Real World Science: Forces

AIMS Multimedia is a leading producer and distributor of educational programs serving schools and libraries for nearly 40 years. AIMS draws upon the most up-to-date knowledge, existing and emerging technologies, and all of the instructional and pedagogical resources available to develop and distribute educational programs in film, videocassette, laserdisc, CD-ROM and CD-i formats.

Persons or schools interested in obtaining additional copies of this AIMS Teaching Module, please contact:

AIMS Multimedia

1-800-FOR-AIMS
1-800-367-2467

Congratulations!

You have chosen a learning program that will actively motivate your students AND provide you with easily accessible and easily manageable instructional guidelines designed to make your teaching role efficient and rewarding.

The AIMS Teaching Module provides you with a video program keyed to your classroom curriculum, instructions and guidelines for use, plus a comprehensive teaching program containing a wide range of activities and ideas for interaction between all content areas. Our authors, educators, and consultants have written and reviewed the AIMS Teaching Modules to align with the Educate America Act: Goals 2000.

This ATM, with its clear definition of manageability, both in the classroom and beyond, allows you to tailor specific activities to meet all of your classroom needs.

RATIONALE

In today's classrooms, educational pedagogy is often founded on Benjamin S. Bloom's "Six Levels of Cognitive Complexity." The practical application of Bloom's Taxonomy is to evaluate students' thinking skills on these levels, from the simple to the complex: Knowledge (rote memory skills), Comprehension (the ability to relate or retell), Application (the ability to apply knowledge outside its origin), Analysis (relating and differentiating parts of a whole), Synthesis (relating parts to a whole), and Evaluation (making a judgment or formulating an opinion).

The AIMS Teaching Module is designed to facilitate these intellectual capabilities, AND to integrate classroom experiences and assimilation of learning with the students' life experiences, realities, and expectations. AIMS' learner verification studies prove that our AIMS Teaching Modules help students to absorb, retain, and to demonstrate ability to use new knowledge in their world. Our educational materials are written and designed for today's classroom, which incorporates a wide range of intellectual, cultural, physical, and emotional diversities.

ORGANIZATION AND MANAGEMENT

To facilitate ease in classroom manageability, the AIMS Teaching Module is organized in four sections. You are reading Section 1, Introduction to the Aims Teaching Module (ATM).

SECTION 2,

INTRODUCING THIS ATM
will give you the specific information you need to integrate the program into your classroom curriculum.

SECTION 3,

PREPARATION FOR VIEWING
provides suggestions and strategies for motivation, language preparedness, readiness, and focus prior to viewing the program with your students.

SECTION 4,

AFTER VIEWING THE PROGRAM
provides suggestions for additional activities plus an assortment of consumable assessment and extended activities, designed to broaden comprehension of the topic and to make connections to other curriculum content areas.

FEATURES

INTRODUCING EACH ATM

SECTION 2

Your AIMS Teaching Module is designed to accompany a video program written and produced by some of the world's most credible and creative writers and producers of educational programming. To facilitate diversity and flexibility in your classroom, your AIMS Teaching Module features these components:

Themes

The Major Theme tells how this AIMS Teaching Module is keyed into the curriculum. Related Themes offer suggestions for interaction with other curriculum content areas, enabling teachers to use the teaching module to incorporate the topic into a variety of learning areas.

Overview

The Overview provides a synopsis of content covered in the video program. Its purpose is to give you a summary of the subject matter and to enhance your introductory preparation.

Objectives

The ATM learning objectives provide guidelines for teachers to assess what learners can be expected to gain from each program. After completion of the AIMS Teaching Module, your students will be able to demonstrate dynamic and applied comprehension of the topic.

PREPARATION FOR VIEWING

SECTION 3

In preparation for viewing the video program, the AIMS Teaching Module offers activity and/or discussion ideas that you may use in any order or combination.

Introduction To The Program

Introduction to the Program is designed to enable students to recall or relate prior knowledge about the topic and to prepare them for what they are about to learn.

Introduction To Vocabulary

Introduction to Vocabulary is a review of language used in the program: words, phrases, usage. This vocabulary introduction is designed to ensure that all learners, including limited English proficiency learners, will have full understanding of the language usage in the content of the program.

Discussion Ideas

Discussion Ideas are designed to help you assess students' prior knowledge about the topic and to give students a preview of what they will learn. Active discussion stimulates interest in a subject and can motivate even the most reluctant learner. Listening, as well as speaking, is active participation. Encourage your students to participate at the rate they feel comfortable. Model sharing personal experiences when applicable, and model listening to students' ideas and opinions.

