

Equilibrium Experiment

Student Handout Experiment Activity 8

Part A. Trials:

Complete these steps before each trial:

1. Read the procedure.
2. Answer the prediction question.
3. Have a watch, phone, or [this online stopwatch](#) ready to time for your partner.

Trial 1: Maintain the water level

Predict: What do you think will happen to the volume of water in the middle cup over time?

Procedure 1: If you are performing the pouring part of this trial at home.

1. *Before completing the official trial 1 rounds, practice performing the trial until you can complete the procedure correctly.*
2. Plug the bottom hole with your finger and fill the center cup up to the top mark with water.
3. Unstopper the hole on the bottom of the cup and begin pouring water from the holding container at the same time.
4. Ask your partner to start timing right when you unstopper the hole and begin pouring.
5. Keep the water level at the top mark on the side of the cup until you run out of water to pour.
6. Ask your partner to stop timing right when you run out of water to pour.
7. Observe what happens to the water level as you pour.
8. Fill out the data table with your results.
9. Refill your pouring container and replace any spilled water.

If you are confused by the procedure, watch [this video](#) before performing the trial.

Procedure 2: If you are performing the pouring part of this trial virtually.

- 1) Watch [this video](#) of the trial.
- 2) Start and stop timing when indicated by the person in the video.
- 3) Observe what happens to the water level as the person pours water into the cup.
- 4) Fill out the data table with your results.

If both you and your partner are performing Procedure 2, whoever goes second should use [this video](#) instead of the video linked in step 1.

Trial 2: Pour the water more slowly

Predict: What do you think will happen to the volume of water in the middle cup over time when you pour more slowly?

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Procedure 1: If you are performing the pouring part of this trial at home.

1. *Before completing the official trial 1 rounds, practice performing the trial until you can complete the procedure correctly.*
2. Plug the bottom hole with your finger and fill the center cup up to the top mark with water.
3. Unstopper the hole on the bottom of the cup and begin pouring water from the holding container at the same time.
4. Ask your partner to start timing right when you unstopper the hole and begin pouring.
5. Pour the water more slowly than in Trial 1. Try to double the pour time recorded in Trial 1 (don't worry about trying to double the time exactly, just pour more slowly).
6. Ask your partner to stop timing right when you run out of water to pour.
7. Observe what happens to the water level as you pour.
8. Fill out the data table with your results.
9. Refill your pouring container and replace any spilled water.

If you are confused by the procedure, watch [this video](#) before performing the trial.

Procedure 2: If you are performing the pouring part of this trial virtually.

- 1) Watch [this video](#) of the trial.
- 2) start and stop timing when indicated by the person in the video.
- 3) Observe what happens to the water level as the person pours water into the cup.
- 4) Fill out the data table with your results.

If both you and your partner are performing Procedure 2, whoever goes second should use [this video](#) instead of the video linked in step 1.

Trial 3: Pour the water more quickly

Predict: What do you think will happen to the volume of water in the middle cup over time when you pour more quickly?

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Procedure 1: If you are performing the pouring part of this trial at home.

1. *Before completing the official trial 1 rounds, practice performing the trial until you can complete the procedure correctly.*
2. Plug the bottom hole with your finger and fill the center cup up to the top mark with water.
3. Unstopper the hole on the bottom of the cup and begin pouring water from the holding container at the same time.
4. Ask your partner to start timing right when you unstopper the hole and begin pouring.
5. Pour the water more quickly than in Trial 1. Try to half the pour time recorded in Trial 1 (don't worry about trying to double the time exactly, just pour more slowly).
6. Ask your partner to stop timing right when you run out of water to pour.
7. Observe what happens to the water level as you pour.
8. Fill out the data table with your results.
9. Refill your pouring container and replace any spilled water.

If you are confused by the procedure, watch [this video](#) before performing the trial.

Procedure 2: If you are performing the pouring part of this trial virtually.

- 1) Watch [this video](#) of the trial.
- 2) Start and stop timing when indicated by the person in the video.
- 3) Observe what happens to the water level as the person pours water into the cup.
- 4) Fill out the data table with your results.

If both you and your partner are performing Procedure 2, whoever goes second should use [this video](#) instead of the video linked in step 1.

Part B. Analysis: Determining equilibrium of the experimental system.

- 1) Graph how the water level in the center cup changed over time for each trial in the graphs provided on the slides below your data table. Type your pour time for each trial in the text box provided on the X-axis of the graph.
- 2) What are the flows and reservoirs in this experiment?

List Reservoirs:

- 1)
- 2)
- 3)

List Flows:

1)

2)

Answer the following discussion questions after a brief class discussion.

Discussion

- 1) Decide if the central reservoir (the cup or bottle with a hole) was in equilibrium (stable) or nonequilibrium (unstable) during trials 1, 2 and 3. Highlight your answer.

Trial 1:	Equilibrium	Nonequilibrium
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Trial 2:	Equilibrium	Nonequilibrium
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Trial 3:	Equilibrium	Nonequilibrium
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- 2) Explain why you circled equilibrium or nonequilibrium for each trial. Write a 1 sentence explanation per trial.

Trial 1:

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Trial 2:

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Trial 3:

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