WORKSHOP GUIDE

AAPT RTP/ILD Virtual Workshop—July 16, 2022

Fun, Engaging, Effective, Research-Validated Introductory Labs and Demos, Including Virtual Learning Options

Workshop Hands-On #1—Activities from RTP Module 1: Mechanics, Lab 2: Changing Motion (20 min)

1. Go to http://pages.uoregon.edu/sokoloff/WorkshopMechLab2Intro.pdf to download the introductory material PDF.
   - Look over the Table of Contents of Module 1 on page ix.
   - Look over the Pre-Lab Sheet for Lab 2 on page 31.
   - Look at the Objectives, Overview, and Investigations 1 and 2, pp. 33-40.
2. Go to http://pages.uoregon.edu/sokoloff/WorkshopMechLab2Activity.pdf to download Investigation 3.
3. Do Activity 3-4 in Investigation 3 beginning on p. 41:
   - Make Predictions 3-3 and 3-4 and discuss them in your small group.
   - Follow the directions in red to view what computer-based measurements of the motion of the cart using a motion sensor look like. After viewing the video, use the back arrow in your browser to return to the lab PDF.
4. Look over the Challenge on p. 50.
   - Fill in the predictions in the table.
   - Observe the video to see the nice analogy between the motion with constant acceleration in Activity 3-4 and the motion of a ball tossed straight upward. (This experiment is actually done with a motion sensor on the floor in Lab 6.)
5. Look over the Homework for Lab 2 on pages 51-59.

Workshop Hands-On #2-Activities from RTP Module 1: Mechanics, Lab 10: Two-Dimensional Motion—Projectile Motion (15 min)

Go to http://pages.uoregon.edu/sokoloff/WorkshopMechanicsLab10.pdf to download this lab writeup.

1. Look over the introduction on pages 221-222.
2. Make Predictions 2-1 and 2-2.
3. Do Activities 2-1 and 2-2 on pages 223-226. Follow the directions in red to view how video analysis can be used to examine projectile motion.

Workshop Hands-On #3—Activities from RTP Module 3: Electricity and Magnetism, Lab 5: Current in Simple DC Circuits (15 min)

Go to http://pages.uoregon.edu/sokoloff/WorkshopE&MLab5.pdf to download this lab writeup.

1. Look over the Table of Contents of Module 3.
2. Look over the Pre-Lab Sheet for Lab 5 on page 77.
3. Look at the Objectives and Overview on pp. 79-80.
4. Do Activities 2-1, 2-2 and 2-3 on pages 86-91.
   - Make Prediction 2-1 and discuss it in your small group.
   - Follow the directions in red to view a video of the experiment.
   - Make Predictions 2-2 and 2-3 and discuss them in your small group.
   - Follow the directions in red to view the computer-based sensor results for Activity 2-2.
   - Make Prediction 2-4 and discuss it in your small group.
   - Follow the directions in red to view the computer-based sensor results for Activity 2-3.
5. Look over the Homework for Lab 5 on pages 97-101.

Workshop Hands-On #4—Interactive Lecture Demonstrations (ILDs) Examples from Introduction to Heat and Temperature

1. See sample *ILD* Prediction and Results sheets on pages 3-6 of this Workshop Guide.
2. The entire book ***Interactive Lecture Demonstration***s can be downloaded at:
   http://pages.uoregon.edu/sokoloff/ILDbook0116.pdf

Virtual Learning Options (10 min)

(1) Workshop Hands-On #5—Home-Adapted ILDs *Force and Motion—Newton's 3rd Law* (10 min)

Information and free curricular materials are available at:

http://pages.uoregon.edu/sokoloff/HomeAdaptedILDs.html

Follow the above link to the Home-Adapted ILD webpage.

1. Open the Home-Adapted ILD sequence *Force and Motion—Newton's 3rd Law*.
2. Read the Directions. Download the Prediction Sheet.
3. Do Demonstrations 4 and 6.

(2) RTP Adapted for IOLab

Information and free curricular materials are available at:

https://pages.uoregon.edu/sokoloff/IOLabInst32120.html

Examples will be demonstrated during the workshop.

