Formula

1. Kirchhoff's voltage law: $\sum_{n=1}^{N} v_n = 0$ at any closed loop.

2. Kirchhoff's law: $\sum_{n=1}^{N} i_n = 0$ at any node.

3. Generalized Ohm's law: $V=IZ$

   Resistor: $Z=R$

   Capacitor: $Z = \frac{1}{j\omega C}$

   Inductor: $Z = j\omega L$

4. Parallel circuit: $\frac{1}{Z_{eq}} = \sum_{i=1}^{N} \frac{1}{Z_i}$; series circuit $Z_{eq} = \sum_{i=1}^{N} Z_i$

5. Power $P=IV$

6. $C = \frac{q}{V}$

7. Capacitor charging by *emf* through resistance: $V_c = \varepsilon\left(1 - e^{-\frac{t}{RC}}\right)$

8. Capacitor discharging through resistance: $V_c = \varepsilon e^{-\frac{t}{RC}}$

9. Inductor charging by *emf* through resistance: $i_L = \frac{\varepsilon}{R}\left(1 - e^{-\frac{t}{L/R}}\right)$

10. Inductor discharging by through resistance: $i_L = \frac{\varepsilon}{R} e^{-\frac{t}{L/R}}$

11. $i_C = C\frac{dv_C}{dt}, \quad v_L = L\frac{di_L}{dt}$