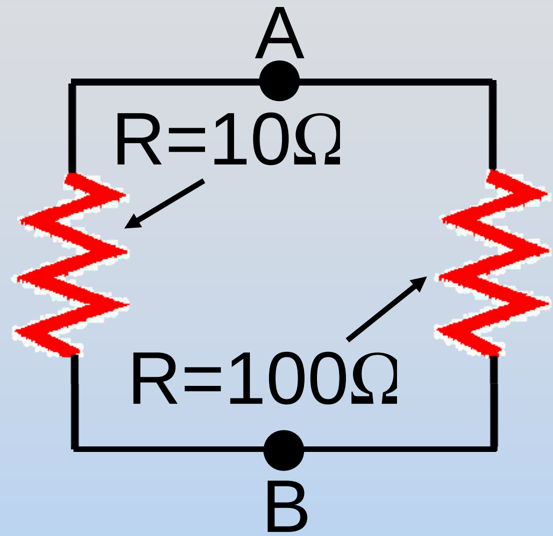
Concept Question: Faraday Circuit

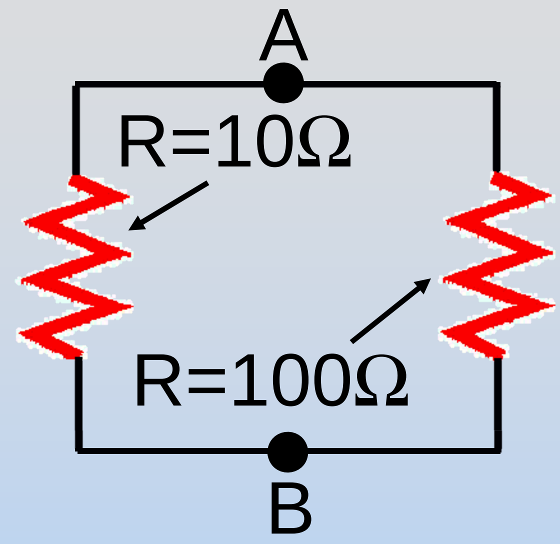
A magnetic field B penetrates this circuit outwards, and is increasing at a rate such that a current of 1 A is induced in the circuit (which direction?).



The potential difference VA-VB is:

1. **+10 V**
2. **-10 V**
3. **+100 V**
4. **-100 V**
5. **+110 V**
6. **-110 V**
7. **+90 V**
8. **-90 V**
9. **None of the above**

Concept Question Answer: Faraday Circuit



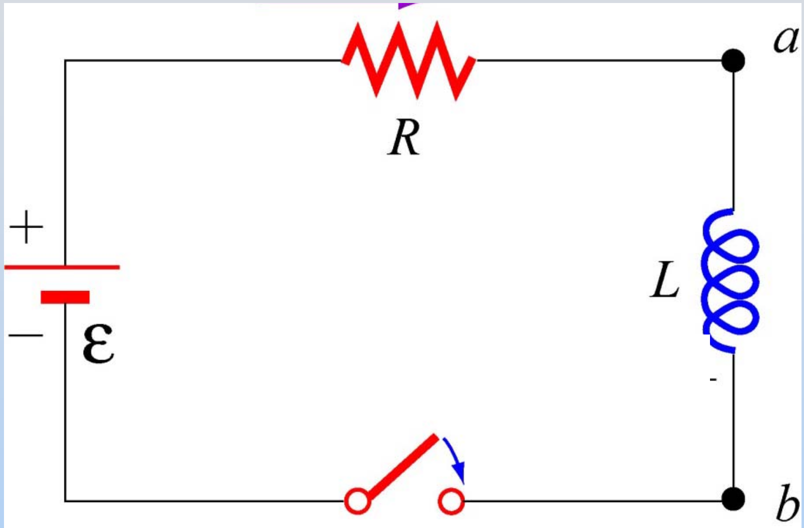
Answer: 9. None of the above

The question is meaningless. There is no such thing as potential difference when a changing magnetic flux is present.

By Faraday's law, a non-conservative E is induced (that is, its integral around a closed loop is non-zero). Non-conservative fields can't have potentials associated with them.