Focus

Help learners set a purpose for watching the program with Focus, designed to give students a focal point for comprehension continuity.

Jump Right In

Jump Right In provides abbreviated instructions for quick management of the program.

AFTER VIEWING THE PROGRAM

SECTION 4

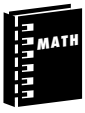
After your students have viewed the program, you may introduce any or all of these activities to interact with other curriculum content areas, provide reinforcement, assess comprehension skills, or provide hands-on and in-depth extended study of the topic.

SUGGESTED ACTIVITIES

The Suggested Activities offer ideas for activities you can direct in the classroom or have your students complete independently, in pairs, or in small work groups after they have viewed the program. To accommodate your range of classroom needs, the activities are organized into skills categories. Their labels will tell you how to identify each activity and help you correlate it into your classroom curriculum. To help you schedule your classroom lesson time, the AIMS hourglass gives you an estimate of the time each activity should require. Some of the activities fall into these categories:

Meeting Individual Needs

These activities are designed to aid in classroom continuity. Reluctant learners and learners acquiring English will benefit from these activities geared to enhance comprehension of language in order to fully grasp content meaning.



Curriculum Connections

Many of the suggested activities are intended to integrate the content of the ATM program into other content areas of the classroom curriculum. These cross-connections turn the classroom teaching experience into a whole learning experience.

Critical Thinking

Critical Thinking activities are designed to stimulate learners' own opinions and ideas. These activities require students to use the thinking process to discern fact from opinion, consider their own problems and formulate possible solutions, draw conclusions, discuss cause and effect, or combine what they already know with what they have learned to make inferences.

Cultural Diversity

Each AIMS Teaching Module has an activity called Cultural Awareness, Cultural Diversity, or Cultural Exchange that encourages students to share their backgrounds, cultures, heritage, or knowledge of other countries, customs, and language.

Hands On

These are experimental or tactile activities that relate directly to the material taught in the program.Your students will have opportunities to make discoveries and formulate ideas on their own, based on what they learn in this unit.

Writing

Every AIMS Teaching Module will contain an activity designed for students to use the writing process to express their ideas about what they have learned. The writing activity may also help them to make the connection between what they are learning in this unit and how it applies to other content areas.

In The Newsroom

Each AIMS Teaching Module contains a newsroom activity designed to help students make the relationship between what they learn in the classroom and how it applies in their world. The purpose of In The Newsroom is to actively involve each class member in a whole learning experience. Each student will have an opportunity to perform all of the tasks involved in production: writing, researching, producing, directing, and interviewing as they create their own classroom news program.

Extended Activities

These activities provide opportunities for students to work separately or together to conduct further research, explore answers to their own questions, or apply what they have learned to other media or content areas.

Link to the World

These activities offer ideas for connecting learners' classroom activities to their community and the rest of the world.

Culminating Activity

To wrap up the unit, AIMS Teaching Modules offer suggestions for ways to reinforce what students have learned and how they can use their new knowledge to enhance their world view.

VOCABULARY

Every ATM contains an activity that reinforces the meaning and usage of the vocabulary words introduced in the program content. Students will either read or find the definition of each vocabulary word, then use the word in a written sentence.

CHECKING COMPREHENSION

Checking Comprehension is designed to help you evaluate how well your students understand, retain, and recall the information presented in the AIMS Teaching Module. Depending on your students' needs, you may direct this activity to the whole group yourself, or you may want to have students work on the activity page independently, in pairs, or in small groups. Students can verify their written answers through discussion or by viewing the video a second time. If you choose, you can reproduce the answers from your Answer Key or write the answer choices in a Word Bank for students to use. Students can use this completed activity as a study guide to prepare for the test.

CONSUMABLE ACTIVITIES

The AIMS Teaching Module provides a selection of consumable activities, designed to specifically reinforce the content of this learning unit. Whenever applicable, they are arranged in order from low to high difficulty level, to allow a seamless facilitation of the learning process. You may choose to have students take these activities home or to work on them in the classroom independently, in pairs or in small groups.

CHECKING VOCABULARY

The Checking Vocabulary activity provides the opportunity for students to assess their knowledge of new vocabulary with this word game or puzzle. The format of this vocabulary activity allows students to use the related words and phrases in a different context.

TEST

The AIMS Teaching Module Test permits you to assess students' understanding of what they have learned. The test is formatted in one of several standard test formats to give your students a range of experiences in test-taking techniques. Be sure to read, or remind students to read, the directions carefully and to read each answer choice before making a selection. Use the Answer Key to check their answers.

ADDITIONAL AIMS MULTIMEDIA PROGRAMS

After you have completed this AIMS Teaching Module you may be interested in more of the programs that AIMS offers. This list includes several related AIMS programs.

ADDITIONAL READING SUGGESTIONS

AIMS offers a carefully researched list of other resources that you and your students may find rewarding.

ANSWER KEY

Reproduces tests and work pages with answers marked.

Real World Science: Forces

THEMES

Real World Science: Forces explores the characteristics of force in its many forms. Friction, gravity and electromagnetism are some of the forms discussed in the program. The basic principles of force are also explained, in particular Newton's three Laws of Motion. Examples of each law are given, using common occurrences from daily life.

OVERVIEW

Force is a push or pull on an object that causes a change in the object's motion. There are several kinds of force. The force that opposes movement between objects which are not perfectly smooth is called friction. It causes moving objects to slow down or stop. Gravity is a force that attracts objects to each other because of their mass. The strong force that keeps the small particles of an atom glued together is called nuclear force. All types of force follow three Laws of Motion, summed up by Sir Isaac Newton. The first law deals with inertia, the property of matter that causes an object to resist a change in motion. The second law is stated as an equation: force equals mass times acceleration. The third law says that for every action there is an equal and opposite reaction.

OBJECTIVES

- To learn more about the basic types of force present in the universe.
- To discuss Newton's three Laws of Motion.
- To examine various concepts related to force, including friction, mass and gravity.
- To explore force at work in the real world.

Use this page for your individual notes about planning and/or effective ways to manage this AIMS Teaching Module in your classroom.

Our AIMS Multimedia Educational Department welcomes your observations and comments. Please feel free to address your correspondence to:

AIMS Multimedia
Editorial Department
9710 DeSoto Avenue
Chatsworth, California 91311-4409

INTRODUCTION TO THE PROGRAM

Forces are at work all around us. They make it possible for us to sit in a chair without floating into space. In fact, force is involved in almost everything we do. Different types of force—gravity, friction, pressure, electromagnetism, even nuclear force—set the world in motion.

INTRODUCTION TO VOCABULARY

Before starting the program, write the following words on the board. Ask the class to discuss the meaning of each word, and review the terms that are unfamiliar to students.

mass - amount of matter it takes to make up an object

matter - anything that has mass and takes up space

force - a push or a pull on an object that causes a change in its motion

FOCUS

The world seems filled with an endless assortment of stops, starts and changes in motion. However, if we look more closely, we realize that force actually behaves in a few certain ways—over and over again. Scientists have recognized laws that can predict how objects are going to behave. These laws explain the principles of force.

DISCUSSION IDEAS

Explain to students that force can generally be divided into two types: pushes and pulls. What are some examples of exerting force with a push? What are some examples of exerting force with a pull?

JUMP RIGHT IN

HOW TO USE THE *REAL WORLD SCIENCE: FORCES* AIMS TEACHING MODULE

Preparation

- Read *Real World Science: Force* **Themes, Overview,** and **Objectives** to become familiar with program content and expectations.
- Use **Preparation for Viewing** suggestions to introduce the topic to students.

Viewing *REAL WORLD SCIENCE: FORCES*

- Set up viewing monitor so that all students have a clear view.
- Depending on your classroom size and learning range, you may choose to have students view *Real World Science: Force* together or in small groups.
- Some students may benefit from viewing the video more than one time.

After Viewing *REAL WORLD SCIENCE: FORCES*

- Select **Suggested Activities** that integrate into your classroom curriculum. If applicable, gather materials or resources.
- Choose the best way for students to work on each activity. Some activities work best for the whole group. Other activities are designed for students to work independently, in pairs, or in small groups. Whenever possible, encourage students to share their work with the rest of the group.
- Duplicate the appropriate number of **Vocabulary, Checking Comprehension**, and consumable activity pages for your students.
- You may choose to have students take consumable activities home, or complete them in the classroom, independently, or in groups.
- Administer the Test to assess students' comprehension of what they have learned, and to provide them with practice in test-taking procedures.
- Use the **Culminating Activity** as a forum for students to display, summarize, extend, or share what they have learned with each other, the rest of the school, or a local community organization.

SUGGESTED ACTIVITIES

Writing

30 Minutes

Ask students to investigate their homes to find examples of force. Encourage them to look for gravity, pressure and friction at work. Have them record the things they see on paper, describing in detail what they observe and what type of force is at work.

In class, ask for volunteers to share their findings. Try to get examples that are both complex and simple. Allow everyone an opportunity to discuss their written observations.

