4th Grade Science Home Packet #3

Riverside Elementary

April 6 - 17, 2020

(2 Weeks of Work)

Science | 4th Grade | April 6 - 17, 2020

"Electricity and Magnetism" (2Weeks)

April 6-10

Monday	Parents, I am including the Answer Keys to Home Packets #1 and #2 at the end of this packet. Please check your child's packets for the correct answers. If wrong, let the child correct his/her papers. I really want them to know the correct answers so that the learning will be correct. Definition answers do not have to be exact, as long as they are similar. This may take a couple of days since you are looking at two packets. I miss all of you and wish you safety during this time. Love, Mrs. Barr
Tuesday	What is Static Electricity? Read pages F6 – F9. Work Worksheet #1 using pages F6 –F9
Wednesday	Watch "Electricity" video on "studyjams.com" (free) Reread p. F6 – F9 to recall facts about Static Electricity Work Worksheet #2 – "Static Electricity". Read & Answer Questions.
Thursday	Re-watch "Electricity" video on Studyjams.com Work the test on the video until you get all answers correct. You may need to watch the video again.
Friday	WS #3 – "Electrical Charges" – Count the positive and negative charges. Decide if the "charge" is positive, negative, or neutral. WS #4 – "Static Electricity"

April 13-17

Monday	Magnets - Read pages F18 – F21 Work Worksheet #5 using pages F18 – F21.
Tuesday	Work Worksheets - Read & Answer Questions # 6 - "How Do Magnets Work?" # 7 – "Magnets Attract and Repel"
Wednesday	If you have internet access, type in search for: Bill Nye the Science Guy – Magnetism. Watch the video. Magnets videos for kids - Watch a couple of videos on magnets If you don't have internet access, just skip this part.
Thursday	Reread pages F18 – F21. WS # 8 - "Magnetic Attraction" Decide if the magnets attract or repel.
Friday	Worksheets - Read & Answer Questions # 9 - "There's A Magnet in my Speaker" #10 – "A New Use for Magnets"

LEARN ABOUT

Static Electricity

FIND OUT

- about a property of matter called charge
- how charges move from one piece of matter to another
- how electric fields cause forces

VOCABULARY

charge
static electricity
electric field

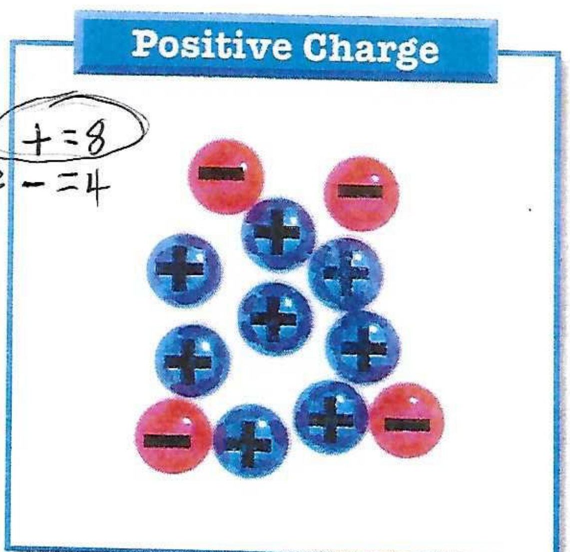
Two Kinds of Charge

Remember that matter is made of particles that have mass and volume. Particles of matter also have a property called *electric charge.* A particle can have a positive (+) charge, a negative (–) charge, or no charge at all.

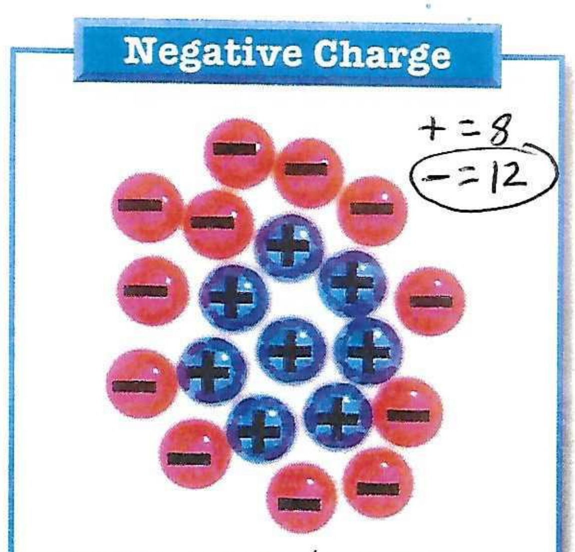
Matter in an object normally has equal numbers of positive and negative particles. It is *neutral.* Rubbing two objects together, however, can move negative particles from one object to the other. That is exactly what happened in the Investigation. The result was that the number of positive charges on each balloon was different from the number of negative charges. Charge is a measure of the extra positive or negative particles that an object has. Rubbing gave one object an overall *positive charge,* and it gave the other an overall *negative charge.*

The charge that stays on an object is called static electricity (STAT•ik ee•lek•TRIS•ih•tee). *Static* means "not moving." Even though the charges moved to get to the object, once there they stayed.

✓ **What are the two types of charges?**



▲ A single positive charge is labeled +. A single negative charge is labeled –. When an object has more positive charges than negative charges, its overall charge is positive.



▲ If an object has more negative charges than positive charges, its overall charge is negative. How many extra negative charges are shown here?

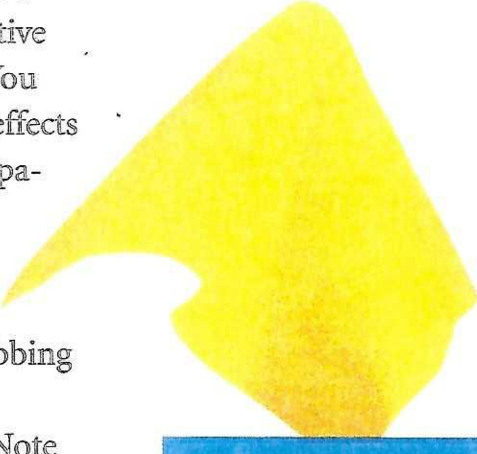
Separating Charges

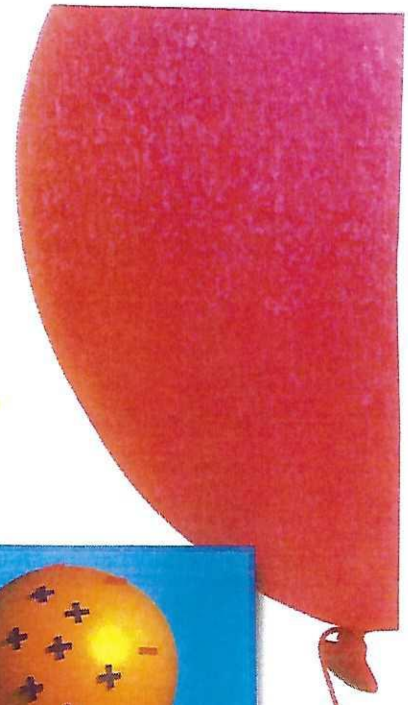
Most of the time, you, a balloon, and a doorknob have neither an overall negative charge nor an overall positive charge. You and the objects are neutral. To see the effects of forces between charges, you must separate negative charges from positive charges.

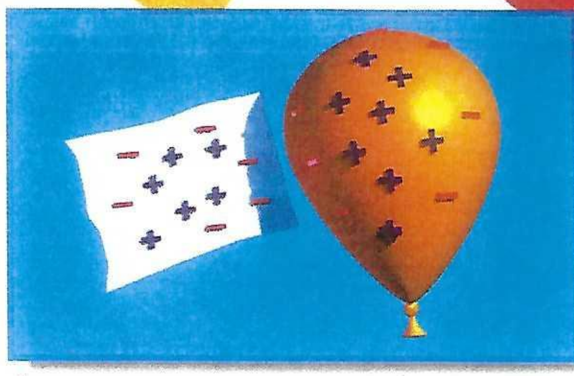
You can separate the negative and positive charges of many objects by rubbing them together. Rubbing pulls negative charges off one object onto the other. Note that only negative charges move in this way.

When you comb dry hair, the teeth of the comb rub negative charges from the hair. The comb gets extra negative charges, so it has an overall negative charge. Your hair loses negative charges. It now has an overall positive charge.

✔ **Which kind of charge moves to make a static charge?**

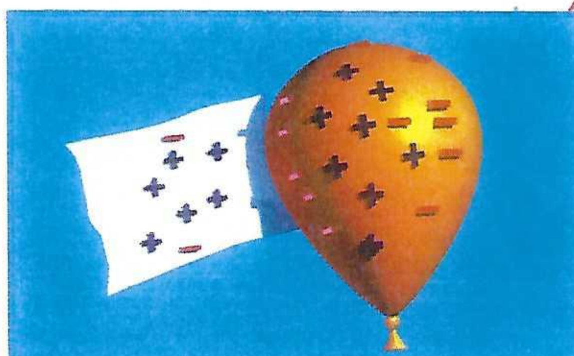






▲ If you hold a piece of wool next to a balloon, nothing happens. So you know that neither the wool nor the balloon is charged. The numbers of positive and negative charges on the balloon are equal. The charges are also equal on the wool. Both items have a neutral charge.

