Electromagnetic Induction

$\varepsilon = Blv$

1. Explain what this formula is all about. Make sure you explain what each of the symbols means, and give its unit.

2. Write an example question which uses this formula. Make sure you draw a diagram. Then solve the question, showing your working clearly.

3. Here I want you to think of AS MANY IDEAS AS YOU CAN. Given a piece of wire and a uniform magnetic field, how could you
   a) Induce a voltage across the ends of the wire?

   b) NOT induce a voltage across the ends of the wire?

4. In some of your examples for 3 b) all of B, l, and v may have been greater than zero, and yet ε was zero. This seems to contradict the formula at the top of the first page. How can the formula be modified to fix this?

Electromagnetic Induction – loops and coils

Four **unconnected** pieces of wire are mounted on a cardboard square. A stick is fixed to the back of the square. The corners of the square are labelled A, B, C and D. To the right of this there is a uniform magnetic field which is directed into the page.

1. The square is moved to the right at a constant speed, then brought to a stop in the middle of the field. Describe and explain what happens to the potential difference across the ends of each of the pieces of wire when this happens. Make sure you are clear which end is positive and which is negative. A sketch of voltage against time might help. (You can sketch them all on the same axes.)

AB

BC

CD

DA

2. Once stationary inside the field, the square is moved out of the page at a constant speed, then brought to a stop. Repeat Q1 for this situation.

3. The square is stationary in the middle of the field. It is then rotated by turning the stick at a constant rate of 1 whole rotation per second. Repeat Q1 for this situation. It would definitely be useful to sketch graphs in this instance (again on the same axes).