## Exercise 11.10 (Cont.)

## EXERCISE 11.10: Continued

| letallic coppe  | r is place  | d in 1 M  | AgNO <sub>3</sub> .   |   |                         |                |
|---|---|---|---|---|-------------------------|----------------|
| Oxidation half  | reaction:   |   |   |   |                         |                |
|   | _ =   |   | + .   |   | e <sup>1-</sup>         |                |
| Red. 1  |   | Ox. 1   |   |   |                         |                |
| Reduction half  | reaction:   |   |   |   |                         |                |
|   | _ +   |   | $- e^{1-}$  | <u> </u>  |                         |                |
| Ox. 2   |   |   |   | Re  | d. 2                    |                |
| The number of   | electrons t   | ransferred  | (or the L   | CM) is:   |                         |                |
| Write the net e   | quation (if   | any).   |   |   |                         |                |
|   | _ +   |   | $\_\rightarrow$   |   | _ +                     |                |
|   |   | Or 2  |   | Ox 1  |                         | Red 2          |
| Red. 1  |   | OX. 2   |   | 0.1.1   |                         | 1000. 2        |
| Red. 1<br>The standard c  | ell potentia  | al in volts i   | s:  |   |                         | 1004. 2        |
| Red. 1<br>The standard c  | ell potentia  | al in volts is  | s:  |   |                         | 10041 2        |
| Red. 1<br>The standard c<br><b>fetallic chrom</b>   | ell potentia<br>ium is pl   | al in volts in aced in 1                                | s:<br>M CuSC  | ) <sub>4</sub> .  |                         | 1001 -         |
| Red. 1<br>The standard c<br><b>Ietallic chrom</b><br>Oxidation half   | ell potentia<br>ium is pl<br>reaction:  | al in volts in aced in 1                                | s:<br>M CuSC  | ) <sub>4</sub> .  |                         |                |
| Red. 1<br>The standard c<br><b>fetallic chrom</b><br>Oxidation half   | ell potentia<br><b>ium is pl</b><br>reaction:<br>_  | al in volts i   | s:<br>M CuSC  | ) <sub>4</sub> .  | e <sup>1–</sup>         | 100al <u>-</u> |
| Red. 1<br>The standard c<br><b>fetallic chrom</b><br>Oxidation half<br>Red. 1   | ell potentia<br>.ium is pl<br>reaction:<br>_ ≓  | Ox. 2<br>al in volts in<br>aced in 1<br>Ox. 1           | s:<br>M CuSC<br>+   | ) <sub>4</sub> .  | e <sup>1–</sup>         | 100ar <u>-</u> |
| Red. 1<br>The standard c<br>Ietallic chrom<br>Oxidation half<br>Red. 1<br>Reduction half  | ell potentia<br><b>fium is pl</b><br>reaction:  | ox. 2<br>al in volts in<br>aced in 1<br>Ox. 1           | s:<br>M CuSC  | ) <sub>4</sub> .  | e <sup>1</sup>          | 100al <u>-</u> |
| Red. 1<br>The standard c<br>Ietallic chrom<br>Oxidation half<br>Red. 1<br>Reduction half  | ell potentia<br>ium is pl<br>reaction:<br>$ \Rightarrow -$<br>reaction:<br>+ -  | Ox. 2<br>al in volts in<br>aced in 1<br>Ox. 1           | s:<br><b>M CuSO</b><br>+  | <br>D₄.   | e <sup>1–</sup>         |                |
| Red. 1<br>The standard c<br>fetallic chrom<br>Oxidation half<br>Red. 1<br>Reduction half<br>Ox. 2   | ell potentia<br>ium is pl<br>reaction:  | Ox. 2<br>al in volts in<br>aced in 1<br>Ox. 1           | s:<br>M CuSC<br>+<br>e <sup>1</sup> ;   | D₄.   | e <sup>1-</sup>         |                |
| Red. 1<br>The standard c<br>Ietallic chrom<br>Oxidation half<br>Red. 1<br>Reduction half<br>Ox. 2<br>The number of                                  | ell potentia<br>ium is pl<br>reaction:<br>$ \rightarrow -$<br>reaction:<br>- + -<br>electrons t                       | Ox. 2<br>al in volts in<br>aced in 1<br>Ox. 1           | s:<br><b>M CuSC</b><br><u>+</u> +<br><u>-</u> e <sup>1-</sup> ;<br>(or the L0 | D4.<br>→<br>Ref<br>CM) is:  | e <sup>1-</sup><br>d. 2 |                |
