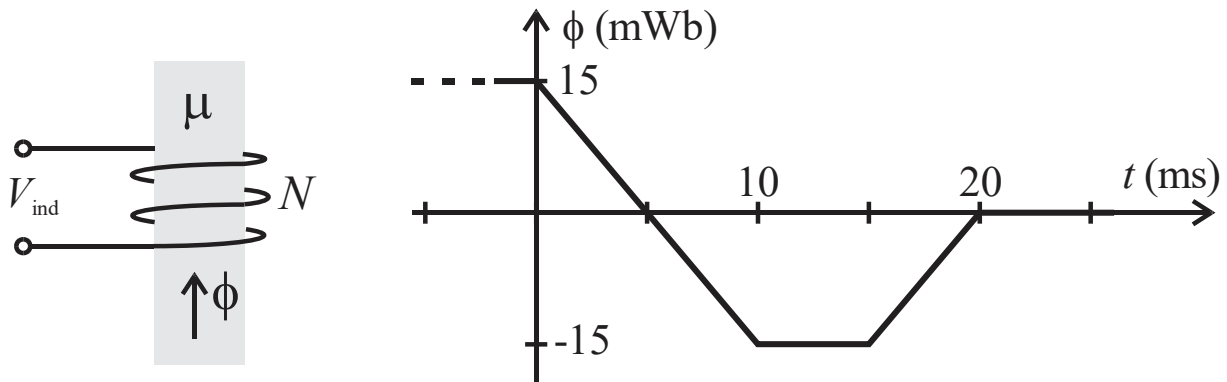


A 40-turn coil of copper magnetic wire is tightly-wound about a magnetic core as shown. If the core carries the magnetic flux ϕ shown, determine the polarity of the voltage induced V_{ind} at the wire terminals (show polarity on figure) and sketch on the provided axes.



Using Lenz's Law, the induced emf on the coil will be in the direction that induces a magnetic flux (ϕ_{ind}) that opposes the change in ϕ . In this case, ϕ is initially decreasing. Therefore, ϕ_{ind} is upward to oppose the decrease in ϕ which means that e_{ind} is toward the **upper terminal**.

Per (1-36), the induced emf is $e_{\text{ind}} = -N \frac{d\phi}{dt} = -N$ (slope of ϕ).

For time intervals $t < 0$, $10 < t < 15$ ms, & $t > 20$ ms, $e_{\text{ind}} = 40 (0) = 0$ V.

For $0 \leq t \leq 10$ ms, $e_{\text{ind}} = -40 (-30 \cdot 10^{-3} / 10 \cdot 10^{-3}) = 120$ V.

For $15 \leq t \leq 20$ ms, $e_{\text{ind}} = -40 (15 \cdot 10^{-3} / 5 \cdot 10^{-3}) = -120$ V.

Sketches of the coil showing polarity and the induced voltage are shown below.

