

**REMOTE LEARNING LESSON PLANS**

The Remote Learning Lesson Plans are adapted from the IQWST Teacher Edition to support continuous learning. Each plan condenses what is taught with specific teaching recommendations and identifies the digital resources, print resources, and materials needed to teach and learn IQWST remotely.

|  |  |
| --- | --- |
| **UNIT TITLE** | **PS2** |
| **DRIVING QUESTION** | Why do some things stop while others keep going? |
| **UNIT STORYLINE** | [PS2 Storyline](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1571332396-ps2-3.0-storyline-with-appendix.pdf) |
| **IQWST OVERVIEW** | [IQWST 3.0 Overview](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1534960182-iqwst-3-0-overview.pdf) |
| **TEACHER EDITION**  | [Teacher Edition (PDF)](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1533150581-san-ps2stopv3-te.pdf) |
| **STUDENT EDITION**  | [Student Edition (PDF)](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1538757877-san-ps2stopv3-se-color.pdf) |
| **LESSON PLAN OVERVIEW** | [Remote Learning Overview](http://activatelearning.com/wp-content/uploads/2020/05/remote-lesson-plans-overview.pdf) |

|  |
| --- |
| **STUDENT MATERIALS:** Each student will need the following materials. Teachers can modify lessons based on which materials the students have access to. For Blended Learning options, teachers may draw from a combination of digital and print resources.  |
| **DIGITAL RESOURCES** | **PRINT RESOURCES** | **MATERIALS NEEDED** (FOR EACH STUDENT) |
| * Access to Interactive Student Edition
* Access to teacher-led lesson or video
* Access to IQWST lesson videos
* Audio recordings of readings

**Access from any device with a web browser.** * For PCs and Chromebooks, we recommend using **Chrome** as the browser
* For Macs and iOS, we recommend using **Safari** as the browser
* Internet Explorer is NOT supported
* Read the full Technical Requirements [here](https://s3.amazonaws.com/al.general/website/pages/ALDP%2BRequirements.pdf)

**Login:** <http://activatelearning.com/digital-resources/>* Select your program
* Enter the Username and/or Password provided by your teacher
 | * PS2 Student Edition
* Hard copies of selected Projected Images (PIs)

*Print student editions are necessary for students who do not have internet access (or reliable access).*  | **IQWST Equipment (from kit)\***-Pad of sticky notes-A simple, regular toy top to spin-Larger and smaller can-piece of modeling clay -toothpicks -marker -ruler-Rubber band, -(2) rulers, each with a different amount of flex/rigidity -(1) sheet of paper crumpled into a ball-(2) balls that bounce, one a significantly smaller size than the other-(1)string -(1) mass/weight that can be tied to the string -pencil -sheets of paper, tape -(2) clear cups/containers -liquid food coloring in squeeze bottle (or Ss need a dropper)-(2) pieces of aluminum foil -(2) pieces of bubble wrap or other plastic wrap -(2) pieces of felt or fabric that can get wet -(1) plate made of any material**Household Items**-sand, flour, sugar, cornmeal-Hot water, cold water-(2)ice cubes-2 rocks or marbles of different masses -pan containing at least 1 c loosely packed material (e.g., sand, flour, sugar, cornmeal) or a sandy area outdoors**Students may also need the following General Classroom Supplies (if not using the IDE):**Pencils and sharpenerColored pencils Black marker and/or ink penPlain paper for drawing (10-20 sheets)Glue stick or transparent tapePad of sticky notes Scissors*\* If kits have been purchased, they include enough equipment for 8 groups of 4 students. You will need additional equipment if you opt to provide materials to each student.* |

