Exam #2 - Chunk 1 Questions

1) $3.40\text{ g } NH_3 \times \frac{1\text{ mol } NH_3}{17.04\text{ g } NH_3} \times \frac{6.02\times10^{23}\text{ molecules}}{1\text{ mol } NH_3} \times \frac{4\text{ atoms}}{1\text{ molecule } NH_3} = \boxed{4.81\times10^{23}\text{ atoms}}$

2) $CuCl_2 + 2\,NaNO_3 \rightarrow Cu(NO_3)_2 + 2\,NaCl$

$20.0\text{ g } CuCl_2 \times \frac{1\text{ mol } CuCl_2}{134.45\text{ g } CuCl_2} \times \frac{2\text{ mol NaCl}}{1\text{ mol } CuCl_2} \times \frac{58.44\text{ g NaCl}}{1\text{ mol NaCl}} = \boxed{17.39\text{ g NaCl}}$

3) $2\,H_2S + 3\,O_2 \rightarrow 2\,SO_2 + 2\,H_2O$

$8.20\text{ mol } SO_2 \times \frac{2\text{ mol } H_2S}{2\text{ mol } SO_2} = \boxed{8.20\text{ mol } SO_2}$

4) $6.82\text{ g } H_2S \times \frac{1\text{ mol } H_2S}{34.09\text{ g } H_2S} \times \frac{2\text{ mol } H_2O}{2\text{ mol } H_2S} \times \frac{18.02\text{ g } H_2O}{1\text{ mol } H_2O} = \boxed{3.61\text{ g } H_2O}$

5) $CuCl_2 + 2\,NaNO_3 \rightarrow Cu(NO_3)_2 + 2\,NaCl$

$20.0\text{ g } CuCl_2 \times \frac{1\text{ mol } CuCl_2}{134.45\text{ g } CuCl_2} \times \frac{1\text{ mol } Cu(NO_3)_2}{1\text{ mol } CuCl_2} \times \frac{6.02\times10^{23}\text{ molecules}}{1\text{ mol } Cu(NO_3)_2}$

$= \boxed{8.96\times10^{22}\text{ molecules}}$

6) $0.500\text{ mol CuBr} \times \frac{143.45\text{ g CuBr}}{1\text{ mol CuBr}} = \boxed{71.73\text{ g CuBr}}$

7) $2\,KClO_3 \rightarrow 2\,KCl + 3\,O_2$

$12.0\text{ mol } KClO_3 \times \frac{3\text{ mol } O_2}{2\text{ mol } KClO_3} = \boxed{18\text{ mol } O_2}$

8) $2\,K + Cl_2 \rightarrow 2\,KCl$

$2.50\text{ g K} \times \frac{1\text{ mol K}}{39.01\text{ g K}} \times \frac{2\text{ mol KCl}}{2\text{ mol K}} \times \frac{74.55\text{ g KCl}}{1\text{ mol KCl}} = \boxed{4.78\text{ g KCl}}$

9) $2\,KClO_3 \rightarrow 2\,KCl + 3\,O_2$

$5.00\text{ g } KClO_3 \times \frac{1\text{ mol } KClO_3}{74.44\text{ g } KClO_3} \times \frac{3\text{ mol } O_2}{2\text{ mol } KClO_3} \times \frac{32.00\text{ g } O_2}{1\text{ mol } O_2} = \boxed{3.22\text{ g } O_2}$

10) $Pb(SO_4)_2 + 4\,LiNO_3 \rightarrow Pb(NO_3)_4 + 2\,Li_2SO_4$

$250\text{ g } Li_2SO_4 \times \frac{1\text{ mol } Li_2SO_4}{109.95\text{ g } Li_2SO_4} \times \frac{4\text{ mol } LiNO_3}{2\text{ mol } Li_2SO_4} \times \frac{68.95\text{ g } LiNO_3}{1\text{ mol } LiNO_3} = \boxed{313.55\text{ g } LiNO_3}$

11) $2\,Fe + 6\,HCl \rightarrow 2\,FeCl_3 + 3\,H_2$

$$6\text{ mol } H_2 \times \frac{2\text{ mol Fe}}{3\text{ mol } H_2} \times \frac{6.02\times10^{23}\text{ molecules}}{1\text{ mol Fe}} = \boxed{2.41\times10^{24}\text{ molecules}}$$

12) $$7.0\text{ mol HCl} \times \frac{3\text{ mol } H_2}{6\text{ mol HCl}} \times \frac{2.02\text{ g } H_2}{1\text{ mol } H_2} = \boxed{7.07\text{ g } H_2}$$

13) $Li_2CO_3 \rightarrow Li_2O + CO_2$

$$2\text{ mol } CO_2 \times \frac{1\text{ mol } Li_2CO_3}{1\text{ mol } CO_2} \times \frac{73.89\text{ g } Li_2CO_3}{1\text{ mol } Li_2CO_3} = \boxed{147.78\text{ g } Li_2CO_3}$$

