

CHAPTER 8: FORCES

Dear Family,

Your Child is learning about forces with series of science lab activities.

8.1 The Nature of Force:

How are forces described? A force is a push or a pull. When one object pushes or pulls another object, the first object exerts a force on the second object. Like velocity and acceleration, a force is described by its strength and by the direction in which it acts. The strength of a force is measured in a SI unit called the newton (N).

How do forces affect Motion? Often more than one force acts on an object at the same time. The combination of all the forces acting on an object is called the net force. It determines if and how an object will accelerate. A net force causes a change in the object's motion.

In this context, to understand the internal struggle that our nafs goes through in order to maintain goodness and understand the forces that act upon our nafs, the students will also make a play about the "Battle of the Nafs" - Nafs ul-Ammarah, Nafs ul-Lawammah, Nafs ul- Mutmainah

8.2 Friction & Gravity:

What Factors affect friction? The force that two surfaces exert on each other when they rub against each other is called friction. Friction acts in a direction opposite to the direction of the object's motion. Two factors that affect the force of friction are the types of surfaces involved and how hard the surfaces are pushed together.

What Factors Affect Gravity? Gravity is a force that pulls objects toward each other. Gravity keeps the moon orbiting Earth. It keeps all the planets in our solar system orbiting the sun. Two factors affect the gravitational attraction between objects: mass and distance. The more mass an object has, the greater its gravitational force. The shorter the distance is between one object and another, the stronger the gravitational force between the objects. Mass and weight have different meanings. Weight is a measure of the force of gravity on an object. Mass is a measure of the amount of matter in an object.

Students make analogies by recalling that the two factors that affect friction as defined in science, by considering friction between people. To be an exemplar Muslim, the lesser the friction between you and halal; the greater should be the friction between you and haram.

8.3 Newton's Laws of Motion:

What is Newton's First Law of Motion? Newton's first law of motion states that an object at rest will remain at rest unless acted upon by an unbalanced force.

What is Newton's Second Law of Motion? Newton's second law shows that force is measured in kilograms times meters per second per second ($\text{kg}\cdot\text{m}/\text{s}^2$). This unit is also called the newton (N), which is the SI unit of force.

What is Newton's Third Law of Motion? For every action there is an equal but opposite reaction.

Students will do an activity Action-Reaction Pairs. How positive and negative reactions will affect a human relation. Students will also investigate what happens when a force stops a toy car, but no force acts on the load the car was carrying.

8.4 Momentum:

What is an object's momentum? All moving objects have what Newton called a “quantity of motion.” Today it is called momentum. Momentum is a characteristic of a moving object that is related to the mass and the velocity of the object. The momentum of a moving object can be determined by multiplying the object's mass by its velocity.

Students will investigate what happens to a straw and a book with a rubber band wrapped around it. When the straw is pressed against the rubber band and when both the book and the straw are released.

8.5 Free Fall & Circular Motion:

What is a free Fall? When the only force acting on an object is gravity, the object is said to be in free fall. In free fall, the force of gravity is an unbalanced force, which causes an object to accelerate. Near the surface of Earth, the acceleration due to gravity is 9.8 m/s^2 . This means that for every second an object is falling, its velocity increases by 9.8 m/s .

What keeps a satellite in orbit? Satellites in orbit around Earth continuously fall toward Earth, but because Earth is curved they travel around it.

Students will investigate the motion of a tethered object as it moves at varying speeds.

8.6 Sinking and Floating:

What makes things Float? If you have ever picked up an object under water, you know that it seems much lighter in water than in air. Water and other fluids exert an upward force, called buoyant force, on a submerged object. Buoyant force acts in the opposite direction to the force of gravity, so it makes an object feel lighter.

What will float? You can make an object sink or float in a fluid by changing its density.

Students will investigate how testing a prototype can uncover design problems that may lead to redesigning a product or process.

Sincerely,

Ms. Talath Ansari