|  |
| --- |
| **Learning Set 1: What Determines How Fast or High an Object Will Go?** |
| **Lesson 1** **(1-2 sessions)**  | **Energy**  | [Download Lesson 1 Teaching Slides](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1589911888-PS2%20Lesson%201.pptx) |
| **ACTIVITY** | **TEACHING RECOMMENDATIONS** | **DIGITAL RESOURCES** | **PRINT RESOURCES** | **MATERIALS****FOR EACH STUDENT** |
| Activity 1.1 | **Anchoring Phenomena:** The radiometer demonstration and Newton vs. Goldberg Video illustrate phenomena that kick off the unit, but the devices in Activity 1.2 are phenomena that are revisited throughout the unit. If possible, demonstrate a radiometer and/or share Activity Video 1.1. Share Video: Newton vs. Goldberg (available on the Teacher Portal) Share PI: Newton vs. Goldberg Video ConversionsIntroduce the Driving Question Board (DQB): Throughout the unit, Ss record their own, original questions as they arise. See *IQWST Overview* for more information on how to use and manage the DQB. Discussion Prompts: Throughout the unit, teachers should: 1) choose discussion prompts applicable to remote learning and ability to discuss with Ss, or 2) have Ss write answers to teacher-selected prompts that can be added to the slide deck, if discussion is not possible, or 3) choose questions in take-home format for Ss to discuss remotely, perhaps writing responses that are then submitted. Ss can write questions on sticky notes and share as they would in class. Print users can post to the front of their SEs as a holding place during remote learning; IDE users can add new questions to the Questions space in IDE. If teachers use a digital DQB, Ss can also post there. Questions in the SEs: Throughout the unit, teachers should decide on the method by which the lesson will be delivered, and then have Ss ignore any questions in their SEs that do not fit the way in which the lesson needed to be enacted remotely. Teachers may provide a handout for print-only Ss who cannot access the curriculum remotely, so that they know which questions in their SEs they should respond to. Key: Cause and Effect--one thing can make something else happen.  | Access to Student Edition (SE) in Interactive Digital Edition (IDE) [Activity Video 1.1](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-radiometer-demo.mp4)[Video: Isaac Newton vs Rube Goldberg](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/PS2_se_v2_0_5_video-lesson_1_video_1-1026.mp4)Teacher-created DQB (e.g., jamboard, padlet) or physical DQB to share during virtual lessons. | Hard copy of the Student Edition (SE) to be used for all activities, readings, writing tasks. PI: Newton vs. Goldberg Video ConversionsSs will write questions on sticky notes, and post at the front of their SEs on the *Driving Question Notes* pages.  | Pad of sticky notes  |
| Activity 1.2*Observing Surprising Devices* | Share the Activity VideosSs will be unable to do this activity remotely, but because the devices are revisited throughout the unit, Ss need to observe the devices via a teacher demo--or will need to view the videos of each of the devices. If Ss have a regular, simple top, they will be able to participate by spinning it at the same time that the video of the spinning top is played (or the teacher demo is done). Their top will stop spinning long before the “secret” top does. The top can be spun by Ss, as well, as they think about questions teachers pose such as: What makes it start to spin? What makes it keep going once it starts? Why does it stop? Such questions can prompt thinking and spur new questions about other objects and motion.Key: To generate interest and raise questions about phenomena related to stopping, starting, and movement more generally.  | SE Act 1.1 & 1.2[Activity Video 1.2a](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-roll-back-can.mp4)[Activity Video 1.2b](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-simple-pendulum.mp4)[Activity Video 1.2c](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/activity-videos/ps2/PS2%2B-%2BJupiter%2BPendulum.mp4)[Activity Video 1.2d](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-infinity-pendulum.mp4)[Activity Video 1.2e](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-simple-spinning-top.mp4)[Activity Video 1.2f](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-infinity-spinning-top.mp4)[Activity Video 1.2g](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-infinity-pendulum.mp4) | SE Act 1.1 & 1.2  | A simple, regular toy top to spin |
| Reading One | *Perpetual-Motion Machines*See TE for Reading Intro and Followup.Key: Why do things start and stop? (Learning about *energy* is key to answering this question.) | SE Reading One | SE Reading One |  |

