



Grade 9 Lab Notebook

## Science in Action 9

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**QUICKLAB CHARGE IT!** (p. 273)

To experience the nature of electrical forces

**Observations: Trial 1**

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**Observations: Trial 2**

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**Observations: Trial 3**

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**Question 8**

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**Question 9**

**Trial 1**

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**Trial 2**

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**Trial 3**

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## QUICKLAB STATIC CHARGE (p. 275)

**Purpose:** To observe the characteristics of static electricity

**Observations: Procedure 1**

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**Observations: Procedure 2**

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**Van de Graff Generator**

1 \_\_\_\_\_

2 \_\_\_\_\_

3 \_\_\_\_\_

4 \_\_\_\_\_

**Question 4**

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**Question 5**

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Activity D-1 Inquiry ***Investigating Static Electricity***

**PROBLEM:** What is the effect of charged objects on each other and on natural objects?

**HYPOTHESIS:** \_\_\_\_\_

**PROCEDURE:** Follow the procedure in the textbook p. 277

**DATA COLLECTION:**

Hanging Object	Approaching Object	Observations

**ANALYSIS / INTERPRETATION OF DATA**

7. \_\_\_\_\_

8. \_\_\_\_\_

**CONCLUSION**

**APPLICATION**

**QUICKLAB ELECTRICAL CURRENT** (p. 279)

To observe the characteristics of electrical current

Question 6 (Illustrate) / Question 7 (Explain)

