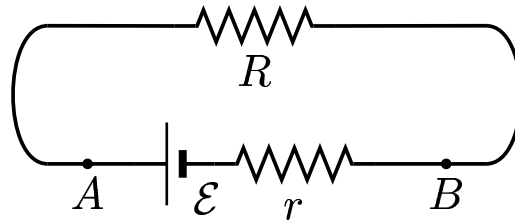


Given battery has *emf* $\mathcal{E} = 10 \text{ V}$ and the internal resistance $r = 1 \Omega$, as shown in the figure below. An external resistance $R = 0.01 \Omega$ is connected to the battery.



Compare V_{AB} with \mathcal{E} .

- A) $V_{AB} \ll \mathcal{E}$.
- B) $V_{AB} \approx \mathcal{E}$.
- C) $V_{AB} \gg \mathcal{E}$.

$$R_{total} = R + r$$

$$I = \frac{\mathcal{E}}{R + r}$$

$$V_{AB} = \frac{R}{R + r} \mathcal{E} = \frac{0.01}{0.01 + 1} 10 \text{ V} = .099 \text{ V}$$

This simple calculation shows $V_{AB} = .099 \text{ V} \ll \mathcal{E}$. In other words, when $r \gg R$, most of the potential drop is across the internal resistance r .

Answer **A**.

28.02-01a EMF and internal resistance 2004-3-24