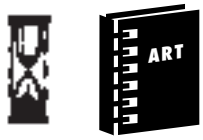
Meeting Individual Needs

20 Minutes

Ask students to make sentences using the following words. Encourage them to use a dictionary if they are unsure of the meanings. Make sure that their sentences display an understanding of the words as they relate to the program.

- reaction - change that occurs because a force is exerted
- repel - to push away
- attract - to pull on another object
- theory - an idea or principle offered to explain a scientific event
- property - something that describes a particular thing or that is common to a group of things

Connection to Art



45 Minutes

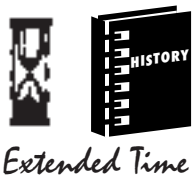
Supply each student with three sheets of drawing paper. Ask them to illustrate common examples of Newton's Laws of Motion, with one law shown on each sheet. Some common examples are shown below.

First Law of Motion: chair being pushed, tennis ball hitting the ground and bouncing up, flag being blown by the wind

Second Law of Motion: billiard ball being struck by a cue stick, football being kicked, toy car being pushed across a table

Third Law of Motion: rocket blasting off, speed boat moving through water, Newton's cradle causing balls to push against each other

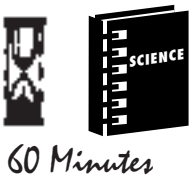
Connection to History



In addition to the Laws of Motion, Sir Isaac Newton made many other contributions to science. He was the first to state the laws of gravity and its role in holding the universe together. According to legend, the discovery was sparked when Newton saw an apple fall from a tree. He also invented calculus, a special kind of mathematics, and discovered many important things about the behavior of light and color.

Ask students to learn more about Newton by reading biographies, scientific encyclopedia and websites on the subject. Have them summarize their findings in a short report. In addition to Newton's experiments, encourage students to include facts about his personal life and its effect on his scientific work.

Connection to Science



Scientists who study the effects of force are called physicists. Physics is the study of matter, energy and force as seen in the non-living world. It explains why water freezes, how light is reflected in a mirror, and why a leaf falls to the ground.

A physicist might work in the laboratory of a car factory, using physics to design a safer car. This type of job is known as research and development, or "R and D." Many physicists also teach in high schools and colleges.

If possible, invite a physicist from a local college or university to speak to the class. What is a typical day like for a physicist? How much education is required to become a physicist? What kind of jobs can a physicist get after college?

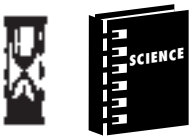
After the guest has to spoken to the class, allow time for a question and answer session. Encourage each student to have at least one question prepared ahead of time.

Extended Activity

Ask each student to look through old magazines to locate examples of force. Machines, automobiles, household tools and appliances can include good examples. Ask students to cut out all of the examples they find. Next, have them to glue their pictures onto poster board. Below each picture, they should write the name of the force that is being exerted.

Display the collages on a wall entitled, "Forces In Our World."

Connection to History



15 Minutes

The Ancient Greeks were probably the first to express ideas about physics, motion and force. The Greek philosopher Aristotle wrote many theories related to physics, but his ideas were based on discussion and logical thinking, not on experiments. Many of his ideas turned out to be wrong. Thousands of years later, Galileo and others challenged Aristotle's ideas by performing experiments. Galileo stressed the importance of repeating carefully controlled experiments many times, in order to have more accurate results.

Why might a philosopher like Aristotle be more willing to base his beliefs on logical thinking, instead of basing them on observation and action? How is a science like philosophy better suited for logical thinking than a physical science, such as physics? Why is it important to repeat experiments many times?

(Philosophy is the study of values and beliefs. Different people interpret philosophical ideas in different ways. Philosophy is not based on observation, but on speculation. This is probably what led Aristotle to depend so highly on thought in his understandng of science. Physical sciences, such as physics, are based on nature. Physics is external, where as philosophy is internal. That is why experiments must be repeated—because they take place in the changing, unpredictable physical world.

Link to the World


60 Minutes

Ask each student to locate a small object in his or her home that can demonstrate a basic principle of force. Encourage students to think carefully about their choices before they present them to classmates. (Students should be reminded to **never** bring a knife, or any object that can be used as a weapon, to school.)

Students should be able to tell the class what type or types of force are present. They should also be able to explain how force is affecting their chosen object. Where is force applied? Is it balanced or unbalanced?

When all of the presentations are completed, ask students to think about how many examples of force we see each day...on the school bus, in the car, in the park, in the kitchen and in the classroom.

Culminating Activity


30 Minutes

Ask each student to think of a simple way that force affects his or her life. Next, have them write a paragraph describing what life would be like if that particular force were not present. How would their lives change or become more difficult? Would life even be possible? Encourage class members to share their paragraphs with one another.

