### **Unit D Electrical Principles & Technologies**



### **Electrical Principles and Technologies**

### **Unit D**

### Topic 1 **Electric Charges**

- **Producing Charges**
- Making Sense of Electrical Charges
- Conductors, Insulators, and In-Between
- **Neutralizing Unbalanced Charges**
- Preventing Electrostatic Buildup

### Topic 2 **Electricity Within a Circuit**

- Circuit Elements and Diagrams
- Basic Circuit Symbols
- Measuring Current

- Measuring Voltage
- Rivers of Electricity

### Topic 3 **Resisting the Movement of Charge**

- Calculating Resistance
- Model problem

- Variable Resistors
- Types of Circuits House Wiring

- Resistors
- Topic 4 **The Energy Connection** 
  - Electricity and Heat
  - Electricity to Motion
  - Motion to Electricity

- Electricity to Light
- Light to Electricity

### Topic 5 **Portable Power**

- **Electrochemical Cells**
- Fuel Cells
- Types of 'dry' cells

### Topic 6 **Generators and Motors**

- Electricity to Magnetism
- Electromagnets
- Magnetism to Electricity
- What's in a Generator?
- **DC** Generators

- Electric Motors: Electric to Mechanical Energy
- DC Motors
- **AC Motors**

### Topic 7 **Electricity in the Home**

- Transmission of Electricity through the Power Grid
- From the Grid into Your Home
- Home Wiring
- **Digital Devices**
- Measuring Electric Power
- Model Problem
- Paying For Electric Energy
- Model Problem

- Power Rating
- Electric Devices and Efficiency
- Incandescent Bulbs
- Halogen Bulbs
- Fluorescent Tubes
- Model Problem
- Home Electric Safety
- **Electric Safety Outdoors**

### Topic 8 **Electricity Production and the Environment**

- Electric Energy from Burning Fuels
- Fossil Fuels Affect Land and Air
- Electric Energy from Flowing Rivers
- **Energy from Atomic Reactions**
- Heating the Environment
- Electrical Technology and Society
- Cogeneration
- Reducing the Energy Wasted by
- Alternative Energy Sources
- Electrical Energy Sources and Alternatives

### Unit D Electrical Principles & Technologies

**Review Booklet** 

**Topic 1** (pgs. 266-271) Explain how an object becomes 'charged'. What is the difference is between a 'positive charge' and a 'negative charge'? Describe and illustrate the 'Laws of Electric Charge'. Explain the difference between conductors, semi-conductors and super conductors. How are they different from insulators? How can you prevent an electric discharge from doing harm to people or expensive electrical equipment?

# Unit D Electrical Principles & Technologies

**Topic 2** ( pgs. 272-278 )

List and give	examples of	of the four	hasic elements	or types of	f components in	a simple circuit.
List and give	CAGITIPICS (	or tire rour	Dasic Cicilicitis	OI LYPUS OI		i a simple chean.

Component	Description	Examples
<del>-</del>		

Identify *or* illustrate the electrical circuit component *or* symbol in the table.

wire		resistor
cell		
		variable resistor
lamp	— <b>A</b> —	

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Illustrate how an amm	eter, a galvanometer, and a vo	Itmeter are included in a schematic drawing
What do each of these	electrical devices measure?	
Ammeter	Voltmeter	Galvanometer
All forms of energy are different units are used	e measured in <b>joules</b> (J). When d. What units are used in each ca	n describing the electrical energy in a circuiase?
Current	Voltage	
Describe and Illustrate	the difference between Current	, and <b>Voltage</b> using a <i>MODEL</i>

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**Review Booklet** 

**Topic 3** ( pgs. 279-291 )

<b>Resistance</b> is the property of a substance that hinders the and converts electrical energy into other forms of energy. understand about this statement.	movement (motion) of electric charge Use a diagram to illustrate what you
According to Georg Simon Ohm, what is the relationship be and how can it be calculated?	tween current, voltage and resistance,
In what applications are variable resistors used?	

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**Review Booklet** 

Illustrate a series circuit and a parallel circuit using the following:

Power source – 4 cells Loads – 3 resistors (eg. buzzer, 2 lamps) As many switches as you think you need

	On who a	Devellel
	Series	Parallel
What is a potential pro	oblem with a parallel circuit in	your house, and what is used to prevent it from
nappening:		
100		
What are the factors a	nd that affect resistance of w	ire, and how does each factor affect resistance?
Footow.		T#act
Factor		Effect

# Unit D Electrical Principles & Technologies

To	opic 4 ( pgs. 293-299 )		
	/hat is <b>energy</b> ?		
С	omplete the table that show	s <b>energy conversions</b> related	to electricity
	Device	Type of Energy Used	Type of energy converted to
	thermopile		
	piezoelectric crystal		
	piezoelectric crystal		
	LED		
	photovoltaic cell		
	electroplaques		
	escribe how a <b>thermocoup</b> ow it works.	le is made, what energy transfo	ormation occurs when it is used and
W	hat is the 'piezoelectric ef	fect'?	
W	hat process/device enables	a <b>solar cell</b> to transform the S	Sun's energy into useable electricity?