Concept Question: Voltage Across Inductor

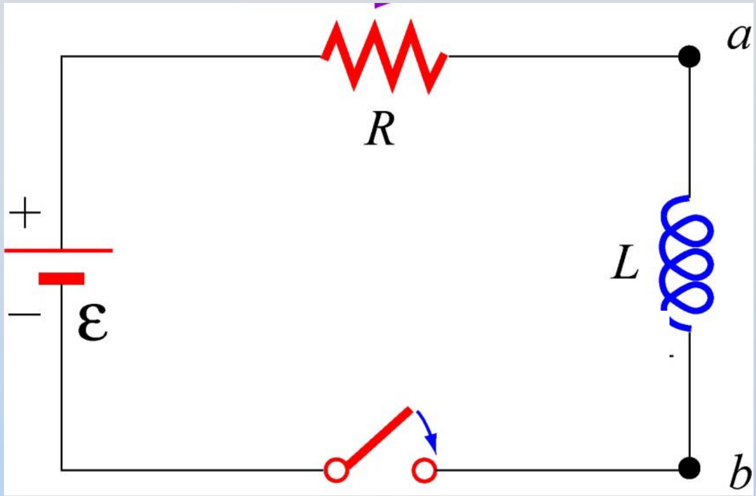
In the circuit at right the switch is closed at $t = 0$. A voltmeter hooked across the inductor will read:



1. $V_L = \varepsilon e^{-t/\tau}$
2. $V_L = \varepsilon(1 - e^{-t/\tau})$
3. $V_L = 0$
4. I don't know

Concept Question Answer: V Across Inductor

Answer: 1. $V_L = \varepsilon e^{-t/\tau}$



The inductor "works hard" at first, preventing current flow, then "relaxes" as the current becomes constant in time.

Although "voltage differences" between two points isn't completely meaningful now, we certainly can hook a voltmeter across an inductor and measure the EMF it generates.

Concept Question: Inserting a Core

When you insert the iron core what happens?

1. B Increases so L does too
2. B Decreases so L does too
3. B Increases so L Decreases
4. B Decreases so L Increases
5. I don’t know

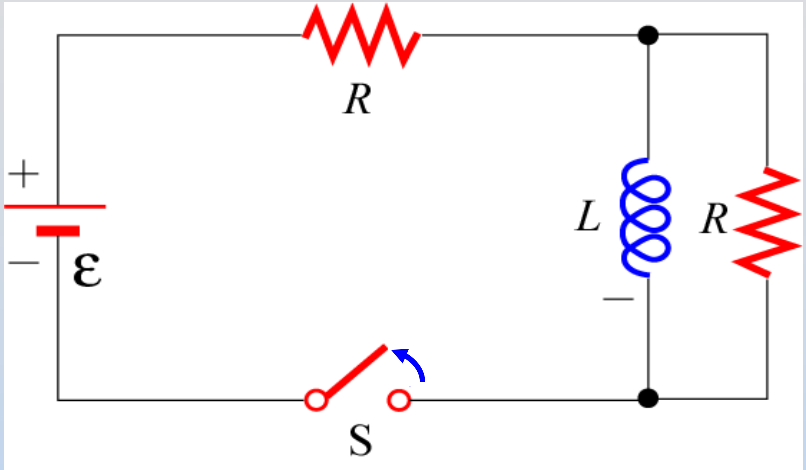
Concept Question Answer: Inserting a Core

Answer: 1. B increases so L does too

The moments in the material align with the external field, increasing the B field, and hence increasing the flux through the coil and thus its inductance

Concept Q.: RL Circuit

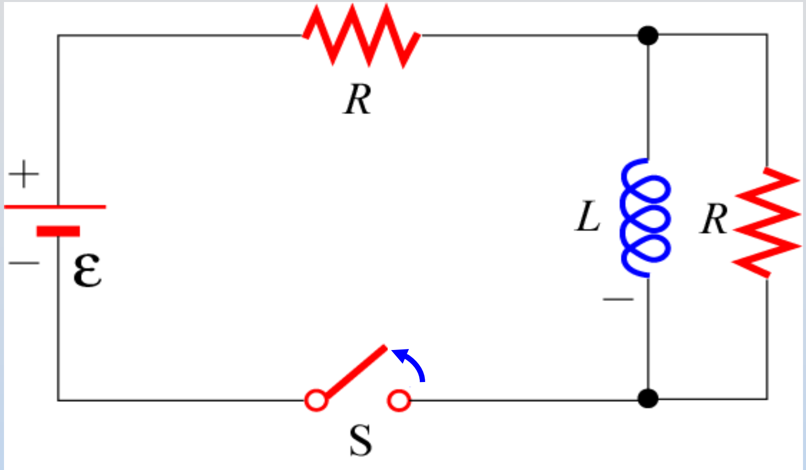
In the circuit at right the switch S has been closed a very long time. At t = 0, the switch is opened. Taking downward current as positive, immediately after the switch is opened the current in the inductor is equal to



1. ε / R
2. $\varepsilon / 2R$
3. $-\varepsilon / R$
4. $-\varepsilon / 2R$
5. Zero
6. I don't know

Concept Q. Answer: RL Circuit

Answer: 1. ε / R



The current stays at what is was just before throwing the switch (the inductor hates change!).

After a very long time, the inductor looked like a wire, so there was just a current ε /R through it.

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