Name

VOCABULARY

The following terms are from *Real World Science: Force*. Fill in the number of each term next to its closest definition.

1. force
2. friction
3. gravity
4. mass
5. electromagnetism
6. nuclear
7. inertia
8. acceleration
9. pressure
10. repel

___ the strongest force in the universe; exists inside an atom and holds smaller particles together

___ to push each other away

___ property of matter that causes an object to resist a change in motion

___ force that opposes movement between objects that are not perfectly smooth

___ the amount of matter that makes up an object

___ any change in an object's direction or rate of speed

___ a push or pull on an object that causes its change in motion

___ force produced by the interaction between electricity and magnets

___ force that is exerted over a given area

___ force that attracts objects to each other as a result of their mass

Name

CHECKING COMPREHENSION

Read the following sentences and circle the letter of the word that best fills each blank.

Force is a push or pull on an object that causes a change in its ___1___ . When forces are equal, we say that the force is ___2___ . There are several kinds of force. The force that opposes movement between objects that are not perfectly smooth is called ___3___ . It causes moving objects to ___4___ . ___5___ is a force that attracts objects to each other because of their mass. The strong force that keeps the small particles of an atom glued together is called ___6___ force. All kinds of force follow three Laws of Motion, summed up by ___7___ . The first law deals with ___8___ , the property of matter that causes an object to resist a change in motion. The second law is stated as an equation: force equals mass times ___9___ . The third law says that for every action there is an equal and opposite ___10___ .

1. A. mass
   B. color
   C. motion
   D. polarity

2. A. average
   B. balanced
   C. ignited
   D. accelerated

3. A. friction
   B. gravity
   C. electromagnetism
   D. fission

4. A. accelerate
   B. remain constant
   C. slow down and stop
   D. attract other objects

5. A. Inertia
   B. Pressure
   C. Cohesion
   (D.) Gravity

6. A. nuclear
   B. centrifugal
   C. dynamic
   D. electromotive

7. A. Sir Isaac Newton
   B. Andre Marie Ampere
   C. William Gilbert
   D. Johannes Kepler

8. A. pressure
   B. inertia
   C. torque
   D. gravitation

9. A. acceleration
   B. motion
   C. pressure
   D. polarity

10. A. inertia
    B. reaction
    C. force
    D. magnetism

Name

REAL WORLD EXAMPLES

For each term listed below, write a typical example from daily life. The first one has been done for you.

1. Gravity **A heavy book is dropped and quickly falls to the ground.**

2. Friction

3. Balanced Forces

4. Pressure

5. First Law of Motion

6. Second Law of Motion

7. Third Law of Motion

Name

TRUE OR FALSE

Place a T next to statements that are true and an F next to statements that are false.

1. ___ When one force is stronger than another, we say that the forces are balanced.
2. ___ Forces give every object its shape.
3. ___ Friction is the force that creates movement between objects.
4. ___ Mass is the amount of matter that makes up an object.
5. ___ Televisions and computers use the force of electromagnetism.
6. ___ Nuclear force is the strongest force known in the universe.
7. ___ Inertia is the property of matter that causes an object to move with ease.
8. ___ Newton's second Law of Motion states that force equals mass times acceleration.
9. ___ For every action, there is an equal and opposite reaction.
10. ___ Pressure is equal to force over acceleration.

Name _____

NUMBER CODE

A = 1	I = 9	Q = 17
B = 2	J = 10	R = 18
C = 3	K = 11	S = 19
D = 4	L = 12	T= 20
E = 5	M = 13	U = 21
F = 6	N = 14	V = 22
G = 7	O = 15	W = 23
H = 8	P = 16	Y = 24

1. 14-21-3-12-5-1-18 force is millions of times stronger than electromagnetic force.

   _____

2. Force plays an important role in the 4-5-19-9-7-14 of tall buildings and bridges.

   _____

3. The moon's 7-18-1-22-9-20-24 pulls on the oceans of the Earth, causing the tides to rise.

   _____

4. 9-14-5-18-20-9-1 explains why it is easier to move a jar filled with cotton than to move a jar filled with sand.

   _____

5. 1-3-3-5-12-5-18-1-20-9-15-14 occurs when an object speeds up or when it slows down.

   _____

6. The second Law of Motion helped scientists develop the 18-15-3-11-5-20, making space travel possible.

   _____

7. Although we don't feel it, air 16-18-5-19-19-21-18-5 is pushing against our skin at all times.

   _____

8. Without 6-18-9-3-20-9-15-14, we could not walk because our shoes would slide out from under us.

   _____

Name

A CLOSER LOOK

The list below includes some major types of force found in our world. Use the Internet and library resources to prepare a 3- to 5-minute speech on a type that interests you.