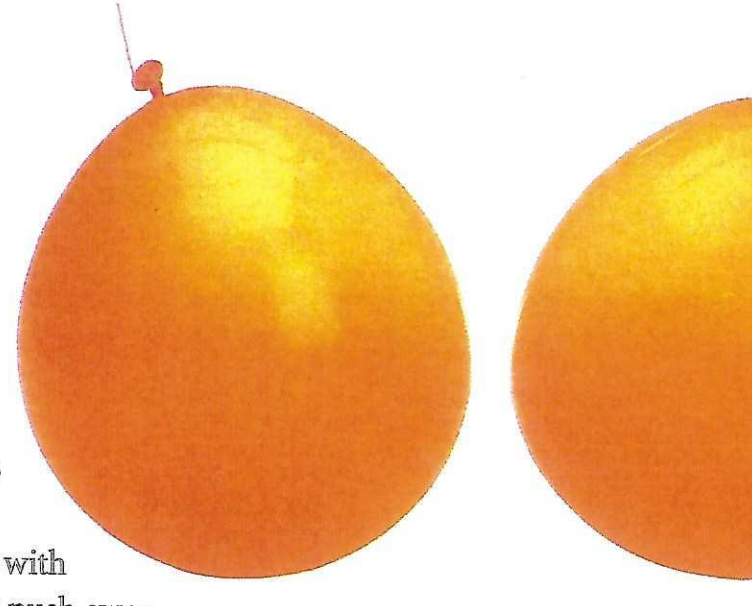
As clothes tumble in a dryer, different fabrics rub against each other. Negative charges move from one piece of clothing to another. When this happens the clothes stick together. ▼



▲ Rubbing wool on a balloon separates charges. Negative charges move from the wool to the balloon. The balloon now has more negative charges than positive charges. The balloon is negatively charged. The wool loses negative charges. Now it has more positive charges than negative charges. It is positively charged.

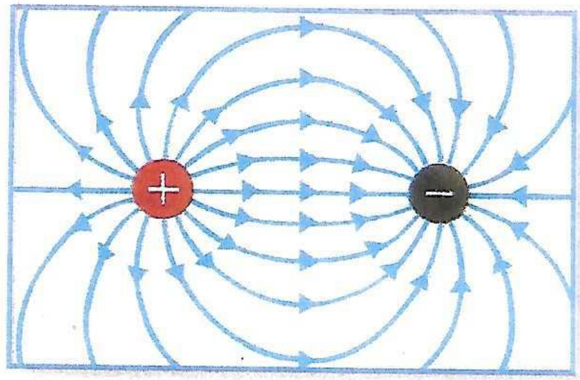
Electric Forces

In the investigation you saw how a charged balloon pushed or pulled another charged balloon. The push or pull between objects with different charges is an *electric force.* An electric force causes two objects with opposite charges to *attract,* or pull, each other. An electric force causes two objects with like charges to *repel* (rih•PEL), or push away from, each other.



The space where electric forces occur around an object is called an **electric field**. The electric field of a positive charge attracts a nearby negative charge. The electric field of a positive charge repels a nearby positive charge.

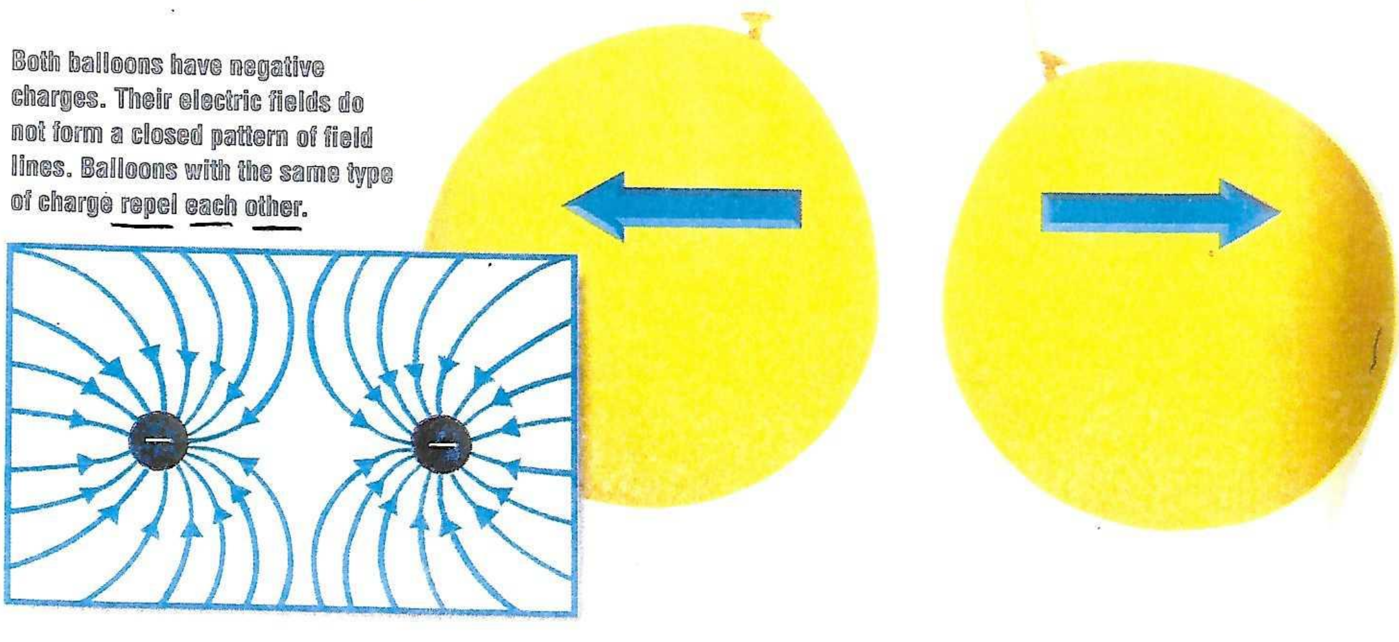
In diagrams, arrows are used to show an electric field. They point the way one positive charge would be pulled by the field. The pictures here show the electric fields of two pairs of balloons. One pair has opposite charges. The other pair has the same charges.

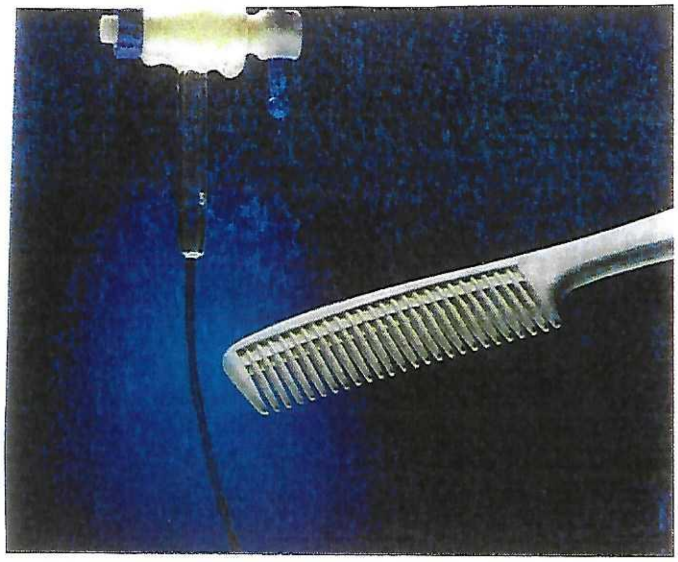


▲ One balloon has a positive charge. The other has a negative charge. Their electric fields form a closed pattern of field lines. Balloons with opposite charges attract each other.

✔ **What is an electric field?**

Both balloons have negative charges. Their electric fields do not form a closed pattern of field lines. Balloons with the same type of charge repel each other.





▲ After you comb your hair, your comb has a negative charge. Its electric field repels the negative particles in the stream of water. Negative particles are pushed to the opposite side of the stream. That leaves extra positive charges on the side near the comb. The stream bends toward the comb.

Summary

Objects become electrically charged when they gain or lose negative charges. A charge causes an electric field. The electric fields of charged objects interact to produce electric forces. Objects with like charges repel each other. Objects with unlike charges attract each other.

Review

1. What is static electricity?
2. What is charge?
3. What is an electric field?
4. **Critical Thinking** How can you make a piece of rubber that has an overall positive charge neutral again?
5. **Test Prep** A plastic ruler can get a positive charge by —
   A gaining a single negative charge
   B losing a single negative charge
   C gaining a single positive charge
   D losing a single positive charge

LINKS

MATH LINK

Use Addition Properties The two pictures on page F6 show charges. How many single negative charges must each object gain or lose to become neutral? Use numbers and math symbols to show how you found your answer.

WRITING LINK

Informative Writing—Description Suppose you are a balloon. Write a paragraph for a classmate describing what happens to you as you gain a negative charge from a piece of wool.

HEALTH LINK

Lightning Safety Lightning is a big movement of charged particles. It can kill people and animals, and it can start fires. Find out the safety rules you should follow during a thunderstorm. Make a poster illustrating the rules.

GO ONLINE TECHNOLOGY LINK

Learn more about early use of electricity by visiting the National Museum of American History Internet site. **www.si.edu/harcourt/science**

Smithsonian Institution®

Electricity and Magnetism
Static Electricity - Lesson 1
pages F6-F9

WS #1

Name ______________________

1. What is static electricity? ____
____

2. What is charge? ____
____

3. What is an electric field? ____
____
____

4. How can you make a piece of rubber that has an overall positive charge neutral again?
____
____

5. A plastic ruler can get a positive charge by _____.
   A. gaining a single negative charge
   B. losing a single negative charge
   C. gaining a single positive charge
   D. losing a single positive charge

6. Two kinds of charges are ____________________ and ____________________.

WS #2

Static Electricity

By Cindy Grigg

1 Have you ever had someone rub a balloon against your hair? What happened? Did your hair stand up? Did the balloon then stick to the wall? How did that happen? All matter -- every object, you, even the air -- has tiny bits of electricity called **electric charges**.

