

Physics: Forces and Motion

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PW: Physics

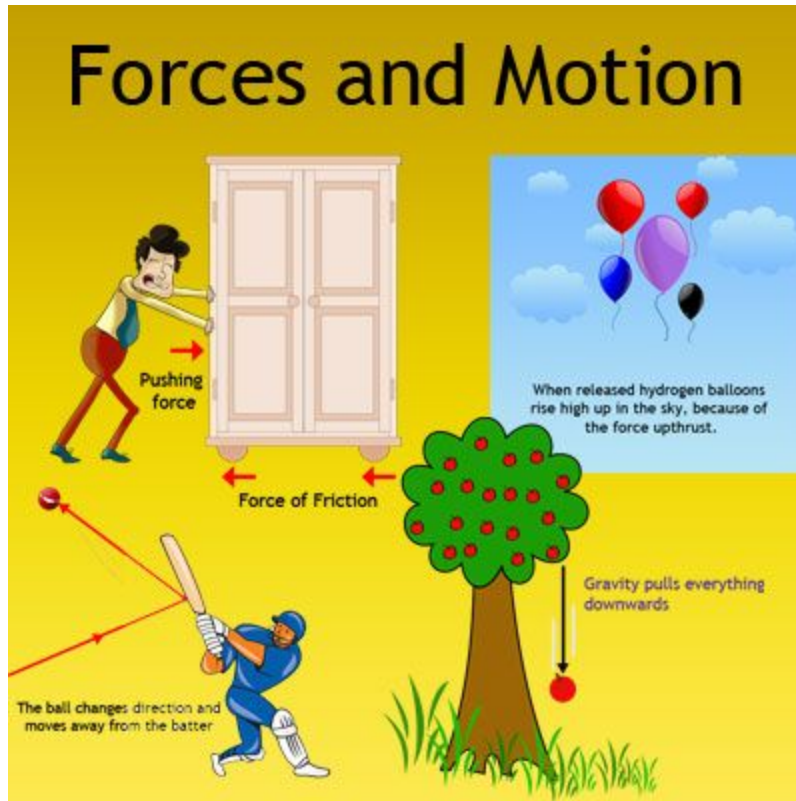
Essential understanding

- HS-PS2-1. Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
- HS-PS2-2. Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.
- HS-PS2-3. Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision
- HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
- HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.
- HS-ETS1-4. Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.



“Love is related to Newton’s Third Law, deeper the love equal amount of pain in the end” - Ruthvik suri

“I can calculate the motion of heavenly bodies but not the madness of people” - Isaac Newton



Overview

Students make predictions using Newton’s Laws. Students mathematically describe how changes in motion relate to forces. They investigate collisions in Earth’s crust and in an engineering challenge.

Lab Work

Labs will be done in groups

Lab Handouts: There may be a pre-lab for students to complete before the lab experiment, during the lab the students will gather the necessary data to complete the lab and answer the questions associated with the topic. After the necessary data is collected students will work on completing their Virtual or hardcopy lab notebook.

Lab Notebook: Every student is required to keep a lab notebook. The lab notebook will be each student’s personal “copy”. You will receive specific instructions on the lab notebook requirements.

→ This notebook will be graded on proper usage and completeness.

→ This can be a digital notebook.

Individual work (All Weeks)

- _ Participation/Classroom expectations
- _ Daily Question of the Day Journal

Guiding question: What is the science behind a collision and how does it change in a variety of contexts? (Cars vs Earthquakes vs Explosions?)

All Due Dates are posted in Schoology with Descriptions to the assignments.

Week 1 8/24 (Noon Dismissal)**Lessons**

- _ Introduction to class
- _ Study Guide

Group Work

- _ Motion Activity 60mins

Individual work

- _ Class Contract
- _ Setting up Digital Lab Notebook

Week 2 8/31**Lessons**

- _ Kinematics & Simple Motion

Group Work

- _ Interpreting graphs and equations 45 mins
- _ Competing arguments: Backwards acceleration 45 mins

Individual work

- _ Catching mistakes: The case of motion graphs 45 mins
- _ The meaning of speed 20 mins

Week 3 9/7 (No School Monday)

Group Work

_ Newton's Laws - Create "mini lessons" on the three laws of motion to present to the class.
60mins

1. Description
2. Examples of demonstrations.
3. Newton's Law of Motion - Organizer

Individual work

_ Velocity-Time Graphing the World 45 mins

Week 4 9/14

Lessons

_ Terminal Velocity & Gravity

Group Work

_ Acceleration due to Gravity reading 45mins
→ Explore your weight on different planets Activity

Individual work

_ Gravity Connection Problems 60mins

Assessment

_ FreeFall Guiding question Checkpoint 30 mins
_ Engineering Connection project- Testing Material Strength 2hr

Week 5 9/21

Lessons

_ Newton's Law of Motion - Organizer Review

Group Work

_ Inertia Stations 60mins

Assessment Project Due End of week

_ Engineering Connection - Testing Material Strength

Week 6 9/28

Lessons

_ The Forces of the World

Group Work

_ Friction & Tension Exploration 60 mins

Individual work

_ Calculating Net Force Practice 50 mins

_ The Law of Newton Practice 50 mins

Week 7 10/5

Project

_ Breaking down Life's Motion: 4hr

The motion of such things as a swinging trapeze artist, the crushing of a car door during a side impact, or the ground shaking during an earthquake can be broken down and analyzed qualitatively in terms of the three-dimensional forces acting on the objects at each moment during the motion

Week 8 10/12 (No School Monday)

Lessons

_ What is Momentum?

Individual work

_ Conservation of momentum & Explosions 60 mins

Project

_ Engineering Connection: Collision Challenge 3hr

Week 9 10/19 Quarter Ends

Individual work

_ Project Presentation

_Guiding Question Connections