

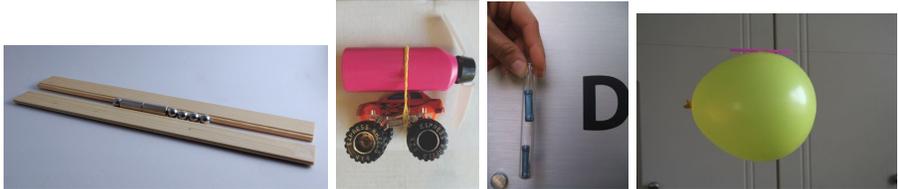
ALTERNATIVE LESSON PLANS FOR DISTANCE LEARNING

These alternative lesson plans condense what is taught and suggest ways to support students learning at home. We acknowledge that every situation is unique and strive to provide plans that can be used online or as printed packets. Focus on fewer scientific principles. Use print and audio readings. Share the videos that you can. Discuss if you can.

PS3 is an especially challenging unit to teach remotely due to the nature of the activities and apparatuses/devices needed. This alternative plan will give students the opportunity to make sense of how force influences motion, how to describe motion, and the relationship between force and energy. A great deal needs to be done via video given that students cannot access the equipment.

UNIT TITLE	PS3
DRIVING QUESTION	How will it move?

Lesson 1 (2 days)	Anchoring Activity and Driving Question Board
Activity 1.1	<p>Anchoring Activity: Share Image from TE p 5</p> <p>Student Activity Videos: https://iat.wistia.com/medias/byixq2x53x https://iat.wistia.com/medias/nomxralwka https://www.youtube.com/watch?v=Fog3mFN1eZ8 (optional)</p> <p>This video does not have the same set-up of steel balls and magnet that the curriculum does; however, it demonstrates clearly the unexpected action of the last ball that <i>appears</i> to fly off the end of the rail.</p> <p>Teachers and students will need to track scientific principles through the unit to be used to write a final scientific explanation for the magnetic cannon.</p>
Activity1.2	<p>Driving Question Board</p> <p>If you are able to have a discussion board or interact with your students, you will be able to generate student questions.</p>
Reading 1	<p><i>Newton's Cradle</i></p> <p>Student Activity Videos: https://iat.wistia.com/medias/t8v438jzh/ https://iat.wistia.com/medias/nqxaf8b1g/ https://iat.wistia.com/medias/euim5bla9w/</p> <p>Search for YouTube videos showing Newton's Cradle, such as https://www.youtube.com/watch?v=kA2vjXHnySU. Mute video, as the explanation given is more complex than needed.</p> <p>Ask students to make observations, and to explain GE and KE at various points.</p>

Lesson 2 (3 days)	Which Forces Act on an Object?
Activity 2.1	<p>Analyzing Apparatuses</p> <p>Show set-up video: https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/PS3_se_v2_0_5_video-lesson_2-1115.mp4</p> <p>Show apparatus videos: https://iat.wistia.com/medias/byixq2x53x https://iat.wistia.com/medias/lt1dmowfys https://iat.wistia.com/medias/s5ivlouemu https://iat.wistia.com/medias/toteqa759z</p> <p>https://www.youtube.com/watch?v=t9Jnyw0mCRg <i>optional</i></p> <p>Show images for devices: https://drive.google.com/file/d/1XJP0EfOWs8PRXcEvHPa2H8L6qqhh7-0-/view?usp=sharing</p> 
Activity 2.2	<p>Systems and Contact Forces</p> <p>Share PI:</p> <ol style="list-style-type: none"> 1) Vehicle in Tow 2) Two Hands 3) Pushing the Wall 4) Leaning Ladder 5) Shoe on a Shelf <p>You will need to provide discussion prompts for students.</p>
Activity 2.4 <i>Optional</i>	Provide images from TE of each apparatus TE pp 48-49, and have students explain the forces acting on each part.
Extension Activity	The World's Greatest Sandwich

	<p style="text-align: center;">Lesson 2 Homework Two: The World's Greatest Sandwich</p> <p>Ofra's Deli has the reputation of making the best sandwiches in the world. The photo shows Ofra's masterpiece, called the "Imperial." It is made of six layers—freshly-baked sourdough country bread, honey-smoked turkey breast, ruby-ripe vine tomatoes, Gouda cheese, Romaine lettuce, and another slice of bread. Ofra says the secret to her masterpiece is knowing exactly how much force each layer should apply to the others.</p> <p>Construct a model describing the "Imperial" as a system, its components, and the contact force pairs acting between the components. Also, make a table that lists the contact forces between the components.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td>Bread (top slice)</td></tr> <tr><td>Lettuce</td></tr> <tr><td>Cheese</td></tr> <tr><td>Tomatoes</td></tr> <tr><td>Turkey</td></tr> <tr><td>Bread (bottom slice)</td></tr> </table>	Bread (top slice)	Lettuce	Cheese	Tomatoes	Turkey	Bread (bottom slice)	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>Bread (bottom slice)</th> <th>Turkey</th> <th>Tomatoes</th> <th>Cheese</th> <th>Lettuce</th> <th>Bread (top slice)</th> </tr> </thead> <tbody> <tr> <th>Bread (bottom slice)</th> <td>-</td> <td>+</td> <td>-</td> <td>-</td> <td>+</td> <td>+</td> </tr> <tr> <th>Turkey</th> <td>+</td> <td>-</td> <td>+</td> <td>-</td> <td>-</td> <td>-</td> </tr> <tr> <th>Tomatoes</th> <td>-</td> <td>+</td> <td>-</td> <td>+</td> <td>-</td> <td>-</td> </tr> <tr> <th>Cheese</th> <td>-</td> <td>-</td> <td>+</td> <td>-</td> <td>+</td> <td>-</td> </tr> <tr> <th>Lettuce</th> <td>-</td> <td>-</td> <td>-</td> <td>+</td> <td>-</td> <td>+</td> </tr> <tr> <th>Bread (top slice)</th> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>+</td> <td>-</td> </tr> </tbody> </table> <p style="text-align: right; font-size: small;">LESSON 2 WHICH FORCES ACT ON AN OBJECT? 35</p>		Bread (bottom slice)	Turkey	Tomatoes	Cheese	Lettuce	Bread (top slice)	Bread (bottom slice)	-	+	-	-	+	+	Turkey	+	-	+	-	-	-	Tomatoes	-	+	-	+	-	-	Cheese	-	-	+	-	+	-	Lettuce	-	-	-	+	-	+	Bread (top slice)	-	-	-	-	+	-
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Reading 1	<i>Balance and Force</i>																																																								

