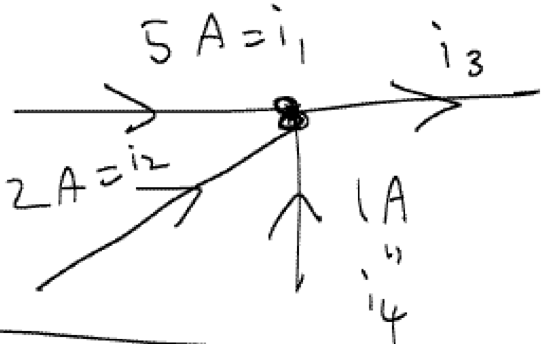
Discussion Notes - 1

Eg 1: KCL (Kirchoff's Current Law) Find i_3

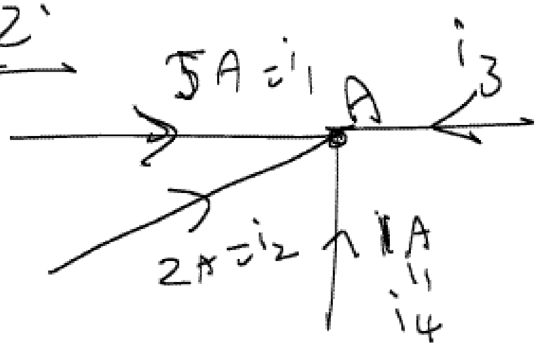


$i_3 = 8\ A$ (KCL) — (1)

KCL: $i_1 + i_2 + i_4 = i_3$

Current entering = Current leaving] KCL

Eg 2:



$i_3 = ?$

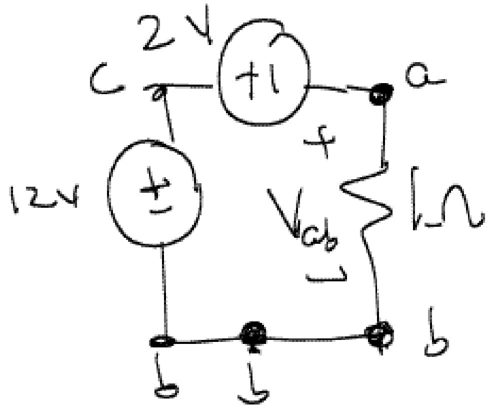
KCL: $i_1 + i_2 + i_4 + i_3 = 0$

$\Rightarrow \quad i_3 = -(i_1 + i_2 + i_4)$

$$\boxed{i_3 = -8\,A} \quad \text{— (2)}$$

Compare (1) & (2), magnitude of i_3 is the same (8 A) but sign is different. This is because, in Eq 2, all currents are drawn as entering the point A, which is not physically possible. Therefore i_3 in Eq 2 is −ve (negative) because i_1, i_2 & i_4 are fixed!

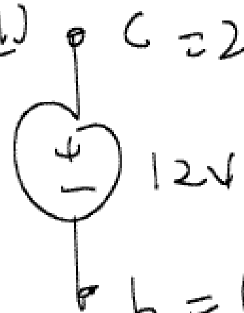
Eg 3: (KVL)



$V_{ab} = ? = 10$ or 14

KVL: $\sum$ (voltages around a loop) $= 0$

Note: (1) c = 22?

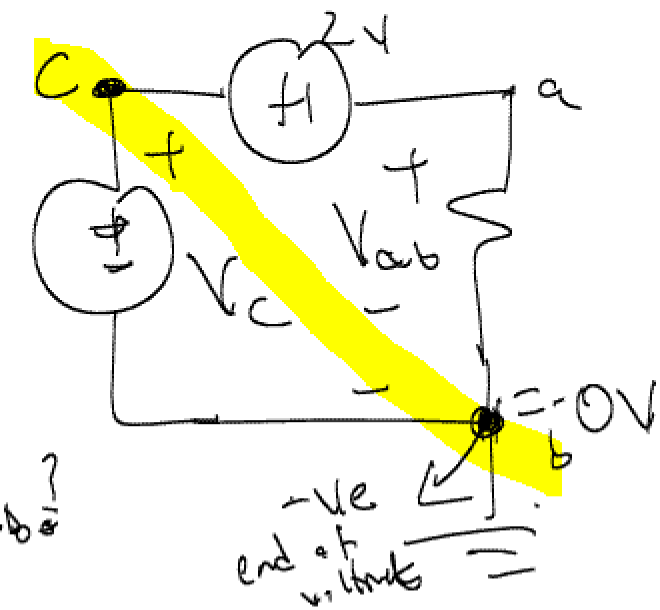


b = 10 V

$V_{cb} = 12$ V

(2) GND (or) ref really does not matter in the sense that potential differences are important

Eg:



Find V_{ab}?