2 Every atom of matter has electrons having electric charges. When you rub two objects together, you can cause these charges to move from one object to another. The balloon picked up charges from your hair. The balloon and the wall have charges that are unlike (or opposite from) each other. Unlike charges attract or pull toward each other. This pulling force between unlike charges makes the balloon stick to the wall.

3 Try rubbing two balloons with a piece of wool. If you hold the two balloons near each other, they will push away from each other. The balloons will have electric charges that are the same. Like charges push away from (repel) each other.

4 This kind of electric charge is called **static electricity.** Static electricity builds up on an object, like the balloon. When you rub the balloon, you are moving electric charges from one object to the other. It is called **static** because it doesn't move by itself.

5 Static electricity builds up on an object. When you walk across carpet and touch a metal doorknob, that shock you feel comes from static electricity. You build up electric charges on your skin. When you reach for the doorknob, the charges can jump. You might see a spark when this happens. You might get a shock! Lightning is a form of static electricity. Electric charges jump from cloud to cloud. They can jump from a cloud to the ground, too. Static electricity can't be used to run your TV or lights.

1. Tiny bits of electricity in matter are called ______.
   - (A) Electric circuits
   - (B) Static electricity
   - (C) Electric charges
   - (D) Electric currents

2. The word "static" means ______.

3. An example of static electricity is ______.
   - (A) Lightning
   - (B) Thunder
   - (C) Electricity in your house
   - (D) All of the above

4. Charges that are unlike or opposite from each other will ______ each other.
   - (A) Pull toward
   - (B) Attract
   - (C) Both A and B
   - (D) Neither A nor B

5. Like charges or charges that are the same will ______.

WS #3

Name: ______________________________ Review p. F6 -

Electrical Charges

If an object has more positive charges (⊕) than negative charges (⊖), its electrical charge is positive (⊕).

If an object has more negative charges (⊖) than positive charges (⊕), its electrical charge is negative (⊖).

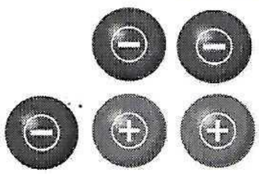
If an object has the same number of positive (⊕) and negative (⊖) charges, it has no electrical charge or is neutral.

Example:

Electrical charge: positive charge

Count the positive and negative charges in each picture. Write <u>positive charge</u>, <u>negative charge</u>, or <u>no charge</u> (neutral) on each line.

1.

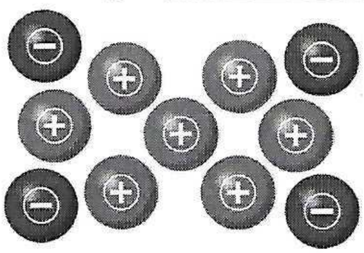


electrical charge: ____________________

2.

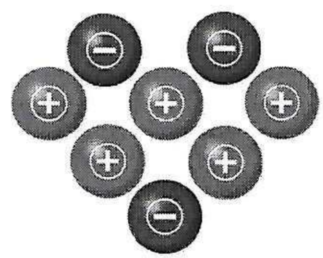
electrical charge: ____________________

3.



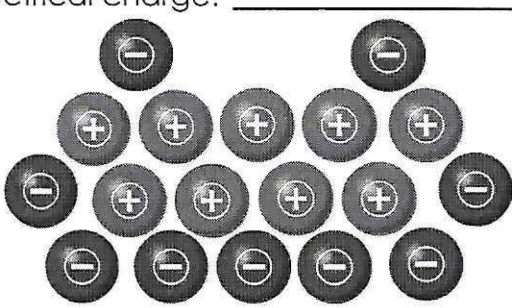
electrical charge: ____________________

4.



electrical charge: ____________________

5.



electrical charge: ____________________

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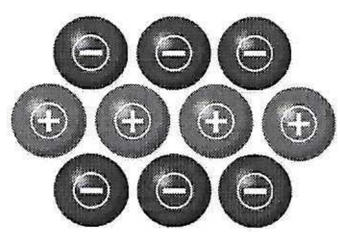


electrical charge: ____________________

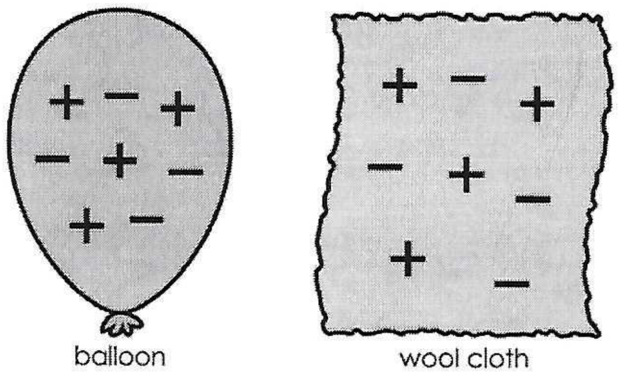
WS #4

Name: ______________________________

Static Electricity

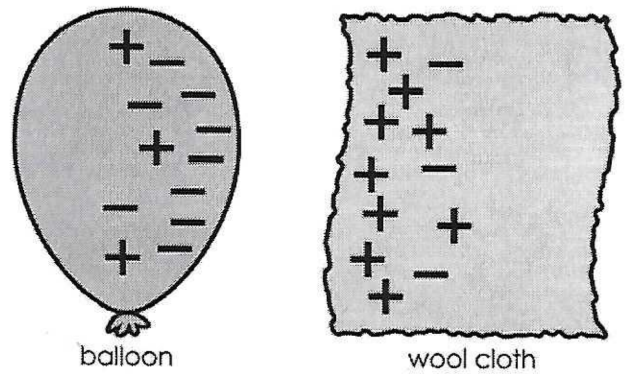
Rubbing a balloon with wool cloth will create static electricity charges.

This balloon has **not** been rubbed with the wool cloth.



Picture 1

This balloon **has** been rubbed with the wool cloth.



Picture 2

1. In Picture 1, does the balloon have a positive charge, negative charge, or no charge? (neutral) __________

2. In Picture 1, does the cloth have a positive charge, negative charge, or no charge? __________

3. In Picture 2, does the balloon have a positive charge, negative charge, or no charge? __________

4. In Picture 2, does the cloth have a positive charge, negative charge, or no charge? __________

LEARN ABOUT

Magnets

FIND OUT

- about magnetic poles
- how magnetic fields cause magnetic forces
- how to use Earth's magnetic field to find directions

VOCABULARY

magnet
magnetic pole
magnetic field

Two Poles

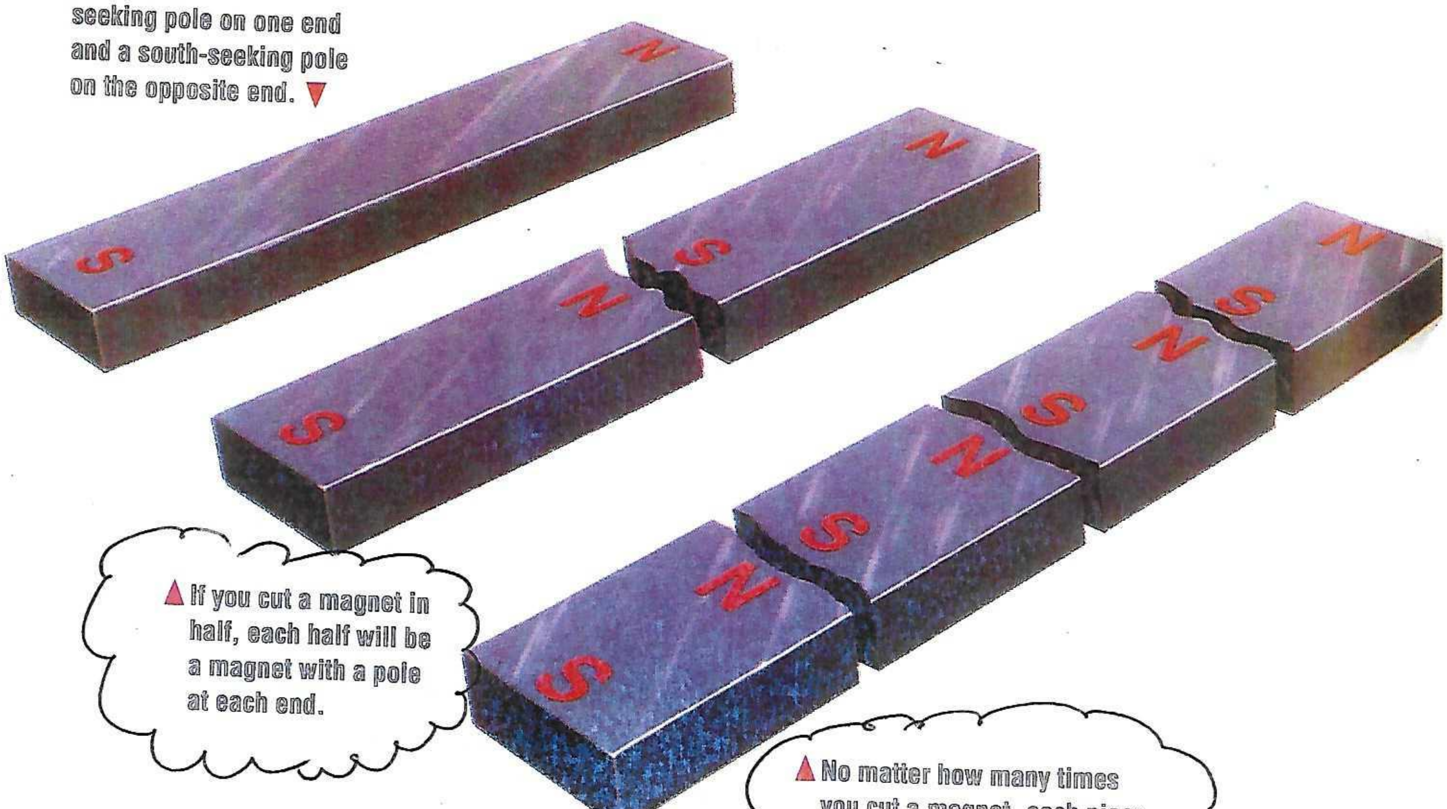
Rub a sewing needle on a magnet. Then try to pick up a paper clip.