Lesson 3 (2 days)	Why Does an Object Start Moving?
Activity 3.1	<p>Objects that Begin Moving</p> <p>Student Activity Videos: https://iat.wistia.com/medias/rigonhr8kb https://iat.wistia.com/medias/gre8n9w85l</p> <p>Share set up video: https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/PS3_se_v2_0_5_video-lesson_3-1116.mp4</p>
Activity 3.2	<p>More Objects that Begin Moving</p> <p>Share video:https://iat.wistia.com/medias/wrty0go3dk</p>
Extension Activity	Heavy-Duty Shopping
Reading 1	<i>Why Does an Object Start Moving?</i>

Lesson 4 (2 days)	How Strong Is That Force?
Reading 1	<i>What Keeps Things from Moving?</i>
Reading 2	<i>Who Will Win a Tug-of-War?</i>

Lesson 5 (1-2 days)	Why Does an Object Stop Moving
Activity 5.1	A Book that Stops Moving
Reading 1	<i>What Affects How Quickly Something Stops Moving</i>

Lesson 6 (3 days)	How Can We Describe How an Object Moves?
Activity 6.1	<p>Graphs that Show When a Ball Moves</p> <p>Share PI:</p> <ol style="list-style-type: none"> 1) Newton’s Cradle 2) Balls in Motion 1 3) Balls in Motion 2 <p>Student Activity Videos: https://iat.wistia.com/medias/t8v438jzhl Newton’s Cradle: search for YouTube video of Newton’s Cradle, such as: https://www.youtube.com/watch?v=kA2vjXHnySU (Mute the video.)</p> <p>You may want to provide graphs for students and talk through them rather than have students construct the graphs; otherwise, Lesson 6 might need to be skipped.</p>
Activity 6.2	<p>Graphs that Show How a Ball Moves</p> <p>Share PI:</p> <ol style="list-style-type: none"> 1) Newton’s Cradle Drawing 2) Ball in Motion 3 3) Balls in Motion 4
Activity 6.3	<p>Motion Graphs for the Magnetic Cannon</p> <p>Share PI: Magnetic Cannon</p>

Lesson 7 (2 days)	Why Do Things Change Their Speed or Direction?
Activity 7.1	<p>Changing Speed</p> <p>Share videos with students. If able to discuss live, use discussion questions from TE pp 207-208. Otherwise, post discussion prompts to focus student attention on the “types of motion change”: beginning to move, stopping, slowing down, and speeding up.</p> <p>https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/PS3_se_v2_0_5_video-lesson_7_video_7-1113.mp4</p> <p>https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/PS3_se_v2_0_5_video-lesson_7_video_7-1118.mp4</p> <p>https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/PS3_se_v2_0_5_video-lesson_7_video_7-1117.mp4</p>
Activity 7.2	<p>Changing Direction</p> <p>Share video: https://iat.wistia.com/medias/elz14qpwle</p>
Extension/Homework Activity	<p>One: Force and Motion</p>

Lesson 8 (1 day)	Using Forces and Energy to Understand the Magnetic Cannon
Activity 8.1	Revisiting and Summarizing the Scientific Principles Provide students with a list of the Scientific Principles that have been developed to facilitate their summarization of activities and readings that have helped them to construct understanding over time. Use the list of scientific principles identified in the TE, as needed, to support student learning.
Activity 8.2	Can We Explain the Behavior of the Magnetic Cannon?

Appendix Lesson 1	Designing the Best Electromagnet
Reading 1	<i>How Do Electromagnets Work? (reading only)</i>

Appendix Lesson 2	The Universe
Reading 1	<i>Studying the Universe (reading only)</i>

SUMMATIVE ASSESSMENT: Students will construct a complete, evidence-based explanation of the behavior of the Magnetic Cannon and answer the Driving Question “How will it move?” You might choose to emphasize only a portion of this as a final assessment, given what you are able to teach and what students are actually able to do during this remotely taught unit.