Adopt-An-Element

Requirements:

1) Complete an Adopt An Element information sheet. (60% of grade)

You may use a variety of reference sources. Possible ideas are encyclopedias (book or CD Rom), science encyclopedias, science catalogs, magazines, and/or Internet sites*. Information sheets must be neat, written in black ink, and contain all the information requested. You also need to provide a list of your sources on the back of your information sheet. A minimum of three sources are required.

2) Create an advertisement for your element. (40% of grade)

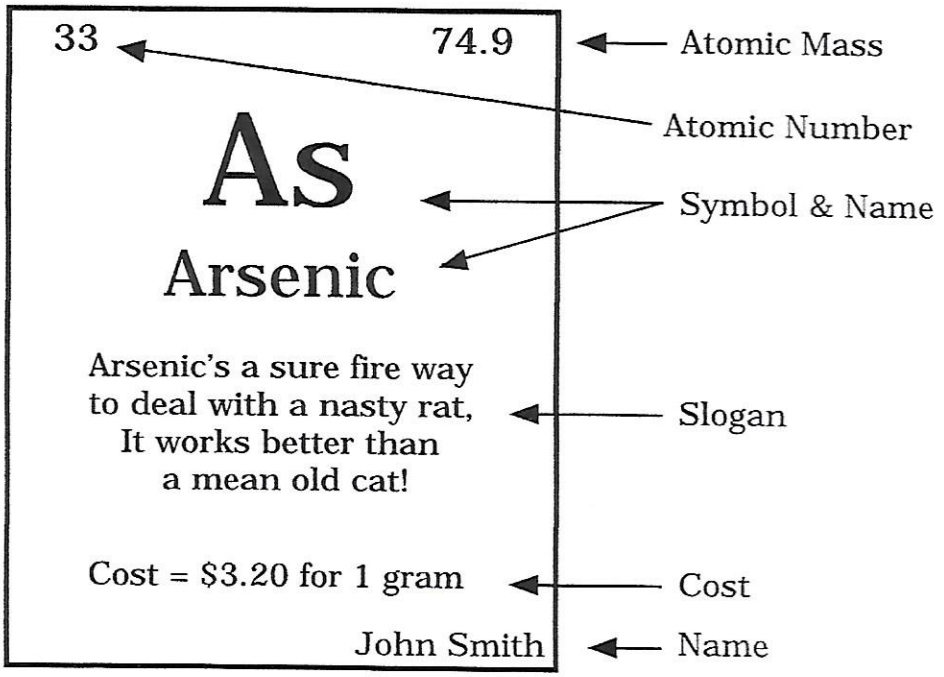
The advertisement must include the element's name, symbol, atomic number, atomic mass, cost, and an advertising slogan that describes one or more of its important uses. Advertisements must be neat, colorful, and contain all the information listed above. You may add pictures that relate to your advertisement theme.

Example:

Be sure to include:
- √ Element's symbol
- √ Element's name
- √ Atomic number
- √ Atomic mass
- √ Ad slogan
- √ Cost
- √ Your name

You may add pictures or drawings that illustrate the various uses for your element.

Your ad must follow the same format as this example!



A list of periodic table sites is available on

The Science Spot

http://sciencespot.net/

Go to **Kid Zone**, then choose **Chemistry Links**

Adopt An Element

Name _____

Fact Sheet

Element _____

Symbol	Atomic Number	Atomic Mass
_____	_____	_____
# of Protons	# of Neutrons	# of Electrons
_____	_____	_____
Melting Point	Boiling Point	Normal Phase
_____ °C	_____ °C	_____

Cost = _____ for _____

Classification: ○ Nonmetal ○ Metal ○ Metalloid

My element belongs to the _____ family.

Origin of Name _____

Discovered by _____ in _____

Interesting Info: May include important uses, interesting facts, common compounds, etc.

1.

2.

3.

4.

5.

6.

Adopt An Element

Grade Sheet

Name _____

Advertisement = 24 points (40%)

- **Provided basic information* ..... + 12** _____
  - ○ Atomic # ○ Symbol ○ Cost
  - ○ Atomic mass ○ Name ○ Student's Name
- **Slogan and pictures relevant ..... + 10** _____
- **Followed directions ..... + 2** _____
  Neat, correct spelling/format, original

Information Sheet = 36 points (60%)

- **Provided basic information ..... + 10** _____
  - ○ Name ○ Symbol ○ Atomic # ○ Atomic Mass
  - ○ Protons ○ Neutrons ○ Electrons ○ Melting Point
  - ○ Boiling Point ○ Normal Phase
- **Other information ..... + 11** _____
  - ○ Cost
  - ○ Nonmetal/Metal/Metalloid
  - ○ Family
  - ○ Origin of Name
  - ○ ○ Discovery & Date
  - ○ ○ ○ ○ ○ ○ Interesting Information/Uses
- **References ..... + 9** _____
  Minimum of 3; provided required information; correct format
- **Miscellaneous ..... + 6** _____
  Black ink, complete sentences, correct spelling, neat

Total Points = _____ out of 60 = _____%

A B C D F

Adopt An Element

Grade Sheet

Name _____

Advertisement = 24 points (40%)

- **Provided basic information* ..... + 12** _____
  - ○ Atomic # ○ Symbol ○ Cost
  - ○ Atomic mass ○ Name ○ Student's Name
- **Slogan and pictures relevant ..... + 10** _____
- **Followed directions ..... + 2** _____
  Neat, correct spelling/format, original

Information Sheet = 36 points (60%)

- **Provided basic information ..... + 10** _____
  - ○ Name ○ Symbol ○ Atomic # ○ Atomic Mass
  - ○ Protons ○ Neutrons ○ Electrons ○ Melting Point
  - ○ Boiling Point ○ Normal Phase
- **Other information ..... + 11** _____
  - ○ Cost
  - ○ Nonmetal/Metal/Metalloid
  - ○ Family
  - ○ Origin of Name
  - ○ ○ Discovery & Date
  - ○ ○ ○ ○ ○ ○ Interesting Information/Uses
- **References ..... + 9** _____
  Minimum of 3; provided required information; correct format
- **Miscellaneous ..... + 6** _____
  Black ink, complete sentences, correct spelling, neat

Total Points = _____ out of 60 = _____%

A B C D F

chapter 5

Motion, Forces, and Simple Machines

section 3 Work and Simple Machines

What You'll Learn

- how to define work
- different types of simple machines
- how machines make work easier

Before You Read

Did you do work today? Write your own definition of work on the lines below.

_____

_____

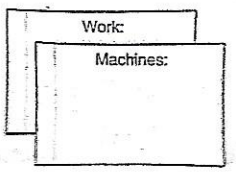
_____

Study Coach

Create a Quiz As you read the text under each heading, write questions to help you remember the important information. When you finish reading, answer the questions to quiz yourself on what you learned.

FOLDABLES

Compare and Contrast Make the following note card Foldables out of two half-sheets of paper. Write down information to help you understand how work and machines are related.



Read to Learn

Work

You may think of work as doing chores or even doing your homework. However, in science there is a certain definition for work. In science, **work** is done when a force causes an object to move in the same direction as the force that is applied. Some of what you may think of as work does not include applying a force.

Why doesn't effort always equal work?

If you push against a wall, do you do work? Two things must happen for work to be done. First, a force must be applied to an object. Second, the object must move in the same direction as the force that is applied. If the wall does not move, no work is done.

You do work when you pick a box up from the floor. What happens if you walk forward with the box? Your arms still apply an upward force to the box. But the box does not move up. It moves forward. The motion of the box is not the same as the direction of the force applied by your arms. No work is being done by your arms.

Calculating Work

The amount of work done depends on the amount of force applied and the distance. Does it take more work to lift a shoe or a stack of books 1 m in the air? The distance is the same, but it takes more force to move the stack of books. So more work is done lifting the books. You can calculate work with the following equation.

$$\textbf{work (in J)} = \textbf{force (in N)} \times \textbf{distance (in m)}$$
$$w = Fd$$

Work is measured in joules (J). One joule is about the amount of work it takes to lift a baseball from the ground to your waist.

What is a machine?

How many machines have you used today? A machine is a device that makes work easier. A hand can opener is a machine. It changes a small force applied by your hand into a larger force that makes it easier to open a can.

A **simple machine** is a machine that uses only one movement. A screwdriver is a simple machine. The pulley, lever, wheel and axle, inclined plane, wedge, and screw are all simple machines. A **compound machine** is a combination of simple machines. The hand can opener is a compound machine. Machines make work easier in two ways. They can change the size of the force you apply. They also can change the direction of the force.

