



Lesson #1: Energy Terms and Concepts (5 class periods)

Objectives

Students will be able to...

- Identify different types and sources of energy.
- Describe the relationship between potential and kinetic energy.
- Determine the approximate energy used by various tools or systems.

Standards

LS 11-12.6
RSIT 11-12.2
RHSS 11-12.7
Problem Solving and Critical Thinking 5.1, 5.3, 5.4
Health and Safety 6.2, 6.3, 6.4, 6.5, 6.6
Mathematics 1.1
Communication 2.2
Responsibility and Flexibility 7.0
Leadership and Teamwork 9.0
Technical Knowledge and Skills 10.0, 10.1, 10.2, 10.3
Demonstration and Application 11.0
Residential and Commercial Pathway D1.2, D1.3, D1.4, D1.5, D2.1, D2.2, D3.1, D3.2, D3.3,
D 9.1, D 9.2, D9.3, D9.4, D9.5, D9.6

Materials

Potential vs. Kinetic Energy Packet
Sources/Types of Energy Handout
Building Energy Efficiency Terms Handout
Kill A Meter
Kill A Meter Activity Handout
Spec Sheets for Power Tools and gas fired equipment

Lesson Sequence

- Introduce Potential vs. Kinetic Energy to students by reviewing the information in the ***Potential vs. Kinetic Energy Packet***. Answer any questions students may have along the way. Have students highlight important information.
- Review the different types of sources of energy with the class. Follow the process from fossil fuel to light bulb. Pass out the ***Sources/Types of Energy Handout*** and have students highlight important information. *Special note: solar/renewables will continue to be an important component in energy and buildings as California moves towards greenhouse gas reductions. Consider discussing solar as it applies to residential building uses with the caveat that reducing the building energy load should be primary and supplementing with solar technology is secondary.

- Identify the fuel energy sources for several common appliances found in homes.
Example:

Heating systems-natural gas, propane, oil, kerosene, coal, wood

Air conditioning systems- electricity, natural gas, propane, oil

Water heating systems- electricity, natural gas, oil, wood, geothermal

- Identify common equipment available in the classroom, workshop or surrounding areas (examples-computers, power tools, gas powered tools, and generators) and estimate their energy usage.
- Perform calculations as a class. Example: A 1500 w tool uses _____ kWh if operated for _____ minutes. If 1 kWh costs \$_____, that tool would cost \$_____ to run for that amount of time.

Divide the number of watts by 1000 to convert the number from watts to kilowatt. 15000 W divided by 1000 results in 0.15 kW. Multiply the number of kilowatts by the number of hours the device will be used. If the device will be used for three hours, multiply by 0.15 kW by three to produce 0.45kWh.

At \$0.25 per kWh, this tool would cost \$0.1125 to operate for 3 hours.

- Demonstrate the potential vs. kinetic experiment by using a hammer and nail, catapult, ball drop.
- Pass out the ***Kill A Watt Activity***. Walk students through the correct way of using a Kill A Meter. Then have students perform the Kill A Meter Investigation. Support students as needed.
- Have students take the ***Forms of Energy Quiz, Electricity Quiz, Measuring Electricity Quiz*** once investigation is completed.

Assessment

Forms of Energy Quiz
Electricity Vocabulary Quiz
Measuring Electricity Quiz
Informal observation when students are performing estimation of energy (including “more than/less than” or actual calculations)

Accommodations/Modifications

Provide Calculator
One on One Assistance
Peer Support
Highlight Important Content on Handouts

Forms of Energy Quiz

Fill in the blanks with the words from the word bank. Some words may be used more than once. Use the word that best completes the sentence.

Chemical	Conservation of Energy	Elastic	Electrical
Energy Efficiency	Gravitational Potential	Kinetic	Motion
Nuclear	Potential	Radiant	Sound
Thermal			

1. Stored energy and the energy of position are _____ energy.
2. Compressed springs and stretched rubber bands are examples of _____ energy.
3. The vibrational and movement of the atoms and molecules within substances is called _____ energy.
4. The scientific rule that states that energy cannot be created or destroyed is called the Law of _____.
5. The movement of energy through substances in longitudinal waves is _____ energy.
6. The energy of position such as a rock on a hill is _____ energy.
7. The movement of objects and substances from place to place is _____ energy.
8. Electromagnetic energy traveling in transverse waves is _____ energy.
9. Energy stores I the bonds of atoms and molecules is _____ energy.
10. The movement of atoms, molecules, waves, and electrons is _____ energy.

