Unit 2: Forces and Changes in Motion

Part 1: Force

**Essential Question:** What are the different types   
of forces and how do they act on objects?

* What is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_? A push or pull upon an object resulting from the object’s interaction with another object.
* Can act with or without direct \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* may or may not cause \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* If an object is moving, a \_\_\_\_\_\_\_\_\_\_\_\_\_\_ will speed it up, slow it down or change direction
* if an object is at \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, a force can get it moving

**Two Types of Forces**

* **­­­­­­­­­­­­**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (normal) Force - objects are touching, or in direct contact
* Non-Contact Forces - forces act at a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Contact Forces**

* + Applied force - a push or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ force - floor or ground pushing you up)
  + Friction - the resistance of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ when one object rubs against another

**Non-Contact Forces –** types forces that act at a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

-a push or pull without \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + Electrical force – force between two \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ objects
    - static cling
  + Magnetic Force – force of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or

repulsion between two magnetic poles

* + - magnetic substance: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, cobalt and nickel
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Force - the force of attraction between two objects with mass
    - an apple falling on your head

How do magnets work?

* A magnet has 2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or ends, north and south.
* Opposite poles are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_attracted to each other, while the same poles repel each other
* Magnetism is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_that works from a distance depending on the strength of the magnet

YOU do:

Gravitational Force (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) **-** the force that acts between any two masses

­­­­­­­­­­­­­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_- the measure of an amount of matter in an object

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - anything that has mass and takes up space

The more mass an object has, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the gravitational force between it and other objects.

Distance - as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ increases between two objects, the gravitational force will decrease.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_- the amount of gravitational pull on an object

**The Law of Universal Gravity**

A law tells us \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* The force of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ acts between all objects in the universe
  + You are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to Earth ***and*** everything around you
  + Gravity is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_that keep the moon orbiting the earth and all the planets orbiting the sun
  + Gravity always pulls \_\_\_\_\_\_\_\_\_\_\_\_\_\_ toward the center of the earth
  + Earth pulls on objects even when there are other objects in between

**YOU do – Remember :**  
**C**ircle vocab words  
**U**nderline important words  
**B**ox in the question  
**E**liminate the wrong answers

1. A group of people rented a fishing boat for the day and traveled far from land. Later they discovered they needed a compass to find their way back. Which of the following describes the force acting on the compass to guide them safely back to land?  
   
A. Gravity  
B. Electrical Force  
C. Magnetic Force  
D. Friction

2. In 1969, Neil Armstrong became the first person to walk on the Moon. Video coverage showing the astronaut walking on the surface of the Moon gives the impression that he was bouncing while he walked. What is the reason for this?

1. The astronaut's mass on the Moon decreases.
2. The density of the astronaut on the Moon is higher than on Earth.
3. The atmosphere of the Moon affects the way the astronaut can move.
4. The astronaut's weight on the Moon depends on the Moon's gravitational force.

Refer to the picture of the satellite orbiting the Earth to help you answer this question.

3. According to the Law of Universal Gravitation, which satellite would experience the **least** amount of gravitational attraction to the Earth?

1. Satellite A 
2. Satellite B
3. Satellite C
4. Satellite D

Part 2: Balanced and Unbalanced Forces

**Essential Questions:** What are balanced and unbalanced force?

How do unbalanced forces cause a change in an object’s position, direction, and speed?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_– two forces, equal in size, acting in opposite directions on an object

* Anytime there is balanced force on an object, the object stays still **OR** continues to move at the same \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_in the same direction.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_– two forces that are not equal in size acting on an object

* Can cause an object to:
  + - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ –** the sum of all the forces acting on an object

* Measured in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (N)

Balanced forces – net force = 0, motion stays the same (\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)

Unbalanced forces – net force is NOT 0, motion will change (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)

Speed – amount of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

traveled divided by time – 55 mph (miles per hour, miles / hour)

Velocity - the rate at which an object changes its position in a specific \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (speed + a direction)

- distance traveled divided by time and add a direction to it: 55mph North

Isaac \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – very influential English physicist and mathematician in the 1600’s

* 3 laws of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (Newton’s Laws of Motion)
  + 1 – Inertia
  + 2 – Force and Acceleration
  + 3 – Action and Reaction

Recall: what is a law?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – the property of an object, due to its mass, by which it resists any change in its position unless overcome by a force  
  
  
Newton’s First Law – The Law of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + Inertia – the property of an object due to its mass, by which it resists any change in its position unless overcome by a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
  + An object at rest tends to stay at \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and an object in motion tends to stay in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
  + More specifically, if there is no \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, an object at rest will stay at rest and an object in motion will continue to move in the same direction at the same speed.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - The rate at which an object changes its speed or direction (speeding up, slowing down, or changing direction)  
  
 Newton’s Second Law

* The acceleration of an object depends on its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and force.
  + a = acceleration
  + m = mass
  + F = force

Newton’s Third Law

For every action there is an equal and opposite \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

- an action is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Can you explain how a rocket launches using this law?

Explain why Newton’s findings are laws and not theories.