Challenge 1

Caption \_\_\_\_\_

Challenge 2

Caption \_\_\_\_\_

Challenge 3

Caption \_\_\_\_\_

Challenge 4

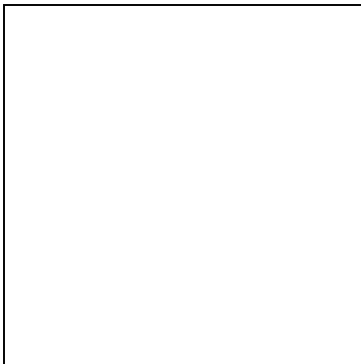
Caption \_\_\_\_\_

Challenge 5

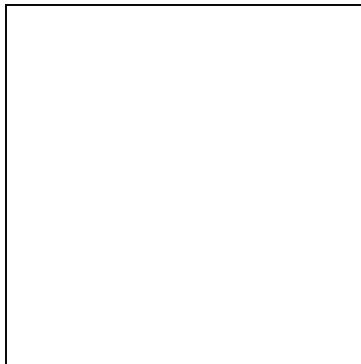
Caption \_\_\_\_\_

## USING VOLTMETERS

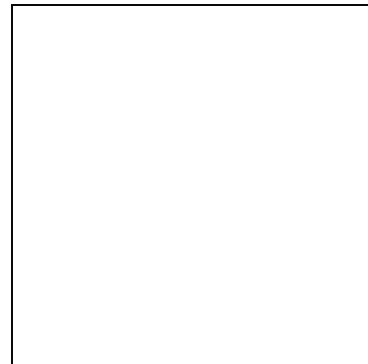
Cell 1



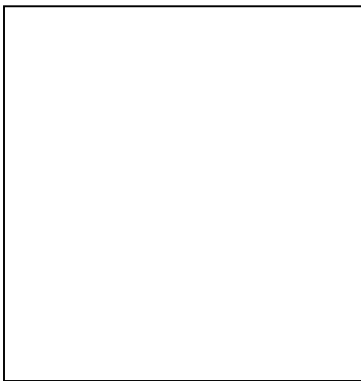
Cell 2



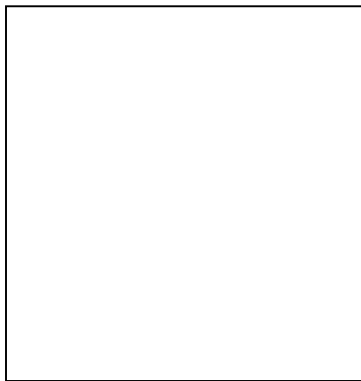
Cell 3



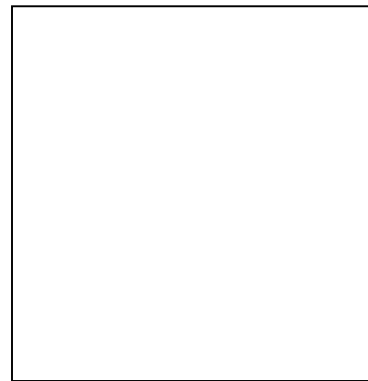
Cell 4



Cell 5



Cell 6



## VOLTMETER READINGS

Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6

**PREDICTION** (when two cells are connected): \_\_\_\_\_

\_\_\_\_\_

**EXPLANATION OF RESULTS** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**QUICKLAB BLOW A FUSE!** ( p. 286 )

**Purpose:** To observe the function of a fuse

**Illustration of bulb and steel wool**

**Observations:**

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**Question 5**

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**QUICKLAB FRUIT CELLS** (p. 290)

**Purpose:** To test the ability of fruits and vegetables to act as electrolytes

**OBSERVATIONS:**

**Voltmeter Reading:**

**Voltage obtained from different Fruits and Vegetables**

Type of Fruit / Vegetable	Prediction (voltage)	Actual (voltage)

**Question 4**

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**Question 5 (connecting two fruits/vegetables)**

Activity D-2 Inquiry **Choosing Electrolytes**

**PROBLEM:** What type of solution is the best electrolyte for a wet cell?

**HYPOTHESIS:** \_\_\_\_\_

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**PROCEDURE:** Follow the procedure in the textbook p. 291

**DATA COLLECTION:**

Solution	Voltage
Distilled water	
Tap water	
Sugar solution	
Salt solution	
Lemon juice	
Vinegar	
Dilute hydrochloric acid	
Dilute potassium hydroxide	

**ANALYSIS / INTERPRETATION OF DATA**

9. \_\_\_\_\_

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10. \_\_\_\_\_

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**CONCLUSION**

11. \_\_\_\_\_

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**APPLICATION ( ELECTROLYTES IN THE BODY )**

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**EXTENSION ( BEST ELECTRODES )**

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Activity D-3 Inquiry **Investigating Conductivity**

**PROBLEM:** How does the conductivity of different solutions compare?

**HYPOTHESIS:** \_\_\_\_\_

**PROCEDURE:** Follow the procedure in the textbook p. 299

**DATA COLLECTION:**

Solution	Conductivity Reading
Distilled water	
Tap water	
Salt solution	
Copper II Sulfate	
Vinegar	
Dilute hydrochloric acid	
Dilute potassium hydroxide	

**ANALYSIS / INTERPRETATION OF DATA**

7. \_\_\_\_\_

\_\_\_\_\_

8. \_\_\_\_\_

\_\_\_\_\_

**CONCLUSION**

9. \_\_\_\_\_

\_\_\_\_\_

**APPLICATION ( ENVIRONMENTAL MONITORING )**

\_\_\_\_\_

**EXTENSION ( AMOUNT OF SOLUTE IN SOLVENT )**

\_\_\_\_\_

**QUICKLAB MAKE YOUR OWN DIMMER SWITCH** ( p. 301 )

**Purpose:** To control the amount of current flowing through an electrical device

**ILLUSTRATION:**

**Question 5**

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## QUICKLAB FUNNEL POWER ( p. 304 )