|  |  |  |
| --- | --- | --- |
| **Lesson 2** **(1-2 sessions)** | **Kinetic Energy** | [Download Lesson 2 Teaching Slides](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1589914400-PS2%20Lesson%202.pptx) |
| **ACTIVITY** | **TEACHING RECOMMENDATIONS** | **DIGITAL RESOURCES** | **PRINT RESOURCES** | **MATERIALS****FOR EACH STUDENT** |
| Activity 2.1 *Objects in Motion* | Given the likelihood of reduced time for remote learning, Activities 2.1 and 2.2 could be combined so that kinetic energy can be addressed in only 1 session. Share the two activity videosShare the Objects in Motion videoProject the PI: Energy Chart to use for discussion.Key: All objects that move do so because of energy. Kinetic energy [KE] is the energy of motion.  | SE Activity 2.1[Activity Video 2.1a](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-infinity-spinning-top.mp4)[Activity Video 2.1b](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-infinity-spinning-top.mp4)[Video: objects in motion](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/PS2_se_v2_0_5_video-lesson_2_video_2-1027.mp4) | SE Activity 2.1PI: Energy Chart  |  |
| Activity 2.2*Investigating Kinetic Energy* | If possible, demo this activity. Ss could do this investigation remotely if the materials were available to them. Otherwise:Share the Activity VideosShare PI: Kinetic Energ*y* ActivityShare Setup Video 2.2Note: Activity 2.2 could be combined with--or replaced by adaptations to--the investigation in Reading One in order to achieve the stated learning goal.Key: Kinetic energy increases as speed and/or mass increases. | SE Activity 2.2[Activity Video 2.2a](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-2.2.1-investigating-kinetic-energy--introducing-the-activity.mp4)[Activity Video 2.2b](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-2.2.2-investigating-kinetic-energy--investigating-the-effect-of-mass-on-the-amount-of-kinetic-energy.mp4)[Setup Video 2.2](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/PS2_se_v2_0_5_video-lesson_2-81.mp4) | SE Activity 2.2PI: Kinetic Energ*y* Activity | Larger and smaller can, piece of modeling clay, toothpicks, marker, ruler(Materials will be reused for Activity 3.1.) |
| Reading One | *Impact Craters*Ss could do the investigation in the reading remotely if the materials were available to them. GIven a ruler, then could collect quantitative as well as qualitative data. Key: The amount of kinetic energy varies with the speed and mass of an object.  | SE Reading One | SE Reading One | 1 ruler, 2 rocks or marbles or similar objects of different masses, pan containing at least 1 c loosely packed material (e.g., sand, flour, sugar, cornmeal) or a sandy area outdoors. (Materials will be reused for Activity 3.1.) |
| Activity 2.3*Predicting the Amount of Kinetic Energy in Scenarios*  | Share the two videos (in Teacher Portal) and the simulation.Consider the effect of mathematics variables (speed, mass) on energy.  Key: Kinetic energy increases as an object’s speed and/or its mass increase. | SE Activity 2.3[Video: Rube Goldberg machine](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/PS2_se_v2_0_5_video-lesson_1_video_1-1026.mp4)[Video: smoosh ball](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/PS2_se_v2_0_5_video-lesson_2_video_2-1028.mp4)[Simulation: spring mass](https://d16dnhlej6sizh.cloudfront.net/assets/media/sims/massspring.html) | SE Activity 2.3 |  |

|  |  |  |
| --- | --- | --- |
| **Lesson 3** **(1-2 sessions)** |  **Gravitational Energy** | [Download Lesson 3 Teaching Slides](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1589914495-PS2%20Lesson%203.pptx) |
| **ACTIVITY** | **TEACHING RECOMMENDATIONS** | **DIGITAL RESOURCES** | **PRINT RESOURCES** | **MATERIALS****FOR EACH STUDENT** |
| Activity 3.1*Investigating the Connection between Elevation and Energy* | Given the likelihood of reduced time for remote learning, Activities 3.1, 3.2, and 3.3 could be combined so that energy conversions of the pendulum and skate park are addressed in only 1-2 sessions. Share the Activity Videos and/or demo the pendulums as directed in the TE. Share Video 1.1: Isaac Newton vs. Rube Goldberg (Teacher Portal) Demo the adaptations to Activity 2.2, if possible. If Ss have the materials from Activity 2.2 or from Activity 2 Reading One, they can do this activity remotely.Key: Objects at a higher height (further from Earth’s surface) have more gravitational energy.  | SE Activity 3.1[Activity Video 3.1a](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-simple-pendulum.mp4)[Activity Video 3.1b](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-infinity-pendulum.mp4)[Activity Video 3.1c](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-3.1-investigating-the-connection-between-elevation-and-energy.mp4)[Video 1.1](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/PS2_se_v2_0_5_video-lesson_1_video_1-1026.mp4) | SE Activity 3.1 | Reuse materials from Lesson 2. |
| Activity 3.2*Gravitational Energy, Energy Conversions, and Energy Conversion Diagrams* | Share PIs: 1) Falling Object2) Bar Charts Teachers may want to share the completed work and discuss the conversion graphs, rather than construct the graphs.Key: Even if an object isn’t moving, it still has energy due to its mass and distance from Earth (its Gravitational Energy [GE]).  | SE Activity 3.2 | SE Activity 3.2PIs: •Falling Object•Bar Charts |  |
| Reading One | *Gravitational and Kinetic Energy*Key: Real-world application of principles to skateboards and roller coasters.  | SE Reading One | SE Reading One |  |
| Activity 3.3*Investigating How a Pendulum Works* | Given the likelihood of reduced time for remote learning, teachers may wish to share the completed work and discuss the conversion graphs, rather than to construct the graphs.Share the Activity Videos and/or simulations of the pendulum and skate park. Share PI: Energy Conversion DiagramKey: GE increases as an object’s mass or distance from Earth’s surface (its elevation) increases. Energy can be converted from one type to another.  | SE Activity 3.3[Activity Video 3.3a](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-simple-pendulum.mp4)[Activity Video 3.3b](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-infinity-pendulum.mp4)[Sim: pendulum](https://lab.concord.org/embeddable.html#interactives/inquiry-space/pendulum/1-pendulum.json)[Sim: Energy Skate Park](https://phet.colorado.edu/files/prototypes-2012/energy-skate-park/simulations/energy-skate-park/) | SE Activity 3.3PI: Energy Conversion Diagram |  |
| Checkpoint: Ss markings and explanations of the skateboard diagram in the reading can support teachers in gauging Ss understanding of GE and KE and the conversion of one type to another. Ss could also be asked to model and describe energy types and conversions of a playground swing, jumping up and down, or tossing an object into the air.  |

