# Electric Circuits
Homework Set 1

1. How much charge is represented by these number of electrons?
    a. 6.482×10^{17}
    b. 1.24×10^{18}
    c. 2.46×10^{19}
    d. 1.628×10^{20}

2. Determine the current $i(t)$ flowing through an element if the charge flow is given by:
    a. $q(t) = (3t + 8)\ mC$
    b. $q(t) = (8t^2 + 4t - 2)\ C$
    c. $q(t) = (3e^{-t} - 5e^{-2t})\ nC$
    d. $q(t) = 10\sin(120\pi t)\ pC$
    e. $q(t) = 20e^{-4t}\cos(50t)\ \mu C$

3. Find the charge $q(t)$ flowing through a device if the current is:
    a. $i(t) = 3A,\ \ q(0) = 1C$
    b. $i(t) = (2t + 5)\ mA,\ \ q(0) = 0$
    c. $i(t) = 20\cos(10t + \pi/6)\ \mu A,\ \ q(0) = 2\ \mu C$
    d. $i(t) = 10e^{-30t}\sin(40t)\ A,\ \ q(0) = 0$

4. A current of 7.4 A flows through a conductor. Calculate how much charge passes through any cross-section of the conductor in 20 seconds.

5. Determine the total charge transferred over the time interval $0 \le t \le 10$ s when $i(t) = (0.5)t$ A.

6. The charge entering a certain element is shown in the following figure. Find the current at:
    a. $t = 1\ ms$
    b. $t = 6\ ms$
    c. $t = 10\ ms$
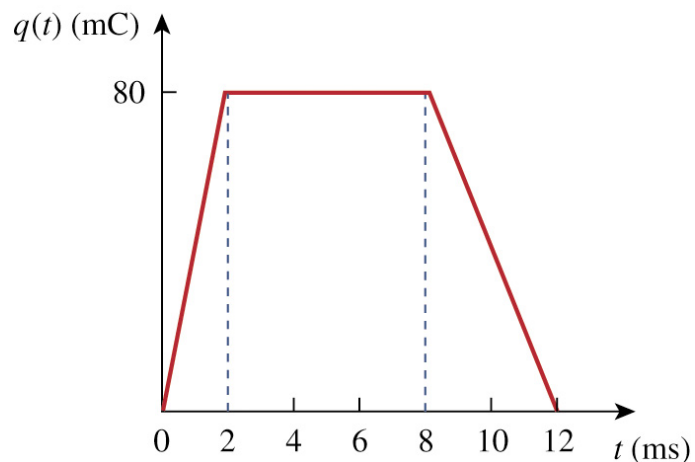
7. **The charge flowing in a wire is plotted in the following figure. Sketch the corresponding current over the same time interval.
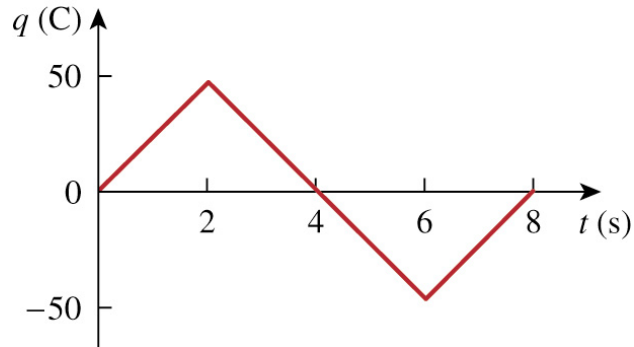
8. The current flowing past a point in a device is shown below. Calculate the total charge through the point.
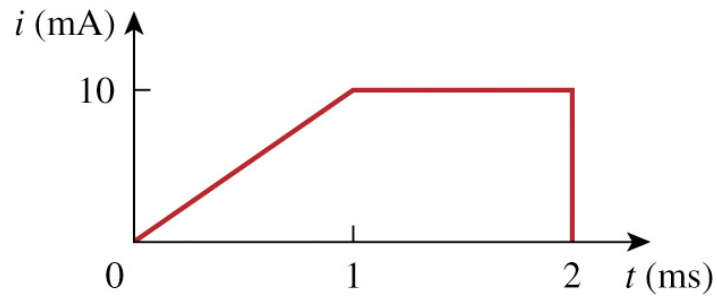
9. The current through an element is shown in the following graph. Determine the total charge that passed through the element at:

    a. $t = 1\ s$
    b. $t = 3\ s$
    c. $t = 5\ s$