**Purpose:** To build a model that represents different amounts of current and resistance in a circuit

**ILLUSTRATION:**

**Question 4**

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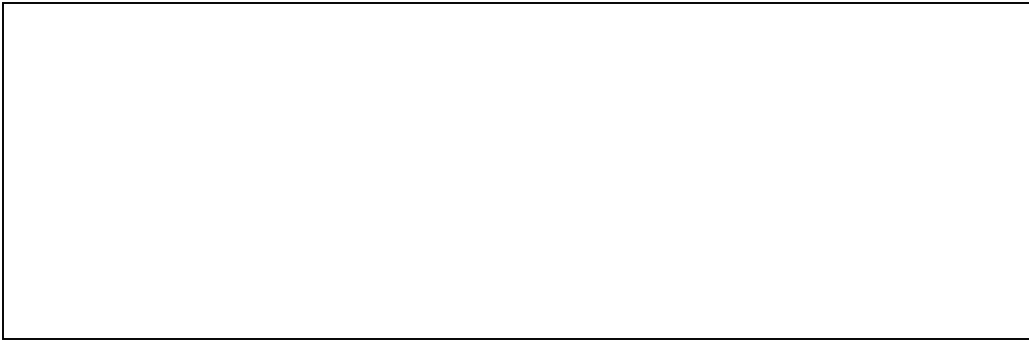
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## USING OHM'S LAW

