Capítulo 2 - Voltagem e Corrente

Perguntas:

1) (Opção D).
2) (Opção D).
3) (Opção A).
4) (Opção D).
5) (Opção C).

Apesar de os dois tipos de partículas se deslocarem em sentidos opostos, como o sinal das suas cargas também é oposto, produzem corrente no mesmo sentido. $I_m = \frac{\Delta Q}{\Delta t} = \frac{1,602\times10^{-19}\times4\times10^{18} + 1,602\times10^{-19}\times1,5\times10^{19}}{1} = 0,88A.$

2) custo = 10 cent/kwh $E_t = 660w \times 0,5h =$
custo = $10\times0,33 = 3,3$ cent. $= 330w\cdot h = 0,33kwh$

3) $I_m = \frac{3+6}{2} = 4,5A$ $I_m = \frac{\Delta Q}{\Delta t} \Leftrightarrow$
$\Leftrightarrow \Delta Q = 4,5\times3\times3600 = 48600C = 48,6KC.$

4) $I_m = \frac{\Delta Q}{\Delta t} \Leftrightarrow \Delta Q = 50\times10^{-3}\times50 = 2,5A\cdot h$

$\Delta Q = Q_i - Q_f \Leftrightarrow Q_f = 8 - 2,5 \Leftrightarrow Q_f = 5,5A\cdot h$
$\frac{5,5}{8} = 0,69 = 69\%.$

Problemas:

1) $\frac{m}{2}v^2 + qV = \frac{m}{2}v_0^2 + qV_0 \Leftrightarrow \frac{9,109\times10^{-31}}{2}v^2 = \frac{9,109\times10^{-31}}{2} - e(V_0 - V) \Leftrightarrow$

$\Leftrightarrow 4,5545\times10^{-31}v^2 = 4,5545\times10^{-31} - 1,602\times10^{-19}(-200) \Leftrightarrow v = 8,8\times10^6 m/s =$
$= 8,8 Mm/s$

2a) $\Delta U_e = q\Delta V = -1,602\times10^{-19}\times4\times10^3 = -6,408\times10^{-16} J$

Sistema conservativo $\rightarrow \Delta E_m = 0 \Leftrightarrow U_{ei} + \vec{E_{ci}}^{0} = E_{cf} + U_{ef} \Leftrightarrow$

$\Leftrightarrow E_{cf} = U_{ei} - U_{ef} \Leftrightarrow E_{cf} = -\Delta U_e = 6,408\times10^{-16} J$

$E_{cf} = \frac{1}{2}mv^2 \Leftrightarrow v^2 = \frac{2\times6,408\times10^{-16}}{9,109\times10^{-31}} \Leftrightarrow v = 37,5\times10^6 m/s = 37,5 Mm/s$

b) $V_i - V_f = \int_0^{0,8} E\,ds \Leftrightarrow 4000 = 0,8E \Leftrightarrow E = \frac{4000}{0,8} = 5000 V/m$ (N/C)

3a) $Q_i = 250A\cdot h = 250\times3600C = 9,0\times10^5 C$ $Q_f = 0,6\times9,0\times10^5 = 5,4\times10^5 C$
ou $Q_f = 0,6\times250 = 150A\cdot h$

b) $I_i = 7A$ $I_f = 3A$ $\Delta t = 6h = 6\times3600s = 21600s$
Como diminui linearmente, $I_m = \frac{7+3}{2} = 5A$
$\Delta Q = \int_0^6 I_m\,dt = 6\times5 = 30A\cdot h$ $\Delta Q = Q_f - Q_i \Leftrightarrow 30 = Q_f - 150 \Leftrightarrow$
$\Leftrightarrow Q_f = 180A\cdot h$ $\% = \frac{180}{250}\times100 = 72\%$. R: Fica com 70% da carga inicial.

