Lesson Plans

Day 1

Objectives

Grades 1-4: Describe properties of magnets.
Grades 5-8: Describe the historical use of magnets; describe the characteristics of magnets; distinguish between magnets and magnetic fields.

Materials Needed

Grades 1-4: collection of odds and ends, some of which are attracted to magnets and some which are not; magnets; copies of recording sheet, one per group;
Grades 5-8: bar magnet, sewing needle, Styrofoam cube, Styrofoam cup, water; copies of homework sheet, one per student
Both: sticky notes, large K/W/L chart (what we think we **K**now/what we **W**ant to know/ and what we **L**earned); Canadian and U.S. nickel.

Introduction

Reveal the following riddle clues, one at a time, to students in cooperative groups.

- This is an item people often take with them when they go camping or hiking in wilderness areas.
- It has moving parts.
- It might get lost but you won't if you know where it is.

The answer is a compass. Ask if students know why a compass works. The answer is that the needle in a compass is actually a magnet. Explain that we will be learning about magnets and their characteristics.

Procedure

In heterogeneous cooperative groups, have students brainstorm and record on sticky notes individual bits of information they think they know about magnets. As the ideas are recorded, have the reporter in each cooperative group place the sticky note in the "K" section of the KWL chart, checking to see if the idea is already listed. If it is, place the idea on top of the one like it. When students have had enough time to brainstorm what they know, have them follow the same procedure to identify some things that they want to know.

Have upper grade students read the first four paragraphs on page 444 in *Discover God's Creation* to lower grade students. Then have upper grade students read through page 445 and conduct the experiment *Try This 23-1* on page 446, recording what happens. Have students quiz each other on the *Review It* questions and informally research how sailors navigated before the invention of the compass.

Meanwhile, provide lower grade students a collection of odds and ends, some of which are attracted by magnets and some which are not. Have them experiment to see which are attracted by magnets and record their findings on the accompanying sheet (students with emergent writing skills may draw the items in the correct column). Encourage students to try various other items around the room. Have students summarize what they learned about magnets in terms of their properties.

Bring students back together and show them a Canadian nickel and a U.S. nickel. Ask them to predict if they will be attracted by the magnet (the Canadian nickel will but the U.S. nickel will have a weak or non-existent attraction). Ask them why they think this is so (the element nickel is attracted to a magnet but U.S. nickel does not contain enough while the Canadian does).

Assessment

Grades 1-4: Have students in first and second grades work with students in third and fourth grades to complete the accompanying Venn diagram which shows the relationship between various materials and magnets.
Grades 5-8: Assess upper grade students based on their completed assignments.

Homework

Grades 1-4: Assign students to generate a list of ways in which magnets are used at home or in an office.
Grades 5-8: Assign upper grade students to research the meanings of the terms on the accompanying worksheet.