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<b>Topic 5</b> ( pgs. 300-307 )	
What did Luigi Galvini discover and what importan	ce did it have for the science of physics?
What are 'voltaic piles'?	
what are voltaic plies !	
- <u></u>	
Illustrate the difference between a Wet Cell and a	Dry Cell.
Wet Cell	Dry Cell
Explain the difference between a <b>primary cell</b> and and what devices would use them.	d a <b>secondary cell</b> . Give two examples of each

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<b>Topic 6</b> ( pgs. 309-317 )					
Describe how a device, such as a <b>generator</b> , converts mechanical energy into electrical energy.					
How is an <b>electromagnet</b> constructed?					
Explain the difference between <b>AC</b> and <b>DC</b> of	current.				
Illustrate a DC Generator and a DC Motor					
DC Generator	DC Motor				
How does an <b>AC Motor</b> differ from a DC Mo	tor?				

### Unit D Electrical Principles & Technologies

**Review Booklet** 

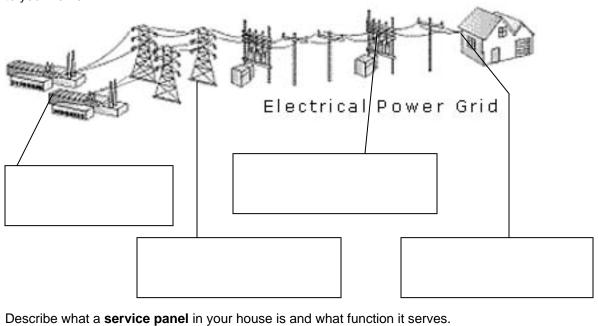
Illustrate a Simple Motor you can make with common household materials.				

Describe the **step-by-step procedure** and what you observed when it worked, or didn't work (the **troubleshooting techniques** you used.

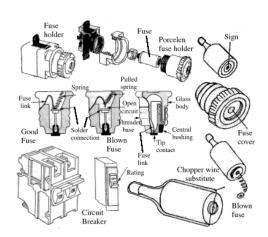
Procedure Order	Description of what to do	What worked or didn't and what you did about it
Step 1		
Step 2		
Step 3		
Step 4		
Step 5		
Step 6		
Step 7		
Step 8		
Step 9		
Step 10		

**Topic 7** (pgs. 318-331)

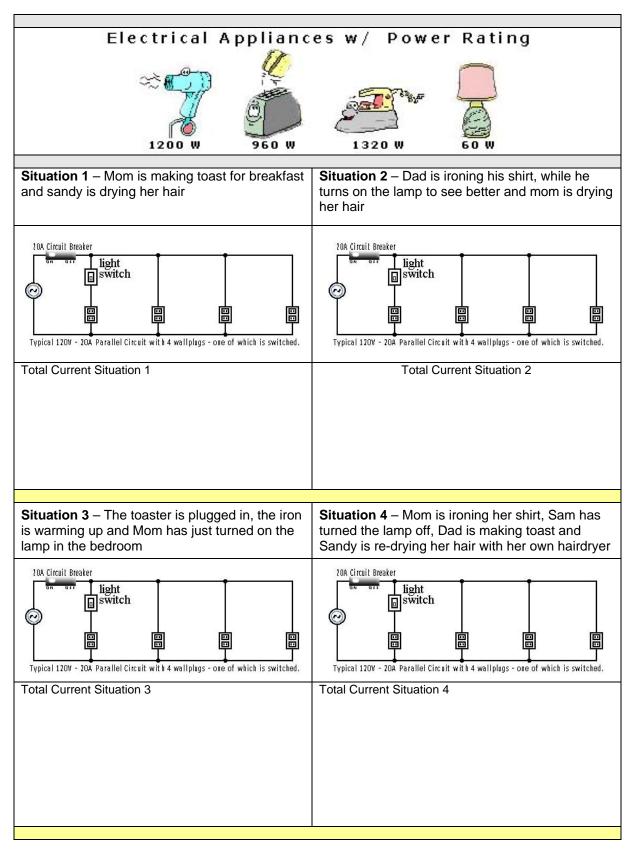
Illustrate and label, with explanations, how power is transmitted from the generating power station to your home.



