

On-line Science Simulations – Magnetic Fields Worksheet

Task 1

Draw the pattern of the magnetic field in the space surrounding a bar magnet.

Instructions:

Add a single magnet.

Drag it to the centre of the screen.

Drag the compass so that it is immediately above the N-pole of the magnet with its needle vertical on the screen.

Press the space bar to draw an arrow on the screen.

Drag the compass so that the S end of the needle just touches the pointed end of the mark you have just made.

Draw a new arrow.

Keep repeating this procedure until the compass reaches the S-pole.

You have just plotted a field line.

- (a) Plot two more field lines above the magnet; one inside the line already drawn and one outside it.

In addition plot three lines below the magnet.

- (b) (i) How can you tell that the magnetic field is strongest near the poles of the magnet?

- (ii) Further away from, the magnet, the field lines are further apart. Why is this?



Task 2

Draw the pattern of the magnetic field in the region between two repelling magnets.

Instructions:

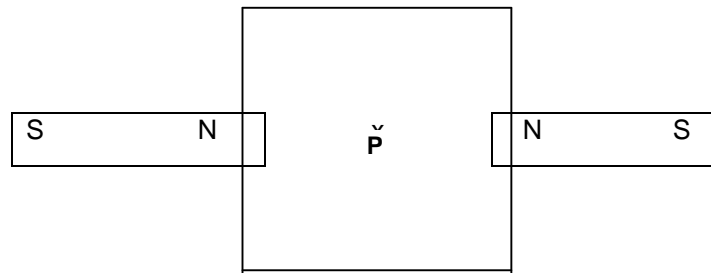
Clear the arrows.

Add a second magnet.

Arrange the two magnets so that they lie on a straight line with the two N-poles facing each other as shown below. The distance between them should be about the same as the length of one magnet.



- (a) Use the plotting compass to determine the pattern of the resultant magnetic field in the region inside the dotted line. Sketch the field lines on the diagram below, and put arrows on the field lines.



- (b) (i) The point labelled **P** is called the neutral point. How would you expect the compass to behave as it moves through this position?

- (ii) Check how well the simulation shows this behaviour.

Task 3

Draw the pattern of the magnetic field in the region between two attracting magnets.

Instructions:

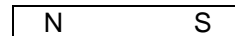
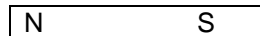
Clear the arrows.

Rotate the left hand magnet by 180° ($2 \times 90^\circ$).

Check that the distance between the two magnets is about the same as the length of one magnet.

Click on the 'Grid Pattern' button.

- (a) Draw the pattern of field lines **throughout the region** on the diagram below.



- (a) (i) Why is there no neutral point on the straight line joining the two magnets?

- (ii) Are there any neutral points when the magnets are arranged in this way?
If so, show where they would be located on your diagram.