What is mechanical advantage?

Some machines can increase the force you apply. The **mechanical advantage** (MA) of a machine is the number of times the applied force is increased by the machine. The force you apply to a machine is the input force (F_i). On a can opener, the input force is the force you apply when turning the handles. The can opener changes your input force to the force pushing the blade into the metal can. The force applied by a machine is the output force (F_o). The mechanical advantage of a machine is the ratio of the output force to the input force. ☑

$$\textbf{mechanical advantage} = \frac{\text{force out (in N)}}{\text{force in (in N)}}$$
$$\text{MA} = \frac{F_o}{F_i}$$

Think it Over

1. **Compare and Contrast** What is the difference between a simple machine and a compound machine?

_____

_____

_____

Reading Check

2. **Explain** Is mechanical advantage the number of times the applied force by a machine is increased or decreased?

_____

What is an ideal machine?

In a simple machine, the input force and the output force do work. An ideal machine is one in which there is no friction. The work done by the input force is equal to the work done by the output force in an ideal machine.

How do machines increase force?

Simple machines can change a small input force into a large output force. How is this possible? Work equals force times distance—$W = Fd$. Look at the equation. If a machine increases force, but work stays the same, then the distance over which the force was applied must change.

So how does a machine change distance? Think of a can opener. When you apply force to the handles, they might move 1 cm. But when the blade punches through the metal, it might move only 1 or 2 mm. The distance decreased, so the force increased. The amount of work done stays the same.

In real machines, friction always happens when parts move. Friction changes some input work to heat. So for a real machine, work out (W_{out}) is always less than work in (W_{in}).

Reading Check

3. **Recognize Cause and Effect** When a machine increases force, what must change?

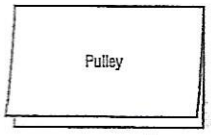
_____

_____

FOLDABLES

Organize Information

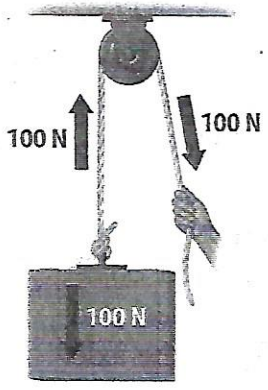
Make six half-book Foldables like the one below to help you organize information about simple machines. Label the Foldables *Pulley, Lever, Wheel and Axle, Inclined Plane, Wedge,* and *Screw.*

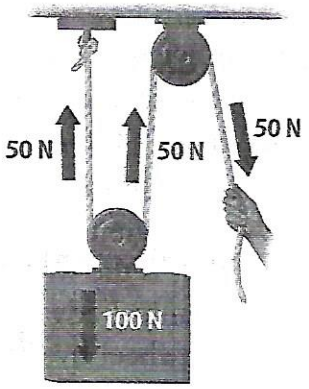


The Pulley

When you raise a window blind, you use a pulley. A **pulley** is an object, like a wheel, that has a groove with a rope or cable running through it. It changes the direction of the input force. Look at the first figure below. The pulley does not change the size of the input force. So, its mechanical advantage is 1.

With more than one pulley, mechanical advantage increases. The pulley system in the second figure has a mechanical advantage of 2. Each supporting rope holds half of the weight. So the input force needed to lift the block is half as large as with one pulley.





Picture This

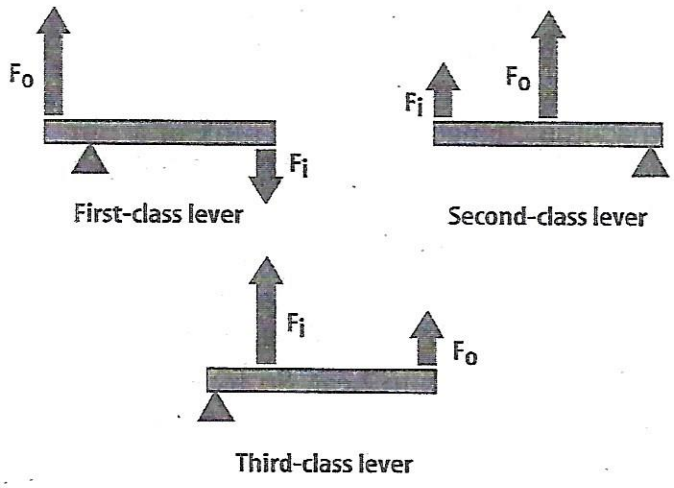
4. **Explain** Why is the force needed to lift the box only 50 N when two pulleys are used?

