

Achievements and Competencies

Learning Outcomes

Grades 10-12
Force, motion and work
Fields
From structures to properties

Achievements and Competencies are based on the Common Framework of Science Learning Outcomes (K-12) set by the Canadian Council of Ministers of Education.

Specific Expectations

Grades 11 & 12

PHYSICS

Force, motion and work

325-12 Describe uniform circular motion using algebraic and vector analysis.

The train demonstrates two-dimensional motion while moving along the track. The track is given two direction vectors: x in the length direction and y in the width direction. The magnetic field is uniform in the x direction but changes considerably in the y direction, which allows the train to follow the track as it moves.

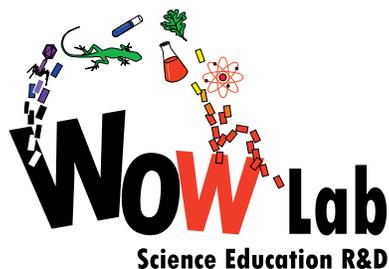
PHYSICS

Fields

328-1 Describe gravitational, electric and magnetic fields as regions of space that affect mass and charge.

The magnetic field generated by the train track induces a magnetic field in the superconductor, which repels the magnetic field from the train track. The repulsion between the two magnetic fields causes the train to levitate and the force of gravity pushes the train down. The train levitates at the point where the repulsive force due to the magnetic fields and the gravitational force are equal but opposite in direction.

328-2 Describe gravitational, electric and magnetic fields by illustrating the source and directions of the lines of force.



a WOW Lab

BLUEPRINT

The Maglev Train - Achievements and Competencies

328-3 Describe electric fields in terms of like and unlike charges, and magnetic fields in terms of poles.

The students will investigate the Meissner effect and how it leads to levitation of the train. To properly understand this phenomenon, they will look at normal magnets and the magnetic fields they produce.

Grades 11 & 12

CHEMISTRY

From structures to properties

114-2 Explain the roles of evidence, theories and paradigms in the development of scientific knowledge (e.g., explain superconductivity using bonding theory).

The maglev train achieves levitation through the phenomenon of superconductivity. The students will use the train as evidence of superconductivity to explain the Meissner effect, which describes how a magnetic field cannot penetrate a superconductor.