

# Forces & Interactions

## NEWTON'S HOUSE OF FORCES

Total Unit Running Time: 30-40\* minutes

### FIELD TRIP: **Concussion Testing At Purdue**

Running Time: 7:50

NGSS: HS-PS2-2, HS-PS2-3

Distinguish between a concussion and subconcussive forces while visiting the Biomedical & Mechanical Engineering Lab at Purdue University. VictoryXR's host, Jim Kent along with Professor Talavage and Professor Nauman, demonstrate drop tower testing and reveal the latest findings in force reduction for optimal helmet design.

For more information, visit [purdue.edu/research/png/research.php](http://purdue.edu/research/png/research.php)

### INTERACTIVE EXPERIENCE: **Force Field**

Running Time: Self-paced\*

Students enter the carnival-like arena for their chance to experience physics in a whole new way. Four different booths allow students to interact with and demonstrate Newton's 1st, 2nd, and 3rd Laws of Motion, as well as Coulomb's Law. By tossing balls and crates with a simple turn of their head, students witness the effects of mass and acceleration on an object's movement within an environment free of gravity and friction.

### STORY 1: **Isaac Newton, Pool Shark**

Running Time: 5:13

NGSS: HS-PS2-1, HS-PS2-2

#### Topics Covered

- Newton's 2nd & 3rd Laws of Motion
- The geometry of billiards
- Concepts of net force and energy transfer

#### Assessment Answer Key & Critical Thinking Skills

1. C (BT1—knowledge)
2. D (BT3—application)
3. B (BT2—comprehension)
4. A (BT2—comprehension)
5. C (BT6—evaluation)

### STORY 2: **Struck By Lightning**

Running Time: 6:08

NGSS: HS-PS2-4

#### Topics Covered

- Coulomb's Law in context
- Causes of lightning
- Concepts of streamers & step leaders

#### Assessment Answer Key & Critical Thinking Skills

1. A (BT1—knowledge)
2. C (BT2—comprehension)
3. D (BT4—analysis)
4. B (BT1—knowledge)
5. D (BT2—comprehension)

### TEACHER DEMO: **Transforming With Wendy**

Running Time: 6:09

NGSS: HS-PS2-5

Vocabulary: capacitor, resonance, electromagnetic induction

#### Topics Covered

- AC vs DC
- How a Tesla Coil functions

#### Assessment Answer Key & Critical Thinking Skills

1. A (BT1—knowledge)
2. D (BT3—application)
3. A (BT3—application)
4. B (BT5—synthesis)
5. D (BT4—analysis)

RELATED STEM CAREERS: Electrical Technician, Electrical Engineer, Sound Engineer

#### Science Standards:

**NGSS:** HS-PS2-1, HS-PS2-2, HS-PS2-3, HS-PS2-4, HS-PS2-5; **TEKS:** 112.38(c.3.D), 112.38(c.3.E), 112.38(c.3.F), 112.38(c.5.C), 112.38(c.5.F), 112.38(c.4.C), 112.38(c.4.D), 112.38(c.4.E), 112.38(c.4.G), 112.39(c.3.A), 112.39(c.3.B), 112.39(c.3.D), 112.39(c.3.E), 112.39(c.4.A), 112.39(c.4.B), 112.39(c.4.D), 112.39(c.4.E), 112.39(c.4.F), 112.39(c.5.C), 112.39(c.5.D), 112.39(c.5.E), 112.39(c.5.G); **CPALMS:** SC.912.N.1.1, SC.912.N.1.4, SC.912.N.1.6, SC.912.N.1.7, SC.912.N.2.5, SC.912.N.4.1, SC.912.P.10.1, SC.912.P.10.13, SC.912.P.10.15, SC.912.P.10.16, SC.912.P.10.17, SC.912.P.10.21, SC.912.P.12.2, SC.912.P.12.3, SC.912.P.12.5,