### 1. Calculations



The amount of **current** created is \_\_\_\_\_

### 2. Calculations



The **voltage** is \_\_\_\_\_

### 3. Calculations



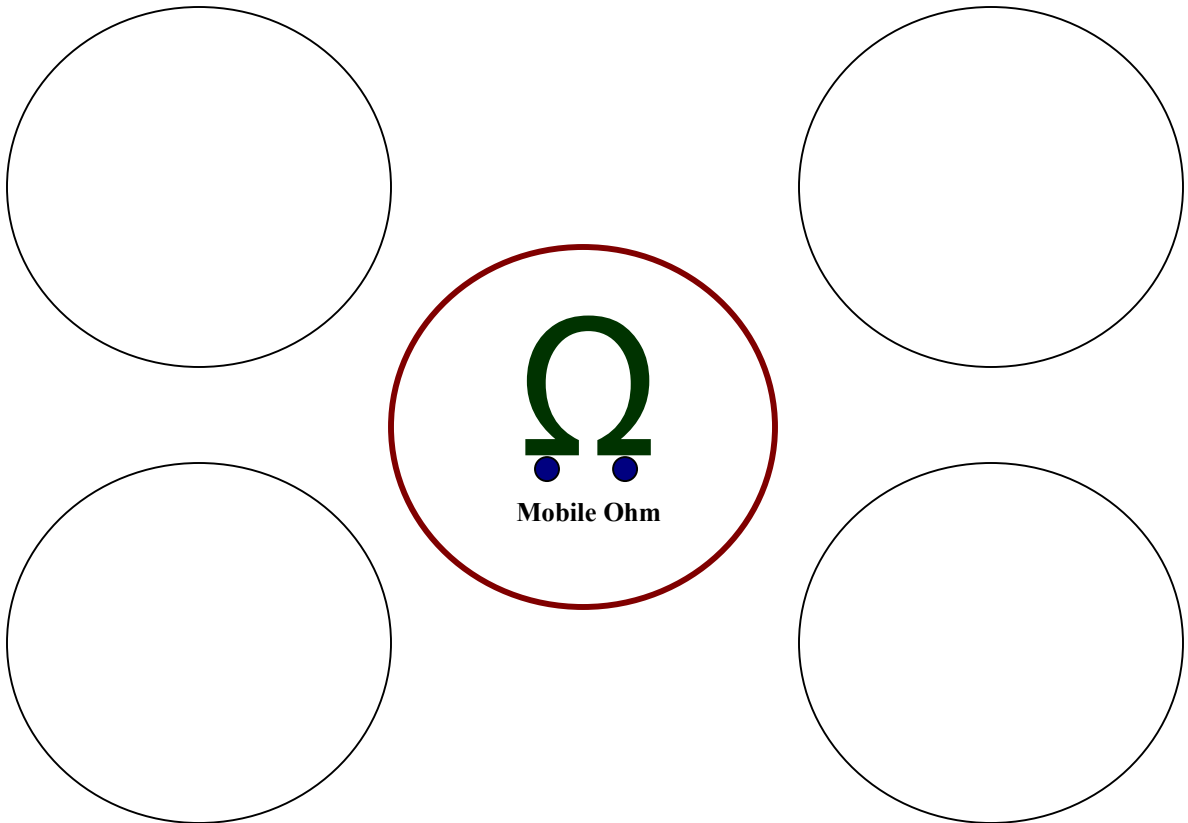
The **resistance** is \_\_\_\_\_

## USING AMMETERS

### Observations

1 bulb	2 bulbs
Reading 1 _____	Reading 2 _____

### OHM'S TO REMEMBER (HOW DO YOU REMEMBER AN OHM ?)



Activity D-4 Inquiry **What's The Resistance?**

**PROBLEM:** Do different materials have different values of electrical resistance?

**HYPOTHESIS:** \_\_\_\_\_

**PROCEDURE:** Follow the procedure in the textbook p. 309

**DATA COLLECTION:**

Substance	Length connected		Voltage	Current	Resistance
	(1 cm)	(10 cm)			
Copper wire	1 cm				
		10 cm			
Nichrome wire	1 cm				
		10 cm			
Solid graphite	1 cm				
		10 cm			
Rubber tubing	1 cm				
		10 cm			
	1 cm				
		10 cm			
	1 cm				
		10 cm			

**ANALYSIS / INTERPRETATION OF DATA**

Using Ohm's Law ( $R = V / I$ )

7. Calculations for **resistance** should be in the table above

8. \_\_\_\_\_

9. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

10. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### CONCLUSION

11. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### APPLICATION ( SURGE PROTECTORS )

EXTENSION ( WARMING PIPES IN WINTER )  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
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## QUICKLAB FLASHLIGHT DESIGN ( p. 311 )

**Purpose:** To explore circuits by designing a simple flashlight

**ILLUSTRATION:**

**Question 3**

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## QUICKLAB HOW DOES THAT TOY WORK ? ( p. 313 )

**Purpose:** To determine the circuit design of an electronic device

ILLUSTRATION OF THE PARTS OF A SIMPLE TOY

SCHEMATIC DIAGRAM

**Question 3 – Design your own unique toy vehicle (maybe a ‘mobile Ohm’)**

**Illustration**

**Schematic**

Activity D-5 Problem Solving **Wiring & Secure & Safe Home**

**NEED** Lights that come on automatically to announce a visitor makes a home safer and deters burglars

**PROBLEM:** Can you design a basic circuit for the interior and exterior of a small home?

**SPECIFICATIONS** in the textbook p. 314

- outdoor light must come on when someone approaches
- a photoconductor device should be included
- schematic should provide lighting for three rooms and the outdoor light
- an electrical control device should also be included (for emergency shut down)

**PROCEDURE:**

- Brainstorm and sketch different designs
- Consider the materials you will require
- Choose the best design and begin to build your model

**SCHEMATIC**



**BUILD A PROTOTYPE**

**TEST / EVALUATE**

**COMMUNICATE** ( Feedback from Peers )

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**GIVE IT A TRY GOING SHOPPING** ( p. 320 )

**Purpose: Examine the photo on p. 320 and answer the questions**



Energy transformations \_\_\_\_\_

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Cooler transformations \_\_\_\_\_

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Wheelchair transformations \_\_\_\_\_

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Pushing by hand \_\_\_\_\_

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Activity D-6 Problem Solving *Transforming Heat into Electricity*

**NEED** There are some places where it is impossible to measure temperature with a thermometer

**PROBLEM:** How can you monitor the temperature inside a kiln, using a thermocouple?

**SPECIFICATIONS** in the textbook p. 322

- Sketch how a thermocouple could be used in a kiln
- Proof is needed to show that the thermocouple converts heat into electricity

**PROCEDURE:**

- How can the electricity produced by a thermocouple be translated into temperature

**ILLUSTRATIVE PROCEDURE**

**TEST / EVALUATE** follow **Steps 2 - 7** on p. 322

**COMMUNICATE**

8. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

9. \_\_\_\_\_

\_\_\_\_\_

10. \_\_\_\_\_

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Activity D-7 Problem Solving **GET YOUR MOTOR RUNNING**

