

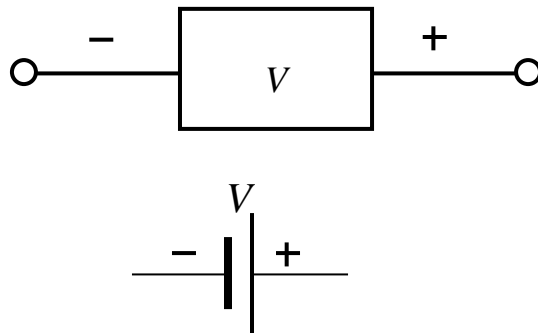
RANGKAIAN ARUS SEARAH

(Direct-Current Circuit)

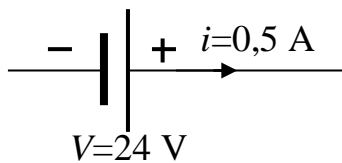
• Reservoir Energi dalam Rangkaian DC

Komponen rangkaian yang berfungsi sebagai reservoir energi dari arus yang dibawa rangkaian disebut emf (electromotive force). Emf mempunyai karakteristik fisis, yaitu: (1) emf mempunyai beda potensial V yang konstan di antara ujung-ujung emf. (2) emf berfungsi sebagai reservoir energi untuk rangkaian.

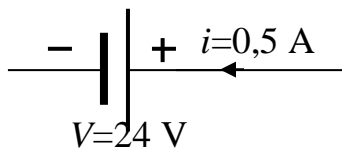
Simbol emf



Latihan 1:



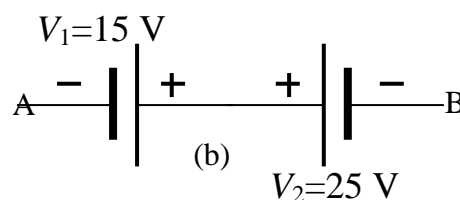
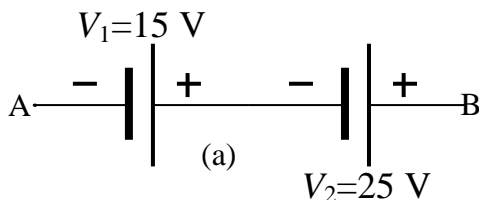
Emf memberikan laju energi 12 W



Emf menyimpan laju energi sebesar 12 W

Latihan 2.

Tentukan beda potensial $V_B - V_A$ untuk setiap kasus dalam gambar berikut:



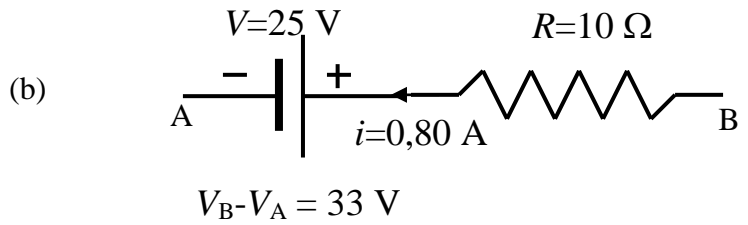
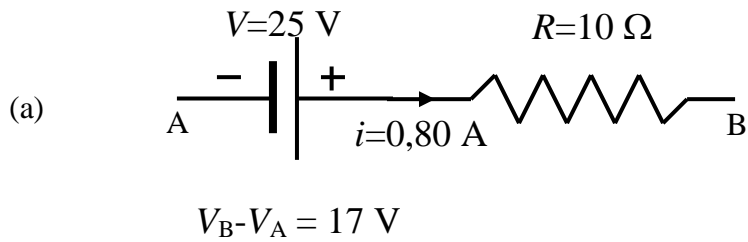
Jawaban:

(a) $V_A + V_1 + V_2 = V_B$

$V_B - V_A = 15 + 25 = 40V$

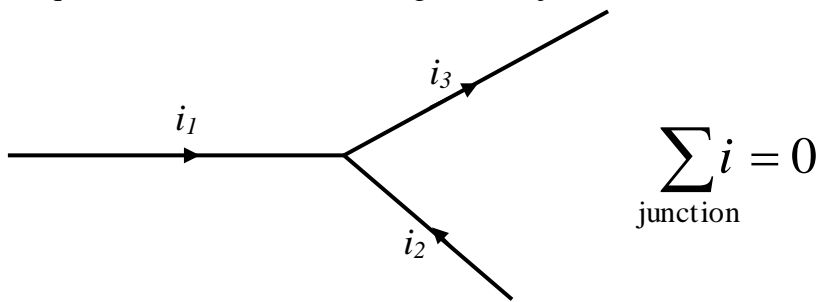
(a) $V_A + V_1 + V_2 = V_B$

$V_B - V_A = 15 - 25 = -10V$



Kirchhoff's Rules

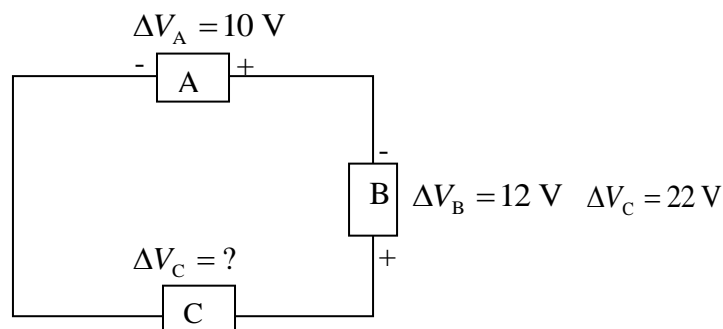
1. **The junction rule:** At any junction of a circuit, the net current entering a junction is equal to the net current leaving that the junction.



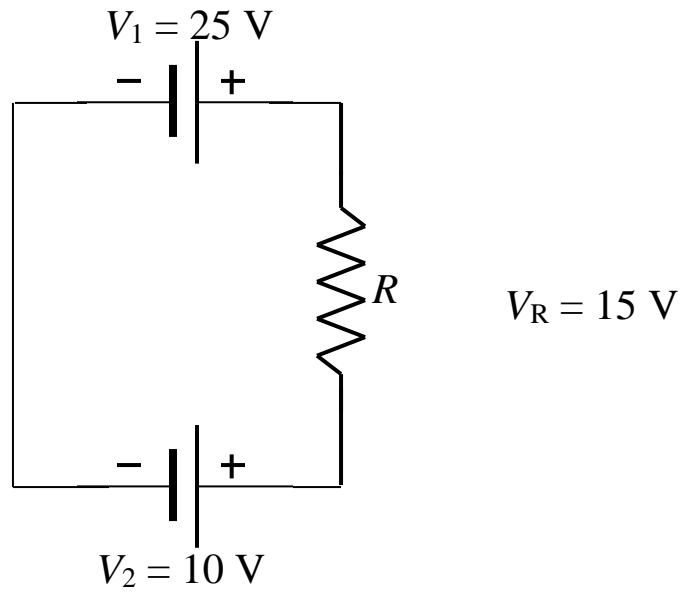
2. **The loop rule:** The sum of all the changes in potential around a loop is equal to zero.

$$\sum_{\text{loop}} \Delta V = 0$$

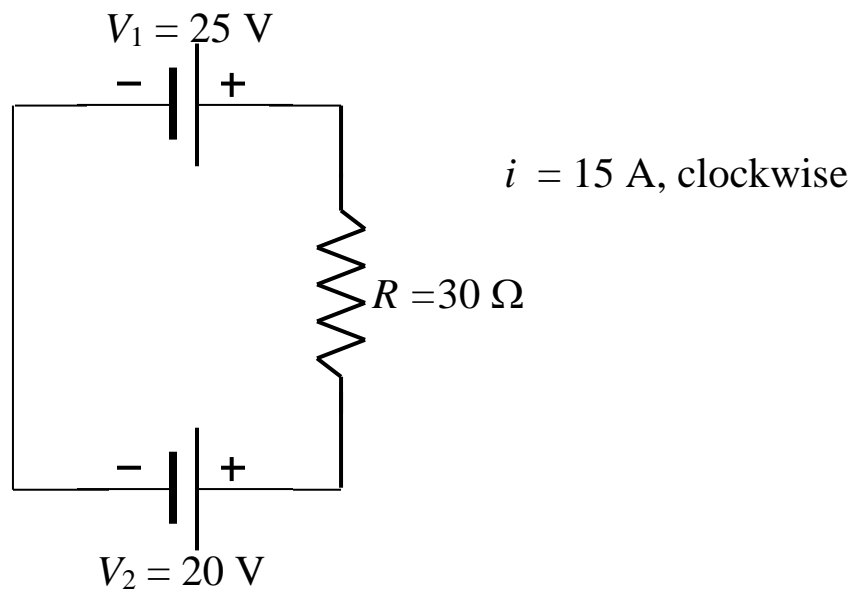
Contoh:



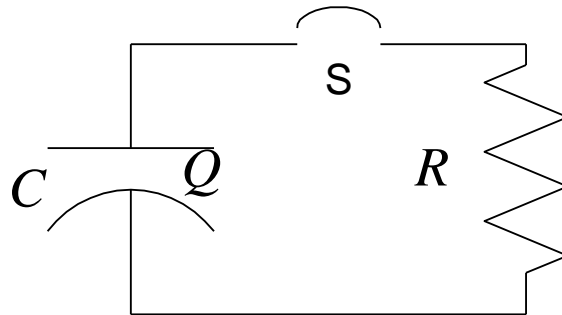
Contoh Soal :



Contoh Soal :



Rangkaian RC



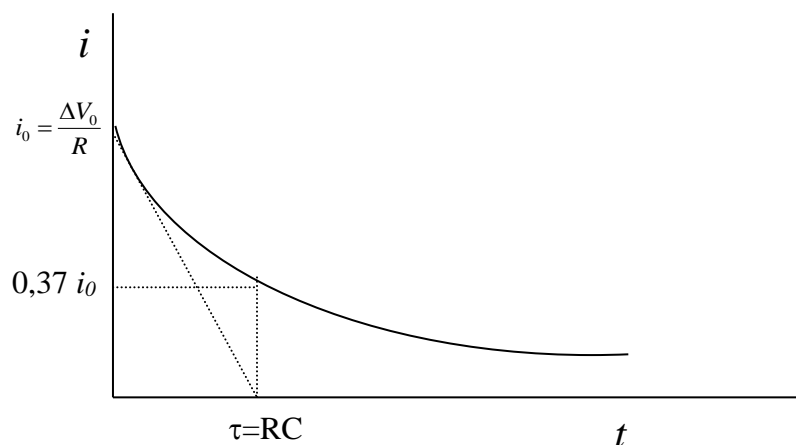
$$\frac{Q}{C} - iR = 0 \qquad \frac{1}{C} \frac{dQ}{dt} - R \frac{di}{dt} = 0$$

- arus dalam rangkaian sama dengan laju penurunannya muatan Q di C , sehingga :

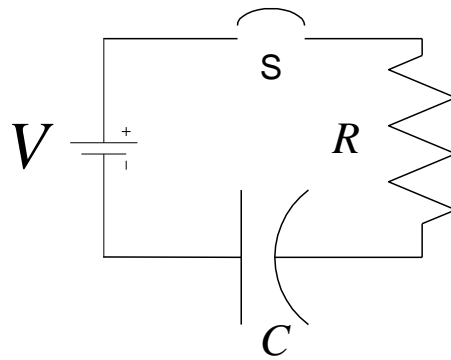
$$i = -\frac{dQ}{dt} \qquad \frac{di}{dt} = -\frac{i}{RC}$$

$$\frac{di}{i} = -\frac{1}{RC} dt \qquad \int_{i=\Delta V_0/R}^{i=i_f} \frac{di}{i} = -\frac{1}{RC} \int_{t=0}^{t=t_f} dt$$

$$i = \frac{\Delta V_0}{R} e^{-t/RC} = i_0 e^{-t/RC}$$



Rangkaian RC dengan Sumber Tegangan V



$$V - \frac{Q}{C} - iR = 0 \quad *)$$

dengan menggunakan: $i = \frac{dq}{dt}$

$$-\frac{1}{C}i - R \frac{di}{dt} = 0 \quad \frac{di}{i} = -\frac{1}{RC} dt$$

$$i = \frac{V}{R} e^{-t/RC} = i_0 e^{-t/RC}$$

dari persamaan *)

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