_____

_____

The Lever

The lever might be the first simple machine invented by humans. A lever is a rod or plank that pivots about a fixed point. The pivot point is called the fulcrum. Levers increase force, or increase the distance over which a force is applied. There are three types, or classes, of levers. The three classes are shown in the figure below.



First Class In a first-class lever, the fulcrum is between the input force and the output force. A first class lever is usually used to increase force. Using a screwdriver to pry open the lid of a paint can is an example of a first class lever.

Second Class In a second-class lever, the output force is between the input force and the fulcrum. The output force is always greater than the input force. A wheelbarrow is an example of a second-class lever.

Third Class In third-class levers, the input force is between the output force and the fulcrum. Third-class levers increase the distance over which input force is applied. A hockey stick is a third-class lever.

What is a wheel and axle?

Try turning a doorknob by holding the narrow base of the knob. It is much easier to turn the larger knob. A doorknob is a wheel and axle. A wheel and axle is made of two round objects that are attached and rotate together around the same axis, or point. The larger object is the wheel. The smaller object is the axle. To find the mechanical advantage of a wheel and axle, divide the radius of the wheel by the radius of the axle.

Picture This

5. **Identify** In what type of lever is the fulcrum between the input and output forces?

Think it Over

6. **Apply** What is another example of a wheel and axle?

_____

The Inclined Plane

A ramp, or **inclined plane**, is a sloped surface. Inclined planes decrease the input force needed by increasing the distance. Imagine lifting a couch into a truck. It is easier if you use a ramp. It takes less force to push a couch up a ramp than to lift it. Either way, the work needed to move the couch is the same. ☑

The mechanical advantage of an inclined plane is the length of the inclined plane divided by the height of the inclined plane. The longer the ramp, the less force it takes to move the object.

Reading Check

7. **Summarize** How do inclined planes decrease the input force needed?

_____

_____

How are wedges and screws related to inclined planes?

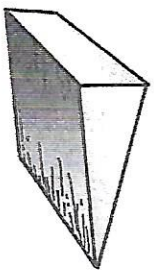
A wedge is a moving inclined plane with one or two sloping sides. A basic wedge is shown in the first figure below. Your front teeth are wedges. A wedge changes the direction of an input force. When you bite an apple, the downward input force is changed by your teeth to a sideways force that splits the apple. Axes and knives are also wedges.

A screw is an inclined plane wrapped around a post, as shown in the second figure below. The inclined plane forms the screw threads. A screw changes the direction of the force you apply. It also increases the distance over which the force is applied. The turning input force is changed to a pulling output force that pulls the screw into the material. Friction between the threads and material holds the screw in place.

Picture This

8. **Highlight** In the figure showing a screw, use a highlighter to trace the inclined plane wrapped around the post.