**NEED** Can some motor-building kits be suitable for beginners and more advanced hobbyists

**PROBLEM:** How can you build a simple motor and then have it operate at different speeds and in different directions?

**SPECIFICATIONS** in the textbook p. 326

- Level 1 - A functioning motor that shows movement
- Level 2 - A functioning motor that turns a half-turn to a full-turn
- Level 3 - A functioning motor that spins continuously
- Level 4 - A functioning motor that can be adjusted to spin at different speeds
- Level 5 - A functioning motor that can spin in different directions

**PROCEDURE:**

- Read **TOOLBOX 3** p. 482

**ILLUSTRATIVE SKETCH OF COMPLETED MOTOR**



**BUILD A PROTOTYPE**

(follow the procedure on p. 327)

**TEST / EVALUATE**

9. Modifications made: \_\_\_\_\_

\_\_\_\_\_

**COMMUNICATE**

10. \_\_\_\_\_

\_\_\_\_\_

11. \_\_\_\_\_

\_\_\_\_\_

12. \_\_\_\_\_

\_\_\_\_\_

13. \_\_\_\_\_

\_\_\_\_\_

## 14. INSTRUCTIONS FOR BUILDING A SIMPLE MOTOR

**Materials Needed:**

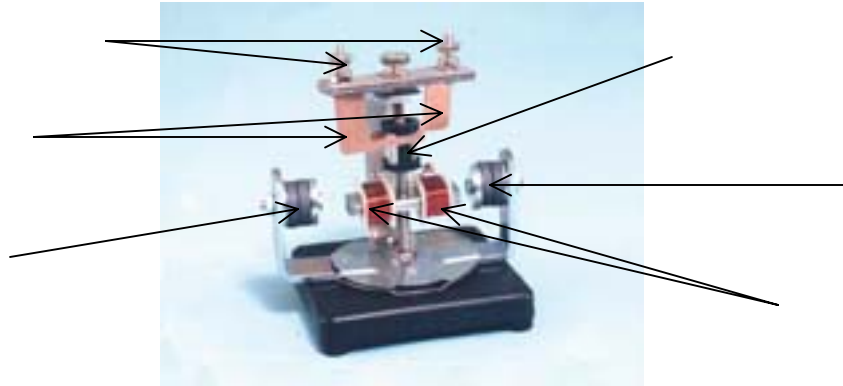

<b>Procedure</b>	<b>Illustration</b>
<b>Step 1</b>	
<b>Step 2</b>	
<b>Step 3</b>	
<b>Step 4</b>	
<b>Step 5</b>	
<b>Step 6</b>	
<b>Step 7</b>	
<b>Step 8</b>	
<b>Step 9</b>	
<b>Step 10</b>	

## QUICKLAB ST. LOUIS MOTOR ( p. 328 )

A St. Louis motor is designed to show how an electric motor works

**Purpose:** To identify the parts of a St. Louis Motor and examine its operation

LABEL THE PARTS OF A ST. LOUIS MOTOR



**Question 4 – Observations in Step 2**

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**Question 5 – Observations in Step 3**

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Activity D-8 *EXPERIMENT* on your own **Generating Electricity**

