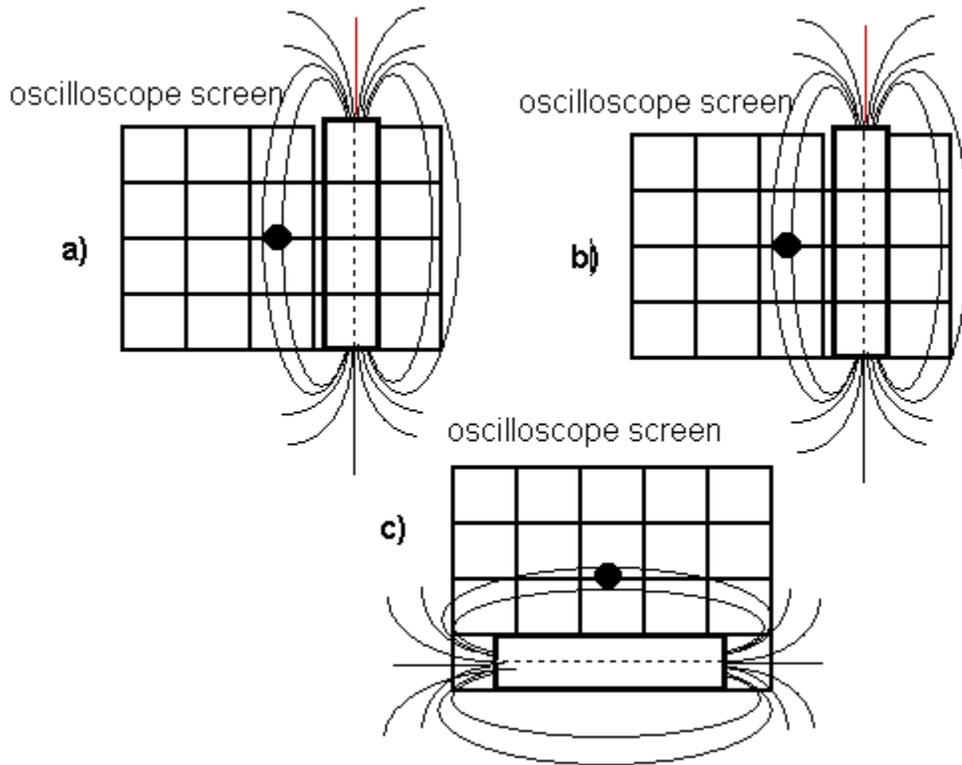


PHY 124 EXPERIMENT 4 Magnetic Force and Induction-Worksheet

PART I: MAGNETIC FORCE:

Enter your observations into the incomplete sketch below: Indicate the motion of the spot (which is the direction of the magnetic force). Fill in the text describing the direction of the electron beam and hence the electric current. Label the magnetic north (N) and south (S) poles of the bar magnet and draw arrows indicating the direction of the magnetic field (which is tangential to the field lines drawn) from the right-hand-rule for the magnetic force. In particular indicate the direction of the field at the location of the electron beam.

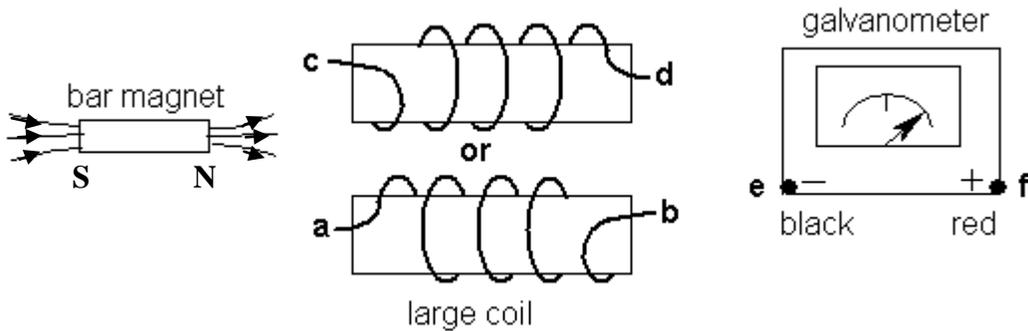


The direction of the electron beam is _____ the plane of this worksheet.

The direction of the electric current is _____ the plane of this worksheet.

PART II A. INDUCTION USING A BAR MAGNET:

Record your **connections** on the right hand side of the incomplete sketch given below. Choose the **correct** sketch of **the coil winding** by drawing the wire connections to the galvanometer.



Which direction did the galvanometer needle move when the bar magnet was inserted into the coil?

Which direction did the galvanometer needle move when the bar magnet was removed from the coil?

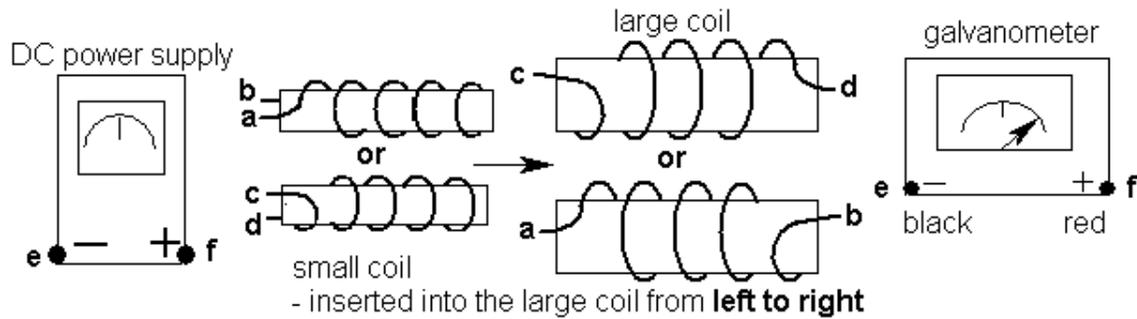
What happened to the induced current (i.e., the needle deflection) when the magnet motion ceased?