Names _____ D1, gr 1-4

Attracted to Magnets	Not Attracted to Magnets

From this activity, we learned that _____

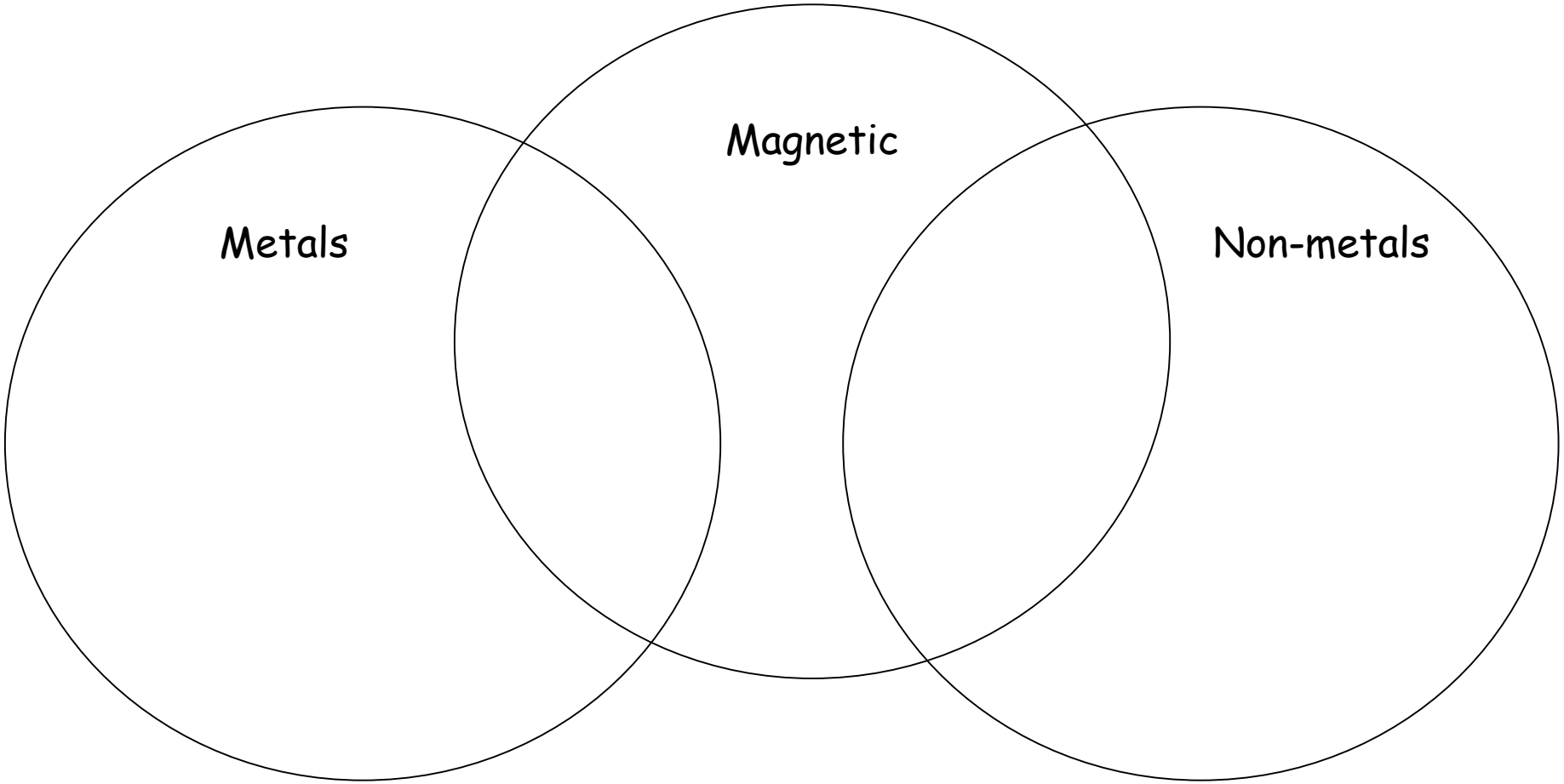
_____

_____

_____

Names _____

D1, Gr 1-4



Place the following words in the correct spaces on the Venn diagram:

Aluminum	Carbon (pencil lead)	Copper (penny)
Cotton	Iron (paper clip)	Paper
Plastic	Rubber (eraser)	Steel (pin)

Name _____ D1, Gr 5-8

Homework

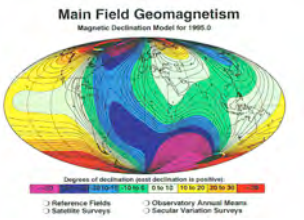
Use reference materials including the internet to define the following terms. Include illustrations, if appropriate, to increase your understanding.

true north:	magnetic north:
declination:	isogonic maps:

Name _____ D1, Gr 5-8

Homework

Use reference materials including the internet to define the following terms. Include illustrations, if appropriate, to increase your understanding.

true north: *The direction of the north pole relative to a navigator's position. It is marked in the skies by the celestial north pole which, for practical purposes, is the position of the star Polaris. The difference between true north and magnetic north occurs because the magnetic poles and axis of rotation do not exactly match up.* 	**magnetic north:** *Earth's magnetic field is shaped somewhat like that of a bar magnet and, like a magnet, it has two magnetic poles, one in the Canadian arctic. This is the North Magnetic Pole, and the location to which a compass needle points. The other pole is off the coast of Antarctica, south of Australia, and is referred to as the South Magnetic Pole.*
declination: *the angle formed between magnetic north and true north. It is described as positive when magnetic north is east of true north. A synonym used more often in navigation is "magnetic variation".*	**isogonic map:** *a map with lines showing the declination for a region.* 

Day 2

Objectives
Grades 1-4: Compare the force of various magnets
Grades 5-8: Explain what causes magnetism; distinguish between permanent and temporary magnets; identify substances from which magnets are made.

Materials Needed
Grades 1-4: copies of blackline master, one or two per pair (see second paragraph under Procedures), magnets, pencil, ruler, paper clips; copies of homework record sheet, one per student.
Grades 5-8: paper, pencil, rulers, scissors; set of 5 magnets of varying strengths, approximately 50 metal paper clips;
Both: bar magnet, nail, tape, 5 paper clips;

Review/Introduction
With students in groups, use a cooperative structure to review terms and concepts. Conduct the demonstration on page 447 of the TE for *Discover God's Creation* following the procedure described there and being sure to include the questions.

Procedure
Have upper grade students partner read pages 447-449 and in small groups conduct *Try This 23-2:Magnetic Domains* and *Class Activity 23-2: How Strong Is It?*. Have at least one group save their materials from *Try This 23-2* for Day 3 lesson plans.

Meanwhile have lower grade students test the strength of various magnets by following the directions and recording results on the accompanying worksheets. Two options are being provided. Choose one, let students choose one, have different groups use different methods or, if time permits, have students use both.

Assessment
Informally assess students by bringing them back together to review the KWL chart and add new knowledge to the "What We Have Learned" section.
Formally assess students based on their completed tasks.

Homework

Grades 1-4: Have students explain to parents or another family member what they have learned about magnets thus far. (see accompanying homework form which could be kept in a folder for on-going use)

Grades 5-8: Have students write their answers to the "Review It" questions on pages 446 and 449 of *Discover God's Creation*.

Strong Magnet/Weak Magnet

grades 1-2

Place a magnet at the 1 cm mark and a paper clip at the zero mark. See if the magnet can attract the paper clip from this distance. Keep moving the magnet 1 cm at a time to see how strong it is. Graph your results. Try another magnet. Are some magnets stronger than others? Be ready to tell why or why not?

Strong Magnet/Weak Magnet

D2 , Gr 3-4

Working with a partner, mark and label the horizontal line below in centimeters. Choose a magnet and place its left edge at the 1 cm mark. Place a paper clip at the zero mark to see if the magnet is strong enough to attract the paper clip. Continue moving the magnet further out until you discover the greatest distance at which it was able to attract the paper clip. Record this data on the bar graph your teacher will provide. Repeat with other magnets. Does the size or shape of the magnet affect it's strength? Be ready to explain your answer.

Names ______________________________________ D2 , Gr 1-4

Title the graph and label the vertical axis.

____

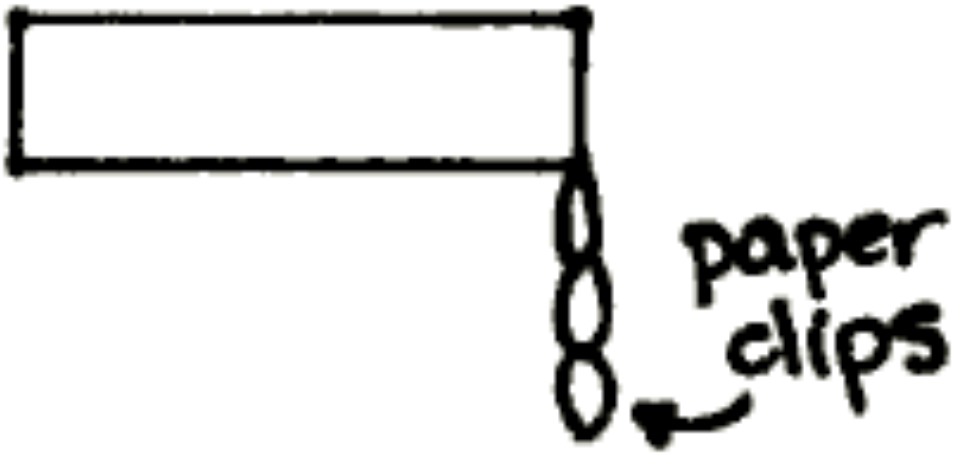
(title)

Magnet A | Magnet B | Magnet C | Magnet D | Magnet E

Names _____ D2 , Gr 1-4

Just How Strong?