**BEFORE YOU START** Energy transformation using a generator (p. 330)

**PROBLEM:** How can mechanical energy be converted into electrical energy?

**PROCEDURE:** (How will you build a generator?)

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

**ILLUSTRATIVE PROCEDURE**

**MODIFICATIONS NEEDED FOR THE GENERATOR TO WORK**

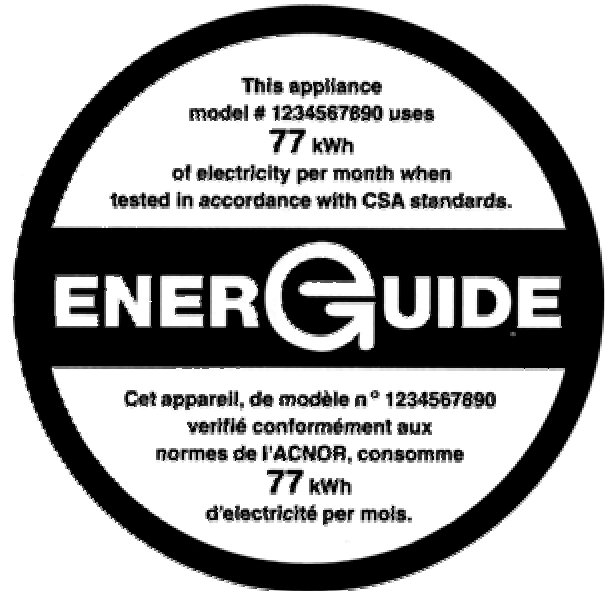
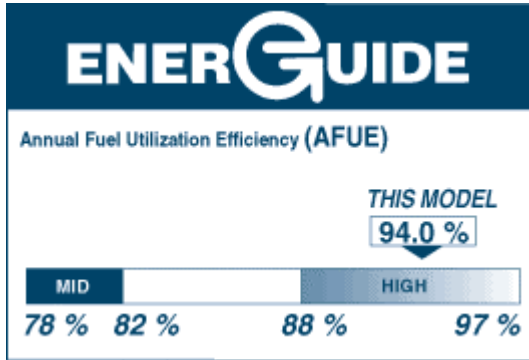
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POWER PRACTICE

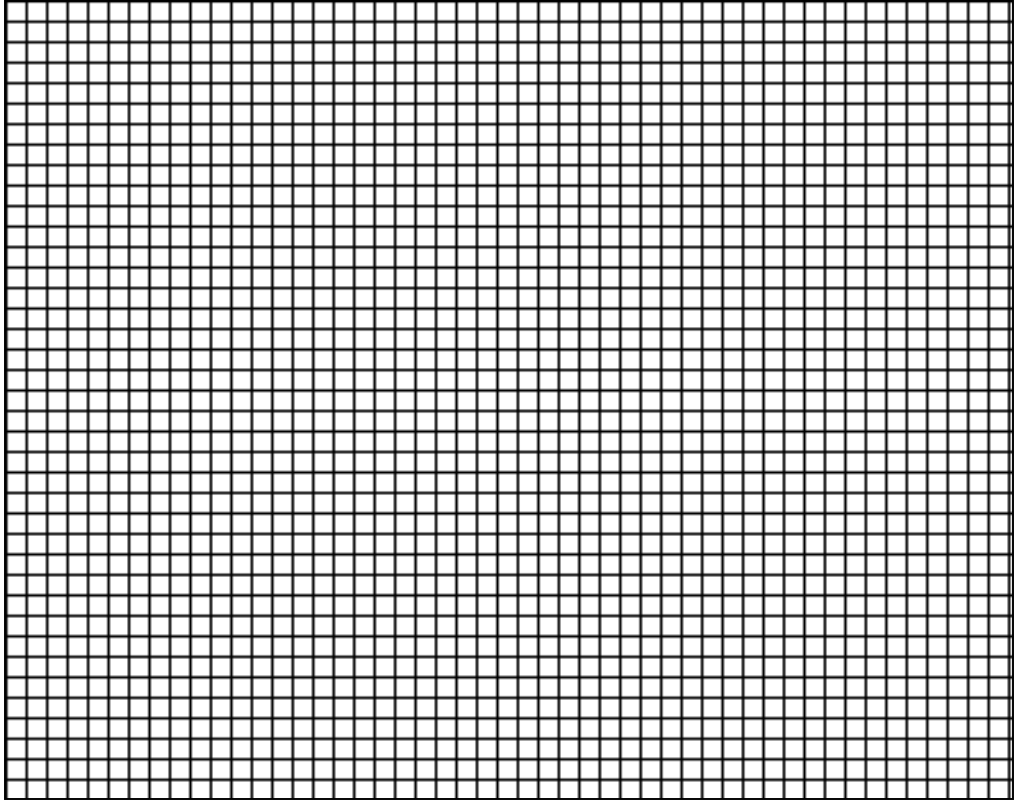
Sample EnerG Guides



Electrical device	Voltage	Current	Power rating	Consumption (Time Running – Est.)	Cost @ \$0.07/kW.h
Light bulb					
Curling iron					
Coffee maker					
Radio					
Alarm clock					
Stereo					
Television					