| Red. 1<br>The standard c<br>Ietallic chrom<br>Oxidation half<br>Red. 1<br>Reduction half<br>Ox. 2<br>The number of<br>Write the net e               | ell potentia<br>ium is pl<br>reaction:<br>$ \rightarrow -$<br>reaction:<br>- + -<br>electrons t<br>quation (if        | Ox. 2<br>al in volts in<br>aced in 1<br>Ox. 1<br>Ox. 1  | s:<br><b>M CuSC</b><br>+  | <ul> <li>D4.</li> <li>D4.</li> <li>Re</li> <li>CM) is:</li> </ul> | e <sup>1-</sup><br>d. 2 |                |
| Red. 1<br>The standard c<br>Ietallic chrom<br>Oxidation half<br>Red. 1<br>Reduction half<br>Ox. 2<br>The number of<br>Write the net e               | ell potentia<br>ium is pl<br>reaction:<br>$ \rightarrow -$<br>reaction:<br>+ -<br>electrons t<br>quation (if<br>+     | Ox. 2<br>al in volts in<br>aced in 1<br>Ox. 1<br>Ox. 1  | s:<br><b>M</b> CuSC<br>+  | Q4.<br>→<br>Ref<br>CM) is:  | e <sup>1-</sup><br>d. 2 |                |
| Red. 1<br>The standard c<br>Ietallic chrom<br>Oxidation half<br>Red. 1<br>Reduction half<br>Ox. 2<br>The number of<br>Write the net e<br><br>Red. 1 | ell potentia<br>ium is pl<br>reaction:<br>$ \rightarrow -$<br>reaction:<br>+ -<br>electrons t<br>quation (if<br>- + - | Ox. 2<br>al in volts is<br>aced in 1<br>Ox. 1<br>Cox. 1 | s:<br><b>M</b> CuSC<br>+<br>(or the LC<br>$ \rightarrow$                      | On 1<br>D4.<br>→<br>Ref<br>CM) is:                                | e <sup>1-</sup><br>d. 2 | Bed 2          |

|  |   | $\pm$  |  | $e^{1-}$   |  |   |
|--|---|--|--|--|--|---|
| Red. 1   | Ox. 1   |  |  | 0  |  |   |
| Poduction half read  | ation   |  |  |  |  |   |
| neulution nan read   |   | a1—  |  |  |  |   |
| · · ·  | +   | e =  | D-1 9  |  |  |   |
| Ox. 2  |   |  | neu. 2                                       |  |  |   |
| The number of elec   | trons transferred (   | or the LCM) is   | : _  |  |  |   |
| Write the net equa   | tion (if any).  |  |  |  |  |   |
| ·  | +   | $\_ \rightarrow \_$  | +  |  |  |   |
| Red. 1   | Ox. 2   | Ox.  | 1  | R  | ted. 2   |   |
| The standard cell r  | potential in volts is   | :  |  |  |  |   |
| <b>Setallic sodium is</b><br>ote: in some half re<br>quired for a balance<br>$_{2}O$ , $OH^{1-}$ , or $H^{1+}$<br>bstance.   | s added to water<br>eactions, there are a<br>ed equations. Thes<br>when they are not  | •<br>substances pres<br>e substances w<br>t involved in th                                       | sent that an<br>ill be referr<br>ne electron | re not invo<br>ed to as "c<br>transfer.                        | lved in the el<br>other." Other<br>This example                  | ectron trans<br>substances<br>e contains of |
| <b>fetallic sodium is</b><br>ote: in some half re-<br>equired for a balanc<br>${}_{2}O, OH^{1-}, \text{ or } H^{1+}$<br>ubstance.<br>Oxidation half reac   | s added to water<br>eactions, there are a<br>ed equations. Thes<br>when they are not<br>ction:  | substances pres<br>e substances w<br>t involved in th  | ent that an<br>ill be referr<br>ne electron  | re not invo<br>ed to as "c<br>transfer. "                      | lved in the el<br>other." Other<br>This example                  | ectron trans<br>substances<br>e contains or |
| <b>fetallic sodium is</b><br>ote: in some half re-<br>equired for a balance<br>_2O, OH <sup>1-</sup> , or H <sup>1+</sup><br>ibstance.<br>Oxidation half reac<br>  | s added to water<br>eactions, there are a<br>ed equations. Thes<br>when they are not<br>etion:<br>$\rightleftharpoons \qquad \qquad$ | substances pres<br>e substances w<br>t involved in th<br>+                                       | Sent that an ill be referr ne electron       | te not invo<br>ed to as "c<br>transfer. $d$<br>$e^{1-}$        | lved in the el<br>ther." Other<br>This example                   | ectron trans<br>substances<br>e contains of |
