Science Virtual Learning

6th Grade Science
Gravity & Inertia

April 23, 2020

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Lesson: April 23, 2020

Objective/Learning Target:
-I can explain gravity and inertia.

You will need paper for this lesson

Warm up #1 - Let's Get Started

Watch this intro to gravity video.

Terms to know:

- Gravity: the force of attraction between objects that have mass.
- The strength of gravity depends on: mass of objects and distance between objects
- Inertia: an object's tendency to resist a change in motion
- The **greater** an object's mass, the **greater** its' inertia and the **larger** the force needed to overcome the inertia.

Warm Up #2

Write Newton's Laws on your piece of paper.

Fill in the blanks to complete Newton's Laws:

Law of Inertia: An object at _____ stays at _____ and an object in _____ stays in _____ with the same speed and in the same direction unless acted upon by _____.

Law of Force: Force = _____ X _____.

Law of Action/Reaction: For every action, there is an _____ and _____ reaction.

Warm Up #2 - Answer Key

Fill in the blanks to complete Newton's Laws:

Law of Inertia: An object at rest stays at rest and an object in motion stays in motion with the same speed and in the same direction unless acted upon by an external force.

Law of Force: Force = Mass X Acceleration.

Law of Action/Reaction: For every action, there is an equal and opposite reaction.

Practice #1

Read the two passages about Gravity and Inertia and answers the questions that follow.

GRAVITY: Gravity attracts all objects towards each other. Gravity has been around since the very beginning of the universe, and it works the same way everywhere in the universe, on all kinds of different objects, of all different sizes (larger than atoms - those are held together by atomic forces instead). The bigger an object is, and the closer you are to it, the stronger its gravitational pull is.

In the very beginning of the universe, after the Big Bang, gravity pulled atoms together to make stars and planets. Once the stars and planets had formed, gravity kept the planets in orbit around the stars, and moons orbiting around the planets. And on each planet that is large enough, gravity keeps an atmosphere around the planet.

On Earth, gravity keeps the air around us (and everything else) from drifting off into space. Gravity also causes things to fall to the ground, and causes the ocean's tides, and causes hot air to rise while colder air falls (which in turn causes wind).

Nobody fully understands how gravity works, or even why gravity exists. One way of looking at gravity is to think of it not as a force like magnetism, but instead as a natural result of the way mass bends space. Any object with mass (like a star) pushes on space and bends it, so that other objects (like planets) that are moving in a straight line are also going around the star. It looks to us like the star is pulling on the planet, but really the star is bending space.

Practice #1 - Continued

INERTIA: A law of physics states that "an object at rest tends to remain at rest, and an object in motion tends to remain in motion." Newton called these tendencies inertia. Inertia is a way of measuring how hard it is to change the momentum of an object, whether that's getting it to speed up or getting it to slow down. That depends on how much mass the object has. Big heavy things (things with a lot of mass) have more inertia than light things. You have to push a bus harder than a scooter to get it to move.

If something has a lot of mass, it's also hard to get it to stop moving. If the bus was moving fast, you'd need good brakes to get it to stop. Because the bus has more mass than the scooter, it would be a lot harder to stop the bus. That's also inertia - inertia's a way of measuring how hard it is to get something to stop moving, too.

According to Newton, the planets are constantly traveling in straight lines away from the Sun. However while they are traveling away from the Sun, the Sun is constantly pulling them back inward. This causes them to appear to circle or "orbit" the Sun. If the Sun suddenly disappeared or lost all of its gravity one day, the planets would go flying outward into space in straight lines

Answer these 3 questions on your piece of paper:

1. Explain why the Earth orbits the Sun, include both of the terms **gravity** and **inertia** in your explanation.
2. Explain what would happen on Earth if our gravity was suddenly decreased (lowered)?
3. What would happen to the planets if the Sun disappeared?

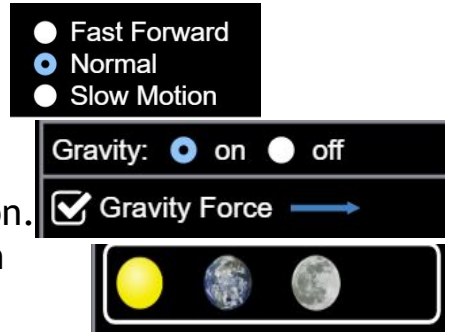
Practice #1 - Answer Key

Check your answers to the 3 questions:

1. Explain why the Earth orbits the Sun, include both of the terms **gravity** and **inertia** in your explanation. Earth has a tendency to resist change, called inertia. Sun's gravity is constantly pulling on Earth causing it to orbit around the Sun.
2. Explain what would happen on Earth if our gravity was suddenly decreased (lowered)? Depending on how much the gravity is decreased, our gravity could mirror the moon where if we jumped, we would stay in the air for awhile before landing. If the gravity was severely decreased, humans would become weightless and begin tumbling through the air.
3. What would happen to the planets if the Sun disappeared? The planets would fly into space in straight lines.

Practice #2 - Gravity & Orbits Simulation

First:
Go to this Simulation.
Click on the Model Option.
Make sure Normal is on.
Make sure Gravity Force is on.
Click all 3: Sun, Earth, Moon



Second:
Click start and see how the Earth and Moon revolve around the sun with gravity on. Hit pause after 365 days. Now refresh, turn gravity off and hit start.
Answer this question on your paper:
What happened to the Earth and moon when you turned gravity off versus having gravity on?

Third:
Explore the simulation further.
Try these:

- Increase mass of sun
- Increase mass of planets
- Turn gravity on and off at the different mass options.

On your piece of paper write down at least 2 things you discover.

Practice #2 - Simulation Key

What happened to the Earth and moon when you turned gravity off versus having gravity on?

When gravity was on, the moon revolved around the Earth while the Earth revolved around the sun. When gravity was off the Earth and moon floated away from the sun into space.

<u>Two things I discover:</u>

- When I keep gravity on and increase the mass of the sun, the Earth crashes into the sun and the moon floats into space.
- When I turn gravity off and increase the mass of the sun and the Earth, the Earth and moon still float into space.

Additional Practice

- Watch this video and complete some of the activities on your own with supplies at your house!
- Learn more about gravity and inertia in this Study Jams, test yourself after and then check your answers.
- Try these at home experiments to demonstrate your knowledge of inertia.