In the investigation you made a needle into a magnet. You could tell it was a magnet because it attracted metal paper clips, just as other magnets do. A **magnet** is an object that attracts certain materials, usually objects made of iron or steel. A needle isn't a natural magnet. You changed it into a magnet by dragging it along the bar magnet.

A magnet has two ends called **magnetic poles**, or just *poles* for short. A magnet's pull is strongest at the poles. If a bar magnet can swing freely, one end, called the *north-seeking pole*, will always point north. The opposite end, called the *south-seeking pole*, will always point south. A magnet's north-seeking pole is usually marked *N*. Its south-seeking pole is marked *S*.

✔ **What is each end of a magnet called?**

A magnet has a north-seeking pole on one end and a south-seeking pole on the opposite end. ▼



▲ If you cut a magnet in half, each half will be a magnet with a pole at each end.

▲ No matter how many times you cut a magnet, each piece will be a magnet with a pole at each end. WOW!

Magnetic Forces

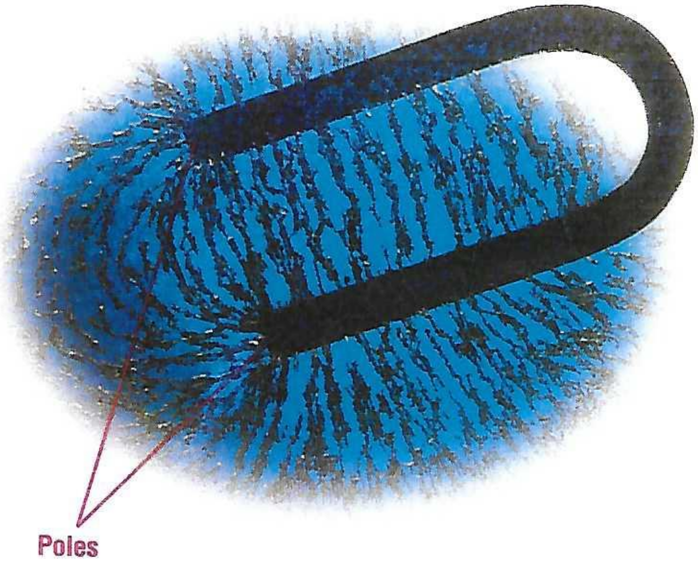
If you've ever played with magnets, you've probably felt them pull toward each other. At other times they seem to push away from each other. The forces you felt are magnetic forces caused by magnetic fields.

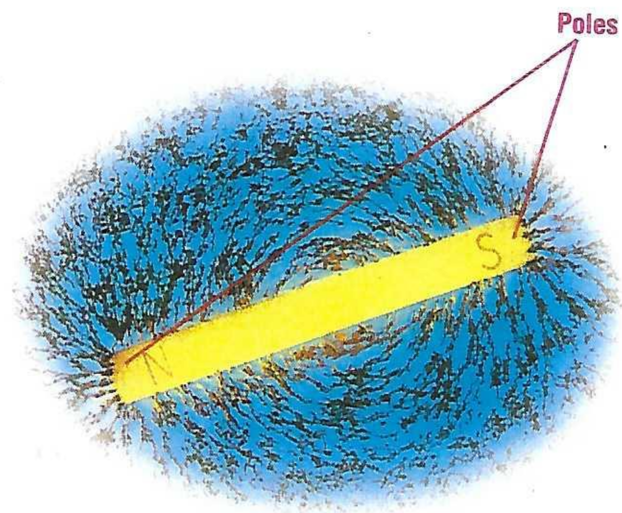
A **magnetic field** is the space all around a magnet where the force of the magnet can act. You can't see the field. However, a magnet can move iron filings into lines. The pattern made by the iron filings shows the shape of the magnet's field.

Forces between magnet poles are like forces between electric charges. Opposite magnetic poles attract, and like poles repel. If the N pole of one magnet is held toward the S pole of another magnet, their fields form a closed pattern. This closed pattern of lines shows a force that pulls the magnets together.

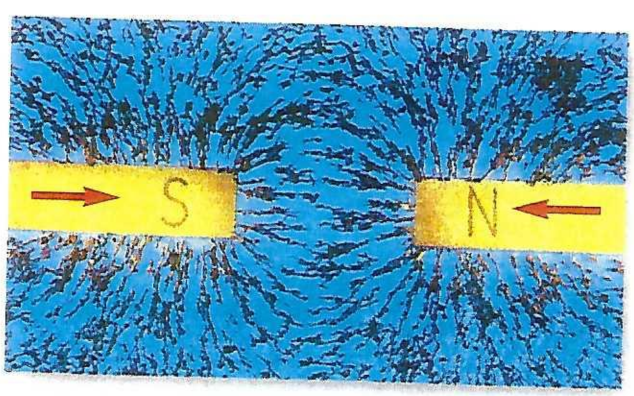
If two magnets are held with their N poles near each other, their magnetic fields form an open pattern of lines. Just as with electric charges, this pattern shows a force that pushes the magnets away from each other.

✔ **Where is the pull of a magnet strongest?**



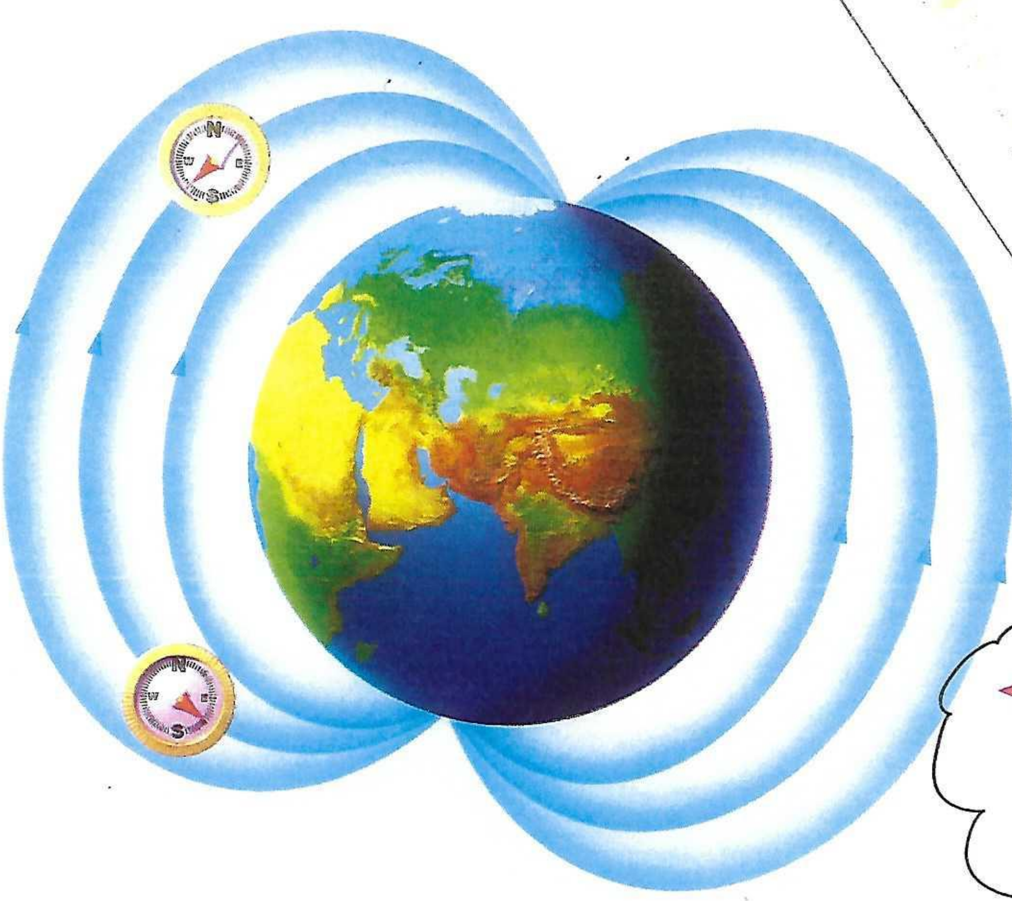


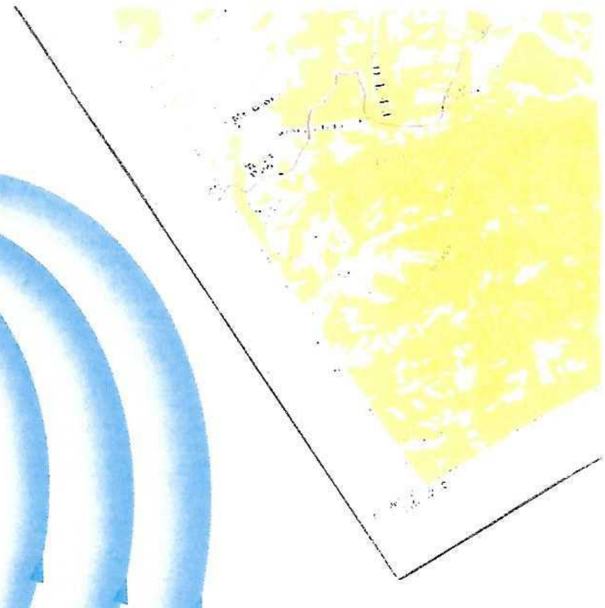
▲ The shape of a magnetic field depends on the shape of the magnet. The bunching of iron filings on the end of a magnet shows that the magnetic force is strongest at a magnet's poles.