Test various magnets to see how many paper clips they can hold. Tape a bar magnet over the edge of a table like a diving board. Place one paper clip on the underside of the "diving board". If it holds, hook another one on, continuing until the magnet can no longer hold the chain of paper clips. On the form provided, graph the maximum number of paper clips the magnet could hold. Repeat with other magnets.



Names ____ D2 , Gr 1-4

Title the graph and label the vertical axis.

____

(title)

Magnet A	Magnet B	Magnet C	Magnet D	Magnet E

Name _____

D2 , Gr 1-4

Magnets and Electricity Homework Sign-Off Sheet

Date_____

My child share the following information with me about ☐ magnets ☐ electricity.

_____

(signature)

Date_____

My child share the following information with me about ☐ magnets ☐ electricity.

_____

(signature)

Date_____

My child share the following information with me about ☐ magnets ☐ electricity.

_____

(signature)

Date_____

My child share the following information with me about ☐ magnets ☐ electricity.

_____

(signature)

Day 3

Objectives

Grades 1-4: Investigate how magnets interact with each other.
Grades 5-8: Describe the relationship between magnetism and electricity; identify uses of electromagnets; distinguish between the function of an electric motor and an electric generator.

Materials Needed

Grades 1-4: 1 8 ½ x 11 inch sheet of white paper, bar magnet, iron filings, small spray bottle, white vinegar, pencil; pairs of bar and/or horseshoe shaped magnets with the poles labeled, one set per pair of students; copies of blackline master, one per student (provided in two levels)
Grades 5-8: set of 5 different magnets, labeled A-E, one set per cooperative group, paper clips; a large iron nail (about 3 inches), about 3 feet of thin coated copper wire, a fresh D size battery, paper clips.
Both:

Advance Preparation

At least one hour prior to science class, with students watching/participating, set up the project entitled *Magnetic Field* so that it will be ready for students to discuss at science time. Ask students to predict what will happen.

Review/Introduction

Using a cooperative structure, review previously taught terms and concepts. Have upper grade students explain to lower grade students what they learned about how a magnet works, using the materials they created for yesterday's activity, *Try This 23-2.*

Procedure

Ask students what words they hear in the word "electromagnet" (electric and magnet). Explain that an electromagnet is a type of magnet in which the magnetic field is produced by the flow of an electric current. Have upper grade students read pages 451-455. Ask students to watch the video found at http://www.sciencebob.com/experiments/electromagnet.html. Provide them with the materials to make an electromagnet and have them experiment with the process.

Meanwhile, have lower grade students shake the filings off the paper in the *Magnetic Field* activity. The filings should have formed curved lines around the magnet which are revealed by the rusty spots caused by the vinegar's interaction with the iron. Explain that every magnet has a "magnetic field" around it. The field is the area affected by the force of the magnet but rather than blanketing an area, the magnetic force is in curved lines. Explain that both the sun and the earth have magnetic fields which, if made visible, would have a pattern similar to the one produced by the bar magnet, though obviously, much larger. Give pairs of students pairs of bar or horseshoe shaped magnets which have been labeled to indicate their north and south poles. Have students experiment with them and in cooperative groups share their observations. Based on their observations, have students complete the accompanying worksheets.

Assessment

Have upper grade students show lower grade students the electromagnets they created and how they work. Have lower grade students show and explain to upper grade students the results of the *Magnetic Field* activity. Further assess students understanding based on their completed assignments. If time permits, have students add to the KWL chart.

Magnetic Field

Directions:

1. Lay a bar magnet on a table or other flat surface where it will not be disturbed.
2. Cover the magnet with the sheet of paper.
3. Sprinkle the iron filings across the surface of the paper.
4. Tap the paper gently with your finger until the filings settle into a pattern.
5. Pour some of the white vinegar into the spray bottle and spray a fine mist over the iron filings.
6. Allow the paper to remain undisturbed for an hour.
7. Carefully lift the paper and shake the filings into the trash. Draw a circle in the center of the pattern created by the rusty filings and label it "sun".

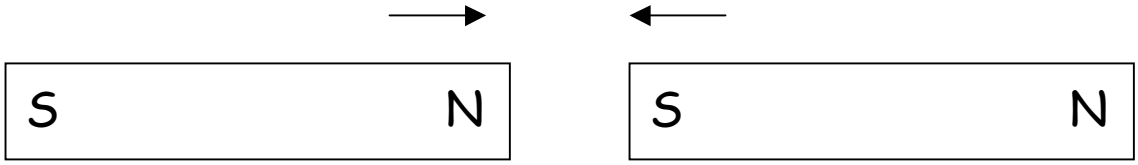
Explanation:

Every magnet has an area of force around it known as the magnetic field. The lines of force have the power to attract magnetic material such as iron. The sun has a magnetic field similar to that of the magnet, even having a north and a south pole. It is thought that the sun's magnetic field reaches out from its north pole to the outer limits of our solar system where it bends around and returns to its magnetic south pole.

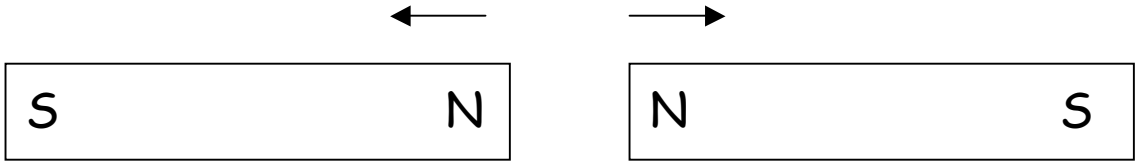
Name _____ D3, Gr 1-2

Attract or Repel?