When inserting or withdrawing the bar magnet with a **fast** motion, is the deflection of the needle larger or smaller than with a **slow** motion of the bar magnet?

What is the name of the law that explains the last two observations? Write the formula for this law.

B. INDUCTION USING AN ELECTRO-MAGNET:

Make the **wire connections** reflecting your setup in the incomplete sketch below. Choose the coil with the **correct winding** for your setup and **label the north pole** of the **small coil** after you have determined it using the **right-hand-rule** for the magnetic field in a current carrying coil, your wire connections and coil winding.



With the small coil inserted into the large coil:

Which direction did the needle go when the DC power was turned on?

_____.

Which direction did the needle go when the DC power was turned off?

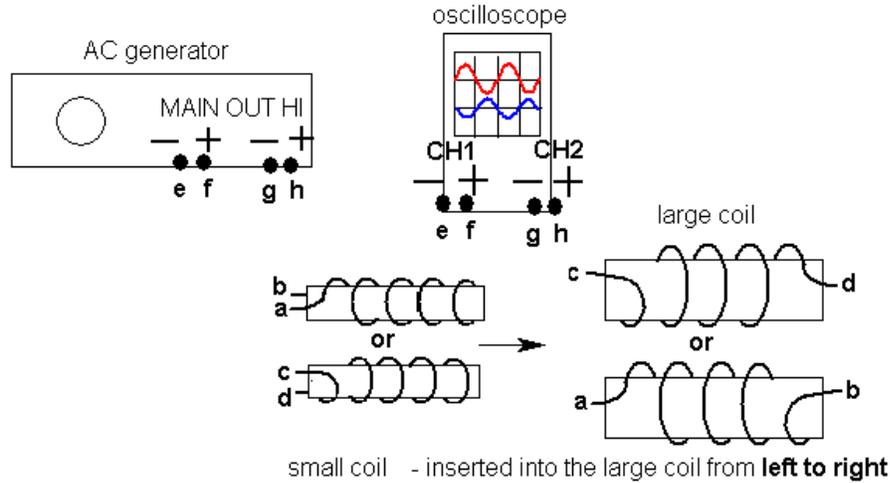
_____.

In both cases what happened to the induced current (i.e., the needle deflection) after a short while when the applied voltage was held constant?

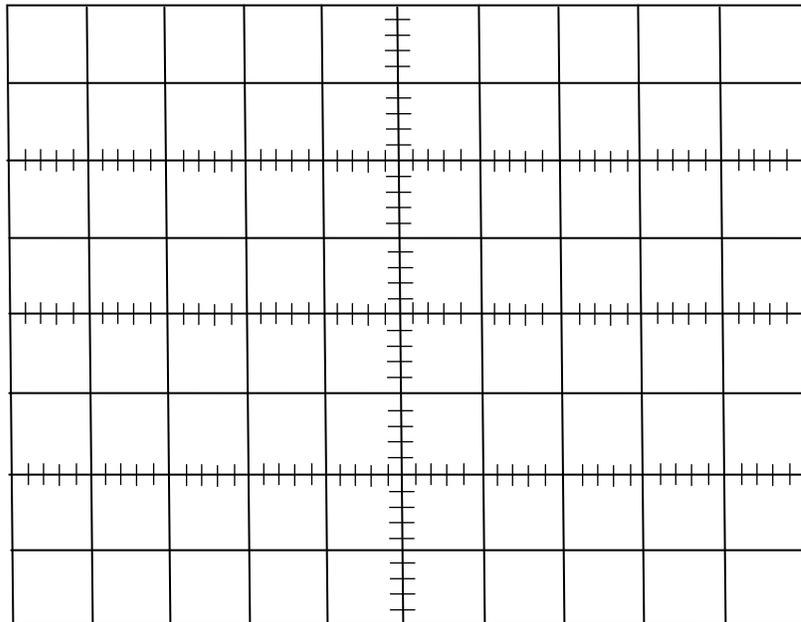
_____.

PART III. INDUCTION USING ALTERNATING CURRENT (AC) POWER :

In the incomplete sketch below record your **wire connections** for both coils, ie. The small coil connected to the **AC generator** and to oscilloscope **CH1**, the large coil to oscilloscope **CH2**.



Draw the two voltage traces observed on the oscilloscope screen below. Specify the VOLTS/DIV and TIME/DIV scale for both CH1 and CH2. Also label and record the peak to peak amplitude and the period of the signal.



Assuming the two coils act like a 100%-efficient transformer, use the ratio of the voltages in the coils to calculate the ratio of the number of turns in the large coils N_2 divided by the number of turns in the small coil N_1 . See Ch19 Sh24-25 and KJF2, Chap. 26.2, "AC Electricity and Transformers", pp. 855-8.