

BUCKLE UP IT'S SCIENCE!

SCIENCE GUIDE



Hooked
On
SCIENCE

www.hookedonscience.org

Southeast Coalition
for Roadway Safety

www.saveMOlives.com

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SCIENCE STANDARDS

Students participating in the "Buckle Up, It's Science" program will acquire a solid foundation, which includes knowledge of...

- ✓ Properties and principles of force and motion.
- ✓ Processes of scientific inquiry such as formulating and testing hypotheses.



SCIENCE SAFETY

PLEASE follow these safety precautions when doing any science experiment.

- **ALWAYS** have an adult present.
- **ALWAYS** wear the correct safety gear while doing any experiment.
- **NEVER** eat or drink anything when performing any experiment.
- **REMEMBER** experiments may require marbles, small balls, balloons, and other small parts. Those objects could become a **CHOCKING HAZARD**. Adults are to perform those experiments using these objects. Any child can choke or suffocate on uninflated or broken balloons. Keep uninflated or broken balloons away from children.

DISCLAIMER

Each experiment is safe to perform with an adult present. If not performed correctly the experiment could be dangerous. Jason Lindsey, Hooked on Science, and the Missouri Department of Transportation expressly disclaims all liability for any occurrence, including, but not limited to, damage, injury or death, which might arise as consequences of the use of any experiment(s) in this book, online, or on air. The guardian of the child and the performer of the experiment assume all the liability and will use these science experiments at their own risk!



SCIENCE TERMS

FORCE

A **Force** is a push or a pull.

FRICTION

Friction is a force that acts when two surfaces rub together.

GRAVITY

Gravity is a force that pulls things toward the center of Earth.

MOTION

Motion is a change in position.

NEWTON'S FIRST LAW OF MOTION

Newton's First Law of Motion says an object in motion tends to stay in motion, and an object at rest tends to stay at rest, unless the object is acted upon by an outside force.

NEWTON'S SECOND LAW OF MOTION

Newton's Second Law of Motion says the acceleration of an object is dependent upon the force acting on the object and the mass of the object.

NEWTON'S THIRD LAW OF MOTION

Newton's Third Law of Motion says every action has an equal and opposite reaction.

SPEED

Speed is the distance an object moves in a period of time.



VOCABULARY QUIZ

Complete the sentences below using a science term from the box.

FRICTION	MOTION	GRAVITY
SPEED	FORCE	NEWTON'S
NEWTON'S	NEWTON'S	SECOND LAW
THIRD LAW	FIRST LAW	OF MOTION
OF MOTION	OF MOTION	

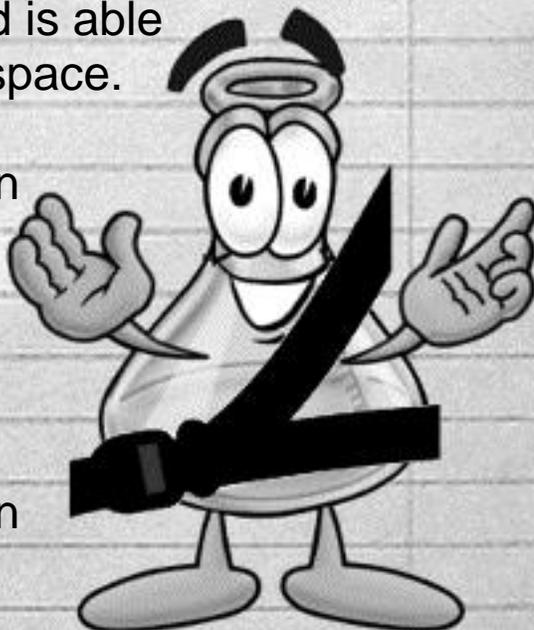
- _____ is the distance an object moves in a period of time.
- _____ says an object in motion tends to stay in motion, and an object at rest tends to stay at rest, unless the object is acted upon by an outside force.
- A _____ is a push or a pull.
- _____ says every action has an equal and opposite reaction.
- _____ is a force that pulls things toward the center of Earth.
- _____ is a change in position.
- _____ says the acceleration of an object is dependent upon the force acting on the object and the mass of the object.
- _____ is a force that acts when two surfaces rub together.



WHICH LAW IS IT?

Read each question and then select the correct answer.

1. You run into your friend while in-line skating and both of you fall in opposite directions.
 - a. First Law of Motion
 - b. Second Law of Motion
 - c. Third Law of Motion
2. A book left on the table overnight is there when you return in the morning.
 - a. First Law of Motion
 - b. Second Law of Motion
 - c. Third Law of Motion
3. A baseball hit with a bat flies farther than a bowling ball hit with a bat.
 - a. First Law of Motion
 - b. Second Law of Motion
 - c. Third Law of Motion
4. A space shuttle propels gas particles out the back of the shuttle and is able to travel forward through space.
 - a. First Law of Motion
 - b. Second Law of Motion
 - c. Third Law of Motion
5. A balloon flies forward when air quickly escapes from it.
 - a. First Law of Motion
 - b. Second Law of Motion
 - c. Third Law of Motion



PSA QUIZ

Read each statement and then determine if it is true or false.

1. **TRUE/FALSE** Buckling up saves millions of lives each year.
2. **TRUE/FALSE** The seat belt in your vehicle can save your life?
3. **TRUE/FALSE** Newton's First Law of Motion says an object in motion tends to stay in motion, unless the object is acted upon by an outside force.
4. **TRUE/FALSE** If you wear your seat belt and your vehicle suddenly stops, you will continue in motion with the same speed and in the same direction until the windshield or another outside force stops you.
5. **TRUE/FALSE** Your seatbelt provides the needed force to bring you from a state of motion to a state of rest.

