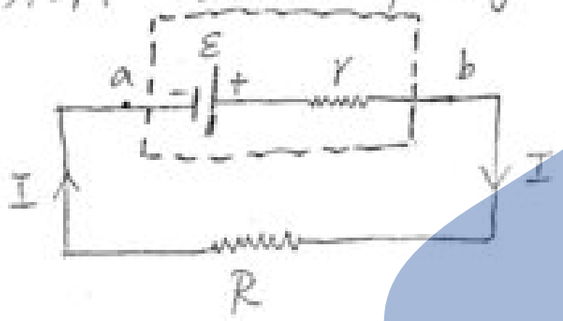
Chapter 18 Direct-Current Circuits

§18.1 Sources of emf



端電壓 $\Delta V = V_b - V_a$

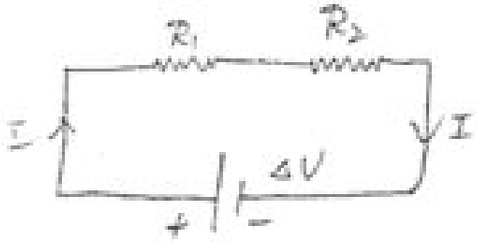
$\Delta V =$ 電動勢 $\mathcal{E} - Ir$

$\mathcal{E} = IR + Ir$

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

$I\mathcal{E} = I^2R + I^2r$

§18.2 Resistors in Series
電阻 串聯



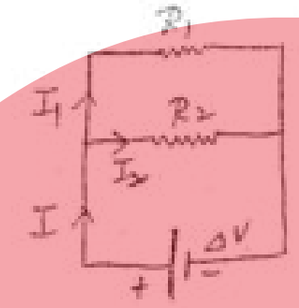
$\Delta V = IR_1 + IR_2 = I(R_1 + R_2)$

$\Delta V = I R_{eq}$

$R_{eq} = R_1 + R_2$

Example 18.1

§18.3 Resistors in Parallel
電阻 並聯



$I_1 = \dfrac{\Delta V}{R_1}, \quad I_2 = \dfrac{\Delta V}{R_2}$

$I = \dfrac{\Delta V}{R_{eq}}$

$I = I_1 + I_2$

$\dfrac{\Delta V}{R_{eq}} = \dfrac{\Delta V}{R_1} + \dfrac{\Delta V}{R_2}$

$$\boxed{\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}}$$

Example 18.2

Example 18.3

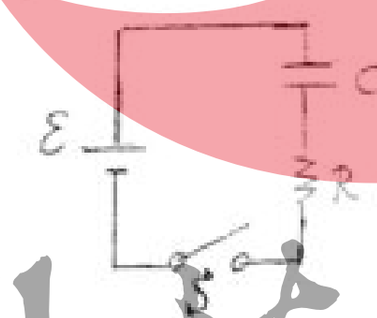
§18.4 Kirchhoff's Rules and Complex DC Circuits
基爾霍夫 定律

Kirchhoff's rules:

1. The sum of the currents entering any junction must equal the sum of the currents leaving that junction. (This rule is often referred to as the junction rule.)
2. The sum of the potential differences across all the elements around any closed-circuit loop must be zero. (This rule is usually called the loop rule.)

Example 18.4

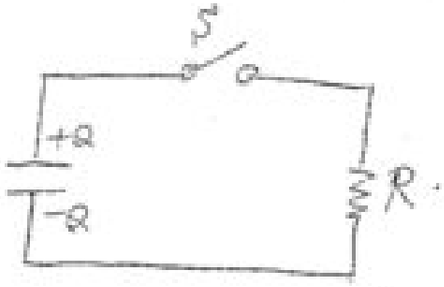
§18.5 RC Circuits

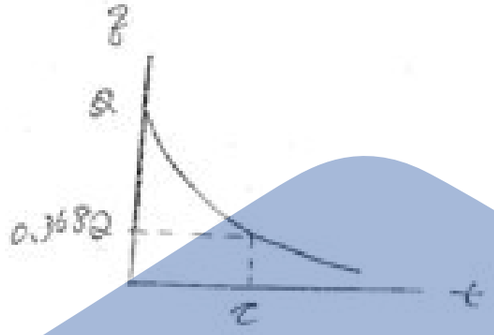


$q = Q(1-e^{-t/RC})$

$\Delta V = \frac{q}{C}$

time constant $\tau = RC$





$$q = Qe^{-t/RC}$$

Example 18.5