



Fantastic **FORCES**

PROGRAM MANUAL

Che-mystery

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Wacky Water





CHE-MYSTERY

SUMMARY:

Children discover the mysterious wonders of chemistry. They learn the difference between physical and chemical changes through exciting, hands-on investigations. They will discover that chemistry is done using lab tools such as pipettes as well as everyday tools such as markers. Children get hands-on working with a non-Newtonian fluid, handling hydrophobic compounds, and making marbled masterpieces. The Dynamic Dish Take-Home lets children bring the lab home.

EDUCATIONAL VALUE:

Che-mystery introduces children to chemistry with mysterious mixtures and surprising solutions. They learn how reactions can result in physical changes or chemical changes. Colloid suspensions, solutions, and indicators are all part of this fun, information-packed class. Children learn the importance of lab safety and get hands-on with some amazing reactions.

TAKE-HOME MESSAGE:

- 1 Chemistry is the study of substances.
- 2 A physical change happens when substances are mixed but do not change.
- 3 A chemical change happens when mixed substances form new substances.



CURRENT EVENTS

SUMMARY:

Children get charged up about the science of current electricity! They learn how tiny invisible particles—electrons—power everything from the fridge to the phone. They learn about insulators, conductors, and experiment to find out what conducts. All their problem-solving skills are put to use to create series and parallel circuits. Once children master circuits, they use their new know-how to engineer a device that can solve mysterious hidden connections. Children build and take home a Circuit Maze to try with their family and friends.

EDUCATIONAL VALUE:

This electrifying class teaches the fundamentals of current electricity. Children test their predictions about which materials conduct electricity, and which are insulators. They explore electrons and cooperate to create real series and parallel circuits. Newfound expertise helps them design an electrical device to decipher the hidden connections in an inference box. At the end of the class, children build and take home their very own Circuit Maze to learn about circuits.

TAKE-HOME MESSAGE:

- 1 Energy can move and change from one form to another.
- 2 Electricity is the energy of moving electrons.
- 3 Electric current flows in a loop called a circuit.



FANTASTIC FLIERS

SUMMARY:

Fantastic Fliers guides children through the basics of flight and aerodynamics. Children use different wind-makers to explore the four forces that affect flight: lift, thrust, gravity, and drag. They make and test various plane designs to see these forces in action. Children fold and fly the Delta Dart plane. Shooting the Stunt Flier plane straight up makes it loop back! They make a Rotor Kite twist and an Paper Dirigible twirl. A fast-flying, spinning cylinder is launched at a tough target. Children build the Sky Hawk Foam Plane Take-Home and fling it forward.

EDUCATIONAL VALUE:

Fantastic Fliers provides children with a combination of practical experiences and theoretical knowledge in aerodynamics. They learn that lift, thrust, gravity, and drag affect an aircraft's flight. Children handle fans to create fast-flowing air. They construct various paper airplanes to observe how air makes them move. They build typical paper planes, closed-wing planes, and other designs for the children to fold, fling, and drop. Adjusting the Stunt Flier's control surfaces allows children to send the planes flying in different directions. Children make, test, and take home a rubber band powered plane that cuts through air with ease.

TAKE-HOME MESSAGE:

- 1 Lift and thrust forces push up and move aircraft forward.
- 2 Gravity and drag forces slow and pull down aircraft.
- 3 Control surfaces change an aircraft's direction.



FUN-DAMENTAL FORCES

SUMMARY:

Find out what makes the world go round in an entertaining introduction to the basic concepts of forces. Sir Isaac Newton would be proud when young scientists investigate his law of inertia. Children experiment with mass and balance using their own centers of gravity. A comparison between rubber and dough balls brings the physical effects of forces to light. Gyroscopes, bike wheels, and rotating platforms reveal the concepts of precession and centripetal force. Children leave with a thirst for physics along with their very own Gravity Game Take-Homes.

EDUCATIONAL VALUE:

Fun-damental Forces introduces children to the pushes and pulls that make the universe tick. Gravity, inertia, and centripetal force are some key concepts they discover along the way. Some exciting, hands-on investigations into forces include the bike wheel gyroscope, a coin-spinning vortex, and a set of center of gravity challenges. This program lays the foundation for further study in the physical sciences.

