31.35. Model: Grounding does not affect a circuit's behavior.
Visualize: Please refer to Figure Ex31.35.
Solve: Let us first obtain the value of the current I in the circuit. Applying Kirchhoff's loop rule, starting clockwise from point c,

$$\sum_i (\Delta V)_i = \Delta V_{2\,\Omega} + \Delta V_{15\text{ V bat}} + \Delta V_{4\,\Omega} + \Delta V_{9\text{ V bat}} = 0$$

$$\Rightarrow -I(2\ \Omega) + 15\text{ V} - I(4\ \Omega) - 9\text{ V} = 0 \Rightarrow I = \frac{6\text{ V}}{6\ \Omega} = 1\text{ A}$$

Because the earth has $V_{earth} = 0$ V, point c is at zero potential. There is a potential drop of $IR = (1\text{ A})(2\ \Omega) = 2$ V across the 2 Ω resistor, so the potential at point d is −2 V. From point d to point a, there is an increase in potential of 15 V, thus the potential at point a is 15 V − 2 V = 13 V. The potential decreases from point a to point b by $IR = (1\text{ A})(4\ \Omega) = 4$ V, so the potential at point b is 13 V − 4 V = 9 V. The potential at point c is 9 V lower than the potential at b, so it 0 V, as it must be. In summary, the potentials at a, b, c, and d are 13 V, 9 V, 0 V, and −2V.