- Adhesion
- Centrifugal Force
- Centripetal Force
- Electromotive Force
- Electromagnetic Force
- Friction
- Gravity
- Nuclear Force
- Pressure

These hints will make your speech more successful:

1. **Decide on your purpose.** What is the main point you want to get across?

2. **Write a brief outline of your presentation.** Begin with an introduction to grab interest, a purpose statement, facts to support your purpose, and a conclusion.

3. **Think about your audience.** How much does the audience know about your subject? What do you want your audience to learn?

4. **Add interest.** Interesting facts and examples from real life will make your paper more memorable.

5. **Rehearse.** You will feel more comfortable if you go through your presentation at least three times. Don't try to memorize it. Instead, write the main points of the presentation on note cards and use the cards as memory cues.

Name

WORD SEARCH

The following words can be found in the maze below. The letters may be arranged horizontally, vertically, diagonally or backward.

force
gravity
friction
nuclear
inertia
acceleration
pressure
motion
mass

K E B H I S M P M C L C
L T F S P N B Q L A J R
F O R C E S E D N R S K
P N I N Z H L R A L Q S
A C C E L E R A T I O N
C H T P T D Q S N I N G
T O I Y G T L E U C A R
K M O T I O N R C V N A
Q S N P A C Y A L E W V
H P Q X D M R B E R G I
E R U S S E R P A V R T
O T D M X Z W G R Y N Y

Name

TEST

Circle the phrase which best answers each question.

1. _____ is a push or pull on an object that causes a change in the object's motion.

   - Inertia
   - Mass
   - Heat
   - Force

2. When one force is stronger than the other, we say that the forces are:

   - balanced.
   - polarized.
   - inert.
   - unbalanced.

3. Force gives every object its:

   - color.
   - shape.
   - mass.
   - none of the above

4. Friction is the force that opposes movement between objects that are:

   - perfectly smooth.
   - balanced.
   - not perfectly smooth.
   - at rest.

5. Gravity is the force that attracts objects to each other as a result of their:

   - pressure.
   - mass.
   - electrons.
   - inertia.

Name

TEST (CONTINUED)

6. _____ is the amount of matter that makes up an object.

   - Weight
   - Pressure
   - Gravity
   - Mass

7. Sir Isaac Newton summed up the three Laws of:

   - Motion.
   - Force.
   - Nuclear Energy.
   - Matter.

8. The first Law of Motion is also known as as the Law of:

   - Inertia.
   - Suspension.
   - Reaction.
   - Change.

9. Acceleration is any change in an object's direction or:

   - mass.
   - solubility.
   - rate of speed.
   - energy level.

10. _____ describes the force that is exerted on a given area.

    - Cohesion
    - Pressure
    - Adhesion
    - Electromotive force

ADDITIONAL AIMS MULTIMEDIA PROGRAMS

You and your students might also enjoy these other AIMS Multimedia programs:

#2570 - Real World Science: Electricity
#2571 - Real World Science: Scientific Method
#2572 - Real World Science: Magnetism
#2569 - Real World Science: Matter - Solids, Liquids and Gases

ANSWER KEY for page 18

VOCABULARY

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1. force
2. friction
3. gravity
4. mass
5. electromagnetism
6. nuclear
7. inertia
8. acceleration
9. pressure
10. repel

6 the strongest force in the universe; exists inside an atom and holds smaller particles together

10 to push each other away

7 property of matter that causes an object to resist a change in motion

2 force that opposes movement between objects that are not perfectly smooth

4 the amount of matter that makes up an object

8 any change in an object's direction or rate of speed

1 a push or pull on an object that causes its change in motion

5 force produced by the interaction between electricity and magnets

9 force that is exerted over a given area

3 force that attracts objects to each other as a result of their mass

ANSWER KEY for page 19

CHECKING COMPREHENSION

Read the following sentences and circle the letter of the word that best fills each blank.

Force is a push or pull on an object that causes a change in its ___1___ . When forces are equal, we say that the force is ___2___ . There are several kinds of force. The force that opposes movement between objects that are not perfectly smooth is called ___3___ . It causes moving objects to ___4___ . ___5___ is a force that attracts objects to each other because of their mass. The strong force that keeps the small particles of an atom glued together is called ___6___ force. All kinds of force follow three Laws of Motion, summed up by ___7___ . The first law deals with ___8___ , the property of matter that causes an object to resist a change in motion. The second law is stated as an equation: force equals mass times ___9___ . The third law says that for every action there is an equal and opposite ___10___ .