|  |  |  |
| --- | --- | --- |
| **Lesson 4** **(2 sessions)** | **Elastic Energy** | [Download Lesson 4 Teaching Slides](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1589914531-PS2%20Lesson%204.pptx) |
| **ACTIVITY** | **TEACHING RECOMMENDATIONS** | **DIGITAL RESOURCES** | **PRINT RESOURCES** | **MATERIALS****FOR EACH STUDENT** |
| Activity 4.1*What Happens to a Ball as It Bounces?* | Revisit rolling can from Lesson 1. Illustrate the elasticity of of a rubber band and bouncing ball for Ss.Ss who are able to handle remotely a rubber band and any kind of ball that bounces will better be able to investigate elasticity hands-on. Share PI: Final Energy ConversionShare videos in Teacher Portal.Share the Activity Videos.If time is a consideration during remote learning, Lesson 4, which addresses elastic energy, could be omitted. Or teachers could do Activity 4.1 only. Key: The energy associated with deformation of a ball is *elastic energy*. | SE Activity 4.1[Video: basketball bounce](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/PS2_se_v2_0_5_video-lesson_4_video_4-1023.mp4)[Video: soccer ball kick](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/PS2_se_v2_0_5_video-lesson_4_video_4-1024.mp4)[Video: reverse drop](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/PS2_se_v2_0_5_video-lesson_4_video_4-1025.mp4)[Activity Video: 4.1a](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-4-dropping-a-racquet-ball.mp4)[Activity Video: 4.1b](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-4-elastic-materials-demonstration.mp4) | SE Activity 4.1PI: Final Energy Conversion | Rubber band, any type of ball that can bounce |
| Activity 4.2*Investigating Elastic Energy* | Share the Activity Videos.If possible, demonstrate several of the objects from the kit. Key: The energy of objects that bounce (or have spring action) can be explained using a combination of elastic, gravitational, and kinetic energy and conversions between them.  | SE Activity 4.2[Activity Video: 4.2a](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-4.2-mouse-trap.mp4)[Activity Video: 4.2b](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-4.2-spring-in-a-can-%288x-slow%29.mp4)[Activity Video: 4.2c](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-4.2-inverted-half-ball-%288x-slow%29.mp4)[Activity Video: 4.2d](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-4.2-guitar-strings.mp4)[Activity Video: 4.2e](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-4.2-athletic-shoe-elasticity-test.mp4) | SE Activity 4.2 |  |
| Activity 4.3*What Determines How Much Elastic Energy an Object Can Have?* | Share: PI: Final Energy ConversionIf Ss were able to have the materials, they could investigate this phenomenon remotely. Otherwise, demo the activity, if possible, and share the videos. Key: Energy increases as the amount of deformation and/or rigidity increases. | SE Activity 4.3[Video: Rube Goldberg machine](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/PS2_se_v2_0_5_video-lesson_1_video_1-1026.mp4)[Activity Video 4.3a](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-4.3-sponge-ball-drop-test.mp4)[Activity Video 4.3b](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-4.3-marble-drop-test.mp4)[Activity Video 4.3c](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-4-slow-motion-racquet-ball-drop.mp4)[Activity Video 4.3d](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-4.3-clay-ball-drop-test.mp4)[Activity Video 4.3e](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-4.3-testing-elasticity-with-rulers.mp4) | SE Activity 4.3PI: Final Energy Conversion | (2) rulers, each with a different amount of flex/rigidity, (1) sheet of paper crumpled into a ball |
| Reading One | *Elasticity and the Body*Provides a life science connection, and everyday-experience context for in-class learning. Key: Elasticity is important to the body.  | SE Reading One | SE Reading One |  |
| Checkpoint: Ss could answer, “What determines how fast or how high an object will go?” using evidence from their activities to explain that the amount of energy is what matters---and that it is more or less depending on particular factors they have studied (e.g., energy from the hand putting an object in motion, amount of deformation/rigidity of a bouncing ball). |

