ANSWERS TO TOPIC B PROBLEMS

1) a)0.188 mol/L (0.188 M)
b) 12.0 g $CaCl_2$
c) 0.671 L (671 mL)

2) a) **0.055 M**
b) **800 mL of water**
c) **0.300 L of the 2.00 M NaOH, 1.20 L of water**.

3) Strong electrolytes: **NaCl, $Mg(NO_3)_2$, $MgCrO_4$, AgF, H_2SO_4, and NH_4Br.**
Weak electrolytes: **$HClO_2$, H_3PO_4, and $HC_3H_5O_3$.**
Nonelectrolytes: **C_2H_5OH, CH_3CN, and $(CH_3)_2CO$.**

4) a) **0.1 M Na^+** and **0.1 M Br^-**
b) **0.04 M K^+** and **0.04 M NO_3^-**
c) **0.2 M Fe^{3+}** and **0.6 M Cl^-**
d) **3.0 M NH_4^+** and **1.5 M SO_4^{2-}**

5) 0.0515 mol Fe^{3+}
0.0772 mol SO_4^{2-}

6) Only **choice c** is correct.

7) **267 mL of water.**

8) 4.918 g $Al(NO_3)_3$

9) 0.750 M

10) a) **0.0600 M**
b) 3.13 g $SnCl_4$

11) a) 0.2x mol Al^{3+}
b) 0.6x mol Br^-
c) you must add **9*x* liters of water.**

12) The only insoluble compounds in this list are **FeS and $Ba_3(PO_4)_2$**.

13)
a) $3\ Mg^{2+}(aq) + 2\ PO_4^{3-}(aq) \rightarrow Mg_3(PO_4)_2(s)$
b) $H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$
c) $Fe^{3+}(aq) + 3\ OH^-(aq) \rightarrow Fe(OH)_3(s)$
d) None of the possible products is insoluble, so there is no reaction.
e) $H^+(aq) + HCO_3^-(aq) \rightarrow H_2O(l) + CO_2(g)$

f) $2\ Ag^+(aq) + CO_3^{2-} \rightarrow Ag_2CO_3(s)$
g) $Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_4(s)$
h) $HC_2H_3O_2(aq) + OH^-(aq) \rightarrow H_2O(l) + C_2H_3O_2^-(aq)$
i) $HC_6H_5O(aq) + OH^-(aq) \rightarrow H_2O(l) + C_6H_5O^-(aq)$
j) Reaction 1: $H_2C_4H_4O_4(aq) + OH^-(aq) \rightarrow H_2O(l) + HC_4H_4O_4^-(aq)$
Reaction 2: $HC_4H_4O_4^-(aq) + OH^-(aq) \rightarrow H_2O(l) + C_4H_4O_4^{2-}(aq)$

14) a) $Ba^{2+}(aq) + CrO_4^{2-}(aq) \rightarrow BaCrO_4(s)$
b) $Ca^{2+}(aq) + 2\ C_{12}H_{22}O_2^-(aq) \rightarrow Ca(C_{12}H_{22}O_2)_2(s)$

15) See the handout for information about this type of reaction. The net ionic equations are:
a) $Mg(OH)_2(s) + 2\ H^+(aq) \rightarrow Mg^{2+}(aq) + 2\ H_2O(l)$
b) $CuO(s) + 2\ H^+(aq) \rightarrow Cu^{2+}(aq) + H_2O(l)$
c) $Al(OH)_3(s) + 3\ H^+(aq) \rightarrow Al^{3+}(aq) + 3\ H_2O(l)$
d) $Cr_2O_3(s) + 6\ H^+(aq) \rightarrow 2\ Cr^{3+}(aq) + 3\ H_2O(l)$

16) a) $CaCO_3(s) + H^+(aq) \rightarrow Ca^{2+}(aq) + HCO_3^-(aq)$
b) $HCO_3^-(aq) + H^+(aq) \rightarrow CO_2(g) + H_2O(l)$

17) The reactions are:
$MgO(s) + 2\ H^+(aq) \rightarrow Mg^{2+}(aq) + H_2O(l)$
$PbO\ (s) + H^+(aq) + HSO_4^-(aq) \rightarrow PbSO_4(s) + H_2O(l)$

18) The answer is…
The solution definitely contains I^-.
The solution definitely does not contain PO_4^{3-}.
You cannot determine whether the solution contains NO_3^-.

19)

	$3\ Ca^{2+}$	+	$2\ PO_4^{3-}$	→	$Ca_3(PO_4)_2$
Initial moles:	**0.0685**		**0.0505**		**0**
Change:	**-0.0685**		**-0.0457**		**+0.0228**
Ending moles:	**0**		**0.0048**		**0.0228**

20)

	$3\ Ca^{2+}$	+	$2\ PO_4^{3-}$	→	$Ca_3(PO_4)_2$
Initial moles:	x		y		**0**
Change:	$-x$		$-0.6667x$		$+0.3333x$
Ending moles:	**0**		$y - 0.6667x$		$0.3333x$

21)

	$3\ Ca^{2+}$	+	$2\ PO_4^{3-}$	→	$Ca_3(PO_4)_2$
Initial moles:	x		y		**0**
Change:	$-1.5y$		$-y$		$+0.5y$
Ending moles:	$x - 1.5y$		**0**		$0.5y$

22) a) **$Cu^{2+}(aq) + 2\ OH^-(aq) \rightarrow Cu(OH)_2(s)$**
b) **K^+ and Cl^-**.
c) The limiting reactant is **OH^-**
d)

	Cu^{2+}	**+**	**$2\ OH^-$**	**→**	**$Cu(OH)_2$**
Initial moles:	**0.0200**		**0.0300**		**0**
Change:	**-0.0150**		**-0.0300**		**+0.0150**
Ending moles:	**0.0050**		**0**		**0.0150**

23) a) **$Pb^{2+}(aq) + 2\ I^-(aq) \rightarrow PbI_2(s)$**
b)

	Pb^{2+}	**+**	**$2\ I^-$**	**→**	**PbI_2**
Initial moles:	**0.000800**		**0.00120**		**0**
Change:	**-0.000600**		**-0.00120**		**+0.000600**
Ending moles:	**0.000200**		**0**		**0.000600**

c) **0.277 g of PbI_2**.
d) **0.0222 M**
e) **0.178 M**

24) a) **2.19 g of AgBr**.
b) **1.53 M**.

25) **35.1 mL**
26) **0.188 M**
27) **0.159 M**