1. A. mass
   B. color
   (C.) motion
   D. polarity

2. A. average
   (B.) balanced
   C. ignited
   D. accelerated

3. (A.) friction
   B. gravity
   C. electromagnetism
   D. fission

4. A. accelerate
   B. remain constant
   (C.) slow down and stop
   D. attract other objects

5. A. Inertia
   B. Pressure
   C. Cohesion
   D. Gravity

6. (A.) nuclear
   B. centrifugal
   C. dynamic
   D. electromotive

7. (A.) Sir Isaac Newton
   B. Andre Marie Ampere
   C. William Gilbert
   D. Johannes Kepler

8. A. pressure
   (B.) inertia
   C. torque
   D. gravitation

9. (A.) acceleration
   B. motion
   C. pressure
   D. polarity

10. A. inertia
    (B.) reaction
    C. force
    D. magnetism

ANSWER KEY for page 20

REAL WORLD EXAMPLES

For each term listed below, write a typical example from daily life. The first one has been done for you.

1. Gravity — **A heavy book is dropped and quickly falls to the ground.**

2. Friction — **A bowling ball is rolled across a floor. Friction between the ball and the floor causes the ball to slow down and eventually stop.**

3. Balanced Forces — **A balloon is blown up. The force of the air inside and outside the balloon is balanced, giving the balloon a round shape.**

4. Pressure — **A knife cuts an apple because the area covered by the slim blade of the knife provides enough pressure to slice the fruit.**

5. First Law of Motion — **A basketball rolling across a court will stop once it reaches a wall.**

6. Second Law of Motion — **A person kicks a football, causing it to move several feet. When the same person kicks a bowling ball, it only moves a few inches.**

7. Third Law of Motion — **The thrusters of a rocket push down on the ground, and the rocket is pushed off into space.**

ANSWER KEY for page 21

TRUE OR FALSE

Place a T next to statements that are true and an F next to statements that are false.

1. **F** When one force is stronger than another, we say that the forces are balanced.
2. **T** Forces give every object its shape.
3. **F** Friction is the force that creates movement between objects.
4. **T** Mass is the amount of matter that makes up an object.
5. **T** Televisions and computers use the force of electromagnetism.
6. **T** Nuclear force is the strongest force known in the universe.
7. **F** Inertia is the property of matter that causes an object to move with ease.
8. **T** Newton's second Law of Motion states that force equals mass times acceleration.
9. **T** For every action, there is an equal and opposite reaction.
10. **F** Pressure is equal to force over acceleration.

ANSWER KEY for page 22

NUMBER CODE

A = 1	I = 9	Q = 17
B = 2	J = 10	R = 18
C = 3	K = 11	S = 19
D = 4	L = 12	T= 20
E = 5	M = 13	U = 21
F = 6	N = 14	V = 22
G = 7	O = 15	W = 23
H = 8	P = 16	Y = 24

1. 14-21-3-12-5-1-18 force is millions of times stronger than electromagnetic force.

   Nuclear

   _____

2. Force plays an important role in the 4-5-19-9-7-14 of tall buildings and bridges.

   design

   _____

3. The moon's 7-18-1-22-9-20-24 pulls on the oceans of the Earth, causing the tides to rise.

   gravity

   _____

4. 9-14-5-18-20-9-1 explains why it is easier to move a jar filled with cotton than to move a jar filled with sand.

   Inertia

   _____

5. 1-3-3-5-12-5-18-1-20-9-15-14 occurs when an object speeds up or when it slows down.

   Acceleration

   _____

6. The second Law of Motion helped scientists develop the 18-15-3-11-5-20, making space travel possible.

   rocket

   _____

7. Although we don't feel it, air 16-18-5-19-19-21-18-5 is pushing against our skin at all times.

   pressure

   _____

8. Without 6-18-9-3-20-9-15-14, we could not walk because our shoes would slide out from under us.

   friction

   _____

ANSWER KEY for page 23

A CLOSER LOOK

The list below includes some major types of force found in our world. Use the Internet and library resources to prepare a 3- to 5-minute speech on a type that interests you.

- Adhesion
- Centrifugal Force
- Centripetal Force
- Electromotive Force
- Electromagnetic Force
- Friction
- Gravity
- Nuclear Force
- Pressure

These hints will make your speech more successful:

1. **Decide on your purpose.** What is the main point you want to get across?

2. **Write a brief outline of your presentation.** Begin with an introduction to grab interest, a purpose statement, facts to support your purpose, and a conclusion.

3. **Think about your audience.** How much does the audience know about your subject? What do you want your audience to learn?

