Current & Voltage Questions

#1) $Q = 12\,C$, $\Delta t = 4.0\,s$, $I = ?$

$$I = \frac{Q}{\Delta t} = \frac{12\,C}{4.0\,s} = \boxed{3.0\ A}$$

#2) $\Delta t = 24\,s$, $Q = 18\,C$, $I = ?$

$$I = \frac{Q}{\Delta t} = \frac{18\,C}{24\,s} = \boxed{0.75\ A}$$

#3) $\Delta t = 4.0\,s$, $I = 225\,A$, $Q = ?$

$$I = \frac{Q}{\Delta t} \rightarrow Q = I\Delta t = (225\,A)(4.0\,s)$$

$$= 900\,C$$

$$= \boxed{9.0 \times 10^2\,C}$$

#4) $n = 1.25 \times 10^{10}$, $\Delta t = 0.50\,s$, $e = 1.602 \times 10^{-19}\,C$, $I = ?$

$$I = \frac{Q}{\Delta t} = \frac{ne}{\Delta t} = \frac{(1.25 \times 10^{10})(1.602 \times 10^{-19}\,C)}{0.50\,s}$$

$$= 4.005 \times 10^{-9}\,A$$

$$= \boxed{4.0\ nA}$$

#5) $I = 0.40\,A$, $Q = 8.0\,C$, $\Delta t = ?$

$$I = \frac{Q}{\Delta t} \rightarrow \Delta t = \frac{Q}{I} = \frac{8.0\,C}{0.40\,A} = \boxed{20.\ s}$$

#6) $\Delta t = 1.0\,s$, $I = 0.50\,A$, $e = 1.602 \times 10^{-19}\,C$, $n = ?$

$$I = \frac{Q}{\Delta t} = \frac{ne}{\Delta t} \rightarrow n = \frac{I\Delta t}{e}$$

$$= \frac{(0.50\,A)(1.0\,s)}{(1.602 \times 10^{-19}\,C)}$$

$$= 3.1211 \times 10^{18}\ e^-$$

$$= \boxed{3.1 \times 10^{18}\ e^-}$$

#7) $q = 800.\,C$
$V = 120.\,V$
$E_q = ?$

$V = \frac{E_q}{q} \rightarrow E_q = qV = (800.\,C)(120.\,V)$
$= \boxed{9.60 \times 10^4\ J}$

#8) $q = 75\,C$
$E_q = 9.0 \times 10^3\ J$
$V = ?$

$V = \frac{E_q}{q} = \frac{9.0 \times 10^3\ J}{75\,C} = \boxed{1.2 \times 10^2\ V}$

#9) $I = 6.0\,A$
$V = 240\,V$
$E_q = 2.2 \times 10^5\ J$
$\Delta t = ?$

$I = \frac{q}{\Delta t} \rightarrow q = I\Delta t$

$\therefore V = \frac{E_q}{q} = \frac{E_q}{I\Delta t} \rightarrow \Delta t = \frac{E_q}{IV}$

$\Delta t = \frac{(2.2 \times 10^5\ J)}{(6.0\,A)(240\,V)} = 1.5278 \times 10^2\ s = \boxed{150\ s}$

#10) $E_q = 1.5 \times 10^9\ J$
$V = 5.0 \times 10^7\ V$
$q = ?$

$V = \frac{E_q}{q} \rightarrow q = \frac{E_q}{V} = \frac{1.5 \times 10^9\ J}{5.0 \times 10^7\ V}$

$= \boxed{30.\,C}$

#11) $V = 9.0\,V$
$I = 5.0\ mA$
$\Delta t = 2.0 \times 10^3\ s$
$E_q = ?$

$I = \frac{q}{\Delta t} \rightarrow q = I\Delta t$

$V = \frac{E_q}{q} \rightarrow E_q = qV = I\Delta t V$
$= (5.0 \times 10^{-3}\,A)(2.0 \times 10^3\,s)(9.0\,V)$
$= \boxed{90.\,J}$

#12) $q = 0.30\,C$
$\Delta E_q = 5.4\,J$
$\Delta V = ?$

$\Delta V = \frac{\Delta E_q}{q} = \frac{5.4\,J}{0.30\,C} = \boxed{18\ V}$