$V_{cb} = 12V$

$\Rightarrow V_c - V_b = 12V$

$\Rightarrow \boxed{V_c = 12V}$

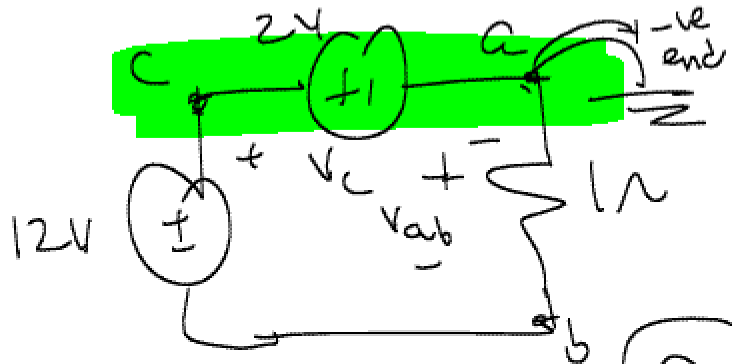
Now, $V_{ca} = 2V$

$\Rightarrow V_c - V_a = 2V \Rightarrow V_a = V_c - 2$

$\Rightarrow \boxed{V_a = 10V}$

$V_{ab} = V_a - V_b = 10V$

But, suppose:



What is V_{ab} now?

$$\begin{cases} V_c - V_a = 2V & (1) \\ V_c - V_b = 12V & (2) \end{cases}$$

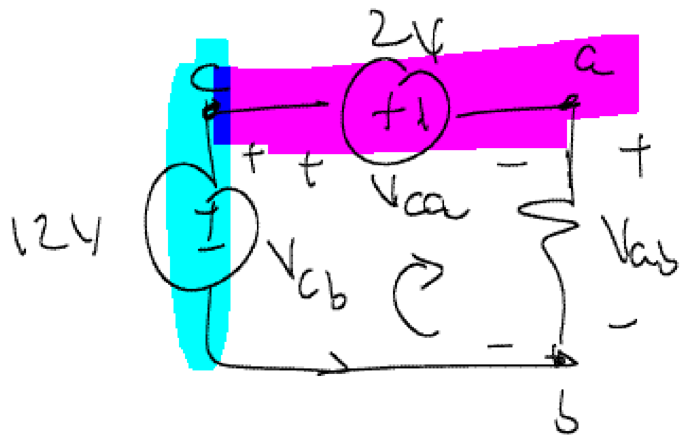
(1) ⇒ $V_c = 2V$ $[V_a = 0V]$

$V_c - V_b = 12V \Rightarrow V_b = V_c - 12$

$$\boxed{V_b = -10V}$$

$$\boxed{V_{ab} = V_a - V_b = 0 - (-10) = 10V}$$

Notice V_{ab} did not change !!!!, because of KVL:



Note: V_{cb} means plus at c & minus at b i.e.. $V_{cb} \triangleq V_c - V_b$

going clockwise from b:

$$+V_{cb} - V_{ca} - V_{ab} = 0$$

→ rise in potential

$$V_{ab} = V_{cb} - V_{ca}$$
$$= 12 - 2 = 10\ V$$

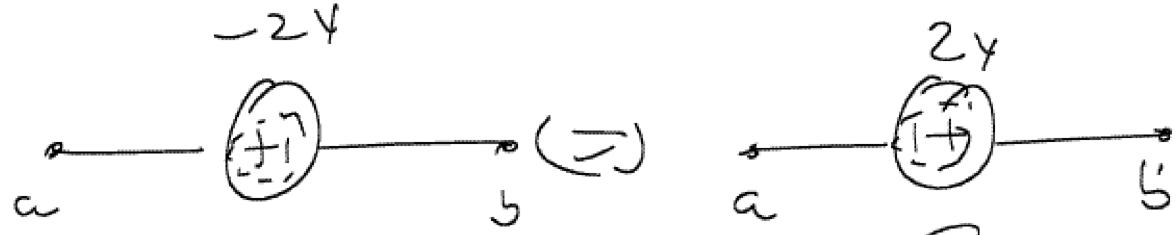
→ drop in potential

} convention

Note: If my convention was "opposite": $-12 + 2 + V_{ab} = 0$

$\Rightarrow$ $V_{ab} = 10\,V$

Eg:



$V_a - V_b = -2$

$\Rightarrow$ $V_b - V_a = +2$