Calculating pOH and Changing from pH to pOH Answer Key

1.

(a) $\text{pOH} = -\log[\text{OH}^-(\text{aq})]$

$$\text{pOH} = -\log\left(4.67\times10^{-3}\,\frac{\text{mol}}{\text{L}}\right)$$

$$\text{pOH} = 2.331$$

(b) $\text{pOH} = -\log[\text{OH}^-(\text{aq})]$

$$\text{pOH} = -\log\left(5.84\times10^{-8}\,\frac{\text{mol}}{\text{L}}\right)$$

$$\text{pOH} = 7.234$$

(c) $\text{pOH} = -\log[\text{OH}^-(\text{aq})]$

$$\text{pOH} = -\log\left(1.478\times10^{-14}\,\frac{\text{mol}}{\text{L}}\right)$$

$$\text{pOH} = 13.8303$$

(d) $\text{pOH} = -\log[\text{OH}^-(\text{aq})]$

$$\text{pOH} = -\log\left(3.4\times10^{-2}\,\frac{\text{mol}}{\text{L}}\right)$$

$$\text{pOH} = 1.47$$

2. Solutions **(b)** and **(c)** are acidic.

3. pH = 14 – pOH
pOH = 14 – pH

(a) pOH = 1.7
(b) pH = 8.5
(c) pH = 11.05
(d) pOH = 7.371
(e) pH = 12.9

4.

$[OH^-(aq)]$ mol/L	**pOH**	**pH**
1.28	–0.107	14.107
5.35×10^{-3}	2.272	11.728
8.459×10^{-5}	4.0727	9.9273
9.6×10^{-8}	7.02	6.98
1.934×10^{-15}	14.7135	–0.7135

**Note that two of the answers show a negative pH or pOH. While the pH and pOH scales were defined so that most acidic and basic solutions would fall within the range from 0 to 14, it is possible for concentrated strong acids or bases to fall outside this range.*

Calculating pOH and Changing from pH to pOH Answer Key

(continued)

5. As acidity increases, pH decreases and pod increases.

6. $LiOH(s) \rightarrow Li^{+}(aq) + OH^{-}(aq)$

$$3.2\frac{mol}{L}Sr(OH)_2(aq) \times \frac{1mol\ OH^{-}(aq)}{1mol\ LiOH(aq)} = 3.2\frac{mol}{L}OH^{-}(aq)$$

$$pOH = -\log[OH^{-}(aq)]$$

$$pOH = -\log(3.2)$$

$$pOH = -0.51$$

7. $Sr(OH)_2(s) \rightarrow Sr^{2+}(aq) + 2OH^{-}(aq)$

$$5.467\frac{mol}{L}Sr(OH)_2(s) \times \frac{2mol\ OH^{-}(aq)}{1mol\ Sr(OH)_2(s)} = 10.934\frac{mol}{L}$$

$$pOH = -\log[OH^{-}(aq)]$$

$$pOH = -\log\left(10.934\frac{mol}{L}\right)$$

$$pOH = -1.0388$$

8. $NaOH(aq) \rightarrow Na^{+}(aq) + OH^{-}(aq)$

$$3.45\frac{mol}{L}NaOH(aq) \times \frac{1mol\ OH^{-}(aq)}{1mol\ NaOH(aq)} = 3.45\frac{mol}{L}\ OH^{-}(aq)$$

$$pOH = -\log[OH^{-}(aq)]$$

$$pOH = -\log(3.45)$$

$$pOH = -0.538$$

$$pH = 14 - pOH$$

$$pH = 14 - (-0.538)$$

$$pH = 14.538$$

9. $KOH(aq) \rightarrow K^{+}(aq) + OH^{-}(aq)$

$$4.95\,g\ KOH(s) \times \frac{1mol}{56.11g} \times \frac{1}{4.50\,L} \times \frac{1mol\ OH^{-}(aq)}{1mol\ KOH(aq)} = 0.0196\frac{mol}{L}OH^{-}(aq)$$

$$pOH = -\log[OH^{-}(aq)]$$

$$pOH = -\log(0.0196)$$

$$pOH = 1.708$$