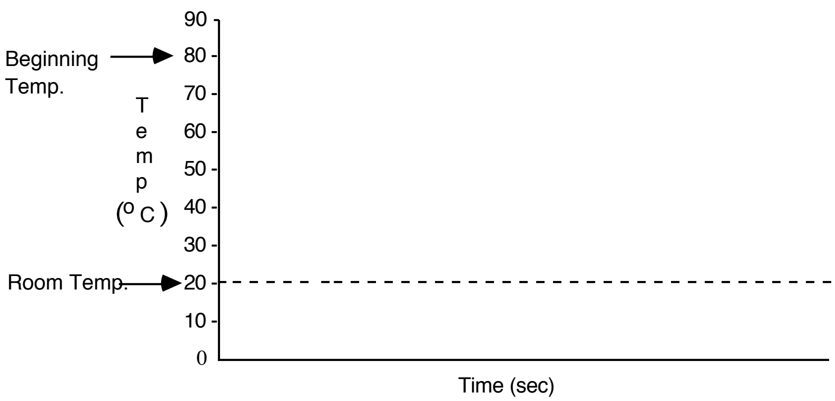
Hand in this sheet **Name_____________________________**

INTERACTIVE LECTURE DEMONSTRATIONS
PREDICTION SHEET— **INTRODUCTION TO HEAT & TEMPERATURE**

Directions: This sheet will be collected. Write your name at the top to record your presence and participation in these demonstrations. Follow your instructor's directions. You may write whatever you wish on the attached Results Sheet and take it with you.

Demonstration 1: A small piece of metal has been raised to a high temperature, around 80-90°C. Sketch below your prediction for the temperature-time graph for the piece of metal cooling in the room air. Be sure to carefully sketch the shape of the curve.

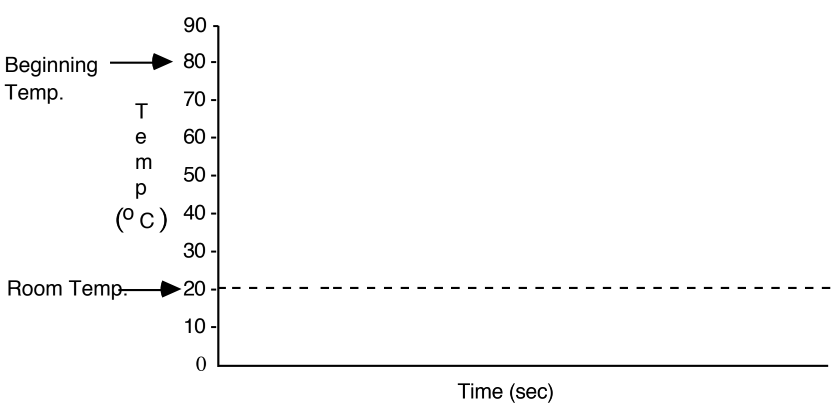
What do you think the final temperature of the metal will be? Zero degrees C? Room temperature? Something different?



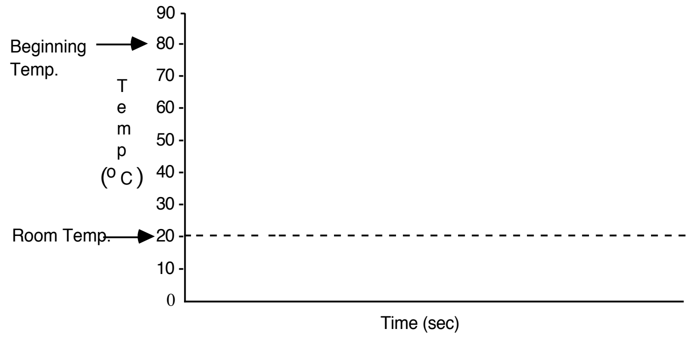
Demonstration 2: Now the same piece of metal at a high temperature (around 80-90°C)) is immersed in a cup filled with cool water (around 20°C). Sketch below your predictions for the temperature-time graphs of the piece of metal and the water in the cup. Be sure to carefully sketch the shapes of the curves.

