

Solenoid

Apparatus

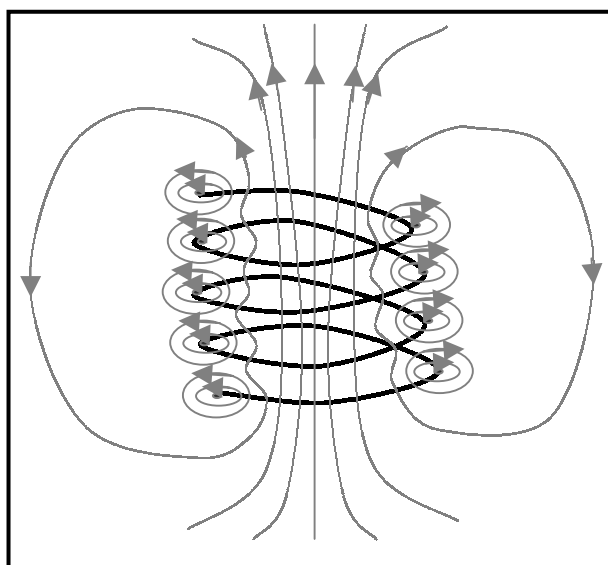
power supply, giant solenoid with no core (a large coil of wire), magnetic field meter with probe

Action

The students use the probe on the magnetic field meter to measure the magnetic field in and around the solenoid. They should try to sketch the field lines.

The Physics

The net magnetic field is the vector sum of the fields due to each loop. These fields tend to add inside the solenoid, and cancel between the loops. The resultant field inside the solenoid is approximately uniform, while that outside the solenoid is approximately zero. The smaller the radius compared to the length of the solenoid, the larger and more uniform the internal field. If the solenoid was infinitely long the field outside would be exactly zero.



Accompanying sheet

Solenoid

Draw a diagram showing the magnetic field in and around the solenoid.

Are there any points where the magnetic field is zero?

How does the magnetic field vary inside the solenoid?