|  |
| --- |
| **Learning Set 2: Why Do Some Things Stop?** |
| **Lesson 5** **(2-3 sessions)** | **Energy Systems, Transfer, and Conservation** | [Download Lesson 5 Teaching Slides](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1589914577-PS2%20Lesson%205.pptx) |
| **ACTIVITY** | **TEACHING RECOMMENDATIONS** | **DIGITAL RESOURCES** | **PRINT RESOURCES** | **MATERIALS****FOR EACH STUDENT** |
| Activity 5.1*Revisiting the Bouncing Ball* | Share the videos in the Teacher Portal.Share the Activity Video.Key: Investigating where the “missing” energy goes to hypothesize and stimulate new questions.  | SE Activity 5.1[Video: bouncing ball](https://d16dnhlej6sizh.cloudfront.net/assets/media/PS2-Video-5-1-Bouncing-Ball.m4v)[Video: ball from height](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/PS2_se_v2_0_5_video-lesson_5_video_5-1029.mp4)[Activity Video 5.1 Racquet Ball](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-4-slow-motion-racquet-ball-drop.mp4)[Video: pool balls](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/PS2_se_v2_0_5_video-lesson_5_video_5-1030.mp4) (billiards) | SE Activity 5.1 | Any type of ball that can bounce. |
| Activity 5.2*Demonstration: Bouncing Two Balls Together* | Teachers should demo the activity if possible and/or share the Activity Video. The predictions are especially important, as Ss are always surprised by what actually happens! Ss who have access to balls of different types and the space to do this activity (e.g., outdoors) could investigate this phenomenon remotely. Key: Energy can be transferred from one object to another.  | SE Activity 5.2[Activity Video 5.2](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-5.2-demonstration--bouncing-two-balls-together.mp4) | SE Activity 5.2 | (2) balls that bounce, one a significantly smaller size than the other |
| Activity 5.3*Observing Objects that Slow Down before They Stop* | Share the Activity Video or demonstrate, if possible. If Ss are able to have the materials, they could investigate this phenomenon remotely with a place to fasten the pendulum, or a helper to hold it in place against a table, chair, or counter.  Discuss starting and stopping points of the pendulum.Key. A pendulum swings less and less high, and slows down before it stops.  | SE Activity 5.3[Activity Video 5.3](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-5.3-observing-objects-that-slow-down-before-they-stop.mp4)  | SE Activity 5.3 | (1)string, (1) mass/weight that can be tied to the string, pencil, sheets of paper, tape |
| Activity 5.4*Energy Transfer and Systems* | Key. Conservation of Energy: Energy that appears to be “missing” is there somewhere, either transferred to another system or converted to another type that isn’t readily visible (e.g., sound) | SE Activity 5.4 | SE Activity 5.4 |  |
| Reading One | *Energy Transfer*Application of energy concepts (including transfer and conservation) in sports and other activities.Key: Things stop moving when all of their energy has been transferred to other objects or systems.  | SE Reading One | SE Reading One |  |