## Comparison of Series and Parallel Circuits



### COMMUNICATE

5. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

6. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

7. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

SKILL PRACTICE (p. 336)

COMPARING INPUT AND OUTPUT ENERGIES

Device	Input Energy	Output Energy	Efficiency
Gas-powered SUV	675 kJ	81 kJ	
Gas-Electric Hybrid	675 kJ	195 kJ	
Mid-efficiency Nat. Gas Furnace	110 MJ	85 MJ	
Electric Baseboard Heater	9.5 kJ	9.5 kJ	
Alkaline Dry Cell	84.52 kJ	74.38 kJ	
Florescent Light	12.5 kJ	2.75 kJ	
Incandescent Light	780 J	31 J	

Most efficient Device is \_\_\_\_\_

Least efficient Device is \_\_\_\_\_

Differences between the most and least efficient devices are:

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Activity D-10 Problem Solving **Kettle Efficiency**

**NEED** Product efficiencies must be true to their claim

**PROBLEM:** Can you test the efficiency of an electric kettle?

**SPECIFICATIONS** in the textbook p. 337 **Criteria for Success**

- Design a procedure to measure the amount of electrical energy is consumed by a kettle while heating (**energy input**)
- Design a procedure to measure the amount of energy gained by the water (**energy output**)

$$E = \text{mass of water in grams} \times 4.19 \times \text{change in temperature in } C^{\circ} = \text{energy in joules}$$

$$\text{Efficiency of Kettle} = \frac{\text{Output Energy}}{\text{Input Energy}} \times 100\%$$

**PROCEDURAL STEPS**

Step 1	
Step 2	
Step 3	
Step 4	
Step 5	
Step 6	
Step 7	
Step 8	

**TEST / EVALUATE**

## OTHER DEVICES AND THEIR EFFICIENCIES

Device	Input Energy	Output Energy	Efficiency

## POSSIBLE SOURCES OF ERROR

6. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## COMMUNICATE

7. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

8. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

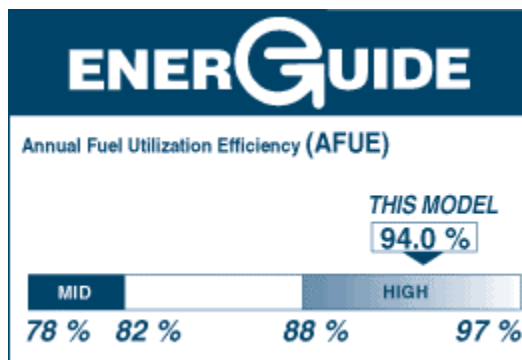
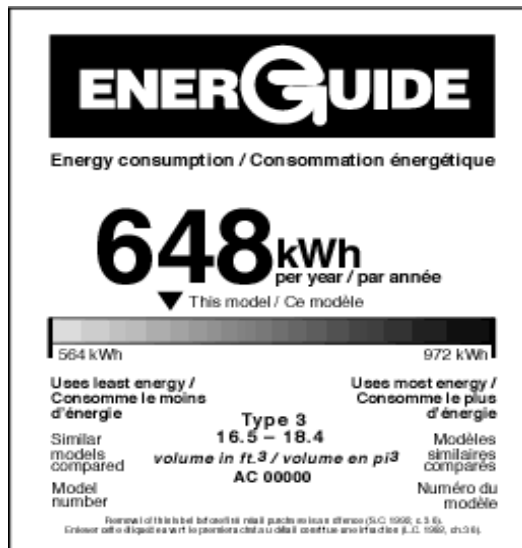
9. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**GIVE IT A TRY SHOPPING FOR APPLIANCES** ( p. 339 )

Purpose:



Check out various stickers, like the ones below, for large and small appliances and report your findings to the class



**Purpose:** To find out about different energy sources and compare them

**Choose any two of the energy sources provided and make comparisons as listed in the table and then present your findings to the class in a creative way.**