4. **Add interest.** Interesting facts and examples from real life will make your paper more memorable.

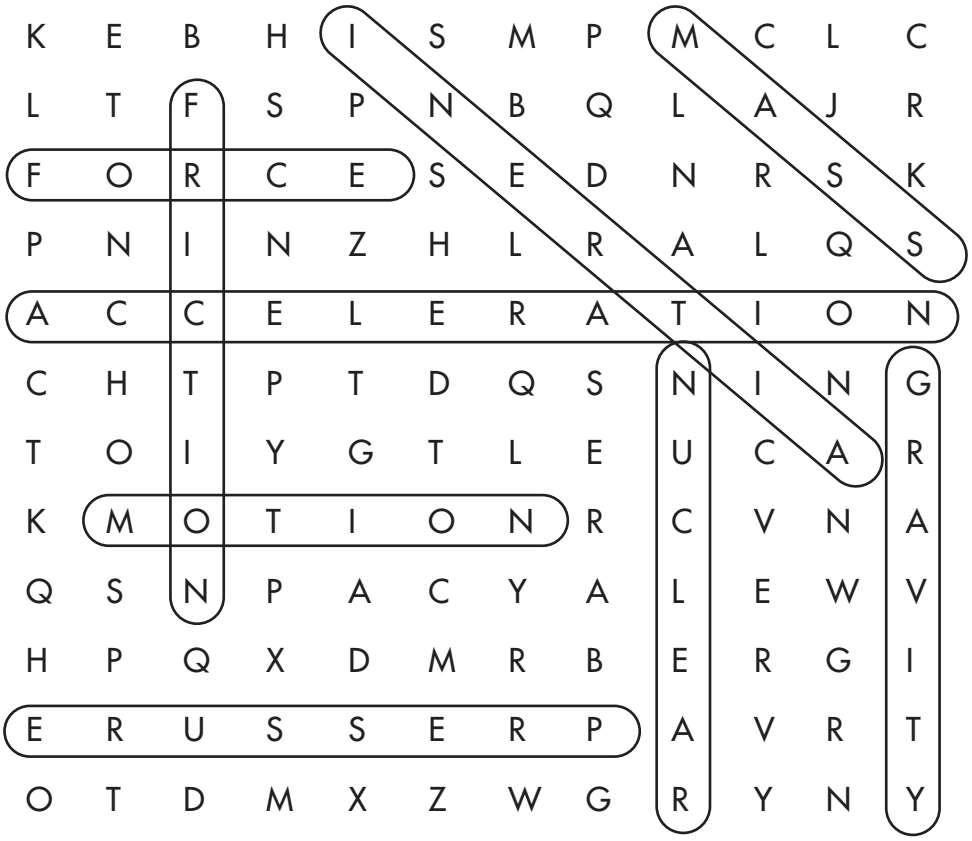
5. **Rehearse.** You will feel more comfortable if you go through your presentation at least three times. Don't try to memorize it. Instead, write the main points of the presentation on note cards and use the cards as memory cues.

ANSWER KEY for page 24

WORD SEARCH

The following words can be found in the maze below. The letters may be arranged horizontally, vertically, diagonally or backward.

force
gravity
friction
nuclear
inertia
acceleration
pressure
motion
mass



ANSWER KEY for page 25

TEST

Circle the phrase which best answers each question.

1. _____ is a push or pull on an object that causes a change in the object's motion.

   - Inertia
   - Mass
   - Heat
   - **Force**

2. When one force is stronger than the other, we say that the forces are:

   - balanced.
   - polarized.
   - inert.
   - **unbalanced.**

3. Force gives every object its:

   - color.
   - **shape.**
   - mass.
   - none of the above

4. Friction is the force that opposes movement between objects that are:

   - perfectly smooth.
   - balanced.
   - **not perfectly smooth.**
   - at rest.

5. Gravity is the force that attracts objects to each other as a result of their:

   - pressure.
   - **mass.**
   - electrons.
   - inertia.

ANSWER KEY for page 26

TEST (CONTINUED)

6. _____ is the amount of matter that makes up an object.

- Weight
- Pressure
- Gravity
- (Mass)

7. Sir Isaac Newton summed up the three Laws of:

- (Motion.)
- Force.
- Nuclear Energy.
- Matter.

8. The first Law of Motion is also known as as the Law of:

- (Inertia.)
- Suspension.
- Reaction.
- Change.

9. Acceleration is any change in an object's direction or:

- mass.
- solubility.
- (rate of speed.)
- energy level.

10. _____ describes the force that is exerted on a given area.

- Cohesion
- (Pressure)
- Adhesion
- Electromotive force