4.5 Review questions

1. a) $1.26 \text{ mol } M \times \dfrac{2 \text{ mol } CuO}{1 \text{ mol } M} = \boxed{2.52 \text{ mol } CuO}$ ✓✓

b) $1.5 \text{ Kg} \times \dfrac{10^3 \text{ g}}{1 \text{ Kg}} \times \dfrac{1 \text{ mol } M}{221.0 \text{ g}} \times \dfrac{2 \text{ mol } CuO}{1 \text{ mol } M} \times \dfrac{79.5 \text{ g}}{1 \text{ mol}} = \boxed{1100 \text{ g } CuO}$

c) $706 \text{ g} \times \dfrac{1 \text{ mol}}{79.5 \text{ g } CuO} \times \dfrac{1 \text{ mol } CO_2}{2 \text{ mol } CuO} \times \dfrac{22.4 \text{ L } CO_2}{1 \text{ mol } CO_2} = \boxed{99.5 \text{ L } CO_2}$

2. a) $3160 \text{ g} \times \dfrac{1 \text{ mol } CH_3NO_2}{61.0 \text{ g}} \times \dfrac{2 \text{ mol } N_2}{4 \text{ mol } CH_3NO_2} \times \dfrac{22.4 \text{ L}}{1 \text{ mol}} = \boxed{5.80 \times 10^2 \text{ L } N_2}$

b) $955 \text{ g} \times \dfrac{1 \text{ mol } N_2}{28.0 \text{ g}} \times \dfrac{4 \text{ mol } CH_3NO_2}{2 \text{ mol } N_2} \times \dfrac{61.0 \text{ g}}{1 \text{ mol}} = \boxed{4160 \text{ g } CH_3NO_2}$

c) $3.5 \times 10^{25} \text{ molec } N_2 \times \dfrac{1 \text{ mol}}{6.02 \times 10^{23} \text{ molec}} \times \dfrac{6 \text{ mol } H_2O}{2 \text{ mol } N_2} \times \dfrac{18.0 \text{ g}}{1 \text{ mol}} = \boxed{3100 \text{ g } H_2O}$

3. $10.0 \text{ mL} \times \dfrac{0.45 \text{ mol } HCl}{1000 \text{ mL}} \times \dfrac{1 \text{ mol } Zn}{2 \text{ mol } HCl} \times \dfrac{65.4 \text{ g}}{1 \text{ mol}} = \boxed{0.15 \text{ g } Zn}$

4. $12.2 \text{ g } Na \times \dfrac{1 \text{ mol } Na}{23.0 \text{ g } Na} \times \dfrac{124.7 \text{ kJ}}{4 \text{ mol } Na} = \boxed{16.5 \text{ kJ}}$ ✓✓ or $\boxed{33.0 \text{ kJ}}$

5. $3.225 \text{ g} \times \dfrac{1 \text{ mol } H_2C_2O_4}{90.0 \text{ g}} \times \dfrac{2 \text{ mol } KMnO_4}{5 \text{ mol } H_2C_2O_4} \times \dfrac{1000 \text{ mL}}{0.250 \text{ mol}} = \boxed{KMnO_4 \quad 57.3 \text{ mL}}$

6. $2Al + 3Cl_2 \longrightarrow 2AlCl_3$

$4.56 \text{ Kg} \times \dfrac{1 \text{ mol}}{0.1335 \text{ Kg}} \times \dfrac{3 \text{ mol } Cl_2}{2 \text{ mol } AlCl_3} \times \dfrac{71.0 \text{ g}}{1 \text{ mol}} = \boxed{3640 \text{ g } Cl_2}$

7. $H_2SO_4 + 2KOH \rightarrow K_2SO_4 + 2H_2O$

$0.034 \text{ mol } KOH \times \dfrac{1 \text{ mol } H_2SO_4}{2 \text{ mol } KOH} = \boxed{0.017 \text{ mol } H_2SO_4}$

8. $C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$ ✓

$35.00 \text{ g } C_2H_5OH \times \dfrac{1 \text{ mol}}{46.0 \text{ g}} \times \dfrac{3 \text{ mol } H_2O}{1 \text{ mol } C_2H_5OH} \times \dfrac{18.0 \text{ g}}{1 \text{ mol}} = \boxed{41.1 \text{ g } H_2O}$

9. $2HCl + FeS \rightarrow H_2S + FeCl_2$ ✓

$21.7 \text{ L} \times \dfrac{1 \text{ mol } H_2S}{22.4 \text{ L}} \times \dfrac{1 \text{ mol } FeS}{1 \text{ mol } H_2S} \times \dfrac{87.9 \text{ g}}{1 \text{ mol}} = \boxed{85.2 \text{ g } FeS}$

10. $CaCO_{3(s)} + 2HCl \rightarrow CaCl_2 + H_2O + CO_{2(g)}$ ✓

$15.0 \text{ g } CaCO_3 \times \dfrac{1 \text{ mol } CaCO_3}{100.1 \text{ g}} \times \dfrac{1 \text{ mol } CO_2}{1 \text{ mol } CaCO_3} \times \dfrac{44.0 \text{ g } CO_2}{1 \text{ mol } CO_2} = \boxed{6.59 \text{ g } CO_2}$

11. $N_2 + 3H_2 \rightarrow 2NH_3$ ✓

$40.0 \text{ L } NH_3 \times \dfrac{3 \text{ L } H_2}{2 \text{ L } NH_3} = \boxed{60.0 \text{ L } H_2}$

12. $5.00 \text{ g } PbI_2 \times \dfrac{1 \text{ mol } PbI_2}{461.0 \text{ g}} \times \dfrac{46.5 \text{ kJ}}{1 \text{ mol } PbI_2} = \boxed{0.504 \text{ kJ}}$ ✓✓

13. $2Zn + Sn(NO_3)_4 \rightarrow 2Zn(NO_3)_2 + Sn$ ✓ (Zn is the R.A.)

$27.5 \text{ g } Sn \times \dfrac{1 \text{ mol } Sn}{118.7 \text{ g } Sn} \times \dfrac{2 \text{ mol } Zn}{1 \text{ mol } Sn} \times \dfrac{65.3 \text{ g } Zn}{1 \text{ mol } Zn} = \boxed{30.3 \text{ g } Zn}$

14. $Ba(NO_3)_2 + K_2SO_4 \rightarrow BaSO_{4(s)} + 2KNO_3$ ✓

$6.5 \text{ mol } Ba(NO_3)_2 \times \dfrac{1 \text{ mol } BaSO_4}{1 \text{ mol } Ba(NO_3)_2} \times \dfrac{233.4 \text{ g}}{1 \text{ mol}} = \boxed{1500 \text{ g}}$ ✓✓

15. See Q 10 for EQN

$12.2 \text{ L } CO_2 \times \dfrac{1 \text{ mol } CO_2}{22.4 \text{ L } CO_2} \times \dfrac{1 \text{ mol } CaCO_3}{1 \text{ mol } CO_2} \times \dfrac{100.1 \text{ g}}{1 \text{ mol}} = \boxed{54.5 \text{ g}}$ ✓✓

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