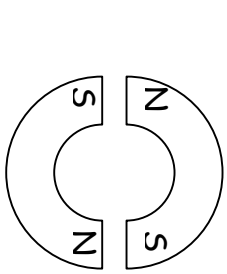
Every magnet has a north pole and a south pole. A north pole is always pulled (attracted) to a south pole when they are close.

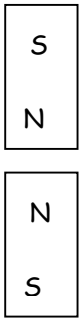


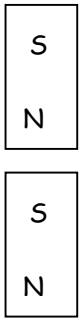
Two north or two south poles will push away from (repel) each other.



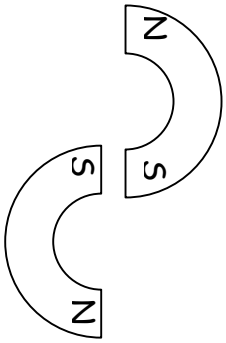
Write what each pair of magnets below will do. Write **attract** or **repel**.

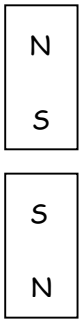


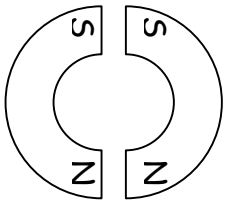




_____ _____ _____







_____ _____ _____

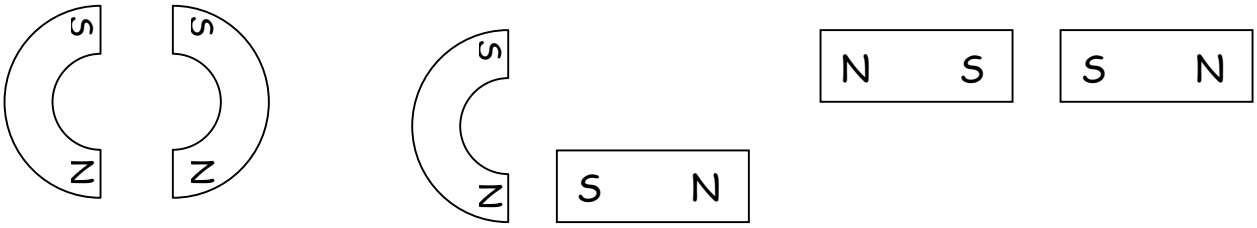
Name _____ D3, Gr 3-4

Attract or Repel?

The ends of a magnet are called its _____. One is called the _____ pole and the other is called the _____ pole. When the ends of the magnets are placed near each other they will either be drawn together or pushed away. The scientific name for being drawn together is _____ and the name for being pushed away is _____. Poles that are the same will _____ while those that are opposite will _____. The push and pull force of a magnet is called _____.

Word Bank					
south	attract	poles	north	magnetism	repel

If the magnets below are brought near each other, will they attract or repel?



_____ _____ _____

Did you know?

If a magnet is broken into pieces, each piece will have a north and a south pole.

Day 4

Objectives
Grades 1-4: Describe properties of magnets.
Grades 5-8: Describe Earth's magnetic field; explain how Earth's magnetic field helps us; explain what causes auroras.

Materials Needed
Grades 1-4: Magnets, sheets of paper, piece of cloth, sheet of plastic (plexiglass or flexible types of plastic such as a trash bag), glass casserole or pie plate, plywood, sheet metal or metal spatula; magnets, cardstock paper, acetate sheets (used for overhead transparencies) and colored pencils/crayons/markers.
Grades 5-8: samples of various brochures for students who will be designing brochures about the uses of magnets; copies of brochure rubric.
Both: video of auroras

Review/Introduction
Use a cooperative structure to review previously taught terms and concepts. Ask students if they have ever seen the aurora borealis and if any have let them share their experiences. Allow students to view a video of auroras.

Procedure
Have upper grade students read pages 456-457 of *Discover God's Creation*. Then, in pairs or alone, have them write in their own words a brief explanation of what causes auroras. Have students complete whatever sections of the chapter 23 *Wrap-Up* is deemed appropriate OR have them create a brochure for a company which produces magnets, illustrating the many products which utilize magnets.

Meanwhile, show lower grade students that magnetic pull can be exerted through paper. Lay a sheet of cardstock over a bar magnet and place a paper clip on top of the paper. Show students that by moving the magnet around the paper the paperclip can be moved as well. In cooperative groups, provide students with various other materials asking them to experiment to determine whether magnets can pull through them. When this task is completed, ask students if they can think of any toys that use magnets. If they don't think of it, explain that a *Magna-doodle* or *Etch-a-Sketch* are examples which use magnets and iron filings. Ask if they have ever played a "fishing" game using a pole with a magnet on the end of it to pick up paper fish with a paperclip attached. Ask students to brainstorm different kinds of toys which could be made

using magnets. Provide them with materials such as those listed above so that they can create some of the toys they thought of.

Assessment

Have lower grade students summarize their findings on materials through which a magnet can act and show their created magnetic toys. Have upper grade students explain to lower grade students what causes auroras. Further evaluate them based on their completed assignments. See the accompanying rubric for evaluating the brochure created by upper grade students on the uses of magnets.

Name _____ **Brochure Rubric**

Rating Key: 4= outstanding performance, 3= satisfactory performance, 2= below expectations, 1= minimal effort invested, 0= no attempt or does not understand, comments on back,	
CRITERIA	Scores
Planning:	
1. Student researched uses of magnets.	
2. Information contained in brochure is factual and accurate.	
3. Student planned brochure and created a rough draft.	
4. At least 4 uses of magnets are included.	
Designing:	
1. Brochure lay-out is organized, uncluttered, and easy to read.	
2. Brochure contains illustrations which are interesting and appealing.	
3. Brochure is edited for writing conventions.	
Collaboration (if done with a partner or team):	
1. The student did his/her fair share of the work.	
2. The student encouraged and supported a partner or team members.	
3. The student was good steward of time.	