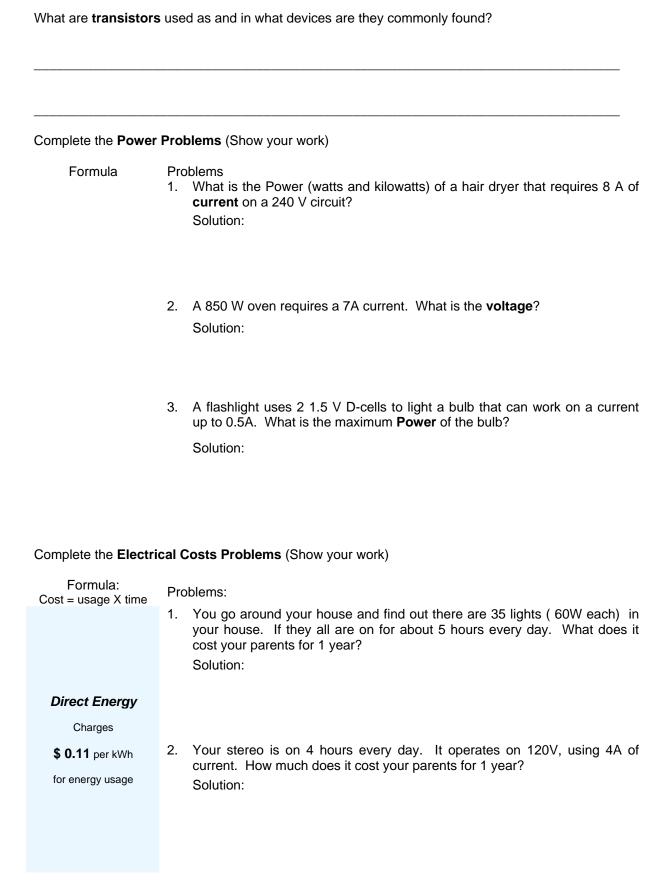
Explain the different between a **fuse** and a **circuit breaker**.

Add these appliances to each house circuit as directed and calculate what the current is. If the circuit is overloaded – color the circuit breaker RED



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## Unit D Electrical Principles & Technologies

**Review Booklet** 

Explain what this illustration means, and how does it help the consumer?

ENER $G$ UIDE Label	Explanation				
ENERGUIDE  Energy consumption / Consommation énergétique					
648 kWh per year / par année  This model / Ce modèle  564 kWh Uses least energy / Consomme le mioins Consomme le plus					
Consomme le mioine d'anergie Consomme le piùs d'anergie 15,5 - 18,4 Modeltes miodelle miodell					
How is the <b>efficiency</b> of a light bulb determined mathematically?					
Formula	Explanation:				

What are the advantages and disadvantages of different light bulbs?

Туре	Advantages	Disadvantages
Incandescent		
Halogen		
Fluorescent		

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**Review Booklet** 

Calculate the efficiency of an 800W kettle that takes 6 min to boil water. To heat the water to boiling point, it takes 200,000 J of energy. What is the **efficiency** of the kettle?

Show	your work	Explanation of how efficient the kettle is:
Identify the safety mea to make it safer.		in each illustration, and identify what should be done
Musication Transfer	What's Unsafe?	What should be done to make it safer?
What are four simple r	ules to follow, to protect y	yourself against <b>fatal electrical shock</b> , from

### Unit D Electrical Principles & Technologies

**Review Booklet** 

**Topic 8** (pgs. 332-342)

Describe the process of electrical generation from the <b>burning of coal</b> .				

Using the Map and Graphic information on p. 333 in your Science Focus 9 Textbook to create a graph of those regions that produce in excess of 1000GW ●h shown using the following different colored bars on the graph:

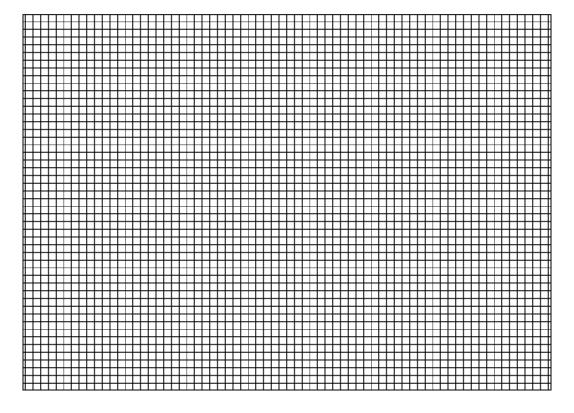
Total electricity production (red)

Electricity from thermo-electric sources (green)

Electricity from hydro-electric sources (blue)

Electricity from nuclear sources (yellow)

Title \_\_\_\_\_



# Unit D Electrical Principles & Technologies

What consequences – affecting Land and Air - result from the use of Fossil Fuels to generate electricity?
How can <b>gravity</b> produce electricity? (Think about flowing water)
How is electricity generated in <b>Nuclear Reactors</b> ?

# Unit D Electrical Principles & Technologies

What is thermal pollution?				
What is <b>cogeneration</b> ?				
Complete the table				

Alternative Energy Source	Advantages	Disadvantages
Wind		
Solar		
Tides		
Geothermal		