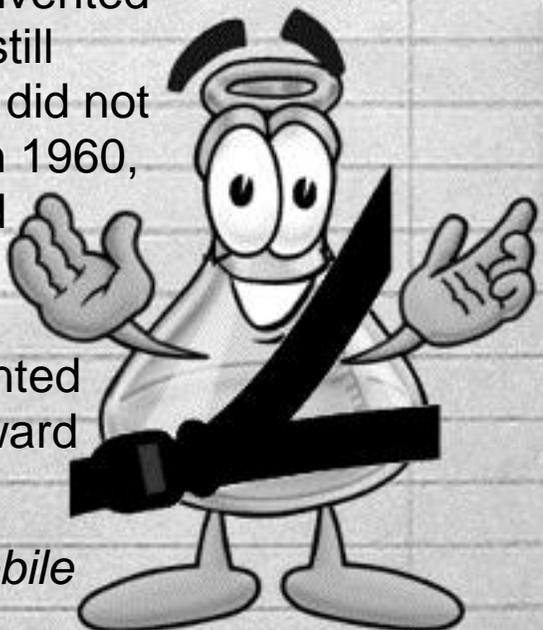
QUICK FACT

According to the National Highway Traffic and Safety Administration, wearing a seat belt reduces the risk of death in car crashes by 50 percent for drivers and front-seat passengers. Seat belts are credited with saving approximately 13,000 lives per year in the United States.



MAKING SAFER CARS

- ✓ Seatbelts, first installed by Nash Motors in 1949, are one of the most important safety features of cars today, but they were not mandatory in cars until the mid-1960's.
- ✓ Early seat belts crossed over people's hips, which held them in their seats during collisions, but did not prevent them from hitting dashboards or windshields.
- ✓ In 1959, Nihls Bolin, an engineer at Swedish car manufacture Volvo, invented the three-point seatbelt.
- ✓ A three-point seatbelt has one strap across the lap and a second diagonal strap across the chest to better hold passengers in place.
- ✓ In 1952, American inventor John Hetrick developed the idea for air bags, which are safety cushions built into steering wheels, dashboards, doors, and seats.
- ✓ The first child car seats, invented in the 1930's, held children still while cars were moving, but did not protect them in collisions. In 1960, designers at Volvo improved the car seat by adding two diagonal belts that held children in place, and prevented them from being thrown forward in collisions.



Source: *Inventing the Automobile*

EXPERIMENT GUIDE

UNBUCKLED EGG

Ingredients

- ✓ Uncooked Egg
- ✓ Plastic Cup

Instructions

STEP 1: Place the uncooked egg into the plastic cup.

STEP 2: Holding the open end of the cup away from you, quickly walk forward, and then suddenly stop.

Explanation

When you suddenly stopped, the egg continued in motion with the same speed and in the same direction until an outside force stopped the egg. The result, a cracked egg on the floor.

The same thing will happen to you if you choose not to wear your seatbelt in a traveling vehicle. Your seatbelt provides the needed force to bring you from a state of motion to a state of rest.

SCIENCE TERM

Newton's First Law of Motion says an object in motion tends to stay in motion, and an object at rest tends to stay at rest, unless the object is acted upon by an outside force.



EXPERIMENT GUIDE

BUCKLED EGG

Ingredients

- ✓ Uncooked Egg
- ✓ Shoe Box
- ✓ Duct Tape

Instructions

STEP 1: Place the uncooked egg into the shoe box.

STEP 4: Restrain the egg by taping it to the bottom of the shoe box with two pieces of duct tape.

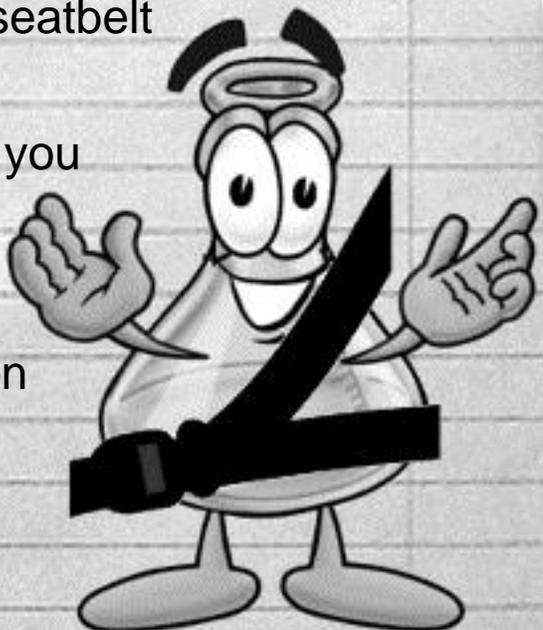
STEP 3: Forcefully slide the shoe box on the floor into the wall.

STEP 4: Open the shoe box and observe

Explanation

When you opened the shoe box the egg should be unbroken due to the duct tape restraining the egg. The duct tape acts as a seatbelt keeping the egg safe.

The same thing will happen to you if you choose to wear your seatbelt. Your seatbelt provides the needed force to bring you from a state of motion to a state of rest.



BUCKLE UP IT'S SCIENCE!

WORD SEARCH

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

Speed
Force
Gravity
First Law of Motion
Friction
Second Law of Motion
Third Law of Motion
Motion



ANSWERS

VOCABULARY QUIZ

1. Speed
2. First Law of Motion
3. Force
4. Third Law of Motion
5. Gravity
6. Motion
7. Second Law of Motion
8. Friction

WHICH LAW IS IT?

1. Third Law of Motion
2. First Law of Motion
3. Second Law of Motion
4. Third Law of Motion
5. Third Law of Motion

PSA QUIZ

1. False
2. True
3. True
4. False
5. True

