Ap Chem Summer Assignment #3

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1 The following reaction was performed, Identify element X.

$$\begin{aligned}
&Fe_2O_3(s)_2{}^{+}X(s) = 2\,Fe(s)^{+}X_2O_3(s)\\
&79.947g + 2x = 55.847g + 50.982g\\
&2x = 106.829g - 79.847g\\
&2x = 26.982g
\end{aligned}$$

Since the atomic weight of 2 Fe is the same as the given weight ($55.847g$), the atomic weight of 2x is $26.982g$ or Aluminium (Al)

2 Fill in the blanks to balance the following chemical equations:

1. $2\,AgI^{+}Na_2S \rightarrow 2\,Ag_2S^{+}NaI$
2. $(NH_4)_2Cr_2O_7 \rightarrow Cr_2O_3{}^{+}N_2{}^{+}{}_4H_2O$
3. $Na_3PO_4{}^{+}{}_3HCl \rightarrow 3\,NaCl^{+}H_3PO_4$
4. $TiCl_4{}^{+}{}_2H_2O \rightarrow TiO_2{}^{+}{}_4HCl$
5. $Ba_3N_2{}^{+}{}_6H_2O \rightarrow 3\,Ba(OH)_2{}^{+}{}_2NH_3$
6. $3\,HNO_2{}^{+}HNO_3 \rightarrow 2\,NO^{+}H_2O$

3 Balance the following equation:

$4\,NH_4OH(aq)^{+}KAI(SO)_4 \cdot {}_{12}H_2O = Al(OH)_3(s)_2{}^{+}(NH_4)_2Cr_2O_7{}^{+}KOH(aq)_{12}{}^{+}H_2O$

We can multiple NH_4OH by 4, and increase NH4 and H2O on the product side to compensate

4 Balance the following equation

$2\,Fe_6{}^{+}HC_2H_3O_2 = 2\,Fe(C_2H_3O_2)_3{}^{+}{}_3H_2$

5 How many grams of water vapor can be generated from the combustion of 18.74 g of ethanol (C 2 H 6 O)?

6 How many grams of potassium iodide are necessary to completely react with 20.61g of Mercury (II) chloride

First we balance the equation $HgCl_2{}^{+}{}_2KL = HgI_2{}^{+}{}_2KCl$ Next we to find the total atomic weight. $200.59 + 2(35.45) + 2(39.10 + 126.90)$ Afterwards, we calculate the ratio needed $\frac{332}{271.49} = 1.22$ Finally we multiply $20.61 * 1.22 = 25.203$

7 A reaction combines 113.484 g of lead (II) nitrate with 45.010 g of sodium hydroxide (NaOH[aq]).

Pb(NO3)2+ 2NaOH→ Pb(OH)2+ 2NaNO3 83.4 grams of Pb(OH)2 The limiting reactant is lead (II) nitrate (0.345837 mols) and the excess reactant left over is sodium hydroxide (1.7773 mols). 1.431463 There is 57.256 grams of the excess reactant left over. The percent yield is 95.9%.

8 A reaction combines 64.81 grams of silver nitrate with 92.67 grams of potassium bromide

1. 72g
2. $AgNO_3$ is the limiting reactant
3. 47.3g
4. 20.5%

9 The moleculer weight of an insecticide, dibromoethane, is 187.9. Its molecular formula is $C_2H_4Br_2$, What percent by mass of bromine does dibromoethane contain?

First we have the following variables

$$\begin{aligned} \mathrm{C} &= 12.011 \\ \mathrm{H} &= 1.008 \\ \mathrm{Br} &= 79.90 \end{aligned}$$

Since the formula is $C_2H_4Br_2$, we can substitute and do the following:

$$\begin{aligned} &= 24.022 + 4.032 + 159.8 \\ &= 187.9 \\ &= 159.8/187.9 \\ &= .8505 \end{aligned}$$

Therefore, dibromoethane contains 85.05 percent by mass of bromine.

10 A given sample of xenon fluoride contains molecules of a single type of XeFn, where n is some whole number.

First, we need to calculate how many moles of xenon fluoride there are, and calculate its weight.

$$\begin{aligned} moles &= 9.03 * 10^{20} / 6.022 * 10^{23} \\ &= 1.5 * 10^{-}3 \\ &= 0.31g \end{aligned}$$

Now, we can calculate for n

$$\begin{aligned} &= 0.31/131 + 19n \\ &= 186.5 + 23.5n = 310 \\ n &= 4 \end{aligned}$$

Therefore its formula is XeF_4

11 A 6.32 g sample of potassium chlorate was decomposed according to the following equation, how many moles were formed?

k = 39.0983 Cl = 35.45 O = 16.00 39.0983 + 35.45 + 3*16 = 122.55g

6.32/122.55 = 6.052 moles 2 mol KClO3 = 3 mol O2 2 = 3 0.052*3/2 = 0.078 mol

12 What is the coefficient in front of water, when it is produced from the reaction of hydrochloric acid with calcium hydroxide? Calcium chloride is the other product.