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11. The movement of electrons is _____ energy.
12. The amount of useful energy you get from a system is its _____.
13. The energy in petroleum and coal is stored as _____ energy.
14. X-rays are an example of _____ energy.
15. Fission and fusion are examples of _____ energy.
16. A hydropower reservoir is an example of _____ energy.
17. Wind is an example of the energy of _____.

Forms of Energy Quiz – Answer Key

1. Potential
2. Elastic
3. Thermal
4. Conservation of Energy
5. Sound
6. Gravitational potential
7. Motion
8. Radiant
9. Chemical
10. Kinetic
11. Electrical
12. Energy efficiency
13. Chemical
14. Radiant
15. Nuclear
16. Gravitational potential
17. motion

Electricity Vocabulary Quiz

Fill in the blanks with the electricity vocabulary words. Some words may be used more than once. Use the word that best completes the sentence.

Baseload	Capacity	Cogeneration	Conservation
Demand-side management	Deregulation	Efficiency	Generator
Kilowatt-hour	Peak demand	Power pool	Reliability
Secondary	Smart meter	Superconductor	Thermal
Transformer	turbine		

1. A device that changes voltage is a _____.
2. A device that changes linear motion into circular motion is a _____.
3. Allowing competition in the power industry is _____.
4. Managing how and when consumers use electricity is called _____.
5. The total amount of electricity a power plant can deliver is _____.
6. Times when many customers need electricity _____.
7. _____ is how well a utility always delivers electricity.
8. Electricity always produced to meet basic demand is _____.
9. A merged network of electric utilities is _____.
10. Reducing energy usage through behavioral changes is _____.
11. A measurement of the amount of electricity used by consumers is _____.
12. Power plants that burn fuel to produce electricity is _____.
13. A material with little resistance to electric current is _____.

14. A device measuring electricity consumption that allows for two-way wireless communication between the utility and consumer is _____.
15. _____ is a source of energy that requires another source to produce it.
16. Manufacturing a product and producing electricity is _____.
17. Reducing the amount of energy consumed by devices through advances in technology is _____.

Electricity Vocabulary Quiz – *Answer Key*

1. Transformer
2. Turbine
3. Deregulation
4. Demand-side management
5. Capacity
6. Peak demand
7. Reliability
8. Baseload
9. Power pool
10. Conservation
11. Kilowatt-hour
12. Thermal
13. Superconductor
14. Smart meter
15. Secondary
16. Cogeneration
17. Efficiency

Measuring Electricity Quiz

Fill in the blanks in the tables below.

Table 1:

Voltage	=	Current	X	Resistance
1.5 V	=	_____ A	X	3 Ω
_____ V	=	3 A	X	4 Ω
120 V	=	4 A	X	_____ Ω
240 V	=	_____ A	x	12 Ω

Table 2:

Power	=	Voltage	X	Current
27 W	=	9 V	X	_____ A
_____ W	=	120 V	X	1.5 A
45 W	=	_____ V	X	3 A
_____ W	=	120 V	x	2 A

Table 3:

Appliance	Power	=	Voltage	X	Current
TV	180 W	=	120 V	X	_____ A
Computer	40 W	=	120 V	X	_____ A
Printer	120 W	=	120 V	X	_____ A
Hair Dryer	1000 W	=	120 V	x	_____ A

Table 4:

Power	X	Time	=	Electrical Energy (kWh)	X	Price	=	Cost
5 kW	X	100 h	=	_____ kWh	X	\$0.127	=	\$ _____
25 kW	X	4 h	=	_____ kWh	X	\$0.127	=	\$ _____
1000 W	X	1 h	=	_____ kWh	X	\$0.127	=	\$ _____

Measuring Electricity Quiz – Answer Key

Table 1:

.5 A

12 V

30Ω

20 A

Table 2:

3 A

180 W

15 V

240 W

Table 3:

1.5 A

.33 A

1 A

8.33 A

Table 4:

500 kWh; \$63.00

100 kWh; \$12.60

1 kWh; \$0.126