Wedge

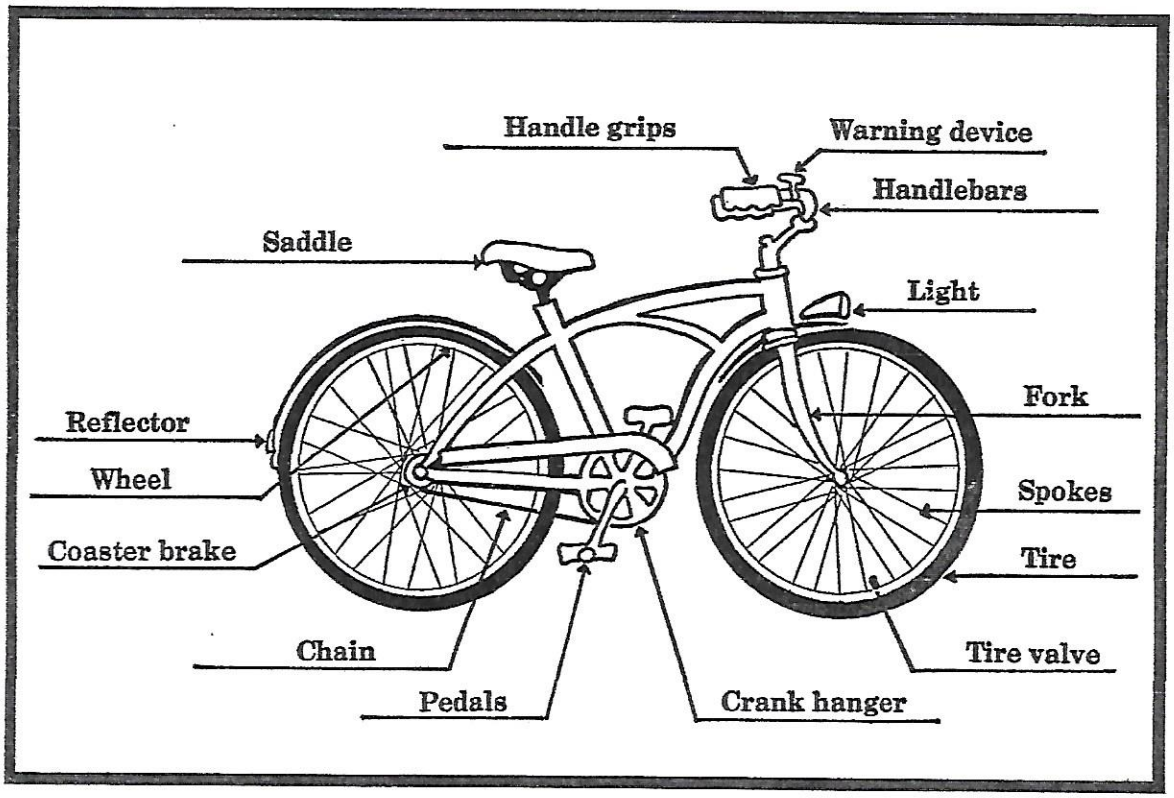


Screw

Exploring Bicycles à la Bloom

● KNOWLEDGE

Study the bicycle diagram below. Find at least one representation in the diagram of each of the six simple machines listed below. List the examples on the lines below each simple machine.



Six Simple Machines

1. **Wheel and Axle**

   _____

   _____

2. **Screw**

   _____

   _____

3. **Lever**

   _____

   _____

4. **Pulley**

   _____

   _____

5. **Wedge**

   _____

   _____

6. **Inclined Plane**

   _____

   _____

Name _____

After You Read

Mini Glossary

compound machine: a combination of simple machines

inclined plane: a sloped surface, sometimes called a ramp

lever: a rod or plank that pivots about a fixed point. The pivot point is called the fulcrum

mechanical advantage: (of a machine) the number of times the applied force is increased

pulley: an object, like a wheel, that has a groove with a rope or cable running through it

simple machine: a machine that uses only one movement

work: is done when a force causes an object to move in the same direction as the force that is applied

1. Review the terms and their definitions in the Mini Glossary. Give an example of a simple machine and how you would use it.

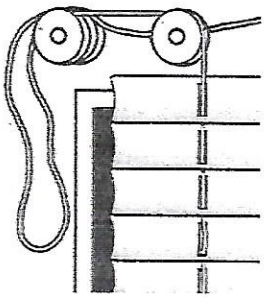
_____

_____

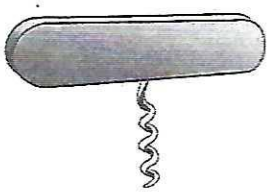
2. Match the examples with the correct simple machine. Write each simple machine on the line by the example it matches. Use each simple machine only once.

pulley wheel and axle lever inclined plane wedge screw

1. _____

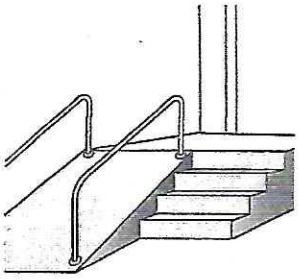


2. _____



3. _____

4. _____



5. _____

6. _____

3. How would touching or using some of the simple machines that you read about in this lesson help you learn more about them?

_____

_____

End of Section

ScienceOnline Visit **red.msscience.com** to access your textbook, interactive games, and projects to help you learn more about work and simple machines.