| <b>fetallic sodium is</b><br>ote: in some half re-<br>equired for a balance<br>2O, OH <sup>1-</sup> , or H <sup>1+</sup><br>ibstance.<br>Oxidation half reac<br>Red. 1   | s added to water<br>eactions, there are a<br>ed equations. Thes<br>when they are not<br>etion:<br>$\rightleftharpoons$ Ox. 1  | •<br>substances pres<br>æ substances w<br>t involved in tl<br>+                                  | sent that an<br>ill be referr<br>ne electron | e not invo<br>ed to as "c<br>transfer. "<br>e <sup>1—</sup>    | lved in the el<br>other." Other<br>This example                  | ectron trans<br>substances<br>e contains or |
| <b>fetallic sodium is</b><br>ote: in some half re-<br>equired for a balance<br>${}_{2}$ O, OH <sup>1-</sup> , or H <sup>1+</sup><br>ibstance.<br>Oxidation half reace<br>Red. 1<br>Red. 1                          | s added to water<br>eactions, there are a<br>ed equations. Thes<br>when they are not<br>etion:<br>$\rightleftharpoons$ Ox. 1<br>ction:  | • substances pres • substances w t involved in t +   | sent that an<br>ill be referr<br>ne electron | e not invo<br>ed to as "c<br>transfer. "<br>e <sup>1–</sup>    | lved in the el<br>other." Other<br>This example                  | ectron trans<br>substances<br>e contains or |
| <b>Ietallic sodium is</b> ote: in some half re-         equired for a balanc         2O, OH <sup>1-</sup> , or H <sup>1+</sup> ibstance.         Oxidation half read            Red. 1         Reduction half read | s added to water<br>eactions, there are a<br>ed equations. Thes<br>when they are not<br>etion:<br>$\rightleftharpoons$ Ox. 1<br>etion:<br>+   | •<br>substances pres<br>to substances with<br>to involved in th<br>- + +                         | Sent that an ill be referr ne electron       | e not invo<br>ed to as "c<br>transfer. "<br>e <sup>1-</sup> +  | lved in the el<br>other." Other<br>This example                  | ectron trans<br>substances<br>e contains or |
| <b>Jetallic sodium is</b><br>ote: in some half re-<br>equired for a balance<br>2,0, OH <sup>1-</sup> , or H <sup>1+</sup><br>ibstance.<br>Oxidation half reace<br>Red. 1<br>Reduction half reace<br>Ox. 2          | s added to water<br>eactions, there are a<br>ed equations. Thes<br>when they are not<br>etion:<br>$\rightleftharpoons$ Ox. 1<br>etion:<br>+   | •<br>substances pres<br>we substances we<br>t involved in th<br>+<br>$e^{1-} \rightleftharpoons$ | Red. 2                                       | re not invo<br>ed to as "c<br>transfer. "<br>e <sup>1-</sup> + | lved in the el<br>other." Other<br>This example                  | ectron trans<br>substances<br>e contains or |
| <b>Ietallic sodium is</b> ote: in some half re-<br>equired for a balance         2O, OH <sup>1-</sup> , or H <sup>1+</sup> ibstance.         Oxidation half read   | s added to water<br>eactions, there are a<br>ed equations. Thes<br>when they are not<br>ction:<br>Ox. 1<br>ction:<br>+  | •<br>substances pres<br>we substances we<br>t involved in th<br>- + +                            | Red. 2                                       | re not invo<br>ed to as "c<br>transfer. "<br>$e^{1-}$ +        | lved in the el<br>other." Other<br>This example<br><br>Other     | ectron trans<br>substances<br>e contains of |