▲ Opposite poles of two magnets attract. The pattern of iron filings is closed. This shows a magnetic force that attracts, or pulls, the magnets together.

▲ Like poles of two magnets repel. The field lines are open, showing lines of force that push the magnets apart.





A magnetic field fills the space around Earth. Earth's magnetic poles and the "true" poles made by Earth's axis are not identical.

Compasses

The north-seeking and south-seeking property of magnets is useful. For hundreds of years, people have used magnets to find direction. The first magnets used were made of a heavy natural material called *lodestone.* Today geologists know this material as the mineral magnetite.

A compass today uses a lightweight magnetic needle that is free to turn. This is much like the needle you made into a magnet in the investigation. A compass needle points along an imaginary line connecting the North and South Poles. This is because Earth is like a giant magnet.

How Magnet Poles Affect a Compass

A compass placed near a bar magnet will point toward one of the magnet's poles. Here you can see the red part of the compass needle pointing toward the N pole of the bar magnet.

When the compass is brought to the other end of the bar magnet, the compass needle swings around so that the red part points away from the S pole of the bar magnet.

When there are no landmarks you know, a map and a compass can help you find your way.

The field lines of Earth's magnetic field come together close to the planet's North and South Poles. This pattern is like the one shown by the iron filings around the bar magnet on page F19. Indeed, Earth's magnetic field is like the field of a giant bar magnet.

✓ **How does a compass work?**

Summary

Magnets are objects that attract materials such as iron. Every magnet has two magnetic poles. Magnetic forces are caused by the interaction of magnetic fields. Earth's magnetic field is like the field of a bar magnet. A compass needle interacts with Earth's magnetic field.

Review

1. How can you find the poles of a magnet?
2. What is a magnetic field?
3. Which type of magnet has a field that is about the same shape as the magnetic field of Earth?
4. **Critical Thinking** Describe the field lines formed if the south poles of two magnets are brought close together.
5. **Test Prep** How many poles does a magnet have?
   A none
   B one
   C two
   D four

LINKS

MATH LINK

Make a Bar Graph Decide on a way to measure the strength of different bar magnets or different magnet shapes. Test some magnets. Then use a computer program such as *Graph Links* to make a bar graph to show what you measured.

WRITING LINK

Informative Writing—How-to Write a paragraph telling a classmate how to use a compass to find the direction in which he or she is traveling.

SOCIAL STUDIES LINK

Earth's Moving Magnetic Poles
Earth's north magnetic pole is constantly moving. Find out how the pole's location is shown on topographical (tahp•uh•GRAF•ih•kuhl) maps, which show the land's surface features, and on navigational charts. Find the current location of the north magnetic pole on a globe. Measure the distance between the true North Pole and the magnetic north pole.

GO ONLINE TECHNOLOGY LINK

Learn more about Earth's magnetic field by visiting the National Air and Space Museum Internet site.
www.si.edu/harcourt/science

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WS #5

Electricity and Magnetism
Magnets -Lesson 3
pages F18-F21

Name ______________________________

1. How can you find the poles of a magnet? ____
____

2. What is a **magnetic field**? ____
____

3. Which type of magnet has a field that is about the same shape as the magnetic field of Earth? ____

4. Describe the field lines formed if the south poles of two magnets are brought close together. ____
____
____

5. How many poles does a magnet have?
   A. none   B. one   C. two   D. four

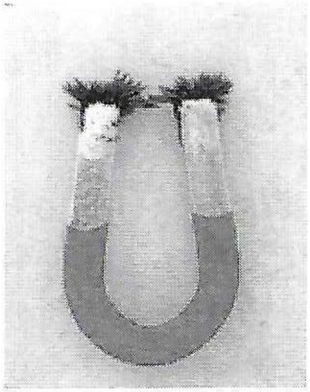
6. **magnet** - ____
____

7. **magnetic pole** - ____

Name ______________________ WS #6

How Do Magnets Work?

By Brandi Waters



You probably have magnets at home. Many people keep them on their refrigerator. They use them to hold up important papers, pictures, or calendars. Maybe you played with the magnets when you were younger. If you did, you probably know a few things about magnets already. You probably know that magnets don't stick to everything. They won't stick to plastic. They won't stick to wood. Magnets will stick to metal objects, like your refrigerator, but they won't stick to all kinds of metal. You might have noticed that magnets will stick to other magnets. If you did, you might also know that they will push away other magnets! All of these things probably left you wondering, "How do magnets work?"

Magnets work because of an invisible force. It is called magnetism, or the magnetic force. The magnetic force surrounds a magnet. The magnetic force is created by the movement of electric charges. Atoms, the tiny building blocks of matter, are the source of this electric charge. An atom has a positively charged core. The core is surrounded by negatively charged electrons. The electrons spin around the core of the atom. This turns the atom into a tiny magnet. Each atom in an object creates a small magnetic force. In most materials, the atoms align in ways where the magnetic forces of the atoms point in many, random directions. The forces cancel each other out. There are some special materials, though, where the atoms align in a way where the magnetic forces of most of the atoms are pointed in the same direction. The forces of the atoms combine and the object behaves as a magnet.

Why do magnets stick to some materials and not others? Generally, magnets stick to materials made out of iron, nickel, or cobalt. These materials are called ferromagnetic materials. Ferromagnetic materials have a special structure. A magnet can change the direction of the magnetic forces of the atoms in these materials. The magnetic forces align and the magnet sticks to the material.

Why do magnets stick together? A magnet has two poles, just like the Earth. It has a north pole and a south pole. The magnetic force pushes out from the north pole of the magnet and travels to the south pole of the magnet. The magnetic force can be felt all around the magnet. The closer you get to the magnet, the stronger the force will be.

The poles on a magnet help to explain why magnets can stick together but can also push away from each other. The north pole of one magnet will stick to the south pole of another magnet. The magnetic forces of each magnet are moving in the same direction. If you have two magnets with their north poles (or south poles) facing each other, they will push each other away. Their magnetic forces are moving in opposite directions. They are pushing against each other.

Magnets have many uses. Of course, they are great for holding notes to your refrigerator, but they can do a lot more. Magnets are used in computers and electric motors. They are used in medical devices. They are used in CD and DVD players. Scientists, engineers, and inventors have found many uses for magnets, and they will, no doubt, continue to find more.

How Do Magnets Work?

Questions

_____ 1. Magnets stick to materials made out of ______.

A. wood
B. plastic
C. copper
D. none of the above

2. The invisible force that surrounds a magnet is called the ______.

____

____

____

WS # 6 Continued

_____ 3. ______ is a ferromagnetic material.

A. Aluminum
B. Iron
C. Copper
D. all of the above

_____ 4. Two magnets will repel each other when ______.

A. their magnetic forces are pushing against each other
B. their north poles are facing each other
C. their south poles are facing each other
D. all of the above

5. The ______ surrounding the core of an atom create a small magnetic force.

____

____

____

Explain why two magnets will stick together. Draw a picture to help explain. Draw lines to show the magnetic field. Draw arrows to show which direction the magnetic field is moving.

____

____

____

____

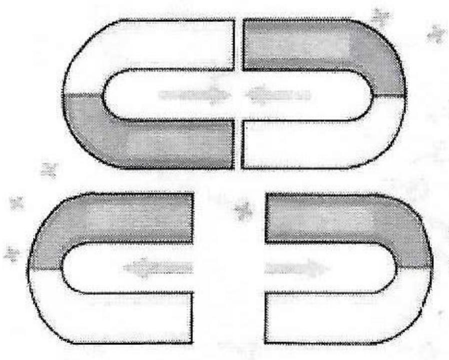
____

WS #7

Name ______________________

Magnets Attract and Repel

By Cindy Grigg



You've probably played with magnets. You know some things about them already. You know that magnets can push and pull on some objects. Do you know why?

Magnets attract some-but not all-metals. A magnet won't attract a penny or a soft drink can. Magnets do not attract paper, cloth, or plastic. Magnets are made of metals like iron, nickel, steel, or cobalt. These are the metals that magnets attract, too. Some rocks with these metals inside them are natural magnets called lodestones.

Magnetism is a force. We can't see it. It acts on some objects so we know it is there. Magnetism comes from the electric charges found in atoms. Everything is made of tiny particles called atoms. Atoms are made of even smaller parts. One of these is the electron. Moving electrons are the cause of magnetism.

Each atom has electrons moving around its center. In a magnet, the electrons pull in the same direction. In things that aren't magnets, the domains of all the atoms are mixed up. They pull in all different directions.

An area of force around a magnet is called its magnetic field. An iron object within this area will be pulled toward the magnet. The field is strongest at the poles of a magnet and weakest in the middle.