TAKE-HOME MESSAGE:

- 1 A force is a push or pull.
- 2 More than one force can act on an object.
- 3 Forces can be balanced or unbalanced.



SCIENCE OF MAGIC

SUMMARY:

The Science of Magic leaves children astounded, amazed, and educated! They learn how magicians use our assumptions and perceptions about how the world works to entertain us. Discovering how to make objects disappear and reappear using optical illusions, polymers, mirrors, as well as hidden compartments, sleight-of-hand, and misdirection are all part of the learning experience. The art of escape with Houdini's chains and the power of perception with the crayon mind-reading trick are a few classics. The Curious Cube Take-Home lets children bring home the magic to mystify their friends and family.

EDUCATIONAL VALUE:

The Science of Magic introduces children to a wide variety of scientific topics, challenging them to think logically and observe scientifically. Natural curiosity leads the way to the ultimate in inquiry-based learning as children ask, "How did they do that?" They investigate scientific concepts ranging from optics to optical illusions to the chemistry of hydrophilic polymers. Building an illusion box with a hidden mirror teaches about the science of optics. There are many illusions for children to see and try as they unlock the secrets of the science of magic.

TAKE-HOME MESSAGE:

- 1 Magicians need to know some science.
- 2 Magic confuses what we sense with what we know.
- 3 Science and magic both require good observation skills.



SUPER STRUCTURES

SUMMARY:

Super Structures lets children act like junior architects and engineers! Children push and pull to get a feel of the forces on structures. They test out shapes for strength and witness the strength of cylinders. They also build and test the support of a Roman Arch block bridge. After a structures challenge with uncommon building materials, the junior engineers will continue constructing ideas at home with the Bridge Basics Take-Home.

EDUCATIONAL VALUE:

Super Structures introduces children to the fascinating science of architecture and engineering. They learn about structures, the forces behind them, and shapes and materials that strengthen them. Images of real-life structures reinforce these concepts. Children take home a bridge-building kit. They use the included components to strengthen a basic bridge structure.

TAKE-HOME MESSAGE:

- 1 Structures hold up, span, or enclose things.
- 2 Structures must stand up against push and pull forces.
- 3 Strong shapes used in structures are triangles, cylinders, and arches.



UNDER PRESSURE

SUMMARY:

Under Pressure is an exciting immersion in the science of air pressure and Bernoulli's principle. Children enjoy the exciting tale of the Viking ship while learning about thermodynamics and weather systems. A hopping, hovering table tennis ball lets children experiment with unbalanced air pressure. An air-blasting Airzooka is a fun way to understand the physics of breathing. Children apply their knowledge to overcome gravity using compressed air, and they will take home their very own Air Blaster foam launchers.

EDUCATIONAL VALUE:

Under Pressure introduces children to the exciting science of air pressure and a host of associated scientific concepts including aerodynamics, the science of flight, thermodynamics, and Bernoulli's principle. Children learn that air is all around us, and vital to life on Earth.

TAKE-HOME MESSAGE:

- 1 The air around Earth pushes on us. It is called the atmosphere.
- 2 High-pressure air moves towards low-pressure air until they balance.
- 3 Bernoulli's principle states that the faster a gas flows, the less it pushes.



WACKY WATER

SUMMARY:

Children make waves and immerse themselves in the wet and wonderful science of water. They discover density and buoyancy as they experiment with what sinks and what floats. They observe flowing currents and see how temperature and salinity affect ocean currents. A model oil spill challenge lets them apply their new-found knowledge to a real-world problem. What techniques can we use, and how hard are they to clean up? Children find out for themselves, and then build and keep their very own Rescue Diver Take-Homes.

EDUCATIONAL VALUE:

Wacky Water introduces children to the properties of water. Children explore this fascinating fluid's many facets including density, buoyancy, water as the universal solvent, water pollution, currents and wave motion. Water is a remarkable substance. It covers more than three quarters of Earth's surface—and no life on Earth could survive without it. Yet, besides water's two other states (steam and ice), children know little about its other properties. The Wacky Water program lets them get their feet wet and wade into a wider study of this all-important compound.

TAKE-HOME MESSAGE:

- 1 Water exists on Earth as a solid, liquid, and gas.
- 2 Less dense matter floats above denser matter.
- 3 Water is important for life on Earth.