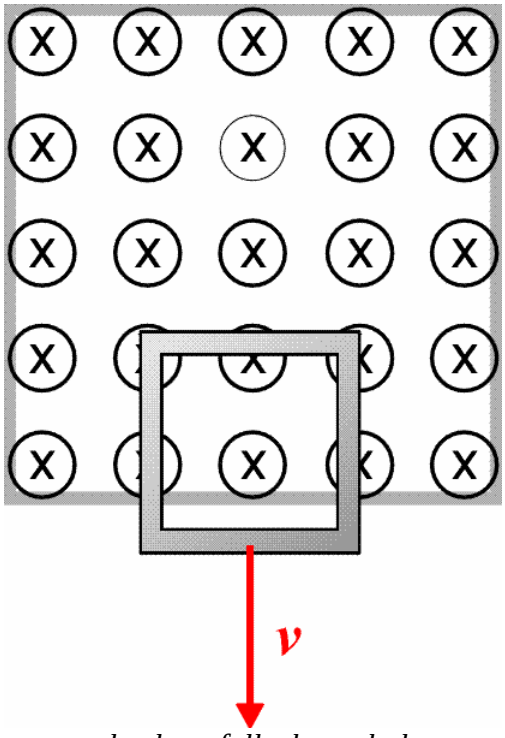
Electromagnetic Induction – Lenz's Law

Lenz's law states:

"An induced electromotive force generates a current that induces a counter magnetic field that opposes the magnetic field generating the current."

In modern terms:
"The induced current is such as to OPPOSE the CHANGE in the magnetic flux within the circuit."

Question 1



The conducting rectangular loop falls through the magnetic field shown. What is the direction of the conventional current induced in the loop as it leaves the field?

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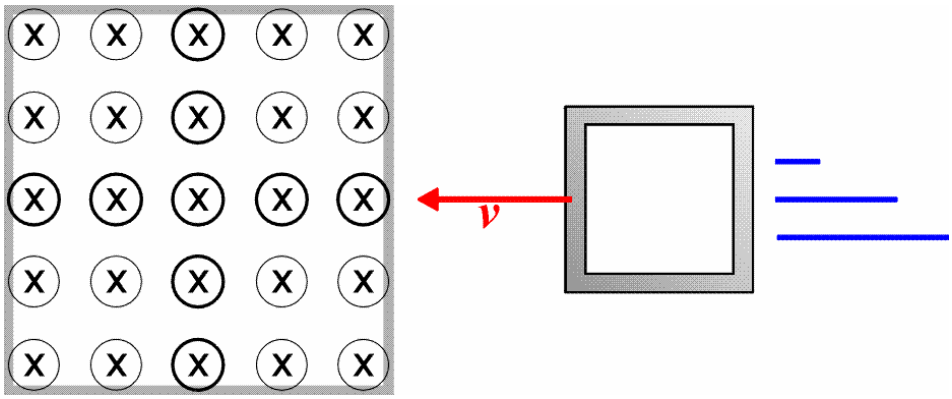
Question 2



The conducting rectangular loop enters the magnetic field shown. What is the direction of the conventional current induced in the loop as it enters the field?

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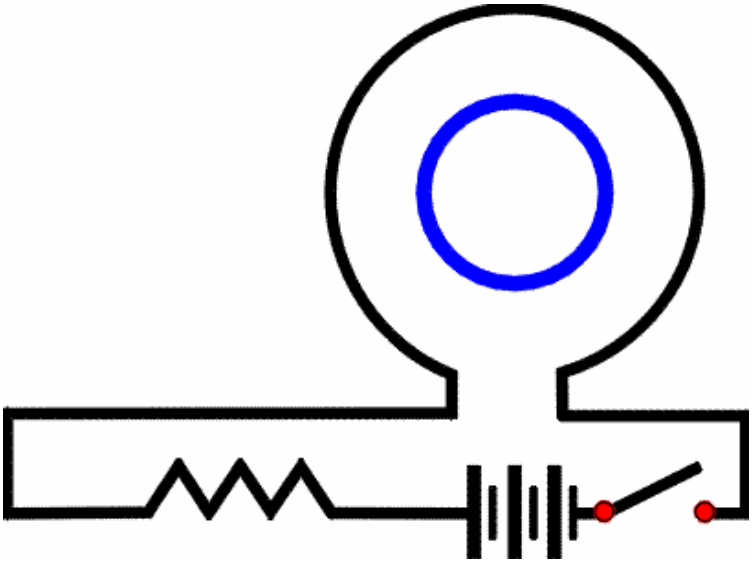
Question 3



A circular wire loop sits inside a larger circular loop that is connected to a battery as shown. Determine the direction of the convention current induced in the inner loop when the switch in the outer circuit is closed.