When iron comes close to a magnet, the magnet's magnetic field causes the domains of all the atoms to line up the same way. That's how magnets attract metals.

A compass shows which direction is north. The needle of a compass will always point north because it lines up with Earth's magnetic field. Earth is magnetic because it has iron in its center. Earth's iron core acts like a giant bar magnet.

You can make a magnet out of steel or iron. Try it with a paper clip or a sewing needle. All you have to do is rub the metal with a magnet. If you rub gently in one direction over and over again, the domains of the atoms will line up. Your paper clip will become magnetized. Then if you tap the paper clip against the table, it will lose its magnetism. Tapping it causes the domains of the atoms to get mixed up again. Heating the paper clip would also cause it to lose its magnetic force. Magnets can be made by sending an electric current through metal.

Magnets can be any shape. Bar magnets are rectangles. Some magnets are shaped like circles. Ring magnets have holes in the middle. No matter how they are shaped, all magnets have a north pole and a south pole. Most magnets are marked with an "N" and "S" showing where the poles are. Sometimes they are marked with plus and minus signs instead.

Try putting two magnets together. Opposite poles, one north and one south, attract or pull toward each other. Two north poles will push away from or repel each other. Two south poles repel each other, too. Opposite poles attract. Like poles repel. The two poles are opposite and equal in strength.

Some magnets are shaped like the letter "U." They are called horseshoe magnets. This shape lets the two poles be close together instead of on opposite ends. This gives the horseshoe magnet a stronger pulling force. The horseshoe shape lets a magnet pick up heavier pieces of metal than a bar magnet of the same size.

Magnets are used for many things. Magnets are found inside electric motors and generators. Without magnets, we would not have electric lights, telephones, or computers. Most of the electrical energy we use every day comes from generators. Magnets make so many things possible!

WS #7 continued

Name ____________________

Magnets Attract and Repel

Questions

_____ 1. Magnets attract what kind of objects?

A. all kinds of metals
B. some metals
C. plastic and leather
D. paper and cloth

2. A rock that is a magnet is called a ______.

____

____

____

3. What is a magnetic field?

____

____

____

_____ 4. Where is a magnetic field strongest?

A. at the poles of the magnet
B. in the middle of the magnet
C. It is equally strong everywhere in the field.
D. none of the above

_____ 5. Horseshoe magnets do not have separate poles.

A. false
B. true

_____ 6. Which of these word pairs are antonyms?

A. magnet, metal
B. pull, attract
C. north, east
D. attract, repel

_____ 7. Which of these word pairs are synonyms?

A. repel, pull
B. north, south
C. attract, push
D. ends, poles

8. What is an advantage of the horseshoe magnet?

____

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(Cause and effect) Explain what causes something to be a magnet.

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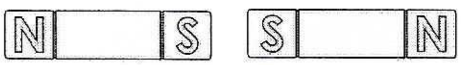
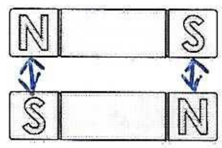
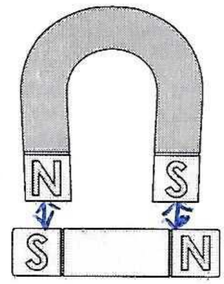
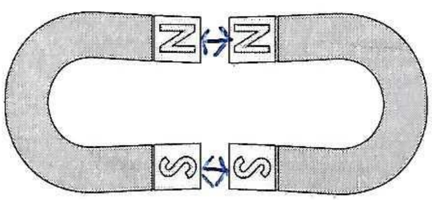
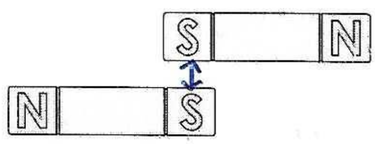
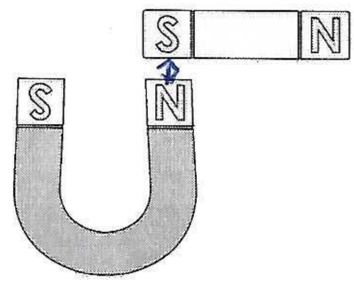
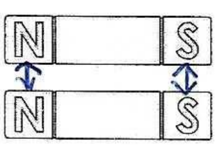
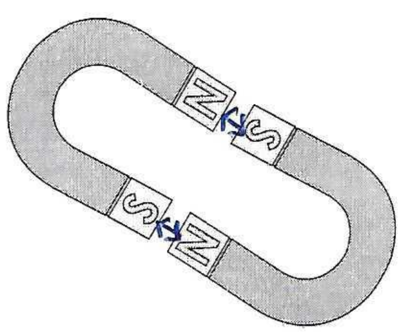
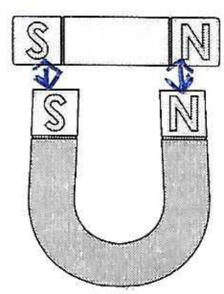
Name: ____________________________ WS #8

Magnetic Attraction

Tell whether each pair of magnets will **attract** or **repel**. Circle correct answer.

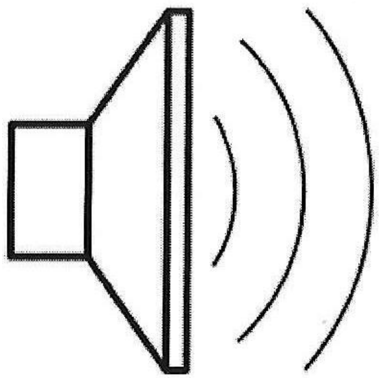
 attract repel	 attract repel	 attract repel
 attract repel	 attract repel	 attract repel
 attract repel	 attract repel	 attract repel

WS #9

Name ____________________

There's a Magnet in My Speaker

By Kathleen W. Redman



Magnets have many uses. Some of them are very obvious. Magnets can hold paper to a refrigerator. Magnets can hold a purse or a laptop computer shut. A magnet on the end of a string can help recover a dropped tool or key. There are many places magnets aren't obvious. Did you know there are magnets in cars? Did you know magnets are used in your television? Magnets are everywhere!

Magnets are a very important part of speakers. The speakers in your computer, television, and headphones have magnets in them. Without magnets, they wouldn't work at all.

Speakers have only a few parts. There's the cone, the voice coil, and a magnet. The cone is the part of the speaker where the sound comes from. Many cones are made of paper or plastic. Some are made of metal. They look like really wide, flat ice cream cones.

The voice coil is attached to the center of the cone. The voice coil is wrapped up wire. The wire is formed into a cylinder. This cylinder of wire fits into a round gap in the magnet. In some speakers, the magnet is big and heavy. In other speakers, like the ones in headphones, the magnet is tiny.

The coil inside the magnet has alternating current running through it. Sound reaches the coil as electricity. The coil acts as an electromagnet and pulls itself up or pushes itself down in response to the magnet inside the speaker. Its motion moves the cone of the speaker.

When the cone of the speaker moves, it creates sound waves in the air in front of it. The sound waves travel through the air to your ears, and you hear the music!

If there were no magnets in the speakers, the electricity wouldn't cause the voice coil to vibrate. If the voice coil didn't vibrate, the cone wouldn't move. If the cone didn't move, there would be no sound from the speaker. That's why a speaker is one of the many places you'll find a magnet!

Questions

_____ 1. The main purpose the writer has for this article is to:

A. inform the reader about many different kinds of magnets
B. inform the reader about different kinds of speakers
C. inform the reader about why speakers have magnets in them
D. entertain the reader

_____ 2. Which sentence in paragraph 1 is a hyperbole?

A. Magnets are everywhere!
B. Magnets have many uses.
C. Magnets can hold paper to a refrigerator.
D. Magnets can hold a purse or a laptop computer shut.

3. Name three parts of a speaker.

____

____

____

4. What kind of current runs through the voice coil?

____

____

____

Name ________________ WS #9 continued

edHelper.com

_____ 5. Sound reaches the voice coil as ______.

A. electricity
B. Morse code
C. garbled speech
D. noise

_____ 6. The cone vibrates and creates ______ in the air in front of it.

A. resistance
B. electricity
C. light
D. waves

_____ 7. There are magnets in the speakers in a television.

A. false
B. true

_____ 8. All magnets are the same size.

A. true
B. false

Write about a use for magnets that was not mentioned in the story.

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WS #10

Name ______________________

A New Use for Magnets?

By Cindy Grigg

Magnets can push and pull on things made of metal. Magnetism is a force. People use this force in many ways. Most of us have used magnets to hold papers on our refrigerator. Many kitchens also have a magnet on an electric can opener that grabs the lid when it is cut from the can. We can use a magnet to find a lost needle in our carpet. Magnets are used to make electric motors and generators. Without magnets, we would not have doorbells or electric motors. We wouldn't have telephones, electric lights, or computers, either.

When paper is recycled, magnets are often used to remove staples and other small bits of metal from paper. Large scrap metal recycling centers use large electromagnets to move junk cars and other large and heavy metal objects.

Here's one use of magnetism that may surprise you. Some trains use magnets to float above the train track. They are called maglev trains, and they can travel at speeds over 300 mph! "Maglev" is short for magnetic levitation. How do they work?

If you've ever played with magnets, you know that a north and a south pole will pull toward each other. Two north poles push away from each other. Opposites attract, and like charges repel each other. This is basically how maglev trains work. Magnets on the train and others on the train track push against each other. The train levitates or floats on a cushion of air. Friction is reduced, and the train can go much faster. Maglev trains are being used now in China and Japan, and the United States is interested in developing the technology. Will maglev trains change the way people travel in the 21st century?

