



Classroom Teacher Preparation

Physics 5: Pendulum Patterns

Please use the following to prepare for the next SfS lesson.

Description:

Students are introduced to pendulums and their periodic motion. After experimenting individually with pendulums of different lengths and bob masses, they systematically measure the period of pendulums with different lengths. Students will observe that a longer pendulum correlates to a longer period and use this pattern to predict the period for a fourth length.

Lesson Objectives – SWBAT (“Students Will Be Able To...”):

3rd-5th

- Predict the length of a pendulum’s period when the length of the chain is changed

Disciplinary Core Idea (DCI)

PS2 Motion and Stability: Forces and Interactions – PS2.A Forces and Motion; PS2.B – Types of Interactions

- (3rd-5th) The effect of unbalanced forces on an object results in a change of motion. Patterns of motion can be used to predict future motion. Some forces act through contact, some forces act even when the objects are not in contact. The gravitational force of Earth acting on an object near Earth’s surface pulls that object toward the planet’s center.

Science & Engineering Practice (SEP)

Planning and Carrying Out Investigations

- (3rd-5th) Make predictions about what would happen if a variable changes.

Crosscutting Concept (CCC)

Patterns

- (3rd-5th) Patterns can be used as evidence to support an explanation.

Preparation:

This lesson is an introduction to pendulums and periodic motion.

Room Set Up for Activities:

Students will work in groups of 3-4 (max of **10** groups) to measure the time it takes for a pendulum to complete 10 swings back and forth. They will test pendulums of different lengths and will need room to stand up and let a pendulum of approximately 82 cm swing. If possible, it would be helpful (but not required) for students to have surfaces available on which to brace their hands while holding the pendulums.

Safety:

Students should only use the pendulums as instructed.



Related Modules:

This lesson may be taught as part of a sequence or group of related modules on **Forces and Energy**. Modules include:

Physics 19: Friction – This lesson provides students with an introduction to the concept of friction and a chance to discover static and kinetic friction. Students explore the differences in frictional forces for different materials through experimentation. Older and younger versions are available.

Physics 16: Energy – This station-based module familiarizes students with many forms of energy. Students explore various conversions of energy through different activities.

For other module sequences and groups, look here: www.sciencefromscientists.org/sequences

Standards Covered:

Please click the following link to our website to review the standards covered by this lesson, listed by state: www.sciencefromscientists.org/standards/

Lessons are matched to both national NGSS and local state standards.

After Our Visit:

Extend this lesson by experimenting with the "incredible shrinking pendulum", a fun application of physics that makes for a neat trick.

Access this Extension activity by visiting the Classroom Post found on our website at sciencefromscientists.org/cohorts. Use the name of your school/cohort and password to log in.

To help Evaluate, check out our Open Response questions online at sciencefromscientists.org/open-response-questions. They are freely available for all of our lessons for current teachers. Use the password supplied by your instructor to log in.

Additional Resources:

- WGBH has a wide variety of pendulum-related videos and activities: http://mass.pbslearningmedia.org/search/?q=pendulum&selected_facets
- This video introduces pendulums through their relevance to circus performers: <http://mass.pbslearningmedia.org/resource/65508e65-74cc-40eb-aac9-6192b13a899a/65508e65-74cc-40ebaac9-6192b13a899a/>