

### Answers to Multiple-Choice Questions

1. c
2. d
3. c
4. b
5. a
6. d
7. c
8. b
9. d
10. d
11. b
12. b
13. c
14. a
15. a

### Answers to Numerical Response Questions

<b>16.</b>	CO: +2; CO <sub>2</sub> : +4; CH <sub>4</sub> : -4; C <sub>2</sub> H <sub>6</sub> : -3
<b>17.</b>	SO <sub>2</sub> : +4; SO <sub>3</sub> : +6; SO: +2; H <sub>2</sub> SO <sub>3</sub> : +4
<b>18.</b>	2.1 g
<b>19.</b>	6.1 g
<b>20.</b>	31.6 g Cl <sub>2</sub>

### Answers to Written Response Questions

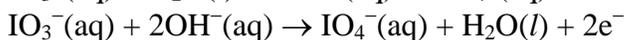
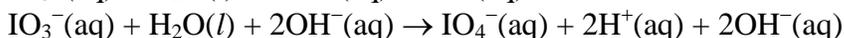
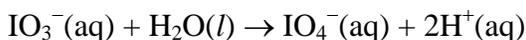
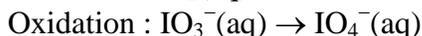
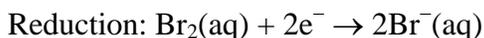
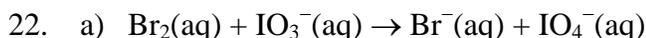
21. a) Oxidation :  $2\text{Cl}^-(\text{aq}) - 2\text{e}^- \rightarrow \text{Cl}_2(\text{g})$   
Reduction:  $\text{MnO}_4^-(\text{aq}) + 8\text{H}^+ + 5\text{e}^- \rightarrow \text{Mn}^{2+}(\text{aq}) + 4\text{H}_2\text{O}(\text{l})$
- b)  $5 \times$  oxidation half-reaction:  $10\text{Cl}^-(\text{aq}) - 10\text{e}^- \rightarrow 5\text{Cl}_2(\text{g})$   
 $2 \times$  reduction half-reaction:  $2\text{MnO}_4^-(\text{aq}) + 16\text{H}^+(\text{aq}) + 10\text{e}^- \rightarrow 2\text{Mn}^{2+}(\text{aq}) + 8\text{H}_2\text{O}(\text{l})$
- Overall reaction:  $10\text{Cl}^-(\text{aq}) + 2\text{MnO}_4^-(\text{aq}) + 16\text{H}^+(\text{aq}) \rightarrow 5\text{Cl}_2(\text{g}) + 2\text{Mn}^{2+}(\text{aq}) + 8\text{H}_2\text{O}(\text{l})$

ANSWER KEY	Chapter 12 Test Answer Key	BLM 12.5.1A
------------	----------------------------	-------------

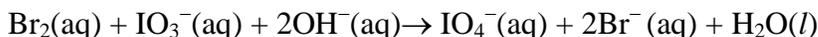
$$c) n(\text{MnO}_4^-) = c \times V = 1.3 \text{ mol/L} \times 0.021 \text{ L} = 0.0273 \text{ mol}$$

$$0.0273 \frac{\cancel{\text{mol MnO}_4^-}}{\cancel{\text{mol MnO}_4^-}} \times \frac{10 \text{ mol Cl}^-}{2 \cancel{\text{mol MnO}_4^-}} = 0.1365 \text{ mol Cl}^-$$

$$n(\text{NaCl}) = \frac{n}{V} = \frac{0.1365 \text{ mol}}{0.100 \text{ L}} = 1.36 \text{ mol/L}$$



Add the two balanced half-reactions:



$$b) n(\text{Br}_2) = \frac{m}{M} = \frac{4.00 \cancel{\text{g}}}{159.8 \frac{\cancel{\text{g}}}{\text{mol}}} = 0.02503 \text{ mol}$$

$$n(\text{KIO}_3) = 0.02503 \frac{\cancel{\text{mol Br}_2}}{\cancel{\text{mol Br}_2}} \times \frac{1 \text{ mol KIO}_3(\text{aq})}{1 \cancel{\text{mol Br}_2}} = 0.02503 \text{ mol KIO}_3(\text{aq})$$

$$V(\text{KIO}_3) = \frac{n}{c} = \frac{0.02503 \cancel{\text{mol}}}{0.788 \frac{\cancel{\text{mol}}}{\text{L}}} = 0.03176 \text{ L} = 31.8 \text{ mL}$$