What do you think the final temperature of the metal will be? (Zero degrees C? Midway between the initial temperatures of the water and the metal? Closer to the initial water temperature? Closer to the initial metal temperature? Other?)

What do you think the final temperature of the water in the cup will be?



Demonstration 3: Now a small film container filled with water at a high temperature (around 80-90°C) is immersed in a cup filled with room temperature water (around 20°C). Sketch below your predictions for the temperature-time graphs of the film container of hot water and the water in the cup. Be sure to carefully sketch the shapes of the curves.

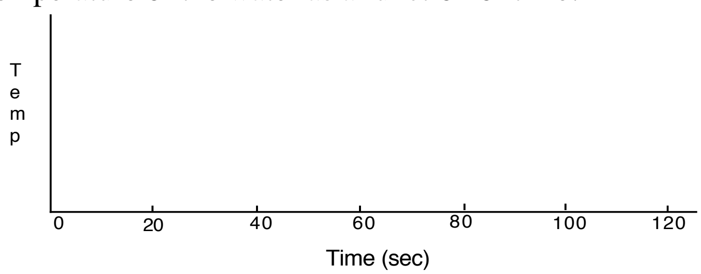


Compare these temperatures to those in Demonstration 2.

What do you think the final temperature of the water in the film container will be? (Zero degrees C? Midway between the initial temperatures of the water in the film container and water in the cup? Closer to the initial film container water temperature? Closer to the initial cup water temperature? Other?)

What do you think the final temperature of the water in the cup will be?

Demonstration 4: Heat is transferred to water in a perfectly insulated cup (no heat can leak in or out) at a steady rate for 80 seconds, and then no more heat is transferred. Sketch below your prediction for the graph of the temperature of the water as a function of time.



Demonstration 5: A heat pulser can transfer a fixed amount of heat into water for each pulse. The temperature of a small amount of water increases by 8°C when 3 pulses are delivered.
What is the temperature change when 6 pulses of heat are transferred to the water?

What happens when 3 pulses are transferred to twice as much water?

Does the same amount of heat always produce the same temperature change even in different amounts of water?

Demonstration 6: You saw that a hot piece of metal cooled down in the room in an earlier demonstration. Hot water would do the same. You also saw the temperature of cold water increase when heat was transferred to it. We want to keep some water at 80°C for 100 seconds in a room where the temperature is 20°C. If it took 12 heat pulses to do so, predict how many pulses would it take to keep the same water at 50°C for 100 seconds under the same circumstances. Explain your reasoning.

How many pulses would it take to keep the water at 20°C (room temperature)?

Keep this sheet

INTERACTIVE LECTURE DEMONSTRATIONS
RESULTS SHEET— **INTRODUCTION TO HEAT & TEMPERATURE**

You may write whatever you wish on this sheet and take it with you.

Demonstration 1: A small piece of metal has been raised to a high temperature, around 80-90°C. Sketch below your prediction for the temperature-time graph for the piece of metal cooling in the room air. Be sure to carefully sketch the shape of the curve.