④ $\mathcal{E} = 1{,}2\,V \quad q_{máx.} = 2300\,mA\cdot h = 2{,}3\,A\cdot h = 2{,}3\times 3600\,A\cdot s = 8280\,C$

$U_{e\,máx.} = q_{máx} \times V_{máx.} = q_{máx.} \times \mathcal{E} = 8280 \times 1{,}2 = 9936\,J$

⑤ $P = I\Delta V \Leftrightarrow P = 40\times 10^{-3} \times 3 = 0{,}12\,W$

$U_{e\,máx.} = q_{máx.} \times V_{máx.} \Leftrightarrow U_{e\,máx} = 8\times 3600 \times 3 = 86\,400\,J$

$P = \frac{|\Delta U_e|}{\Delta t} \Leftrightarrow \Delta t = \frac{|\Delta U_e|}{P} \Leftrightarrow \Delta t = 7{,}2\times 10^5\,s = 200\,h.$

⑥ $I = 30\,A \quad \Delta V = 230\,V \quad P = I\Delta V = 30\times 230 = 6900\,W$

⑦a) $\Delta Q = \int_{t_i}^{t_f} I\,dt \Leftrightarrow \Delta Q = \int_0^{10} (20 + 3t^2)\,dt \Leftrightarrow \Delta Q = \left[20t + t^3\right]_0^{10} \Leftrightarrow$

$\Leftrightarrow \Delta Q = 1200\,mA\cdot s \Leftrightarrow \Delta Q = 1{,}2\,A\cdot s = 1{,}2\,C$

b) $I = \frac{\Delta Q}{\Delta t} \Leftrightarrow I = \frac{1{,}2}{10} = 0{,}12\,A = 120\,mA$

⑧a) $\mathcal{E} = 1{,}5\,V \quad 9{,}6\times 10^{21}\,eletrões \quad \Delta t = 2\,h = 2\times 3600 = 7200\,s$

$\Delta Q = 9{,}6\times 10^{21} \times e = 9{,}6\times 10^{21} \times 1{,}602\times 10^{-19} = 1537{,}92\,C$

$I = \frac{\Delta Q}{\Delta t} \Leftrightarrow I = \frac{1537{,}92}{7200} \Leftrightarrow I = 0{,}2136\,A = 214\,mA$

b) $\Delta U_e = \Delta Q \times \Delta V \Leftrightarrow \Delta U_e = \Delta Q \times \mathcal{E} \Leftrightarrow \Delta U_e = 1537{,}92\times 1{,}5 \Leftrightarrow$

$\Leftrightarrow \Delta U_e = 2307\,J = 2{,}307\,kJ$

c) $P = I\Delta V \Leftrightarrow P = I\times \mathcal{E} \Leftrightarrow P = 0{,}2136\times 1{,}5 \Leftrightarrow P = 0{,}3204\,W$

d) $Q_i = 3\,A\cdot h = 3\times 3600\,A\cdot s = 10800\,C \quad I = \frac{\Delta Q}{\Delta t}$

$\Delta Q = 10800 - 1537{,}92 = 9262{,}08\,C = \frac{9262{,}08}{3600} = 2{,}573\,A\cdot h$

⑨ $P = 132\,000\,J\cdot min = 2200\,J\cdot s = 2200\,W \quad \Delta V = 220\,V$

a) $P = I\Delta V \Leftrightarrow I = \frac{P}{\Delta V} \Leftrightarrow I = \frac{2200}{220} \Leftrightarrow I = 10\,A$

b) $P = \frac{\Delta U_e}{\Delta t} \Leftrightarrow \Delta U_e = P\times \Delta t \Leftrightarrow \Delta U_e = 2200\times 10\times 60 \Leftrightarrow$

$\Leftrightarrow \Delta U_e = 1{,}32\times 10^6\,W\cdot s = 1{,}32\times 10^3\,kW\cdot s = 0{,}367\,kW\cdot h$

custo $= 0{,}367\times 12 = 4{,}4$ cêntimos.