A New Use for Magnets?

Questions WS #10 continued

_____ 1. What does "levitation" mean?

A. to float or rise into the air
B. to make jokes
C. gravity
D. none of the above

_____ 2. To go really fast, maglev trains use:

A. nuclear powered motors
B. non-magnetic objects
C. magnetic forces that are opposites
D. magnetic forces that are alike

_____ 3. Maglev trains work because what force is reduced?

A. friction
B. wind
C. magnetism
D. gravity

_____ 4. Which of these does NOT use magnets?

A. electric generators
B. doorbells
C. steam engines
D. telephones

5. In which countries are maglev trains being used now?

____

____

____

Answer Key #1
Heat Energy

4th Grade Science Home Packet

Riverside Elementary

#1

March 23-27, 2020

Answer Key

Science
Pages 318-319

Heat Energy WS #2

Name Answer Key

1. Insulator - a material that does not transfer heat easily.
2. Conductor - a material that does transfer heat or electricity easily
3. In winter, you might wear a fleece jacket to stay warm. Fleece is an insulator.
4. Fat is an insulator that many animals have in their bodies to keep warm.
5. Metal is a good conductor because heat travels through pots and pans easily.
6. Wood and plastic are good insulators because heat does not travel through them easily.
7. Warm coats and hats trap air against our bodies and keep us warm. Trapped air is a good insulator.
8. Heat is the flow of thermal energy.
9. Metal is a good conductor. Heat travels well through metals.
10. In order for conduction to occur, two objects must be touching.
11. When you hold a cup of hot chocolate, how does heat travel to your hands?
    (a.) conduction b. convection c. radiation
12. How does a sweatshirt keep you warm on a cold day? Sweatshirts are good _____ of heat.
    a. conductors (b.) insulators

Science
Heat - pages 314-317

Heat Energy WS #1

Name Answer Key

1. Thermal energy is the energy of the moving particles of matter.
2. Heat - the movement of thermal energy from a warmer object to a cooler object.
3. The Sun is Earth's main source of heat.
4. Inside Earth, it is very hot and this source of heat called geothermal energy.
5. When you rub your hands together you produce friction. Friction is another way to produce heat.
6. Temperature is related to the thermal energy of the particles in a substance. Heating can change an object's temperature.
7. We measure temperature with a thermometer.
8. Water freezes at 32° F or 0° C. Water boils at 212° F or 100° C.
9. Heat travels in three basic ways - conduction, convection, radiation
10. conduction - the transfer of heat between two objects that are touching.
11. convection - the transfer of heat by flowing gases or liquids. Ex. rising warm air from a heater, water boiling
12. radiation - the transfer of heat by wave energy Ex. light waves, Sun's energy waves, heat waves
13. insulators - a material that does not transfer heat easily Ex. oven mitt, gloves, wool, knitted hat, plastic, fleece, white foam cup
14. conductor - a material that does transfer heat easily. Ex. cooking pot, metal spoon, aluminum pan, asphalt

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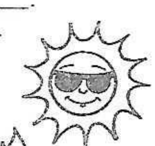
NAME Answer Key Heat Energy WS #3 ____ Using an Index

Finding Out About Heat

Use this index to write the correct page numbers on the blanks below.

Index

Celsius, Anders, 53	Natural gas, 25–26
Coal, how it is formed, 20–21	Petroleum, where it is found, 22;
Fahrenheit, Gabriel, 52–53	petroleum products, 24–26
Fire, 12–19	Sun, facts about, 8–11;
Fuels, 20–26	protection from, 43–44
Heat, sources of, 8–20;	Thermometers, kinds of, 52–53;
how it travels, 38–40;	uses of, 54–55
experiments, 60–61	Wood, 35–38



1. Heat experiments are discussed on pages 60-61.
2. Information on natural gas is on pages 25-26.
3. Pages 38-40 tell how heat travels.
4. Hints about protecting yourself from sunburn are on pages 43-44.
5. Information about Gabriel Fahrenheit is on pages 52-53.
6. The last page on which you will find something about fire is page 19.
7. Facts about kinds of thermometers are on pages 52-53.
8. To find out the sun's temperature, look at pages 8-11.
9. You will find out about Anders Celsius on page 53.
10. Facts about wood are found on pages 35-38.

Try This! Design a cover for a book in which this index might be found.

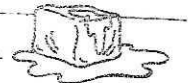
Packet #1

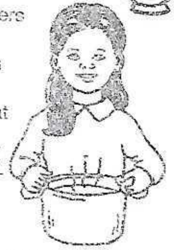
Heat Energy WS #4

Name Answer Key

Comprehension

Heat Travels





1. Heat travels from a warmer object to a cooler one. If you touch an ice cube, the heat moves from your finger to the ice. If you leave your finger on the ice, the ice cube will begin to melt. Suppose you touch a hot cup of tea. The heat from the cup will go to your fingers. OUCH! The heat from a hot pan will go to your hands and burn them if you don't use potholders to pick it up.

The movement of heat through solid materials is called **conduction**. Some materials are better conductors than others. That means they allow heat to pass through more quickly and easily. Aluminum and copper are good conductors. Wood and plastic are poor conductors.

Write the answers.

1. Does heat travel from a cold object to a hot one or from a hot object to a cold one? Heat travels from a warm or hot object to a cold one.
2. What happens to an ice cube when you touch it with your finger? The heat moves from your finger to the ice causing it to melt.
3. Why should you use potholders to pick up a hot pan? The heat from a hot pan will burn your hands.
4. What is the movement of heat through solid materials called? This is called conduction.
5. Name two good conductors. Aluminum and Copper
6. Name two poor conductors. Wood and Plastic.

Heat Energy WS #6

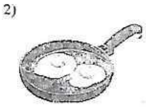
Name Answer Key

Target: Classify heat transfer as conduction, convection or radiation. (knowledge)

Energy Worksheet 2: Conduction, Convection and Radiation

In each of the following examples, identify whether heat is being transferred through conduction, convection or radiation. Some may have two possible answers. Choose the answer that best fits the situation.

1) 
Warming hand over a radiator.
convection

2) 
Eggs cooking in a frying pan.
conduction

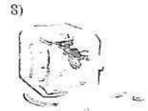
3) 
Snowman melting in the sun.
radiation

4) 
Water boiling in in a kettle.
convection

5) 
Warmth from the fireplace circulating through the house.
radiation or convection

6) 
Tongue freezing to to a metal pole.
conduction

7) 
Newt boiling in a hot caldron.
convection

8) 
Ice melting on a hotplate.
conduction

Where is the heat coming from? Where is it going?

Heat Energy WS #5

Heat –Cause & Effect

Name Answer Key

Thermal energy is the energy of the moving particles of matter.
The faster the movement of particles, the greater the amount of thermal energy.
Heat is the movement of thermal energy from one object to another.
Heat always moves from warmer objects to cooler objects.

Identify Cause and Effect

Directions: Read the pairs of statements below. On the line next to each statement, write **C** if the statement is a cause and **E** if the statements is an effect.

C	1. Wood is burned in a fireplace.
E	Thermal energy is released.
E	2. Carbon dioxide is formed.
C	Carbon combines with oxygen.
E	3. Solar panels can collect solar energy.
C	Solar energy is given off by the sun.
C	4. Thermal energy is released when coal is burned.
E	People near the burning coal feel heat.
E	5. A pan of water on the stove heats up.
C	The burner on a stove is turned on.
E	6. Thermal energy is given off as waste heat.
C	A light bulb heats up when it is turned on.
E	7. The person's body temperature rises.
C	A person exercises for a half-hour.
C	8. Ice cream in a dish absorbs thermal energy.
E	The ice cream melts.

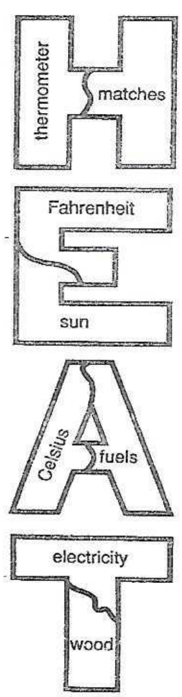
Heat Energy WS #7

Name Answer Key

Review of heat

Can You Take the Heat?

Use the words in the puzzle to answer the questions. Then color each space in the puzzle with the color given beside the question.



1. What star heats the earth? (yellow) sun
2. What are coal and oil called? (green) fuels
3. What device measures temperature? (red) thermometer
4. People long ago cut and burned this for heat and light. (orange) Wood
5. On this scale, the boiling point of water is 100 degrees. (green) Celsius
6. Children should never play with these. (red) matches
7. On this scale, the freezing point of water is 32 degrees. (yellow) Fahrenheit
8. This makes a toaster hot. (orange) electricity

Try This! Make a poster showing five ways to cool off on a hot day.

Packet #1

Heat Energy WS #8

Name Answer Key

Date ______ Period ____

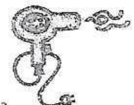
Heat Transfer Worksheet

Fill in the blanks using the correct form of heat transfer

1. The transfer of heat through material by *direct* contact is CONDUCTION.
2. CONVECTION is the transfer of heat in a fluid (gas or liquid) as a result of the movement of the fluid itself.
3. What kind of heat transfer does the sun use? (hint: it transfers heat via electromagnetic waves through space). RADIATION

Identify the method of heat transfer that takes place in each illustration. Some illustrations may show more than one form of heat transfer.