|  |  |  |
| --- | --- | --- |
| **Lesson 6** **(3 sessions)** | **Thermal Energy** | [Download Lesson 6 Teaching Slides](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1589914619-PS2%20Lesson%206.pptx) |
| **ACTIVITY** | **TEACHING RECOMMENDATIONS** | **DIGITAL RESOURCES** | **PRINT RESOURCES** | **MATERIALS****FOR EACH STUDENT** |
| Activity 6.1*Colliding Balls* | Share the Setup Video.Share the simulation for colliding balls, and/or demonstrate if possible. Key: Thermal energy is associated with an object’s temperature. Every object has thermal energy.  | SE Activity 6.1[Setup Video 6.1](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/PS2_se_v2_0_5_video-lesson_6-84.mp4)[Animation: colliding balls](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/Lesson6-Simulation_6.1_CollidingBalls.gif) | SE Activity 6.1 |  |
| Activity 6.2*Thermal Energy: Solids* | Share the animation for molecular motion.Teachers may want to share the completed table in TE with Ss and discuss.Key: Even when an object is stationary, the particles that make up the object are moving. | SE Activity 6.2[Animation: molecular motion](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/Molecular_Motion_in_a_Hot_and_Cold_Solid_Simulation2.gif) | SE Activity 6.2 |  |
| Activity 6.3*Molecules in Motion: Liquids and Gases* | Demo (against a white background) if possible. If Ss have access to materials, they could investigate this phenomenon hands on. Otherwise:Share the Setup Video.Share the Animations.Share the Activity Video.Key: Higher temperature means faster moving molecules, which means more kinetic energy and more thermal energy.  | SE Activity 6.3[Setup Video 6.3](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/PS2_se_v2_0_5_video-lesson_6-82.mp4)[Animation: liquid molecules](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/Molecular_Motion_in_a_Hot_and_Cold_Liquid_Simulation2.gif)[Animation: gas molecules](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/Lesson_6-Simulation_6.4_Molecular_Motion_in_a_Hot_and_Cold_Gas.gif)[Activity Video 6.3](https://iat.wistia.com/projects/f4kdyd9llg) | SE Activity 6.3 | Hot water, cold water, 2 clear cups/containers, liquid food coloring in squeeze bottle (or Ss need a dropper) |
| Activity 6.4*What Determines How Much Thermal Energy an Object Has?* | Show PI: Thermal EnergyKey: An object’s thermal energy increases as the motion of the particles of which it is made up increases. | SE Activity 6.4 | SE Activity 6.4PI: Thermal Energy |  |
| Reading Two | *Potential Energy*Key: All energy is either potential or kinetic.  | SE Reading Two | SE Reading Two |  |
| Checkpoint: The SE 6.4 Making Sense question provides an important checkpoint.  |

|  |  |  |
| --- | --- | --- |
| **Lesson 7** **(1 session)** | **Can Sound Make Things Stop?** | [Download Lesson 7 Teaching Slides](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1589914681-PS2%20Lesson%207.pptx) |
| **ACTIVITY** | **TEACHING RECOMMENDATIONS** | **DIGITAL RESOURCES** | **PRINT RESOURCES** | **MATERIALS****FOR EACH STUDENT** |
| Activity 7.1*What Is Sound Energy?*  | Share PI: Rolling Can.Share the video of vibrating guitar strings. Demo the rolling can, and if possible, a stringed instrument or can with a rubber band around it. Share the Activity Video( video has no sound - focus student attention on the movement of the strings)If time is a factor during remote learning, this lesson could be omitted.Key: When we hear sound, some energy is being transferred to the air.  | SE Activity 7.1[Video: vibrating guitar strings](https://youtu.be/ttgLyWFINJI)[Activity Video 4.2 Guitar Strings](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-4.2-guitar-strings.mp4) | SE Activity 7.1PI: Rolling Can |  |
| Reading One | *Sound Energy*Key: Sound (like light) travels in waves, and just as some light waves cannot be seen by the human eye, some sound waves cannot be heard by the human ear.  | SE Reading One | SE Reading One |  |