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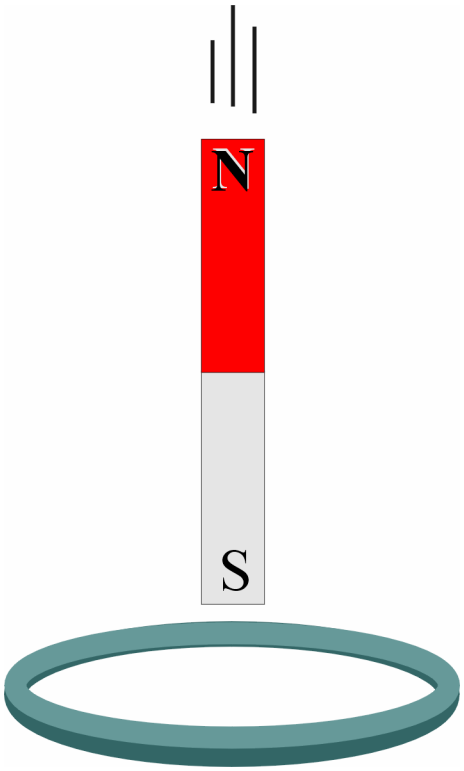
Question 4



A circular wire loop sits below a falling magnet as shown. Determine the direction of the conventional current induced in the loop as the magnet approaches the loop.

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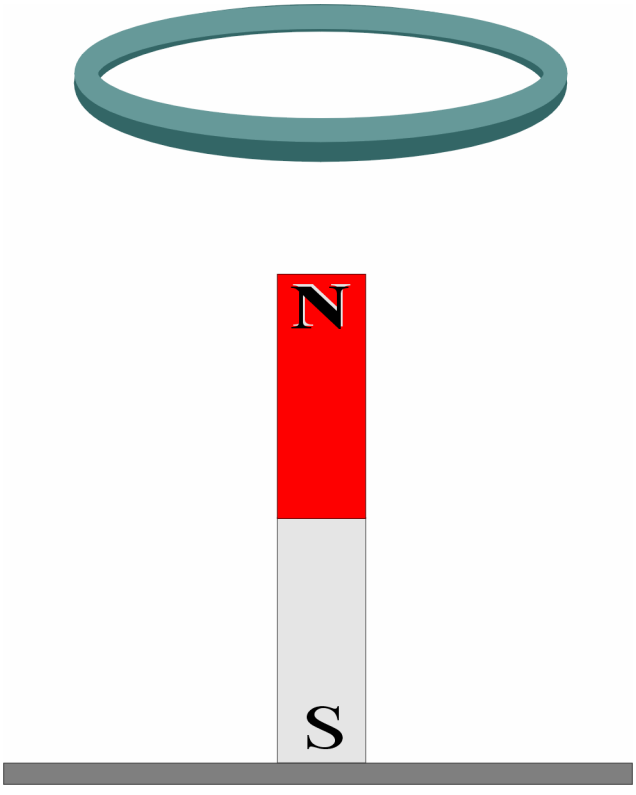

A circular wire loop falls toward a standing magnet as shown here. Determine the direction of the conventional current induced in the loop as the loop approaches the magnet.

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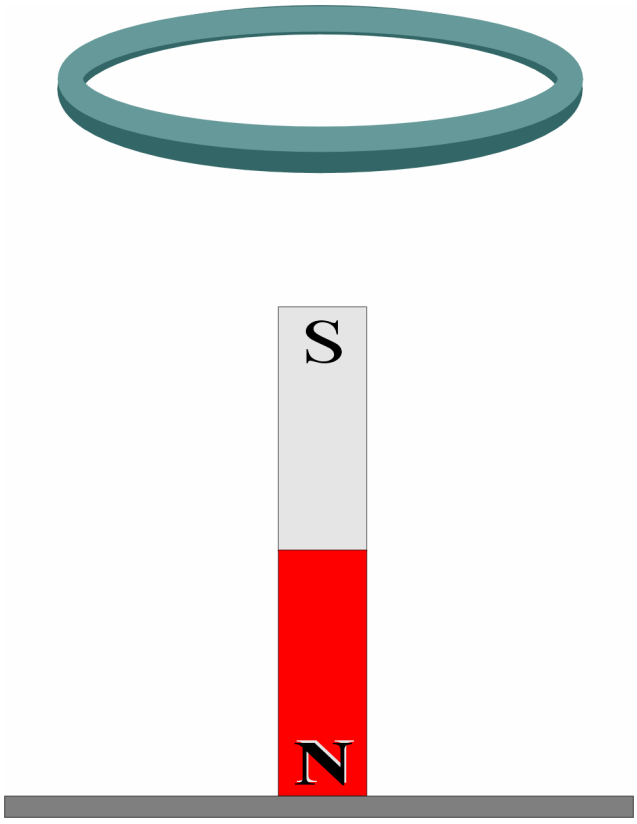

A circular wire loop is falling toward a standing magnet as shown here. Determine the direction of the conventional current induced in the loop as the loop approaches the magnet.

