NAME: _____

Student Worksheet

Activity One

Force, Mass, and Acceleration

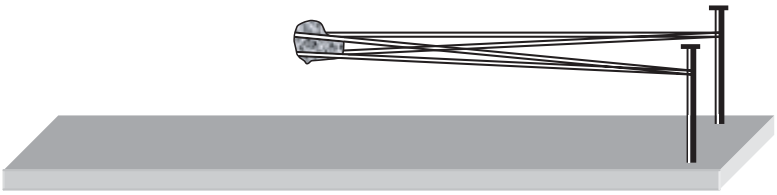
This activity may be done alone or with a partner.

FOR THIS ACTIVITY, you will need:

- Rocks of different sizes. (Use rocks that are all the same kind of rock. Choose rocks from the size of a small marble to the size of your fist.)
- A large, thick rubber band
- A board about two feet long and at least six inches wide
- Two large nails
- A tape measure
- A scale or balance

Steps

1. Measure the masses of the rocks with the scale.
2. Pound the nails into one end of the board a little farther apart than the width of the largest rock.
3. Loop the rubber band around the nails.
4. Try launching one of the rocks with the rubber band. *Be safe!* ***Be sure no one could get hit by the rock you launch. Do not try to shoot the rock more than a few feet!*** Your rock launcher should look like this:



5. The farther you pull back the rubber band, the more force will act on the rock. Measure the distances you pull back the rubber band. This is will give you a rough measure of force.
6. The farther the rock flies, the more it was accelerated by the force of the rubber band. This gives you a rough measure of acceleration.
7. Try different amounts of force on the same rock.
8. Try the same amount of force on different rocks.
9. Write down your results in a table like this:

Distance Rubber Band Was Pulled (Force)	Distance Rock Traveled (Acceleration)	Mass of Rock

What do your results show? How does mass affect acceleration? How does force affect acceleration?

Answers: The greater the mass, the less the acceleration. The greater the force, the greater the acceleration.

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Student Worksheet

Activity Two

Newton's Laws of Motion

Your task is to write a **short essay** on Newton's three laws of motion.

Read about Isaac Newton and his three laws of motion. Search the Internet or ask your teacher to suggest some books to read. Collect as many important facts as you can about Isaac Newton and his laws of motion.

Here are some questions for you to think about as you collect your information:

- **Where and when did Isaac Newton live?**
- **Which things in science did Newton study?**
- **What is the story of Newton and the apple?**
- **Is it true that Newton invented the fig newton?**
- **What are Newton's three laws of motion? (Give an example of each law from everyday life.)**
- **How are many people's ideas about motion *not* correct according to the first law of motion?**

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Student Worksheet

Activity Three

Gravity and the Planets, Moons, and Stars

Write a **short essay** about the force of gravity among the stars, planets, and moons.

Ask your teacher or look on the Internet for places to read about **how gravity affects large objects in space**, like the sun, stars, planets, moons, galaxies, and black holes. Collect as many important facts about this topic as you can.

Here are some questions for you to think about as you do your research:

- **What does gravity have to do with the way moons travel around planets and the way planets travel around the sun?**
- **Is gravity different on the moon?**
- **How much would you weigh on the moon?**
- **How does gravity cause stars to be "born?"**
- **How does gravity cause stars to make light?**
- **What can happen when a star's mass keeps growing and growing?**
- **What are black holes, and what does gravity have to do with them?**

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Student Worksheet

Activity Four

Falling Objects and Acceleration

Write a short essay about **Galileo Galilei** and his study of falling objects.

"Galileo Galilei" and "The Leaning Tower of Pisa"

Search the Internet or ask your teacher for books about Galileo Galilei's study of falling objects. (He is usually called just "Galileo".) Collect as many important facts about this topic as you can.

Consider these questions as you collect your information:

- **Where and when did Galileo live?**
- **What did he discover about falling objects? Did it agree with what people thought at the time?**
- **Is it true that he dropped balls from the Leaning Tower of Pisa? Describe his experiment on falling objects.**

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Student Worksheet

Activity Five

Make an Electromagnet

In this activity you will make an **electromagnet.**
An electromagnet uses an electric current to turn an iron rod into a magnet.

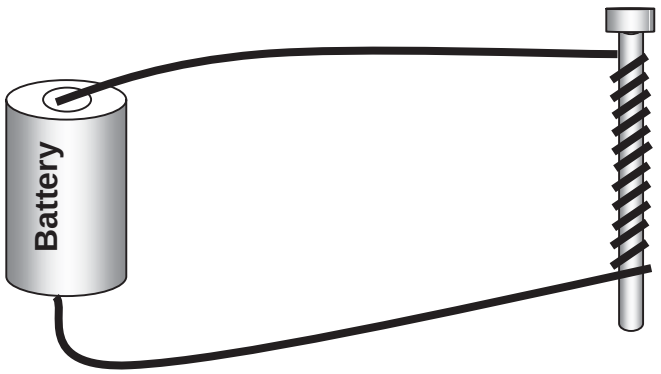
Work with a partner.

FOR THIS ACTIVITY, you will need:

- **A large iron nail or bolt**
- **A battery**
- **About two feet of electrical wire (the wire should be the kind that stays bent when you bend it)**
- **Some small things made of iron, like small nails or paper clips**
- **A bar magnet**

STEPS

1. Wrap the middle part of the wire around the nail at least ten times.
2. Leave about 6 inches of wire at each end that is not wrapped around the nail.
3. Touch or connect the ends of the wire to the battery as shown below.
4. While holding the wires to the battery, have your partner see if the things made of iron will stick to the ends of the nail.
5. Bring one end of the bar magnet close to one end of the nail. Is it attracted or repelled?
6. Reverse the wires on the battery.
7. Bring the same end of the bar magnet close to the same end of the nail. Is it attracted or repelled?



Answers: Answers to #5 and #7 will be reversed. Answers will vary.

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Student Worksheet

Activity Six

Electrostatic Force

FOR THIS ACTIVITY, you will need:

- **a plastic comb**
- **a balloon**
- **tissue paper**
- **wool cloth**
- **plastic tape**
- **a cat would also be good to have, but not necessary.**

STEPS

1. Tear the tissue into several small pieces about this size.
2. Comb your hair with the comb several times, and bring it near the bits of tissue paper.
3. **Gently** comb a cat, and bring the comb near the bits of paper.
4. Rub the comb on wool cloth, and bring it near the bits of paper.
5. Blow up the balloon and tie it shut.
6. Rub the balloon on the wool, and see if it will stick to the wall.
7. Repeat with the cat, **gently**.

All the attractions you saw were caused by electrostatic attraction. The comb and balloon picked up a charge. When you brought them near the bits of paper or the wall, they caused another charge to form in the paper and the wall. **Were the charges on the two things the same or different?** Explain how you know.

8. Cut off two pieces of tape about 8 or 10 inches long.
9. Stick both pieces to a table top.
10. Pull both pieces of tape off at the same time. This puts a charge on each piece of tape.
11. Hold the two pieces at least a foot apart and hanging down. Slowly bring them together.

Were the charges on the pieces of tape the same or different? Explain how you know.

Answers: 7. Different, because unlike charges attract. 11. The same, because like charges repel.