Summary of Chapter 18 – Direct Current Circuits

Please read Chapter 18 carefully, and make sure that you understand the summary points below.

►A **source of EMF** is any device that transforms nonelectrical energy into electrical energy. Examples: battery; electric generator.

►The equivalent resistance of **resistors in series** is

$$R_{eq} = R_1 + R_2 + R_3 + \ldots$$

The equivalent resistance of **resistors in parallel** is

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots$$

►Complex circuits are conveniently analyzed by using **Kirchhoff's rules**:

1. The sum of the currents entering any **junction** must equal the sum of the currents leaving that junction.
2. The sum of the potential differences across all the elements around any **closed-circuit loop** must be zero.

The first rule is a consequence of *conservation of charge*. The second is a consequence of *conservation of energy*.

►As a capacitor is charged by a battery through a resistor, the current drops from a maximum value to zero. The time constant, $\tau = RC$, represents the time it takes the charge on the capacitor to increase from zero to 63% of its maximum value. The time dependence is an example of exponential change.