html>

<http://www.privateline.com/kids/projects.html>

<http://privateline.com/TelephoneHistory/generatingelectricity.htm>

<http://sin.fi.edu/franklin/inventor/bell.html>

<http://sin.fi.edu/franklin/inventor/edison.html>  
<http://sin.fi.edu/franklin/safety.html>  
<http://www.ushistory.org/franklin/kite/index.htm>  
[http://www.nanug.com/ashleigh/lyrics.t.the\\_night\\_the\\_lights\\_went\\_out\\_in\\_georgia.html](http://www.nanug.com/ashleigh/lyrics.t.the_night_the_lights_went_out_in_georgia.html)  
[www.askjeeves.com](http://www.askjeeves.com)  
[www.discovery.com](http://www.discovery.com)  
<http://library.thinkquest.org/28032/cgi-bin/psparse.cgi>  
[http://www.dctech.com/physics/human/ben\\_franklin.php](http://www.dctech.com/physics/human/ben_franklin.php)  
[www.zoomdinosaurs.com/devices/lightbulb/label/](http://www.zoomdinosaurs.com/devices/lightbulb/label/)  
[www.weberelectricsupply.com/sfty.html](http://www.weberelectricsupply.com/sfty.html)  
[www.smud.org/safety/world/site\\_files/hurt/exp\\_franklin.html](http://www.smud.org/safety/world/site_files/hurt/exp_franklin.html)  
[www.reallyrics.com/lyrics/N002600050035.asp](http://www.reallyrics.com/lyrics/N002600050035.asp)  
[www.reallyrics.com/lyrics/S011700040005.asp](http://www.reallyrics.com/lyrics/S011700040005.asp)  
[www.reallyrics.com/lyrics/000140010027.asp](http://www.reallyrics.com/lyrics/000140010027.asp)  
[www.weddingvendors.com/music/lyrics/song-1102.html](http://www.weddingvendors.com/music/lyrics/song-1102.html)  
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