| <b>Ietallic sodium is</b> iote: in some half re-<br>equired for a balance         2O, OH <sup>1-</sup> , or H <sup>1+</sup> ibstance.         Oxidation half read  | s added to water<br>eactions, there are a<br>ed equations. Thes<br>when they are not<br>ction:<br>→   | •<br>substances pres<br>we substances w<br>t involved in th<br>- + +                             | Red. 2                                       | e not invo<br>ed to as "c<br>transfer. "<br>e <sup>1-</sup> +  | lved in the el<br>other." Other<br>This example<br><br>Other     | ectron trans<br>substances<br>e contains or |
| <b>fetallic sodium is</b> iote: in some half re-<br>equired for a balance         2O, OH <sup>1-</sup> , or H <sup>1+</sup> ibstance.         Oxidation half read  | s added to water<br>eactions, there are<br>ed equations. Thes<br>when they are nor<br>etion:<br>→Ox. 1<br>etion:<br>+<br>etrons transferred (a<br>tion (if any).  | •<br>substances pres<br>we substances w<br>t involved in th<br>- +                               | Red. 2                                       | re not invo<br>ed to as "c<br>transfer. "<br>e <sup>1-</sup> + | lved in the el<br>other." Other<br>This example<br><br>Other<br> | ectron trans<br>substances<br>e contains or |

| Oxidation half r   | eaction:   |   |   |  |              |
|--|--|---|---|--|--------------|
|  |  | +   |   | _ e <sup>1-</sup>  |              |
| Red. 1   | Ox. 1  |   |   |  |              |
| Reduction half r   | eaction:   |   |   |  |              |
|  | . +  | e <sup>1-</sup> =                             | ⇒   |  |              |
| Ox. 2  |  |   | Red. 2  |  |              |
| The number of e  | electrons transferred  | (or the LC                                    | M) is:  |  |              |
| Write the net eq   | uation (if any).   |   |   |  |              |
|  | . +  | →   |   | +  |              |
| Red. 1   | Ox. 2  |   | Ox. 1   | Red. 2   |              |
| The standard ce  | ll potential in volts is   | s: _  |   | _  |              |
|  |  |   |   |  |              |
|  |  |   |   |  |              |
| letallic copper  | is placed in 1 M   | nitric acie                                   | d.  |  |              |
| l <b>etallic copper</b><br>Oxidation half r  | is placed in $1 M$ eaction:  | nitric acio                                   | d.  |  |              |
| l <b>etallic copper</b><br>Oxidation half r  | is placed in 1 M reaction:<br>$\Rightarrow$  | nitric acio<br>+                              | d.  | _ e <sup>1-</sup>  |              |
| <b>Ietallic copper</b><br>Oxidation half r<br>Red. 1   | is placed in 1 M :<br>eaction:<br>$\Rightarrow \qquad \qquad$   | nitric acie<br>+                              | d.  | - e <sup>1-</sup>  |              |
| Ietallic copper<br>Oxidation half r<br>Red. 1<br>Reduction half r  | eaction:<br>$\Rightarrow$ Ox. 1<br>eaction:  | nitric ació                                   | d.  | - e <sup>1-</sup>  |              |
| Ietallic copper<br>Oxidation half r<br>Red. 1<br>Reduction half r  | e is placed in 1 M =<br>eaction:<br>$e \rightleftharpoons \qquad $  | nitric ació<br>+<br>+                         | d.<br>e <sup>1−</sup> ≠                                     | _ e <sup>1_</sup>  | _ +          |
| Ietallic copper<br>Oxidation half r<br>Red. 1<br>Reduction half r<br>Ox. 2   | T is placed in 1 M is<br>eaction:<br>$\Rightarrow$   | nitric ació<br>+<br>+                         | d.<br>e <sup>1−</sup> ≂                                     | _ e <sup>1−</sup>  | _ +<br>Other |
| Ietallic copper         Oxidation half r         Red. 1         Reduction half r         Ox. 2         The number of e   | r is placed in 1 M :<br>eaction:<br>. ⇒<br>Ox. 1<br>eaction:<br>. +<br>Other   | nitric acio<br>+<br>+                         | d.<br>e <sup>1-</sup> =                                     | _ e <sup>1−</sup><br>⇒<br>Red. 2   | _ +<br>Other |