14) $Na_2O + CO_2 \rightarrow Na_2CO_3$

$$7\text{ mol } Na_2CO_3 \times \frac{1\text{ mol } Na_2O}{1\text{ mol } Na_2CO_3} \times \frac{6.02\times10^{23}\text{ molecules}}{1\text{ mol } Na_2O} = \boxed{4.21\times10^{24}\text{ molecules}}$$

15) $3\,Ca(OH)_2 + 2\,H_3PO_4 \rightarrow Ca_3(PO_4)_2 + 6\,H_2O$

$$9\text{ mol } H_2O \times \frac{3\text{ mol } Ca(OH)_2}{6\text{ mol } H_2O} \times \frac{74.10\text{ g } Ca(OH)_2}{1\text{ mol } Ca(OH)_2} = \boxed{333.45\text{ g } Ca(OH)_2}$$

16) $Cr_2(SO_3)_3 + 3\,H_2SO_4 \rightarrow Cr_2(SO_4)_3 + 3\,SO_2 + 3\,H_2O$

$$1.800\times10^{24}\text{ molec } Cr_2(SO_3)_3 \frac{1\text{ mol } Cr_2(SO_3)_3}{6.02\times10^{23}\text{ molec}} \times \frac{3\text{ mol } H_2O}{1\text{ mol } Cr_2(SO_3)_3} \times \frac{18.02\text{ g } H_2O}{1\text{ mol } H_2O} = \boxed{161.64\text{ g } H_2O}$$

17) $$30.00\text{ g } Cr_2(SO_3)_3 \times \frac{1\text{ mol } Cr_2(SO_3)_3}{344.21\text{ g } Cr_2(SO_3)_3} \times \frac{3\text{ mol } H_2SO_4}{1\text{ mol } Cr_2(SO_3)_3} \times \frac{6.02\times10^{23}\text{ molec}}{1\text{ mol } H_2SO_4}$$

$$= \boxed{1.57\times10^{23}\text{ molec } H_2SO_4}$$

18) $2\,FePO_4 + 3\,Na_2SO_4 \rightarrow Fe_2(SO_4)_3 + 2\,Na_3PO_4$

$$25.0\text{ g } FePO_4 \times \frac{1\text{ mol } FePO_4}{150.82\text{ g } FePO_4} \times \frac{1\text{ mol } Fe_2(SO_4)_3}{2\text{ mol } FePO_4} \times \frac{399.91\text{ g } Fe_2(SO_4)_3}{1\text{ mol } Fe_2(SO_4)_3} = \boxed{33.14\text{ g } Fe_2(SO_4)_3}$$

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19) $Na_2O + H_2O \rightarrow 2\,NaOH$

$1.20\times10^{2}\,g\,Na_2O \times \frac{1\,mol\,Na_2O}{61.98\,g\,Na_2O} \times \frac{2\,mol\,NaOH}{1\,mol\,Na_2O} \times \frac{40.00\,g\,NaOH}{1\,mol\,NaOH} = \boxed{154.89\,g\,NaOH}$

20) $6\,CO_2 + 6\,H_2O \rightarrow C_6H_{12}O_6 + 6\,O_2$

$120.0\,g\,C_6H_{12}O_6 \times \frac{1\,mol\,C_6H_{12}O_6}{180.18\,g\,C_6H_{12}O_6} \times \frac{6\,mol\,CO_2}{1\,mol\,C_6H_{12}O_6} \times \frac{44.01\,g\,CO_2}{1\,mol\,CO_2} = \boxed{175.86\,g\,CO_2}$

21) $2\,NaClO_3 \rightarrow 2\,NaCl + 3\,O_2$

$80.0\,g\,NaCl \times \frac{1\,mol\,NaCl}{58.44\,g\,NaCl} \times \frac{3\,mol\,O_2}{2\,mol\,NaCl} \times \frac{6.02\times10^{23}\,molec}{1\,mol\,O_2} = \boxed{1.24\times10^{24}\,molec\,O_2}$

22) $Cu + 2\,AgNO_3 \rightarrow Cu(NO_3)_2 + 2\,Ag$

$3.50\,mol\,AgNO_3 \times \frac{1\,mol\,Cu}{2\,mol\,AgNO_3} = \boxed{1.75\,mol\,Cu}$

23) $Na_2S_2O_3 + 4\,Cl_2 + 5\,H_2O \rightarrow 2\,NaHSO_4 + 8\,HCl$

$5.24\times10^{19}\,molec\,HCl \times \frac{1\,mol\,HCl}{6.02\times10^{23}\,molec} \times \frac{5\,mol\,H_2O}{8\,mol\,HCl} = \boxed{5.44\times10^{-5}\,mol\,H_2O}$