Name _____ **Brochure Rubric**

Rating Key: 4= outstanding performance, 3= satisfactory performance, 2= below expectations, 1= minimal effort invested, 0= no attempt or does not understand, comments on back	
CRITERIA	Scores
Planning:	
1. Student researched uses of magnets.	
2. Information contained in brochure is factual and accurate.	
3. Student planned brochure and created a rough draft.	
4. At least 4 uses of magnets are included.	
Designing:	
1. Brochure lay-out is organized, uncluttered, and easy to read.	
2. Brochure contains illustrations which are interesting and appealing.	
3. Brochure is edited for writing conventions.	
Collaboration (if done with a partner or team):	
1. The student did his/her fair share of the work.	
2. The student encouraged and supported a partner or team members.	
3. The student was good steward of time.	

Day 5

Objectives

Grades 1-4: Define electricity; describe electrical fields of force; define static charge; understand the basic nature of static electricity.
Grades 5-8: Identify the cause of electrical force; describe ways static charge is produced; explain how an electroscope measures static electricity; describe the interaction of charged objects.

Materials Needed

Grades 1-4: materials for creating object lessons or bulletin boards, copies of rubric.
Grades 5-8: for each cooperative group or pair of students- a sheet of paper, pepper, salt, comb, eraser, pencil, plastic bag, plastic cup, plastic pen, toothpick, water; materials for creating object lessons or bulletin boards, copies of rubric
Both: 2 inflated balloons, lightweight string, piece of wool (optional), a way to suspend the balloons side by side; 2 hula hoops or 2 large circles of string, index cards equal to the number of students in the class, approximately one third of which have been labeled with a large "+" sign and one third with a large "-" sign,

Review/Introduction

Review previously taught skills and concepts using a cooperative structure. Conduct the demonstration in *Discover God's Creation*, page 398, TE. Ask students to relate their observations of the balloons to their knowledge of magnetic attraction. Help them to understand that the balloons were attracted to one another because one is charged and the other is not, just as opposite poles of the magnets were attracted to each other. Involve older students in explaining the concept of atoms to younger students, correcting any misconceptions. The explanation of page 398-399 of *Discover God's Creation* is quite helpful.

Procedure

(Whole group activity) Place a hula hoop or circle of rope in the center of an open area and explain that it will represent the nucleus of an atom. Give approximately one third of the students an index card with a "+" sign representing protons and place them in one hula hoop or circle of string along with another third of the students who have no index cards as they represent neutrons which have no charge. Give the remaining one third of the students the index cards with the "-" sign to represent electrons and have them walk around the nucleus in a circle (be sure that the protons and electrons are equal in numbers. Review with students their "names". Explain that now you will represent two atoms and how they interact. Recreate the same scene dividing students between two hula hoops or circles of rope, keeping equal numbers of

electrons and protons in each "atom". Have an electron from one "atom" move to the other atom and explain that now the atom with the greater number of electrons is negatively charged (has more electrons) while the other is positively charged (has more protons) so both are charged. Ask students to show what happens when atoms have opposite charges (they should move closer together because they are attracted). Demonstrate and discuss static electricity by having students shuffle across the carpet and then touch a metal object such as the door knob.

Have upper grade students read the balance of pages 400-402 in *Discover God's Creation* and conduct *Try This 21:1* found on page 402. Meanwhile with lower grade students, brainstorm similarities between electricity and the spiritual life. With lower grade students in mixed age groups, have them plan and begin to create an object lesson to be used in a children's story for church or school worship or a bulletin board which represents a spiritual lesson.

Homework

As homework over the next several days, have upper grade students complete the same task assigned to lower grade students. Schedule students to present projects as they are completed.

Evaluation

Use the accompanying rubric to evaluate the object lessons/bulletin boards designed by students.

Name _____ grades 1-8

Object Lesson Rubric

Rating Key: 4= outstanding performance, 3= satisfactory performance, 2= below expectations, 1= minimal effort invested, 0= no attempt or does not understand, comments on back,	
CRITERIA	SCORE
Preparation:	
1. The object lesson accurately teaches a significant spiritual truth.	
2. Manipulatives are used to increase interest in the object lesson.	
Presentation:	
1. The student understands and clearly communicates the object lesson.	
2. The materials are well organized to increase presentation effectiveness.	
3. The student speaks with appropriate volume and speed.	
4. The student makes appropriate eye contact with his/her listeners.	
Collaboration: (if working with peers)	
1. The student did his/her fair share of the work.	
2. The student appropriately encouraged/supported peers.	
3. The student was a good steward of time.	

Name _____ grades 1-8

Object Lesson Rubric

Rating Key: 4= outstanding performance, 3= satisfactory performance, 2= below expectations, 1= minimal effort invested, 0= no attempt or does not understand, comments on back,	
CRITERIA	SCORE
Preparation:	
1. The object lesson accurately teaches a significant spiritual truth.	
2. Manipulatives are used to increase interest in the object lesson.	
Presentation:	
1. The student understands and clearly communicates the object lesson.	
2. The materials are well organized to increase presentation effectiveness.	
3. The student speaks with appropriate volume and speed.	
4. The student makes appropriate eye contact with his/her listeners.	
Collaboration: (if working with peers)	
1. The student did his/her fair share of the work.	
2. The student appropriately encouraged/supported peers.	
3. The student was a good steward of time.	

Name _____ grades 1-8

Bulletin Board Rubric

Rating Key: 4= outstanding performance, 3= satisfactory performance, 2= below expectations, 1= minimal effort invested, 0= no attempt or does not understand, comments on back,	
CRITERIA	SCORE
Preparation:	
1. Bulletin board preparation included a well planned draft.	
2. The bulletin board accurately teaches a significant spiritual truth.	
Presentation:	
1. The bulletin board clearly communicates the object lesson.	
2. The bulletin board is visually balanced and appealing.	
3. The bulletin board incorporates proper writing conventions (spelling, punctuation, grammar, etc).	
Collaboration:	
1. The student did his/her fair share of the work.	
2. The student appropriately encouraged and supported peers.	
3. The student was a good steward of time.	