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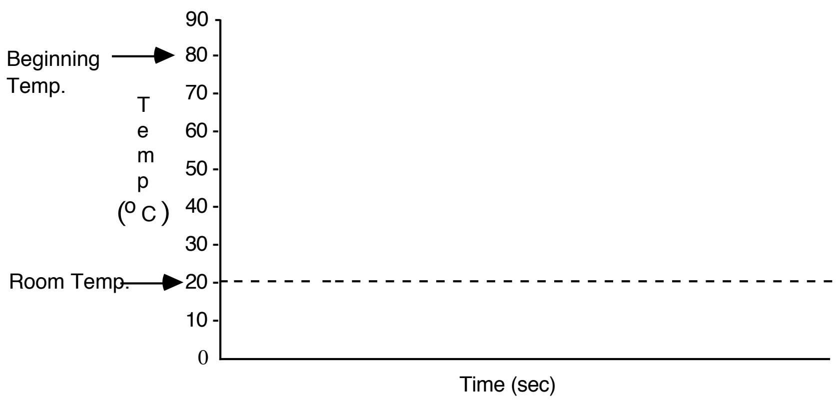
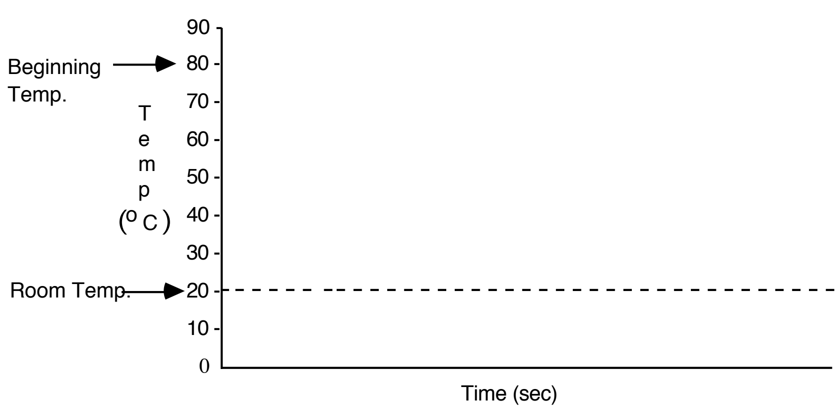


Demonstration 2: Now the same piece of metal at a high temperature (around 80-90°C)) is immersed in a cup filled with room temperature water (around 20°C). Sketch below your predictions for the temperature-time graphs of the piece of metal and the water in the cup. Be sure to carefully sketch the shapes of the curves.

What do you think the final temperature of the metal will be? (Zero degrees C? Midway between the initial temperatures of the water and the metal? Closer to the initial water temperature? Closer to the initial metal temperature? Other?)

What do you think the final temperature of the water in the cup will be?



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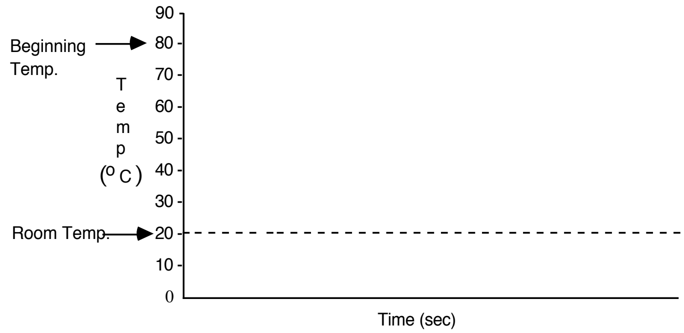

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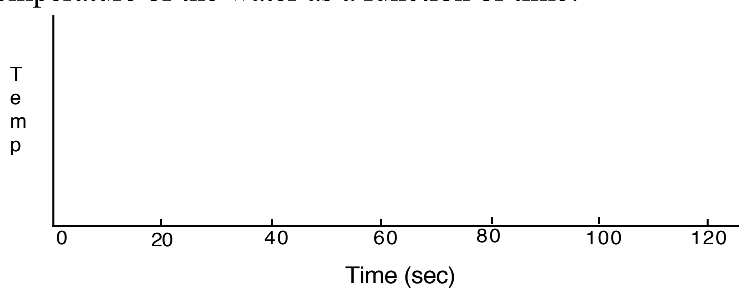

Demonstration 5: A heat pulser can transfer a fixed amount of heat into water for each pulse. The temperature of a small amount of water increases by 5°C when 3 pulses are delivered.
What is the temperature change when 6 pulses of heat are transferred to the water?

What happens when 3 pulses are transferred to twice as much water?

Does the same amount of heat always produce the same temperature change even in different amounts of water?

Demonstration 6: You saw that a hot piece of metal cooled down in room temperature air in an earlier demonstration. Hot water would also do the same. You also saw the temperature of cold water increase when heat was transferred to it. We want to keep some water at 80°C for 100 seconds in a room where the temperature is 20°C. If it took 12 heat pulses to do so, predict how many pulses would it take to keep the same water at 50°C for 100 seconds under the same circumstances. Explain your reasoning.

How many pulses would it take to keep the water at 20°C (room temperature)?