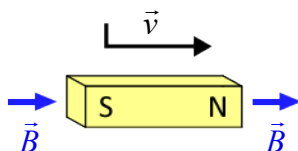
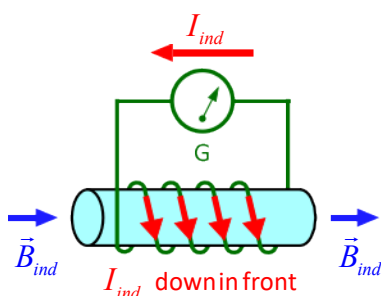


The Laws of Faraday & Lenz – Worksheet

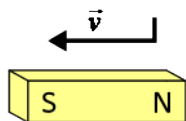
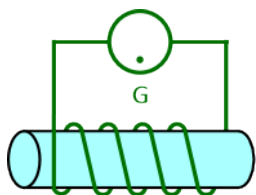
Complete the *eight* diagrams below for a bar magnetic moving towards or away from each end of a coil in the direction indicated by \vec{v} . Draw the following on each diagram, in the order shown:

1. The arrow in the galvanometer as it appeared while the magnet was moving
2. The direction of \vec{I}_{ind} , the induced current through the galvanometer
3. The direction of \vec{I}_{ind} on the front of the coil
4. The direction of \vec{B} on both poles of the magnet (draw a labeled arrow)
5. The direction of \vec{B}_{ind} on both ends of the coil (labeled arrow)
6. Circles on the right indicating the following: the direction of \vec{B} , the bar magnet's field; whether Φ_B , the magnetic flux is increasing or decreasing; the direction of \vec{B}_{ind} , the induced field; and the direction of \vec{I}_{ind} through the galvanometer

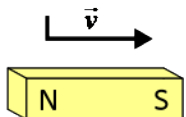
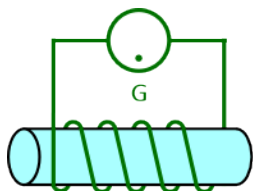
The first diagram, with a south pole leaving the right side of the coil, is drawn for you. **Test this case to make sure your observations agree with the picture.** Then complete the other seven cases.



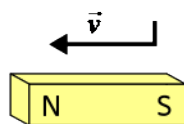
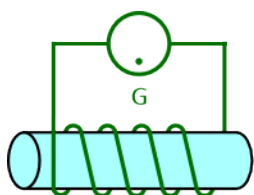
Direction of \vec{B} :	\leftarrow	\rightarrow
Change in Φ_B :	Increase	Decrease
Direction of \vec{B}_{ind} :	\leftarrow	\rightarrow
Direction of \vec{I}_{ind} in G :	\leftarrow	\rightarrow



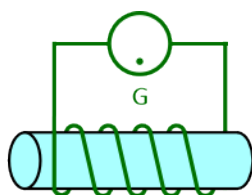
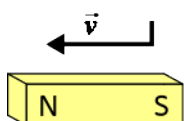
Direction of \vec{B} :	\leftarrow	\rightarrow
Change in Φ_B :	Increase	Decrease
Direction of \vec{B}_{ind} :	\leftarrow	\rightarrow
Direction of \vec{I}_{ind} in G :	\leftarrow	\rightarrow



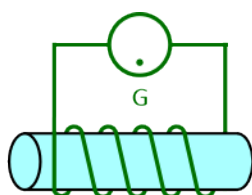
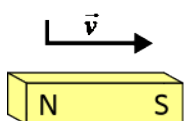
Direction of \vec{B} :	\leftarrow	\rightarrow
Change in Φ_B :	Increase	Decrease
Direction of \vec{B}_{ind} :	\leftarrow	\rightarrow
Direction of \vec{I}_{ind} in G :	\leftarrow	\rightarrow

Direction of \vec{B} :Change in Φ_B :

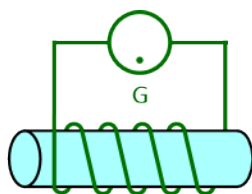
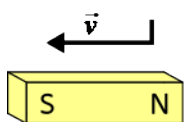
Increase Decrease

Direction of \vec{B}_{ind} :Direction of I_{ind} in G :Direction of \vec{B} :Change in Φ_B :

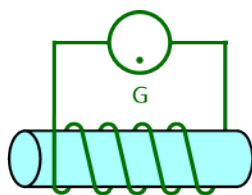
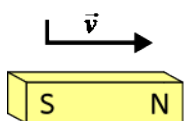
Increase Decrease

Direction of \vec{B}_{ind} :Direction of I_{ind} in G :Direction of \vec{B} :Change in Φ_B :

Increase Decrease

Direction of \vec{B}_{ind} :Direction of I_{ind} in G :Direction of \vec{B} :Change in Φ_B :