Name _____ grades 1-8

Bulletin Board Rubric

Rating Key: 4= outstanding performance, 3= satisfactory performance, 2= below expectations, 1= minimal effort invested, 0= no attempt or does not understand, comments on back,	
CRITERIA	SCORE
Preparation:	
1. Bulletin board preparation included a well planned draft.	
2. The bulletin board accurately teaches a significant spiritual truth.	
Presentation:	
1. The bulletin board clearly communicates the object lesson.	
2. The bulletin board is visually balanced and appealing.	
3. The bulletin board incorporates proper writing conventions (spelling, punctuation, grammar, etc).	
Collaboration:	
1. The student did his/her fair share of the work.	
2. The student appropriately encouraged and supported peers.	
3. The student was a good steward of time.	

Day 6

Objectives
Grades 1-4: Define electricity; describe electrical fields of force; define static charge; understand the basic nature of static electricity.
Grades 5-8: Describe electric current; distinguish between alternating and direct current; distinguish between insulators and conductors; explain the effect of resistance on current.

Materials Needed
Grades 1-4: materials for object lessons or bulletin boards
Grades 5-8: aluminum foil, D cell, flashlight bulb, transparent tape, foil, glass, paper, paper clip, penny, rubber band, Styrofoam.
Both:

Review/Introduction
Give students commands to recreate the simulation of atoms they did on day 5. Require them to get the correct index cards to represent their part of the atom and have them demonstrate their roles. Explain that electricity power created by the flow of electrons. Ask them what type of electricity they learned about yesterday when they shuffled across the floor (static electricity). Explain that today they will learn about two other types of electricity. Conduct the demonstration described on page 403 of *Discover God's Creation*, TE.

Procedure
Have upper grade students "partner read" pages 403-406 of *Discover God's Creation* and do *Try This 21-3*. Near the end of class, have upper grade students present what they learned from their experiment to lower grade students. Meanwhile, have lower grade students work on or complete their object lessons or bulletin board projects.

Evaluation
Evaluate upper grade students based on their presentation to lower grade students. Evaluate completed projects and presentations with the rubric provided on day 5.

Day 7

Objectives
Grades 1-4: Define electricity; describe electrical fields of force; define static charge; understand the basic nature of static electricity; understand the basic nature of current electricity.
Grades 5-8: distinguish between voltage and amperage; distinguish between electrical cells and batteries; distinguish between dry and wet electrical cells; compare and contrast rechargeable and non-rechargeable dry cells.

Materials Needed
Grades 1-4: disassembled flashlights, one per cooperative group; copies of blackline master
Grades 5-8: for each small group- bell wire (approx. 30 cm), two D cells, flashlight bulb, tape; copies of blackline master
Both:

Review/Introduction
Use a cooperative structure to review previously taught terms and concepts. Take students outside to the nearest electrical pole on the school's property. Trace the wire to the point where it enters the building. Next, take students inside to the place where the wires enter the building and lead them to understand that electricity is constantly flowing into the building through the wires. Ask them to identify the type of electricity (current electricity) and then, what type of current electricity (alternating current). Have upper grade students explain the difference.

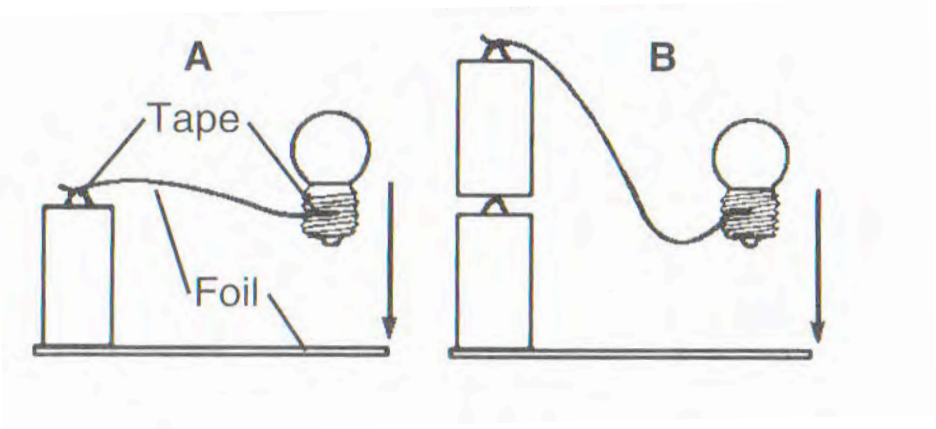
Procedure
Return to the classroom and have upper grade students "partner read" pages 407-411 of *Discover God's Creation*. Provide them with the accompanying directions for the experiment, which is a modification of the demonstration found on page 409 of the TE. In cooperative groups have them complete the experiment and answer the related questions. The have students complete the Venn diagram comparing and contrasting cells and batteries (see accompanying blackline master).

Meanwhile, give lower grades students in cooperative groups a flashlight which has been taken apart. Ask them to choose cooperative roles and work together to assemble the flashlight so that it will work. Bring them together as a group and ask them to describe what did and didn't work. Ask them to explain what powers the flashlight (electricity in the battery) and further explain what this kind of electricity is called (direct current or DC). Using the accompanying blackline master, in cooperative groups have students list as many things as they can think of which are powered by the two different forms of electricity, direct and alternating current.

Evaluation

Evaluate students based on their completed assignment and through informal observations.

Names _____ grades 5-8



Experiment Directions

Materials: bell wire (approximately 30 cm), two D cells, flashlight bulb, tape

Procedure:

1. Tape the wire to the top of the D cell and to the base of the light bulb as shown in A. Set the D cell on the foil. Touch the base of the light bulb to the foil. Using complete sentences, describe what happened.

