22.

- $S_1$, $S_2$ and $S_3$ all open: $i_a = 0.00\,\text{A}$.
- $S_1$ closed, $S_2$ and $S_3$ open: $i_a = \mathcal{E}/2R_1 = 120\,\text{V}/40.0\,\Omega = 3.00\,\text{A}$.
- $S_2$ closed, $S_1$ and $S_3$ open: $i_a = \mathcal{E}/(2R_1 + R_2) = 120\,\text{V}/50.0\,\Omega = 2.40\,\text{A}$.
- $S_3$ closed, $S_1$ and $S_2$ open: $i_a = \mathcal{E}/(2R_1 + R_2) = 120\,\text{V}/60.0\,\Omega = 2.00\,\text{A}$.
- $S_1$ open, $S_2$ and $S_3$ closed: $R_{\text{eq}} = R_1 + R_2 + R_1(R_1 + R_2)/(2R_1 + R_2) = 20.0\,\Omega + 10.0\,\Omega + (20.0\,\Omega)(30.0\,\Omega)/(50.0\,\Omega) = 42.0\,\Omega$, so $i_a = \mathcal{E}/R_{\text{eq}} = 120\,\text{V}/42.0\,\Omega = 2.86\,\text{A}$.
- $S_2$ open, $S_1$ and $S_3$ closed: $R_{\text{eq}} = R_1 + R_1(R_1 + 2R_2)/(2R_1 + 2R_2) = 20.0\,\Omega + (20.0\,\Omega)\times (40.0\,\Omega)/(60.0\,\Omega) = 33.3\,\Omega$, so $i_a = \mathcal{E}/R_{\text{eq}} = 120\,\text{V}/33.3\,\Omega = 3.60\,\text{A}$.
- $S_3$ open, $S_1$ and $S_2$ closed: $R_{\text{eq}} = R_1 + R_1(R_1 + R_2)/(2R_1 + R_2) = 20.0\,\Omega + (20.0\,\Omega)\times (30.0\,\Omega)/(50.0\,\Omega) = 32.0\,\Omega$, so $i_a = \mathcal{E}/R_{\text{eq}} = 120\,\text{V}/32.0\,\Omega = 3.75\,\text{A}$.
- $S_1$, $S_2$ and $S_3$ all closed: $R_{\text{eq}} = R_1 + R_1 R'/(R_1 + R')$ where $R' = R_2 + R_1(R_1 + R_2)/(2R_1 + R_2) = 22.0\,\Omega$, i.e., $R_{\text{eq}} = 20.0\,\Omega + (20.0\,\Omega)(22.0\,\Omega)/(20.0\,\Omega + 22.0\,\Omega) = 30.5\,\Omega$, so $i_a = \mathcal{E}/R_{\text{eq}} = 120\,\text{V}/30.5\,\Omega = 3.94\,\text{A}$.