24) $4\,P + 5\,O_2 \rightarrow P_4O_{10}$

$746\,g\,P_4O_{10} \times \frac{1\,mol\,P_4O_{10}}{283.88\,g\,P_4O_{10}} \times \frac{4\,mol\,P}{1\,mol\,P_4O_{10}} \times \frac{30.97\,g\,P}{1\,mol\,P} = \boxed{326\,g\,P}$

(TNT)

25) $2\,C_7H_5N_3O_6 \rightarrow 7\,CO + 7\,C + 5\,H_2O + 3\,N_2$

$351\,g\,C \times \frac{1\,mol\,C}{12.01\,g\,C} \times \frac{2\,mol\,TNT}{7\,mol\,C} \times \frac{227.15\,g\,TNT}{1\,mol\,TNT} = \boxed{1.90\times10^{3}\,g\,C_7H_5N_3O_6}$

26) $\frac{2\,mol\,H_2S}{3\,mol\,O_2}\quad \frac{2\,mol\,H_2S}{2\,mol\,H_2O}\quad \frac{2\,mol\,H_2S}{2\,mol\,SO_2}\quad \frac{3\,mol\,O_2}{2\,mol\,H_2O}\quad \frac{3\,mol\,O_2}{2\,mol\,SO_2}\quad \frac{2\,mol\,H_2O}{2\,mol\,SO_2}$

27) $1.56\times10^{21}\,atoms\,Na \times \frac{1\,mol\,Na}{6.02\times10^{23}\,atoms\,Na} = \boxed{2.59\times10^{-3}\,mol\,Na}$

28) $Na_2CO_3 + Ca(OH)_2 \rightarrow 2NaOH + CaCO_3$

$1.000\ kg\ Na_2CO_3 \times \frac{1000\ g}{1\ kg} \times \frac{1\ mol\ Na_2CO_3}{105.99\ g\ Na_2CO_3} \times \frac{2\ mol\ NaOH}{1\ mol\ Na_2CO_3} \times \frac{40.00\ g\ NaOH}{1\ mol\ NaOH}$

$= \boxed{7.55 \times 10^2\ g\ NaOH}$

29) $CaCl_2 + 2AgNO_3 \rightarrow Ca(NO_3)_2 + 2AgCl$

$14.3\ g\ AgCl \times \frac{1\ mol\ AgCl}{143.32\ g\ AgCl} \times \frac{1\ mol\ CaCl_2}{2\ mol\ AgCl} \times \frac{110.98\ g\ CaCl_2}{1\ mol\ CaCl_2} = \boxed{5.54\ g\ CaCl_2}$

30) $Cu_2S + O_2 \rightarrow 2Cu + SO_2$

$0.6000\ mol\ Cu_2S \times \frac{2\ mol\ Cu}{1\ mol\ Cu_2S} \times \frac{63.55\ g\ Cu}{1\ mol\ Cu} = \boxed{76.26\ g\ Cu}$

31) $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

$1.03 \times 10^{-2}\ mol\ O_2 \times \frac{1\ mol\ C_6H_{12}O_6}{6\ mol\ O_2} \times \frac{180.18\ g\ C_6H_{12}O_6}{1\ mol\ C_6H_{12}O_6} = \boxed{0.309\ g\ C_6H_{12}O_6}$

32) $Cu + 2AgNO_3 \rightarrow Cu(NO_3)_2 + 2Ag$

$89.5\ g\ Ag \times \frac{1\ mol\ Ag}{107.87\ g\ Ag} \times \frac{1\ mol\ Cu}{2\ mol\ Ag} \times \frac{63.55\ g\ Cu}{1\ mol\ Cu} = \boxed{26.36\ g\ Cu}$

33) $2.35 \times 10^{24}\ molecules\ H_2O \times \frac{1\ mol\ H_2O}{6.02 \times 10^{23}\ molecules} = \boxed{3.90\ mol\ H_2O}$

34) $5.60 \times 10^{22}\ molecules\ SiO_2 \times \frac{1\ mol\ SiO_2}{6.02 \times 10^{23}\ molecules} \times \frac{60.09\ g\ SiO_2}{1\ mol\ SiO_2} = \boxed{5.59\ g\ SiO_2}$

35) $Zn + 2HCl \rightarrow ZnCl_2 + H_2$

$20.0\ g\ Zn \times \frac{1\ mol\ Zn}{65.39\ g\ Zn} \times \frac{1\ mol\ ZnCl_2}{1\ mol\ Zn} \times \frac{136.29\ g\ ZnCl_2}{1\ mol\ ZnCl_2} = \boxed{41.69\ g\ ZnCl_2}$

36) $2NaI + Cl_2 \rightarrow 2NaCl + I_2$

$10.0\ g\ NaCl \times \frac{1\ mol\ NaCl}{58.44\ g\ NaCl} \times \frac{1\ mol\ Cl_2}{2\ mol\ NaCl} \times \frac{70.90\ g\ Cl_2}{1\ mol\ Cl_2} = \boxed{6.07\ g\ Cl_2}$