**WIND  
NUCLEAR  
GEOTHERMAL  
WAVES  
NATURAL GAS  
FUEL CELLS  
COAL  
SOLAR  
TIDAL  
BIOMASS**

<b>Comparative Factor</b>		
<b>availability</b>		
<b>cost</b>		
<b>sustainability</b>		
<b>environmental impact</b>		
<b>applications</b>		
<b>safety</b>		

Activity D-12 Problem Solving *Harness The Wind*

**NEED** Various degrees of winds can be harnesses to generate electricity

**PROBLEM:** Can you design a windmill that operates well in low and high winds?

**SPECIFICATIONS** in the textbook p. 349 **Criteria for Success**

- Free-standing (but it can be anchored to the foundation it rests on)
- Turning shaft must be connected to the armature of a small electric motor, so the motor runs
- It must produce a detectable current
- Must function in a stable manner when tested with a fan at different distances.

**BLUEPRINT**

**LIST OF MATERIALS**

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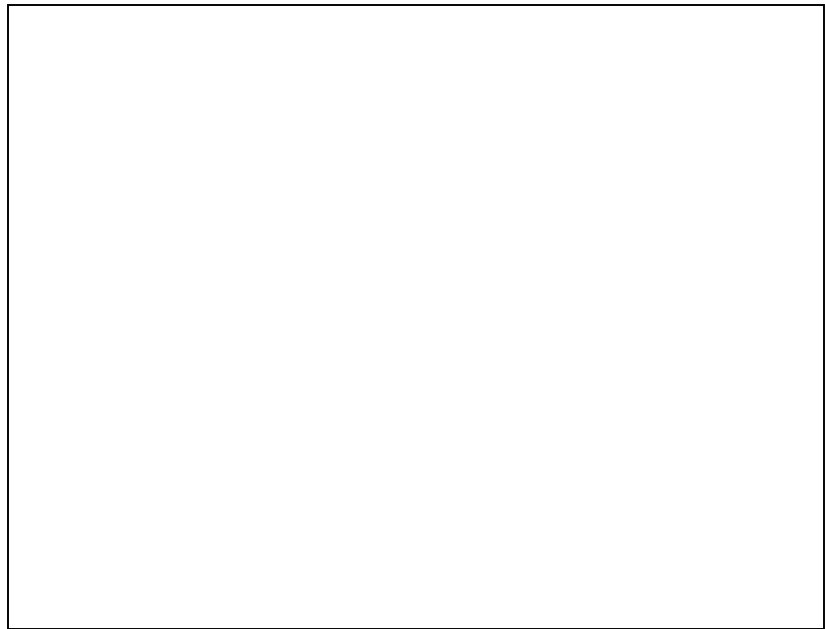
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**TEST / EVALUATE**

**COMMUNICATE** 5. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

6. a) reliability \_\_\_\_\_

b) safety \_\_\_\_\_

c) current generating efficiency \_\_\_\_\_  
\_\_\_\_\_

## GIVE IT A **TRY** NUMBER RACE ( p. 355 )

**Purpose:** To compare the time it takes to do a calculation with a calculator and without one

W/ Calculator	Problem	W/O Calculator
	$345 + 582 + 681 + 984 + 557 + 618 + 343 + 783 + 295 + 235$	
	$345 - 582 + 681 - 984 + 557 + 618 - 343 + 783 - 295 + 235$	
	$345 - 582 - 681 + 984 - 557 + 618 - 343 + 783 + 295 - 235$	
	$345 + 582 - 681 - 984 - 557 + 618 - 343 + 783 - 295 + 235$	
	$345 - 582 + 681 + 984 - 557 + 618 + 343 + 783 - 295 + 235$	
	$345 + 582 - 681 - 984 + 557 - 618 + 343 + 783 + 295 + 235$	
	$345 - 582 + 681 + 984 - 557 - 618 + 343 - 783 + 295 - 235$	
	$345 + 582 - 681 - 984 + 557 - 618 + 343 + 783 - 295 - 235$	
	$345 - 582 - 681 - 984 - 557 - 618 - 343 - 783 - 295 - 235$	

In what way is an electronic device **better** for doing calculations?

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On what way is an electronic device **worse**?

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How you do a similar test with **words**?

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