Increase Decrease

Direction of \vec{B}_{ind} :Direction of I_{ind} in G :Direction of \vec{B} :Change in Φ_B :

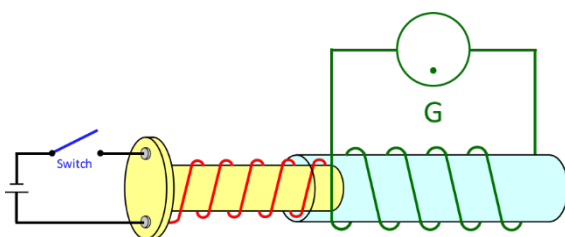
Increase Decrease

Direction of \vec{B}_{ind} :Direction of I_{ind} in G :

Complete the *four* diagrams below for two coils and a switch. Draw the following on each diagram, in the order shown:

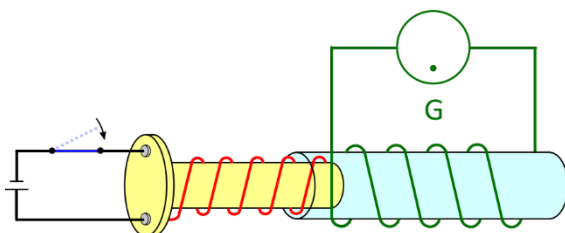
1. The arrow in the galvanometer as it appeared while the switch was opened or closed
2. The direction of \vec{I} in the front of the small coil
3. The direction of \vec{B} in the small coil (draw on the *left* side of the coil)
4. The direction of induced current, \vec{I}_{ind} through the galvanometer
5. The direction of \vec{I}_{ind} in the front of the large coil
6. The direction of \vec{B}_{ind} in the large coil (draw on the *right* side of the coil)
7. Circles on the right indicating the following: direction of \vec{B} , the small coil's field; whether Φ_B , the magnetic flux is increasing, decreasing, or constant; the direction of \vec{B}_{ind} , the induced field through the large coil; the direction of \vec{I}_{ind} , the induced current through the galvanometer; and I , the state of the current in the small coil (chose *one* of the four options).

I. SWITCH OPEN:



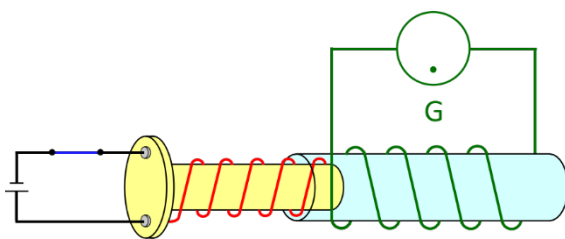
Direction of \vec{B} :	←	→	None
Change in Φ_B :	Increase	Decrease	Constant
Direction of \vec{B}_{ind} :	←	→	None
Direction of \vec{I}_{ind} in G :	←	→	None
<hr/>			
I in small coil:	On (constant)	Off (constant)	
	Increasing	Decreasing	

II. SWITCH JUST CLOSED, CURRENT BEGINS TO FLOW:



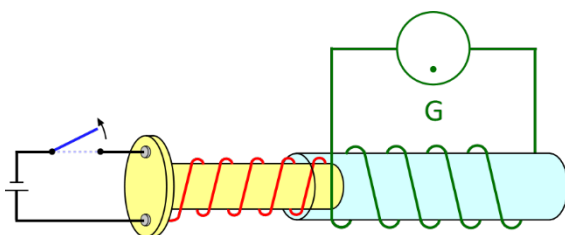
Direction of \vec{B} :	←	→	None
Change in Φ_B :	Increase	Decrease	Constant
Direction of \vec{B}_{ind} :	←	→	None
Direction of \vec{I}_{ind} in G :	←	→	None
<hr/>			
I in small coil:	On (constant)	Off (constant)	
	Increasing	Decreasing	

III. SWITCH CLOSED, CURRENT FLOWS STEADILY:



Direction of \vec{B} :	←	→	None
Change in Φ_B :	Increase	Decrease	Constant
Direction of \vec{B}_{ind} :	←	→	None
Direction of I_{ind} in G :	←	→	None
<hr/>			
I in small coil:	On (<i>constant</i>)	Off (<i>constant</i>)	
	Increasing	Decreasing	

IV. SWITCH JUST OPENED, CURRENT FLOW ENDING:



Direction of \vec{B} :	←	→	None
Change in Φ_B :	Increase	Decrease	Constant
Direction of \vec{B}_{ind} :	←	→	None
Direction of I_{ind} in G :	←	→	None
<hr/>			
I in small coil:	On (<i>constant</i>)	Off (<i>constant</i>)	
	Increasing	Decreasing	