

Build a linear accelerator model

Activity worksheet

Your name _____

Task A: Prediction

What do you think will happen when you release one steel ball at the start of the track?

Task B: Change the variables

How could you change the starting energy of the first ball?

Which other variables could you change?

What do think will happen when you change each of these variables? Discuss in pairs.

Task C: Questions

Which types of energy are being demonstrated?

What kind of energy transfers are happening?

Where does the kinetic energy of the accelerating balls come from in the system?

Optional extension: Measuring acceleration

Measure the precise distance between each set of magnets.

Time how long it takes from the first ball being released to each strike. You may find it easier to film it using the slow-motion function on a smartphone.

Using these measurements, determine the average speed of each ball.

Ball number	Distance travelled (m)	Time taken (s)	Average speed (m/s)

By how much does the kinetic energy increase between each impact?

Task D: Add a target to demonstrate spallation

Take a look at how the European Spallation Source (ESS) works at www.ess.eu/explore.

At ESS, the target is made from tungsten, and the neutrons from the tungsten atoms are released when struck with protons that have been accelerated using a linear accelerator.

1. Place a tray at the end of your track.
2. Put a bunch of at least eight small steel balls at the end of the track as your 'target'.
3. Now release the first steel ball on the track and observe carefully.

Describe what happens when an accelerated ball hits the target:

