Answer Key

Writing BCE + Stoichiometry Problems

1. $C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)}$ Sees everywhere!
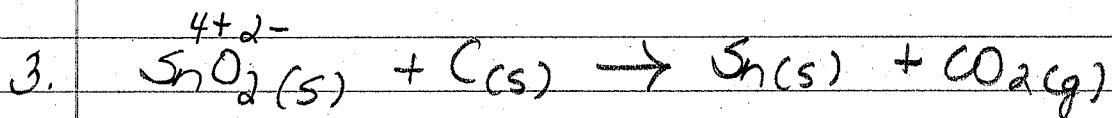
$$10.\,mol\,CO_2 \times \frac{1\,mol\,C}{1\,mol\,CO_2} = 10.\,mol\,C$$

$$10.\,mol\,CO_2 \times \frac{1\,mol\,O_2}{1\,mol\,CO_2} = 10.\,mol\,O_2$$

2. $2\,H_{2(g)} + O_{2(g)} \rightarrow 2\,H_2O_{(l)}$
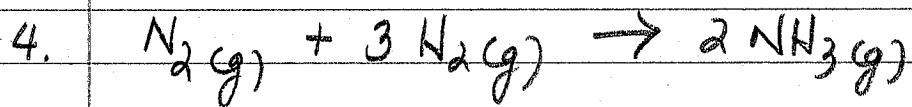
$$5.0\,mol\,H_2O \times \frac{2\,mol\,H_2}{2\,mol\,H_2O} = 5.0\,mol\,H_2$$
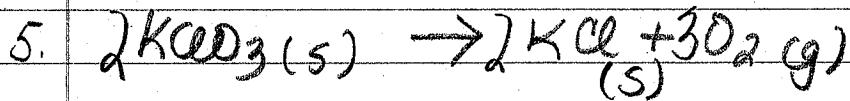
$$5.0\,mol\,H_2O \times \frac{1\,mol\,O_2}{2\,mol\,H_2O} = 2.5\,mol\,O_2$$

3. $\overset{4+\,2-}{SnO_2}{}_{(s)} + C_{(s)} \rightarrow Sn_{(s)} + CO_{2(g)}$
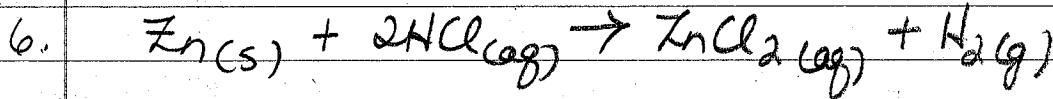
$$2.0\,mol\,SnO_2 \times \frac{1\,mol\,Sn}{1\,mol\,SnO_2} = 2.0\,mol\,Sn$$

4. $N_{2(g)} + 3\,H_{2(g)} \rightarrow 2\,NH_{3(g)}$
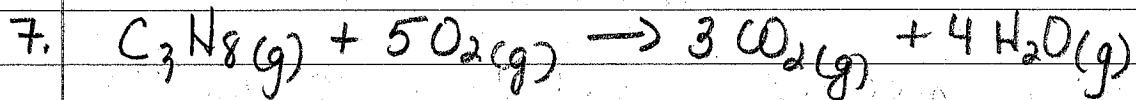
$$3.0\,mol\,N_2 \times \frac{3\,mol\,H_2}{1\,mol\,N_2} = 9.0\,mol\,H_2$$

5. $2\,KClO_{3(s)} \rightarrow 2\,KCl_{(s)} + 3\,O_{2(g)}$
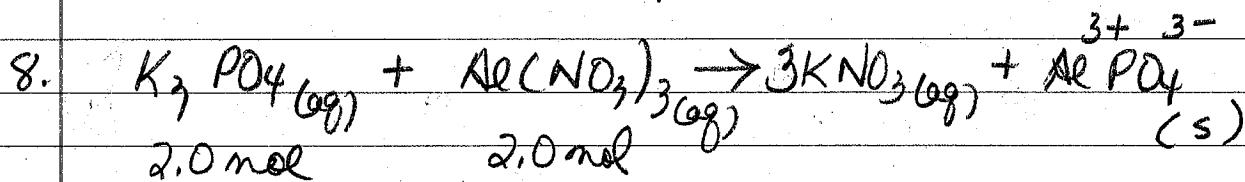
$$6.0\,mol\,KClO_3 \times \frac{3\,mol\,O_2}{2\,mol\,KClO_3} = 9.0\,mol\,O_2$$

6. $Zn_{(s)} + 2HCl_{(aq)} \rightarrow ZnCl_{2\,(aq)} + H_{2\,(g)}$

$$3.0 \, mol \, Zn \times \frac{1 \, mol \, H_2}{1 \, mol \, Zn} = 3.0 \, mol \, Zn$$

7. $C_3H_{8\,(g)} + 5O_{2\,(g)} \rightarrow 3CO_{2\,(g)} + 4H_2O_{(g)}$
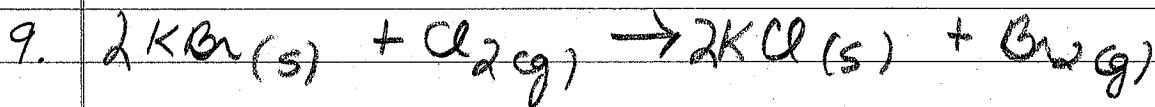
$$4.0 \, mol \, C_3H_8 \times \frac{5 \, mol \, O_2}{1 \, mol \, C_3H_8} = 20. \, mol \, O_2$$

8. $K_3PO_{4\,(aq)} + Al(NO_3)_{3\,(aq)} \rightarrow 3KNO_{3\,(aq)} + Al^{3+}PO_4^{3-}{}_{(s)}$

    2.0 mol   2.0 mol
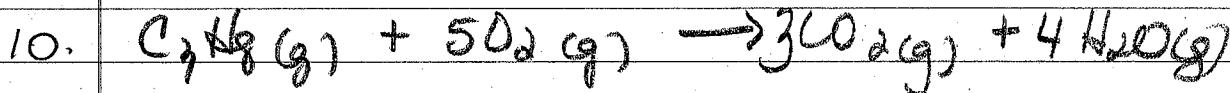
(i) $2.0 \, mol \, K_3PO_4 \times \frac{3 \, mol \, KNO_3}{1 \, mol \, K_3PO_4} = 6.0 \, mol \, K_3PO_4$

(ii) $2.0 \, mol \, Al(NO_3)_3 \times \frac{3 \, mol \, KNO_3}{1 \, mol \, Al(NO_3)_3}$ $\boxed{= 6.0 \, mol \, K_3PO_4}$

Ans: 6.0 mol K_3PO_4

9. $2KBr_{(s)} + Cl_{2\,(g)} \rightarrow 2KCl_{(s)} + Br_{2\,(g)}$
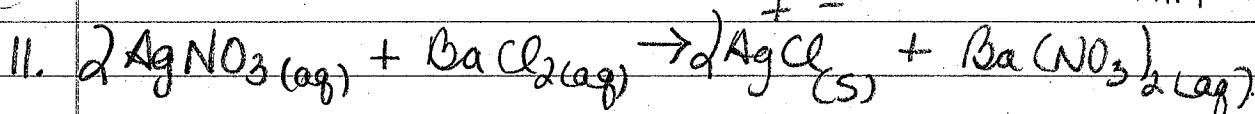
$$100. \, g \, KBr \times \frac{1 \, mol \, KBr}{119.0 \, g} \times \frac{1 \, mol \, Br_2}{2 \, mol \, KBr} = 0.420 \, mol \, Br_2$$

10. $C_3H_{8\,(g)} + 5O_{2\,(g)} \rightarrow 3CO_{2\,(g)} + 4H_2O_{(g)}$
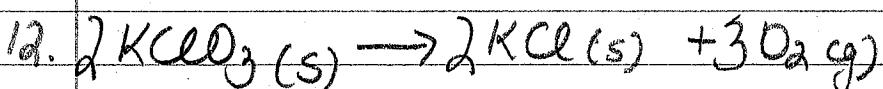
$$156 \, g \, H_2O \times \frac{1 \, mol}{18 \, g} \times \frac{1 \, mol \, C_3H_8}{4 \, mol \, H_2O} \times \frac{44.1 \, g}{1 \, mol} = $$

$$95.6 \, g \, C_3H_8$$

16. $2Al_{(s)} + 3NH_4ClO_4 (aq) \rightarrow Al_2O_{3(aq)} + AlCl_{3(aq)} + 3NO_{(g)} + 6H_2O(l)$
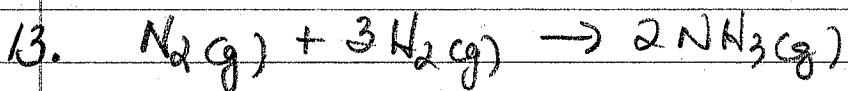
$1 kg\, Al \times \dfrac{1000 g}{1\, kg} \times \dfrac{1\, mol\, Al}{27g} \times \dfrac{3\, mol\, NH_4ClO_4}{2\, mol\, Al} \times \dfrac{117.49g}{1\, mol} = \dfrac{7000 g}{NH_4ClO_4}$

11. $2AgNO_{3(aq)} + BaCl_{2(aq)} \rightarrow 2AgCl_{(s)} + Ba(NO_3)_{2(aq)}$
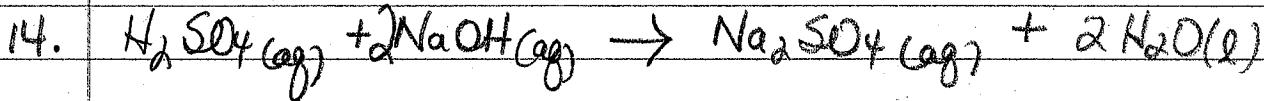
$5.0g\, AgNO_3 \times \dfrac{1\, mol\, AgNO_3}{169.87g} \times \dfrac{2\, mol\, AgCl}{2\, mol\, AgNO_3} \times \dfrac{143.32g}{1\, mol} =$

$4.2g\, AgCl$

12. $2KClO_{3(s)} \rightarrow 2KCl_{(s)} + 3O_{2(g)}$
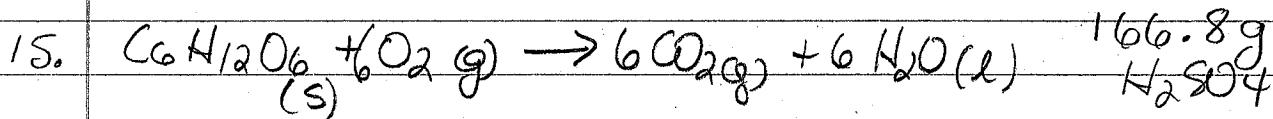
$25.0g\, KClO_3 \times \dfrac{1\, mol\, KClO_3}{122.55g} \times \dfrac{2\, mol\, KCl}{2\, mol\, KClO_3} \times \dfrac{74.55g}{1\, mol\, KCl} =$

$15.2g\, KCl$

13. $N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$

$50.0g\, N_2 \times \dfrac{1\, mol\, N_2}{28g} \times \dfrac{3\, mol\, H_2}{1\, mol\, N_2} \times \dfrac{2.02g\, H_2}{1\, mol\, H_2} = \dfrac{10.8g}{H_2}$

14. $H_2SO_{4(aq)} + 2NaOH_{(aq)} \rightarrow Na_2SO_{4(aq)} + 2H_2O(l)$

$136.0g\, NaOH \times \dfrac{1\, mol\, NaOH}{40g} \times \dfrac{1\, mol\, H_2SO_4}{2\, mol\, NaOH} \times \dfrac{98.1g}{1\, mol\, H_2SO_4} =$

$\dfrac{166.8g}{H_2SO_4}$

15. $C_6H_{12}O_{6(s)} + 6O_{2(g)} \rightarrow 6CO_{2(g)} + 6H_2O(l)$

$100.0g\, glu \times \dfrac{1\, mol\, glu}{180.16g} \times \dfrac{6\, mol\, CO_2}{1\, mol\, glu} \times \dfrac{44.1g}{1\, mol} = \dfrac{146.9g}{CO_2}$

$100.0g\, glu \times \dfrac{1\, mol\, glu}{180.16g} \times \dfrac{6\, mol\, H_2O}{1\, mol\, glu} \times \dfrac{18g}{1\, mol\, H_2O} = \dfrac{59.95g}{H_2O}$