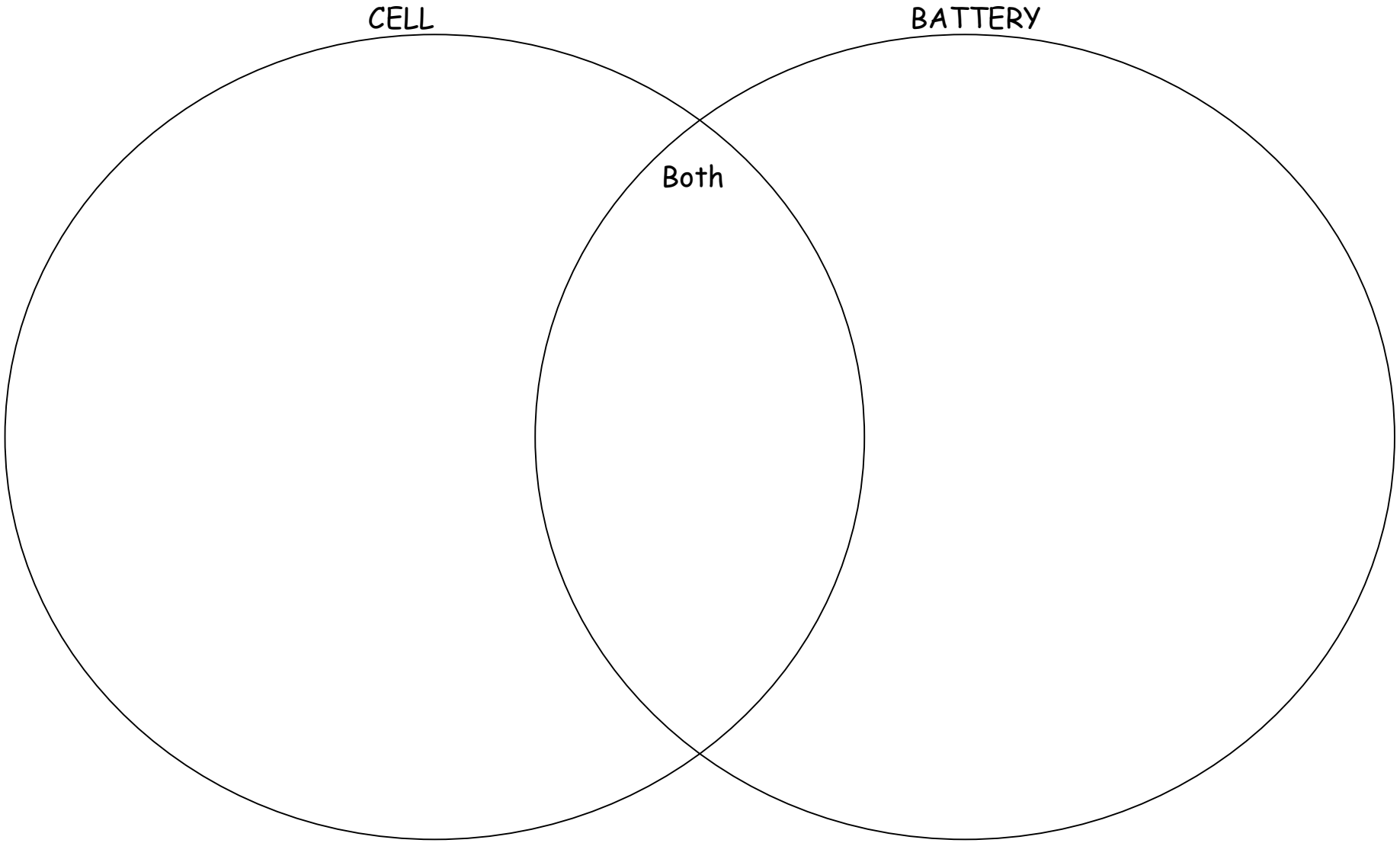
2. Add another battery as shown in B. Touch the base of the bulb to the foil. Using complete sentences, describe how the results compare and contrast with the results from number 1 above.

3. What do you think caused the difference?

4. Relate it to what you learned from the reading assignment.

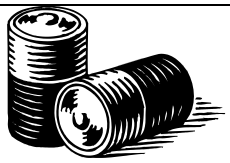
Name _____

grades 5-8



Name _____

grades 1-4

Direct Current 	Alternating Current 

Day 8

Objectives
Grades 1-4: Understand that current electricity must flow through a circuit (supplementary objective)
Grades 5-8: Define a circuit; distinguish between series and parallel circuits; explain the purpose of fuses and circuit breakers.

Materials Needed
Grades 1-4: for each cooperative group, aluminum foil, one piece of bell wire (approx. 30 cm), 1 D cell and 1 flashlight bulb; copies of blackline masters and rubrics
Grades 5-8: for each cooperative group, aluminum foil, two pieces of bell wire (approx. 30 cm each), 1 D cell and 2 flashlight bulbs; sheet of paper for recording answers.
Both: bell wire (approx. 30 cm), D cell, flashlight bulb

Review/Introduction
Using a cooperative structure, review previously taught terms and concepts. Recreate the demonstration from page 407 of *Discover God's Creation* TE but initially do not touch the light bulb to the foil and ask, "Why doesn't the bulb light up?" Then touch the bulb to the foil so that students can see that the bulb does light when touched to the foil. Explain to students that electricity must flow through a circular path called a circuit.

Procedure
Have upper grade students "partner read" pages 412-416 and then in pairs or cooperative groups conduct *Try This 21-6* from page 415 in the TE. On a separate piece of paper have them answer the questions posed under the "procedure section of the experiment.

Meanwhile, provide lower grade student in cooperative groups aluminum foil, one piece of bell wire (approx. 30 cm), 1 D cell and 1 flashlight bulb. Have each group experiment with different sequences until they create a circuit which will light the bulb. Ask them to discuss and explain how this differs from a store bought flashlight (the battery and bulb are in a case to keep them together, they have a switch to turn the light on and off). Have students describe a circuit on the accompanying forms.

Evaluation
Evaluate students based upon their completed assignments. See the accompanying rubrics for lower grade students.