|  |
| --- |
| **Learning Set 3: Why Do Some Things Keep Going?** |
| **Lesson 8** **(3-4 sessions)** | **Chemical Energy** | [Download Lesson 8 Teaching Slides](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1589914728-PS2%20Lesson%208.pptx) |
| **ACTIVITY** | **TEACHING RECOMMENDATIONS** | **DIGITAL RESOURCES** | **PRINT RESOURCES** | **MATERIALS****FOR EACH STUDENT** |
| Activity 8.1*Thermal Energy in Chemical Reactions* | Share the Setup Video.Ss will be unable to experience this phenomenon remotely for safety reasons; therefore, share the Activity Video or demo the activity, if possible. Key: Chemical Energy can be converted to Thermal Energy (which increases the temperature of a system). | SE Activity 8.1[Setup Video 8.1](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/PS2_se_v2_0_5_video-lesson_8-85.mp4)[Activity Video 8.1](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-8.1-thermal-energy-in-chemical-reactions.mp4) | SE Activity 8.1 |  |
| Activity 8.2*The Paper Cup* | Ss will be unable to experience this phenomenon remotely for safety reasons; therefore, share the Activity Videos or demo the activity, if possible. See TE for set up directionsKey: Chemical Energy can be converted to Kinetic Energy (which causes something to move). | SE Activity 8.2[Activity Video 8.2a](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-8.2-the-paper-cup.mp4)[Activity Video 8.2b](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-8.3.2-experiment-2.mp4) | SE Activity 8.2 |  |
| Activity 8.3*How Much Chemical Energy Is There?* | Ss will be unable to experience this phenomenon remotely for safety reasons; therefore, share the Activity Videos or demo the activity, if possible.  Share the Setup Video.Share the Activity Video. Key: The amount of chemical energy is a function of the type of substance and of the mass of a substance. | SE Activity 8.3[Setup Video 8.](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/PS2_se_v2_0_5_video-lesson_8-1017.mp4)3[Activity Video 8.3](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-8.3.1-experiment-1.mp4) | SE Activity 8.3 |  |
| Activity 8.4*Chemical Energy Transformations* | Share PIs: * Engine
* Exercise
* Watch
* Fireworks

Key: Chemical energy in everyday/common phenomena. | SE Activity 8.4 | SE Activity 8.4PIs: •Engine•Exercise•Watch•Fireworks |  |
| Reading One | *Fuels*Provides real-world applications of chemical energy.Key: All fuels have energy that can be converted to other types of energy. | SE Reading One | SE Reading One |  |

|  |  |  |
| --- | --- | --- |
| **Lesson 9** **(2 sessions)** | **Electrical Energy** | [Download Lesson 9 Teaching Slides](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1589914784-PS2%20Lesson%209.pptx) |
| **ACTIVITY** | **TEACHING RECOMMENDATIONS** | **DIGITAL RESOURCES** | **PRINT RESOURCES** | **MATERIALS****FOR EACH STUDENT** |
| Activity 9.1*How Can I Move Energy?* | Ss will be unable to experience this phenomenon remotely for safety reasons; therefore, share the Activity Video or demo the activity, if possible. Share PI: Electrical and Water CircuitsKey: Electrical energy requires a closed circuit and an energy source (e.g., a battery).  | SE Activity 9.1[Activity Video 9.1](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-9.1-how-can-i-move-energy.mp4) | SE Activity 9.1PI: Electrical and Water Circuits |  |
| Activity 9.2*The Homemade Battery* | Ss will be unable to experience this phenomenon remotely; therefore, share the Setup Video or demo the activity, if possible. If time is a factor during remote learning, Activities 9.2 and 9.3 could be omitted. Key: Chemical energy can be converted to electrical energy.  | SE Activity 9.2[Setup Video 9.2](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/PS2_se_v2_0_5_video-lesson_9-1018.mp4) | SE Activity 9.2 |  |
| Reading One | *Batteries and Hydrogen Cells*Key: All batteries store chemical energy.  | SE Reading One | SE Reading One |  |
| Activity 9.3*What Does an Electrical Generator Do?* | Share PI: Electric GeneratorShare the Setup Video for this activity. Look very closely for the light flashing on and off in the lower left corner of the device.Share the Activity Video Key: Generating more energy than is possible with a battery.  | SE Activity 9.3[Setup Video 9.3](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/PS2_se_v2_0_5_video-lesson_9-1021.mp4)[Activity Video 9.3](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/ps2/ps2-9.3-what-does-an-electrical-generator-do.mp4) | SE Activity 9.3PI: Electric Generator |  |
| Checkpoint: Energy transformation/conversion from one form to another. |

|  |  |  |
| --- | --- | --- |
| **Lesson 10** **(1 session)** | **Can Light Make Things Stop or Start?** | [Download Lesson 10 Teaching Slides](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1589914826-PS2%20Lesson%2010.pptx) |
| **ACTIVITY** | **TEACHING RECOMMENDATIONS** | **DIGITAL RESOURCES** | **PRINT RESOURCES** | **MATERIALS****FOR EACH STUDENT** |
| Activity 10.1*How Light Makes Things Happen* | Re-demonstrate the Radiometer from Lesson 1, if possible, or share Activity Video 1.1. Share PIs* Traffic Light
* Plant
* Camera
* Suntan
* Solar Cooker

