Laboratory #3 : DC circuit

Objectives : To study the DC circuit by using Ohm's law and the RC circuit by observing the fall of the voltage.

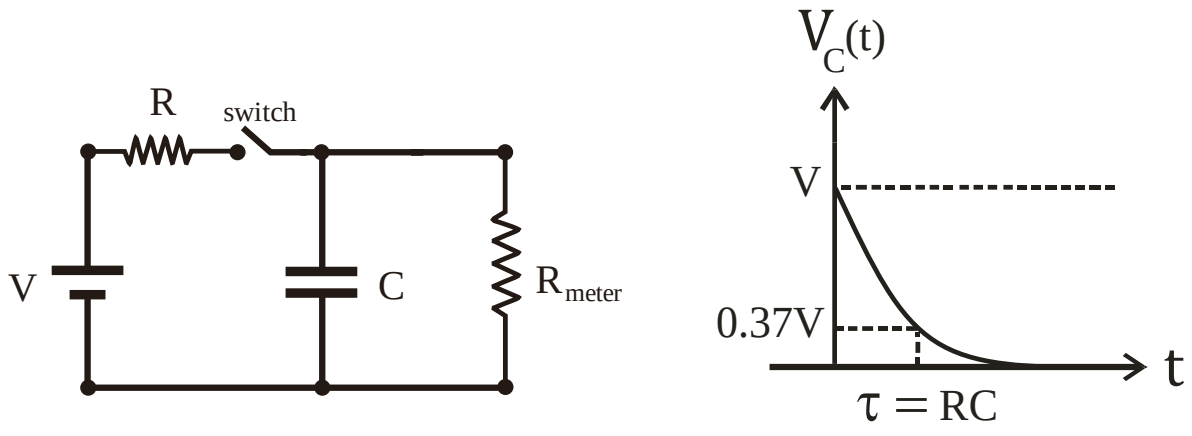
Theory :

Ohm's law is $V = IR$.

For RC circuit shown in figure 2 a), after the switch has been closed for a long time, the capacitor has been fully charged, then the switch is opened. The capacitor discharges its current through the resistor of the mulit-meter. The voltage across the capacitor $V_c(t)$ changes and falls as a function of time, defined as

$$V_c(t) = V\, e^{-\frac{t}{RC}} \quad or \quad ln\, V(t) = ln\, V - \frac{t}{RC}.$$

The RC voltage graph is exponential decay, shown in figure 2 b). At time constant τ, the voltage is 37 percent of its starting value V.



a) b)

Figure 2 a) shows RC circuit as switch is opened and b) shows the declined voltage across the capacitor at various times.

Experiments :

1. Study Ohm's law by measuring voltage and current of the DC circuits below.

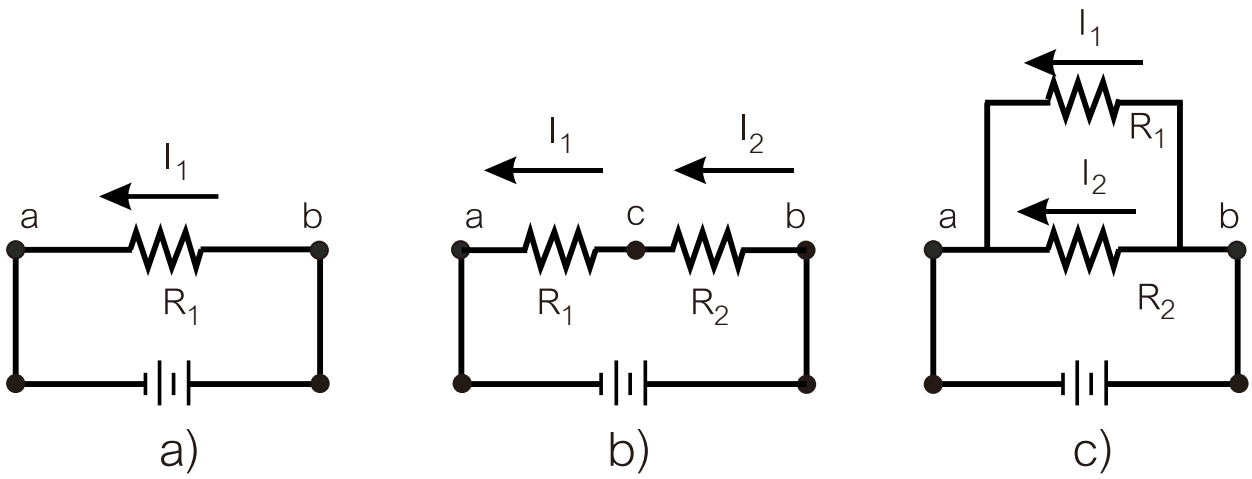


Figure 1 shows resistors used in a) simple circuit, b) series circuit, and c) parallel circuit.

Note that for c) circuit the applying voltage is no more than 5 volts.

Table 1 shows the voltage and resistance value of circuits above.

Circuit	V_{ba} (.....)	V_{bc} (.....)	V_{ca} (.....)	I_{total} (.....)	I_1 (.....)	I_2 (.....)	R_{total} (.....)
Figure 1 a)		-	-		-	-	
Figure 1 b)					-	-	
Figure 1 c)		-	-				

2. Study RC circuit by measuring the voltage across the capacitor at various times. Then, plot $\ln V_c(t)$ and t. Finally determine the RC time constant from the graph.

V = _____ C = _____ R_{meter} = _____