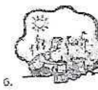
1. 
radiation

2. 
convection

3. 
steam – conduction hot iron touch clothes
convection – steam

4. 
radiation

5. 
Heater
convection

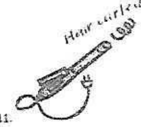
6. 
sun
radiation

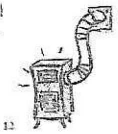
7. 
food on grill
conduction

8. 
oven convection
Gloves and pan
conduction

9. 
steam
convection

10. 
pan over fire
conduction

11. 
Hair curled
conduction

12. 
convection or radiation

Heat Energy WS #10

Name Answer Key

C 3. Greenhouses use geothermal energy to ____
A. warm the soil
B. warm the air inside the greenhouse
(C) both A and B
D. neither A nor B

~~C~~ D 4. Which country is NOT mentioned in the story as using geothermal energy?
A. Italy
B. Iceland
~~(C)~~ the United States
(D) Guatemala

A 5. Geothermal heat pumps are not practical for use in homes.
(A) false
B. true

D 6. Ten feet below the surface, ground temperature stays between ____
A. thirty to forty degrees
B. zero degrees and twenty below zero
C. ten to twenty degrees
(D) fifty and sixty degrees

A 7. What can the reader infer about geothermal heat pumps?
(A) Geothermal heat pumps also use some electricity to run the fan.
B. Geothermal heat pumps are too expensive for many people to afford them.
C. Geothermal heat pumps cannot be used in places where it gets very cold in winter
D. all of the above

B 8. What was the author's main purpose for writing this story?
A. to entertain readers with funny stories about energy
(B) to inform readers with facts
C. to persuade readers that everyone should use geothermal energy

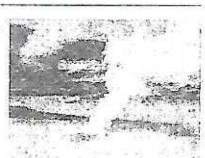
Research different ways to heat homes in your area. Write a short paragraph about each type of energy source. Draw conclusions about which one is best and which is the worst, and give reasons for your choices.

Heat Energy WS

Name Answer Key

How Does Geothermal Energy Work?

By Cindy Grigg



Geothermal energy comes from the heat inside the Earth. People can use geothermal energy to heat and cool their homes and to make electricity. The Earth's heat is a clean energy source. It does not cause any pollution. It is also renewable energy. We can't use it up. But how does geothermal energy work?

Much of the Earth's heat comes from its core. It is still hot from when the Earth formed over four billion years ago. Heat from the core spreads outward through the earth's mantle, or middle layer. Inside the mantle, rocks are mostly in liquid form, called magma, melted by the Earth's internal heat. Magma heats the water under the ground. In some places, the hot water shoots to the surface in hot springs and geysers. This hot water can power geothermal energy systems.

Iceland is one place where geothermal energy is used to heat buildings and to grow food. That country has about 25 active volcanoes. Hot springs and geysers are common there, too. Water from hot springs is piped into buildings. The buildings are heated by the water passing through pipes and radiators instead of furnaces that burn coal, oil, or gas.

Greenhouses use geothermal energy where it is too cold to grow food outdoors. Inside the greenhouses, there are pipes full of hot water. Hot water is pumped up from underground and used to heat the greenhouses. The hot water warms both the soil and the air inside the structure. Greenhouses like this are used to grow food in Iceland, Hungary, Italy, and New Mexico.

Many homes in the U.S. are heated with geothermal heat pumps. These use the stable temperatures found in the soil to even outside temperatures. Pipes are placed in the ground about ten feet below the surface near a building. At this depth, the soil temperature stays between 50 and 60 degrees, summer and winter. This means it stays warmer in the winter than the outside air. It stays cooler in the summer, too.

Heat pumps use this warmer or cooler temperature to heat homes in winter and cool them in summer. A liquid is pumped into the buried pipes. In winter, warmth from the ground warms the liquid in the pipes. An electric fan blows over the pipes to heat the rooms of the house. In the summer, the opposite happens. Hot air from inside the house is cooled under the ground. Then it is sent back into the house. The heat removed from the hotter, summer air can be used to heat water for bathing and washing dishes.

Geothermal heat pumps can keep buildings warm even when it is very cold outside. Many heat pumps are small enough to fit inside a home's basement.

Geothermal energy use is becoming more common in heating homes and buildings.

How Does Geothermal Energy Work?

Questions

1. Where does geothermal energy come from?
Geothermal energy comes from the heat inside the

D 2. What are some good reasons to use geothermal energy?
A. It is a clean energy source.
B. It does not cause pollution.
C. It is renewable energy. We can't use it up.
(D) all of the above

Answer Key #2
Heat Energy

4th Grade Science Home Packet

#2

Riverside Elementary

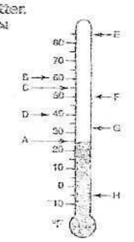
March 30 – April 3, 2020

Answer Key

Name Answer Key   Heat Energy WS #2   Lesson 6.6

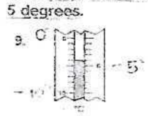
Temperature

Use the thermometer to find the temperature shown by each letter.

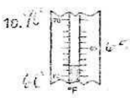


1. A 25°
2. B 60°
3. C 55°
4. D 40°
5. E 85°
6. F 50°
7. G 33°
8. H -5°

Write each temperature. Then estimate to the nearest 5 degrees.

9. 

-4° → est.= -5°

10. 

62° → est=60°

Use a thermometer to find the change in temperature.

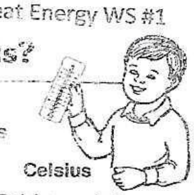
11. 20°F to 5°F — 20°-5°=15° (20 − 5 = 15)
12. 13°F to 72°F — 72°-13°=59° (72 − 13 = 59)
13. 8°C to 35°C — 35°-−8°=43° (35° − −8° = 43°)
14. 63°C to 42°C — 63°-42°=21° (63 − 42 = 21)

Choose the better estimate.

15. hot tea: 30°C or 95°C — 95°C
16. lake: 50°F or 100°F — 50°F
17. ice cream: 3°C or 40°C — 3°C

Name   Heat Energy WS #1

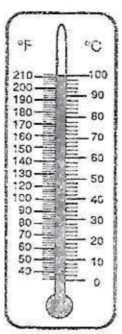
Fahrenheit or Celsius?



A thermometer measures temperature.
Read about two kinds of scales used on thermometers.

Fahrenheit

The Fahrenheit scale is named after Gabriel Fahrenheit, a German scientist. On this scale, the freezing point of water is 32 degrees (32°F). This means that water turns from liquid to solid at 32°F. The boiling point of water is 212°F. A person's normal body temperature is 98.6°F. Most people in the United States use the Fahrenheit scale.



Celsius

The Celsius scale is named after Anders Celsius, a Swedish scientist. It is part of the metric system. Using this scale, the freezing point of water is 0 degrees (0°C) and the boiling point of water is 100°C. A person's normal body temperature is 37°C. Most countries around the world use the Celsius scale.

Read each phrase below. Write the name of the scale it describes.

1. water freezes at 0° — C
2. part of the metric system — C
3. water boils at 212° — F
4. named after a German scientist — F
5. used in most countries — C
6. water freezes at 32° — F
7. named after a Swedish scientist — C
8. normal body temperature is 98.6° — F

Heat Energy WS #4

C
B
B
A
D

Answer Key

Heat transfer worksheet — Heat Energy WS #5

Packet #2

Conduction, convection, or radiation?

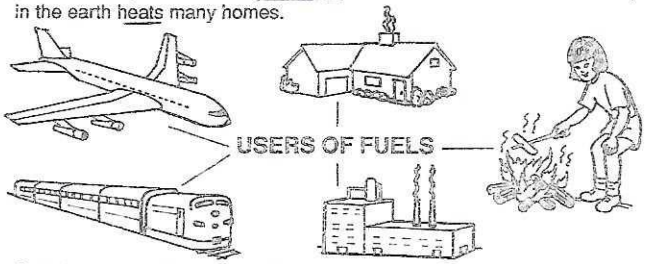
1. radiation The heat you feel from a fireplace
2. conduction This type of heat transfer causes plates to move (your hands touching a plate.)
3. convection boiling water
4. radiation Heat you feel from a hot stove
5. conduction Frying a pancake
6. conduction fast particles colliding with slower particles
7. convection air travels this way
8. conduction transfer through solids
9. radiation transfer through space
10. radiation moves as a wave
11. convection moves as a current (electricity)
12. radiation sun rays reaching earth
13. convection occurs with fluids – (liquids)
14. conduction a coil on an electric stove
15. radiation this type of transfer is affected by color

Name Answer Key — Heat Energy WS #6 — Context clues

Fuels

Anything that is burned to produce heat is a fuel. People use fuels to heat homes, cook foods, and make hot water. Fuel also provides power for cars, trains, airplanes, and other kinds of transportation.

Long ago, people burned wood as fuel to make fire for heat and light. Later, people used oils from animal fat and plants to burn in lamps. The discovery of coal helped factories produce great amounts of power to make products. Today, petroleum, an oily liquid, is used to power most kinds of transportation. The natural gas that comes from wells drilled deep in the earth heats many homes.



Complete the sentences by filling in the missing letters.

1. Fuel is anything that is burned to produce heat.
2. Wood and oil are fuels.
3. Long ago, people used wood to make fire.
4. People use fuels to heat homes and cook foods.
5. Coal is used in many factories.
6. Petroleum is used to power cars, trains, and airplanes.
7. Many homes are heated by natural gas.