Share the video of vibrating guitar strings. Share the Activity Videos.Key: Light energy and sound energy are both types of energy, and a mechanism for transferring energy from one place to another. Sound waves and light waves move similarly.  | SE Activity 10.1[Activity Video 1.1](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/activity-videos/ps2/PS2%2B-%2BRadiometer.mp4)[Video: guitar strings](https://youtu.be/ttgLyWFINJI)[Activity Video: 10.1a](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/activity-videos/ps2/PS2%2B-%2BRadiometer.mp4)[Activity Video 10.1b](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/activity-videos/ps2/PS2%2B-%2B4.2%2B-%2BGuitar%2BStrings.mp4) | SE Activity 10.1 PIs:* Traffic Light
* Plant
* Camera
* Suntan
* Solar Cooker
 |  |
| Reading One | *Solar-Power Plants*Key: Reading provides other everyday examples and extends learning to pros/cons of various forms of generating electricity. | SE Reading One | SE Reading One |  |

|  |  |  |
| --- | --- | --- |
| **Lesson 11** **(1 session)** | **Concluding the Unit** | [Download Lesson 11 Teaching Slides](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1589914899-PS2%20Lesson%2011.pptx) |
| **ACTIVITY** | **TEACHING RECOMMENDATIONS** | **DIGITAL RESOURCES** | **PRINT RESOURCES** | **MATERIALS****FOR EACH STUDENT** |
| Activity 11.1 | Revisiting Learning Sets 1–3Summative Assessment (below) may be done now or following the Appendix Activity. Key: Summarize and Connect all activities.  | SE Activity 11.1 | SE Activity 11.1 |  |
| Reading One | *Examples of Energy Resources*Key: Extends learning by addressing various types of energy resources.  | SE Reading One | SE Reading One |  |

|  |
| --- |
| **Appendix** |
| **Appendix 1** **(0-1 session)** | **Ice Cube Challenges** | [Download Appendix 1 Teaching Slides](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1589914962-PS2%20Appendix%20Lesson%201.pptx) |
| **ACTIVITY** | **TEACHING RECOMMENDATIONS** | **DIGITAL RESOURCES** | **PRINT RESOURCES** | **MATERIALS****FOR EACH STUDENT** |
| Appendix Activity 1.1 | Ice Cube ChallengesThe teacher could demo this investigation, or if Ss have access to supplies, they could undertake Part 1 of this investigation remotely. Other materials could be used, as well, such as waxed paper, cardboard, styrofoam. Without access to an electronic balance, Ss will be able to collect qualitative data only as they observe differences. For safety reasons, Parts 2 and 3 cannot be done remotely.Given the likelihood of reduced time for remote learning, Appendix Activity 1.1 could be omitted. However, the hands-on nature of the activity, and the opportunity to design an investigation should not be passed up if it is possible for Ss to investigate the phenomenon. Key: GIven that energy transfers from hotter to colder areas, the type of material used to conduct or insulate affects energy transfer. | SE Appendix Activity 1.1 | SE Appendix Activity 1.1 | (2) ice cubes, (2) pieces of aluminum foil, (2) pieces of bubble wrap or other plastic wrap, (2) pieces of felt or fabric that can get wet, (1) plate made of any material |
| Appendix Reading One | *Transferring Thermal Energy with Materials*Key: More examples of thermal insulation and conduction. | SE Reading One | SE Reading One |  |

|  |
| --- |
| **SUMMATIVE ASSESSMENT:** There are many possible ways to wrap up this unit. Teachers should choose those that fit their Ss and their learning goals. Possibilities include the following: 1. Ask Ss to provide examples of energy transformations in everyday life (walking or riding to school, eating, texting, playing a sport or instrument, engaging in a hobby or activity) and share ideas about energy transfer or transformation in their examples.
2. Have Ss construct a complete scientific explanation to answer the Driving Question— Why Do Some Things Stop While Others Keep Going?—using examples from class investigations as evidence for the claim they make in response.
3. Ss might answer the following: If you were going to tell someone new to our school the most important things you have learned about energy, what would you tell them they need to understand?
4. Ss might make individual or collaborative books, videos, comic books, or other representations of energy transfer or energy transformation, or about specific instances, such as what makes a ball bounce or a pendulum swing or playground slide.
 |

***Teachers might choose to emphasize only a portion of this as a final assessment, given what they are able to teach and what Ss are actually able to do during this remotely taught unit.***