| Ietallic copper         Oxidation half r         Red. 1         Reduction half r         Ox. 2         The number of e         Write the net equation                        | e is placed in 1 M :<br>eaction:<br>$e$ $\Rightarrow$ $Ox. 1$<br>eaction:<br>e $+$ $Otherelectrons transferreduation (if any).$  | nitric acio                                   | d.<br>e <sup>1−</sup> ≠<br>!M) is:                          | _ e <sup>1−</sup><br>⇒<br>Red. 2   | _ +<br>Other |
| Ietallic copper         Oxidation half r         Red. 1         Reduction half r         Ox. 2         The number of e         Write the net equation                        | e is placed in 1 M is<br>eaction:<br>$e$ $\Rightarrow$ $Ox. 1$<br>reaction:<br>e $+$ $Otherelectrons transferreduation (if any).$  | nitric acio<br>+<br>+<br>(or the LC           | d.<br>e <sup>1−</sup> ≠<br>!M) is:                          | $e^{1-}$ $e^{1-}$ Red. 2 $\rightarrow$   | _ +<br>Other |
| Ietallic copper         Oxidation half r         Red. 1         Reduction half r         Ox. 2         The number of e         Write the net eq         Red. 1               | eaction:<br>$\Rightarrow =$  | nitric acio<br>+<br>+<br>(or the LC<br>+      | d.<br>e <sup>1−</sup> =<br>PM) is:<br>Other                 | $= e^{1-}$ $\stackrel{=}{=} $ Red. 2 $$  | _ +<br>Other |
| Ietallic copper         Oxidation half r         Red. 1         Reduction half r         Ox. 2         The number of e         Write the net eq         Red. 1               | eaction:<br>$\Rightarrow =$  | nitric acio                                   | d.<br>e <sup>1−</sup> ₹<br>PM) is:<br>Other                 | $e^{1-}$ Red. 2 $\rightarrow$  | _ +<br>Other |
| Ietallic copper         Oxidation half r         Red. 1         Reduction half r         Ox. 2         The number of e         Write the net eq         Red. 1               | $\begin{array}{c} \text{is placed in 1 M :}\\ \text{eaction:}\\ \begin{array}{c} \begin{array}{c} \end{array} \\ \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \begin{array}{c} \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \begin{array}{c} \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \begin{array}{c} \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \begin{array}{c} \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \end{array} $ } \\ \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \end{array}  } \\ \end{array} \\ \end{array} \\ \end{array}  } \\ \end{array} \\ \end{array} \\ \end{array} \\ \end{array}  } \\ \end{array}  } \\ \end{array} \\ \end{array} \\ \end{array}  } \\ \end{array} \\ \end{array} \\ \end{array} \\  } \\ \end{array} \\ \end{array} \\ \end{array}  } \\ \end{array} \\ \end{array}  } \\ \end{array} \\ \end{array}  } \\ \end{array} \\ \end{array} \\  } \\ \end{array} \\  } \\ \end{array} \\ \end{array}  } \\ \end{array}  } \\ \end{array}  } \\ \end{array}  } \\ \end{array} \\  } \\ \end{array} \\  } \\ \end{array}  } \\ \end{array}  } \\  } \\ \end{array}  } \\ \end{array}  } \\ | nitric acio<br>+<br>+<br>(or the LC<br>+      | d.<br>e <sup>1-</sup> =<br><br>M) is:<br>Other              | $\stackrel{-e^{1-}}{\longrightarrow} \qquad \qquad$ | _ +<br>Other |
| Ietallic copper         Oxidation half r         Red. 1         Reduction half r         Ox. 2         The number of e         Write the net eq         Red. 1         Ox. 1 | $\begin{array}{c} \text{r is placed in 1 M :}\\ \text{eaction:}\\  \rightleftharpoons & \\ & \\ & \\ & \\ & \\ & \\ & \\ & \\ & \\ & \\$   | nitric acio<br>+<br>+<br>(or the LC<br>+<br>+ | d.<br>e <sup>1-</sup> =<br><br>M) is:<br>Other<br><br>Other | $e^{1-}$ Red. 2 $\rightarrow$  | _ +<br>Other |