

Forces Unit - FALL 2019

BIG IDEA: All interactions between objects are a result of the **four fundamental forces** of the universe: **gravitational, electromagnetic, strong and weak nuclear forces.**

DRIVING QUESTION: How can you explain the motion of objects based upon the forces that are acting upon them?

Date	During class we will...	Outside of class you should...
11/19-20	1. Start <i>Newton HD</i> E1-E2 2. Forces Blog & NGSS Roadmap	1. Review Newton HD
11/21-22	1. DEBRIEF Forces A1-2 2. Continue <i>Newton HD</i> E1-E2 (PhET labs) 3. Forces Blog & NGSS Roadmap	1. Review Newton HD 2. Finish PhET Lab (Forces & Motion)
11/23-12/1	THANKSGIVING BREAK !!	Spend time with family and friends
12/2-3	1. Submit & turn in Forces and Motion Lab (digital in Classroom & yellow copy in Class) 2. DEBRIEF Forces B1-3 & C1-2 3. Continue <i>Newton HD</i> E3-E5 4. Forces Blog & NGSS Roadmap	1. Study for Newton Quiz
12/4-5	1. Newton Quiz 2. Start <i>Forces that Act at a Distance (FAD) HD</i> E1-E5 (no E4) 3. Forces Blog & NGSS Roadmap	1. Review (FAD) HD
12/6-9	1. Continue <i>Forces that Act at a Distance (FAD) HD</i> E1-E5 2. DEBRIEF Forces D1-3 3. Forces Blog & NGSS Roadmap	1. Study for (FAD) Quiz
12/10-11	1. (FAD) Quiz 2. Finish <i>Forces that Act at a Distance (FAD) HD</i> 3. Introduce 3D FINAL - A Step Further 4. Forces Blog & NGSS Roadmap	1. Study for Forces Test
12/12-13	1. Forces Test 2. Work on 3D Final - content & presentation	1. Commit to 3 DCIs, 3 SEPs, & 3 CCCs
12/16-17	1. Work on 3D Final - content & presentation Submit 3D Final Video in GC by 3pm	1. Finish for 3D Final Presentations
12/18-20	3D Final: A Step Further~ Presentations NGSS Roadmap due	ENJOY WINTER BREAK !!

Guiding Questions (GQs) & Essential Understandings (EUs) - NGSS Aligned**A. How do vectors represent the motion of an object? Newton HD (HS-PS2-1)**

1. Be able to use vectors to identify the forces acting upon an object.
2. Use vectors to represent all the forces acting upon an object by drawing a 'free body' diagram. (F_g F_N F_f F_{app} F_{air} and later in (FAD)HyperDoc F_e)

B. How can Newton's second law accurately predict changes in the motion of macroscopic objects? Newton HD (HS-PS2-1)

1. Be able to name, describe and provide evidence for Newton's three laws.
2. Be able to calculate the net force (F_{net}) on a macroscopic object.
3. Be able to use the equation: $F = ma$ to solve for net force, mass or acceleration.

C. How can Newton's third law explain mathematically what can occur during a collision of objects? Newton HD (HS-PS2-2, 2-3)

1. Be able to use mathematical representations to support the claim that the total momentum is neither gained or lost within a closed system (conserved).
2. Given the momentum of two objects within a closed system, calculate the total momentum of the system.

D. How can the variables in Newton's Law of Gravitation and Coulomb's Law affect their respective forces? Forces that Act at a Distance (FAD)HD (HS-PS2-4)

1. Be able to differentiate between contact and action at a distance forces.
2. Be able to differentiate between gravitational and electromagnetic forces, both of which are action at a distance forces.
3. Be able to identify and apply the variables that influence the strength of both electromagnetic (F_e) and gravitational (F_g) forces.

A. NGSS Science & Engineering Practices (SEPs)

4. SEP1: Asking Questions and Defining Problems
5. SEP2: Developing and Using Models
6. SEP4: Analyzing and Interpreting Data
7. SEP5: Using mathematics and computational thinking
8. SEP6: Constructing Explanations and Designing Solutions
9. SEP7: Engaging in Argument from Evidence

A. 21st Century Technology Skills

10. Identify quality online resources (for 3D Final: A step further)
11. Choosing appropriate presentation technology
12. Curate a positive digital footprint