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In modern language:
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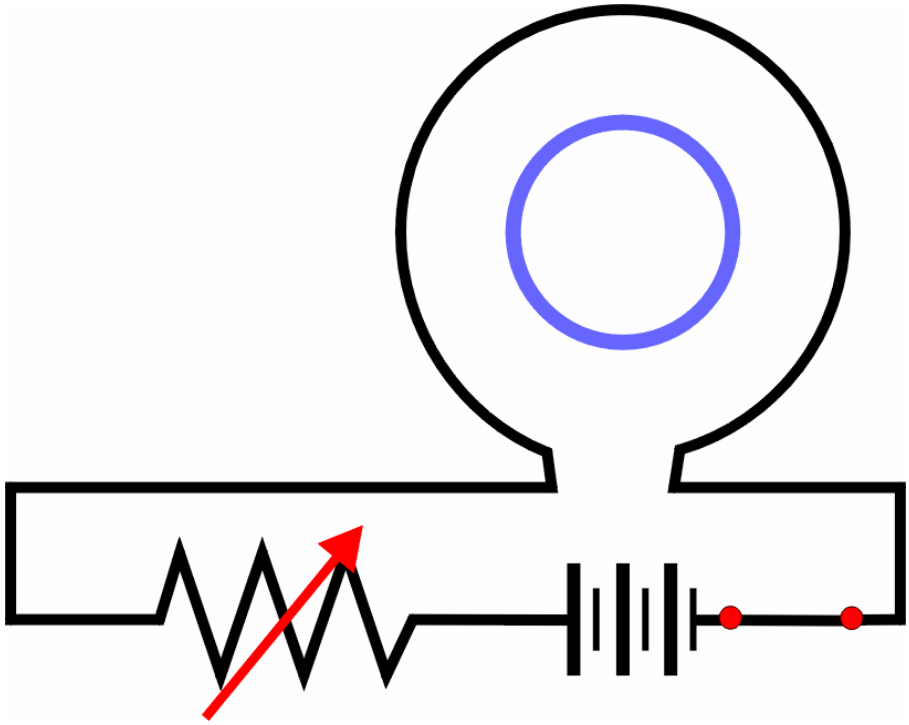
Question 7



A central loop of wire lies inside a larger loop, which is connected to a battery. Current flows around this outer loop. The resistance of the outer loop is increasing. Determine the direction of the conventional current induced in the inner loop.

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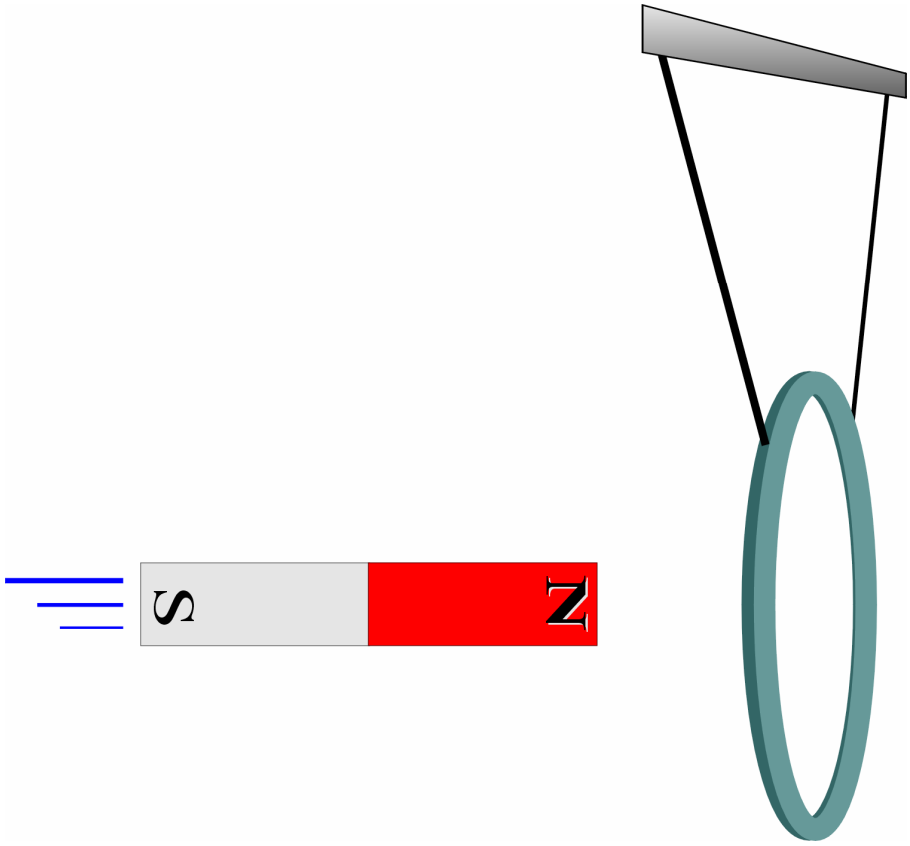
Question 8



As the strong bar magnet approaches the suspended aluminum ring, a current is induced and the ring is repelled. Explain why.
What happens when the magnet is taken away from the ring?

Answers:

1. clockwise 2. counterclockwise 3. counterclockwise
4. clockwise as seen from above the loop
5. clockwise as seen from above the loop
6. counterclockwise as seen from above the loop
7. clockwise
8. opposed B-fields (repulsion), aligned B-fields (attraction)