Name _____

grades 1-2

Draw and label the parts of the circuit you created to light the bulb.

Write at least two sentences to tell what you learned.

Name _____ grades 3-4

Write a paragraph telling what you have learned about electricity. Think about atoms, different kinds of electricity and circuits. Be sure your paragraph includes a topic sentence, at least three supporting sentences and a concluding sentence.

Name _____ grades 1-2

Electricity Rubric

Rating Key: 4= outstanding performance, 3= satisfactory performance, 2= below expectations, 1= minimal effort invested, 0= no attempt or does not understand, comments on back,	
Criteria	Score
1. The drawing accurately shows a circuit with all the necessary parts.	
2. The parts of the circuit are labeled (invented spelling acceptable but students should circle those words they were unsure how to spell)	
3. The student wrote at least two sentences.	
4. The sentences begin with a capital and end with a period.	
5. The information contained in the sentences is accurate.	
6. The completed paper is neat and clean.	
7. The student was a good steward of time.	

Name _____ grades 1-2

Electricity Rubric

Rating Key: 4= outstanding performance, 3= satisfactory performance, 2= below expectations, 1= minimal effort invested, 0= no attempt or does not understand, comments on back,	
Criteria	Score
1. The drawing accurately shows a circuit with all the necessary parts.	
2. The parts of the circuit are labeled (invented spelling acceptable but students should circle those words they were unsure how to spell)	
3. The student wrote at least two sentences.	
4. The sentences begin with a capital and end with a period.	
5. The information contained in the sentences is accurate.	
6. The completed paper is neat and clean.	
7. The student was a good steward of time.	

Name _____ grades 3-4

Electricity Rubric

Rating Key: 4= outstanding performance, 3= satisfactory performance, 2= below expectations, 1= minimal effort invested, 0= no attempt or does not understand, comments on back,	
Criteria	Score
1. The student brainstormed and recorded ideas on a separate sheet of paper before beginning the final paragraph.	
2. The information contained in the paragraph is accurate.	
3. The student wrote at least five sentences.	
4. The paragraph contains a topic sentence and a concluding sentence.	
5. All sentences begin with a capital and end with a period.	
6. The completed paper is neat and clean.	
7. The student was a good steward of time.	

Name _____ grades 3-4

Electricity Rubric

Rating Key: 4= outstanding performance, 3= satisfactory performance, 2= below expectations, 1= minimal effort invested, 0= no attempt or does not understand, comments on back,	
Criteria	Score
1. The student brainstormed and recorded ideas on a separate sheet of paper before beginning the final paragraph.	
2. The information contained in the paragraph is accurate.	
3. The student wrote at least five sentences.	
4. The paragraph contains a topic sentence and a concluding sentence.	
5. All sentences begin with a capital and end with a period.	
6. The completed paper is neat and clean.	
7. The student was a good steward of time.	

Day 9

Objectives
Grades 1-4: Demonstrate knowledge of electricity safety rules.
Grades 5-8: Review and research

Materials Needed
Grades 1-4:
Grades 5-8:
Both: chart paper and marker;

Review/Introduction
Use a cooperative structure to review previously taught terms and concepts. Ask students to brainstorm a list of safety rules related to electricity. Record their ideas on chart paper. Correct any misconceptions they have. See accompanying list of safety do's and don'ts.

Procedure
Have upper grade students do portions of the *Chapter 21 Wrap-Up* including at least one of the research projects listed on page 419.

Meanwhile, have lower grade students create a safety book or series of safety posters to be displayed in the school or in a preschool or day care. If possible have the students use the book or posters to teach younger children these principles after having practiced in school. Be sure to clearly define the steps in the process and teach them to children before giving the assignment.

Evaluation
Evaluate students based on their completed projects. Create a rubric based on the steps you have articulated to students.

Electricity Safety Do's and Don'ts

Do:	Don't
Keep away from outdoor areas marked with signs that say "Danger" or "Danger High Voltage."	Don't play near electrical stations, equipment, wires, hydro towers or utility poles.
Look up for hydro wires running through or beside trees before you climb.	Don't climb or play in trees where there are overhead wires nearby.
Stay clear of overhead power lines and wires.	Don't touch an overhead wire with a pole, stick or other object. Electricity could travel down that object and cause a shock that could kill you.
Respect utility electrical equipment.	Don't throw anything at wires or electrical equipment, and don't fasten things to utility poles. Damaged equipment can be very dangerous.
Fly kites, balloons and model airplanes in wide-open spaces, away from power lines.	Don't fly kites or other toys near overhead power lines or substations. A string or line that contacts electrical equipment or a power line can cause a shock that could kill you.
Always try to get inside a building or a car during a lightning storm.	Don't stay outside when there's lightning. Avoid wide open spaces and tall trees. If you're swimming, get out of the water.
When disconnecting appliances from electrical outlets, use the plug when you pull it out.	Don't pull on the cord when you unplug an electrical appliance. Use the plug.
Remind your parents to replace electrical cords that have cut, broken or cracked insulation.	Don't use appliances that have damaged electrical cords — there's a risk of shock.
Keep electrical cords away from sources of heat.	Don't run cords under carpets.
Keep electrical cords and appliances away from water. Plug cords into GFCI protected outlets when you're working near a sink or other water source.	Don't mix water and electricity. If an electrical cord or appliance is faulty, water will conduct the electricity and increase the risk of shock.
When you're changing a light bulb, be sure to turn off the switch or circuit.	Don't work on light fixtures or appliances without unplugging them or switching off the power. Never put your finger in a light bulb socket.
Put safety caps on any unused electrical outlets, especially if there are young children in the house.	Don't poke anything into an electrical outlet.
If there's an electrical fire, call the fire department. Use a dry chemical fire extinguisher or baking soda to douse an electrical fire. If it's safe to do so, unplug the appliance first.	Don't use water to put out an electrical fire.
Call 911 or your local emergency number if you see a person who is receiving an electrical shock and is seized on an appliance or a wire.	Don't touch someone that is being shocked until the electricity has been turned off.