

# task\_w3wf215v2u98ty07\_with\_calculation

## Student Group

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efficiency, charges, power, exam ee1 SS2023

Exercise E9 Efficiency (written test, approx. 14 % of a 60-minute written test, SS2023)

A. (10 points) A battery with an electromotive force  $\mathcal{E}$  and an internal resistance  $R_i$  is connected to a load resistor  $R_L$ . The battery shall provide energy for a device with an load resistance of  $R_L = 2 + 0.05 R_i$ . The following values are from the battery data sheet.

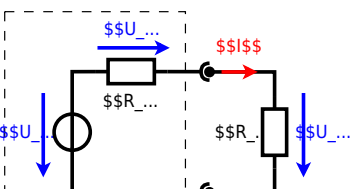
begin{align\*} \text{Solution:} \end{align\*}

• Verify:  $0.05 R_i = 0.05 \cdot 20 \Omega = 1 \Omega$

.. Draw an equivalent circuit diagram with the internal resistance and an external load. Label voltages and currents.

begin{align\*} \eta = \frac{P\_{out}}{P\_{in}} = \frac{I^2 R\_L}{I^2 (R\_i + R\_L)} = \frac{R\_L}{R\_i + R\_L} = \frac{2 + 1}{2 + 1 + 1} = \frac{3}{4} = 0.75 \end{align\*}

Result:  $\eta = 0.75$



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