Practical lesson 10.10 Linear elastic collision between trolleys – conservation of momentum

Recommended teaching time for this lesson: 1 x 60 minute period

• 25 minutes of explicit teaching (including suggested classroom activities)

• 35 minutes of practical work

• 15 minutes homework

Curriculum links

Science inquiry

* Investigate a linear elastic collision between two objects.

Advice for teaching this lesson

Things to know before you start teaching

A risk assessment and lab technician notes are available for this practical.

Risk assessment

Lab technician notes

A video demonstration is also available.

Video demonstration

Preparation

Consult with your lab technician on the minimum time required by your school prior to teaching this lesson, as materials may need to be ordered or prepared.

Ask students to read through the practical and risk assessment as homework prior to the practical class. You may also ask students to watch the video demonstration.

Potential difficulties

* Keeping one of the carts stationary can be troublesome depending on the quality of your tracks. Consider using a level if this is required for a student experiment.

Expected results

Go to the Practical answers for sample data.

Additional resource: Practical answers

When cart 2 is heavier than cart 1, the moving cart will bounce off. Momentum will split proportional to the mass. When cart 1 is heavier than 2 cart, both will continue with forward momentum with the velocity split proportional to mass. Analysing this proportion can make for a good student experiment.

Practical alternatives

Instead of using a recording device, digital smart carts can do the recording for you.

PhET has a good collision simulator that could be used to generate exemplar data or as a replacement for lab work if needed: <https://phet.colorado.edu/sims/html/collision-lab/latest/collision-lab_all.html>

Starter activity: Practical overview

Approximate time: 5 minutes

**Activity placement:** Place directly above “Aim”

**Activity summary:** An overview of the purpose of the practical.

Notes for the teacher

Read the aim out loud and relate it to the science understanding subject matter students have been learning about.

Instructions for students

* Think about what you will learn by doing this practical activity.

Practical: Method and safety discussion

Approximate time: 10 minutes

**Activity placement:** Place directly above “Method”

**Activity summary:** A run through of the practical method and discussion of any safety considerations.

Notes for the teacher

Run through the method with students.

Students should have reviewed the risk assessment as homework prior to this lesson. Ask them to identify the safety considerations. Prompt students until all considerations have been identified.

Remind students of best practice to ensure safety in the laboratory or classroom.

Instructions for students

* Listen to your teacher run through the practical method.

Discussion questions

1. What are the key safety considerations for this practical?
2. What measures should you take to protect yourself and others?
3. What are the disposal methods for the materials you will be using?

Helpful hints

* Refer to this practical’s risk assessment to help you answer the questions.

Risk assessment

Answers

1. Ensure carts do not fall onto feet or pinch fingers.
2. Keep hands clear of moving carts. Ensure that tracks are back from the edge of the lab bench.
3. Not applicable

Practical: Results discussion

Approximate time: 10 minutes

**Activity placement:** Place directly above “Discussion”

**Activity summary:** A class discussion about the results.

Notes for the teacher

Instruct students to complete the discussion questions in their logbooks.

During the last five minutes of class come together to discuss the results of the practical, including identification of errors, mistakes and anomalies, and clarification of any misconceptions.

Assign any incomplete questions for homework.

Instructions for students

* Answer the Results and Discussion questions.
* Consider your results and identify any suspected errors, mistakes and anomalies.
* Discuss these with the rest of the class.