$Ca(OH)_2 + 2HCl = CaCl_2 + 2\,H_2O$

Therefore the coeffecient is 2

13 What is the subscript of aluminum in the formula of aluminum phosphate?

1

14 The reaction of 11.9 g of CHCl 3 with excess chlorine produced 12.6 g of CCl 4 , carbon tetrachloride, what is the percent yield?

$2\,CHCl_3 + 2\,Cl_2 = 2\,CCl_4{}^{+}{}_2HCl$

$CHCl_3 =$ 119.378 $CCl_4 =$ 153.823

Theoretical mass = 153.823 * 0.097 = 15.336g % yield = 12.6/15.336 = %82.16

15 What mass of CCl 4 is formed by the reaction of 8.00 g of methane with an excess of chlorine?Ch4 is the limiting reactant

8x 1 mol Ch4 / 16.04 g/mol = .499

.499 * 153.82 = 76.72g

16 A reaction occurs between sodium carbonate and hydrochloric acid producing sodium chloride, carbon dioxide, and water. Write the balanced chemical equation for the reaction.

sodium carbonate + hydrohloric acid = sodium chloride + carbon doxide + water = $Na_2CO_3{}^{+}HCl + NaCl + CO_2 + H_2O$ = $Na_2CO_3{}^{+}{}_2HCl + 2\,NaCl + 2\,CO_2 + H_2O$

17 Classify the type of reaction from the five major type of reactions you learned in your first year chemistry course and write word equations. If necessary, balance.

1. $NaOH + KNO_3 = NaNO_3{}^{+}KOH$ = double replacement
2. $CH_4{}^{+}{}_2O_2 =$ = combustion
3. $Fe + 3\,NaBr = FaBr_2{}^{+}{}_3Na$ = single replacement
4. already balanced, double replacement
5. already balanced, double replacement
6. already balanced, synthesis
7. already balanced, decomposition

18 Now try these recation types, Rewrite as a balanced equation with the products predicted

1. Ba(OH)2 -> BaO+H2O
2. Na2CO3 -> Na2O +CO2
3. 2LiCLI3 -> 2LiCL + 3O2

4. Al2O3 -> 2AL2 + O3
5. H2SO4 -> H2O + SO3

19 Now try these recation types, Rewrite as a balanced equation with the products predicted

1. 2Mg + O2 = 2MgO
2. N2 + 3H2 = 2NH3
3. S + O2 = SO2
4. CaO + H2O -> Ca(OH)2

20 Attempt to write and predict products the following chemical reactions:

1. 2H2O2 -> 2H2O + O2
2. Cu2+ + So42- + Ba2+ - 20H- -> Cu (OH)2 + BaSO4
3. Al+3Ag+ -> Al3+ + 3Ag
4. Cl2 + 2NaBr -> Br2 + 2NaCl
5. C2H6 + 3O2 -> CO2 + CO + 3H2O

21 Using the solubility rules table, classify each of the substances as being soluble or insoluble in water. Then, Identify the two new compounds that form if the solutions, as suggested by the following table, were mixed via a double displacement reaction.

21.1 Part A

1. Soluble
2. Insoluble
3. Insoluble
4. Insoluble
5. Soluble
6. Insoluble
7. Insoluble
8. Insoluble
9. Soluble
10. Insoluble.
11. Insoluble
12. Soluble
13. Soluble
14. Soluble
15. Insoluble
16. Insoluble

21.2 Part B

1. $AgBr(s)$ $KNO_3(aq)$ $BaBr_2(aq)$ $KCl(aq)$ $AlBr_3(aq)$ $KNO_3(aq)$ $K_2SO_4(aq)$ $CuBr_2(aq)$
2. $Ag_2CO_3(s)$ $KNO_3(aq)$ $NaCl(aq)$ $KCl(aq)$ $Al_2(CO_3)_3(s)$ $KNO_3(aq)$ $CuCO_3(s)$ $CuBr_2(aq)$
3. $Ag_2S(s)$ $KNO_3(aq)$ $CaCl(aq)$ $KCl(aq)$ $AlBr_3(aq)$ $KNO_3(aq)$ $K_2SO_4(aq)$ $CuBr_2(aq)$
4. $AgOH(s)$ $KNO_3(aq)$ $Ba(OH)_2(aq)$ $KCl(aq)$ $Al(OH)_3(aq)$ $KNO_3(aq)$ $NH_4(SO_4)_2(aq)$ $CuBr_2(aq)$

22 Name the following, then draw the Lewis Structure for the following hydrocarbons from their full names.

1. CH_4 - methane
2. C_3H_8 - propane
3. C_4H_8 - butene
4. C_4H_8 - butyne
5. Ethane C_2H (c-c)
6. Methane CH_4 (c-c)
7. Propyne C_3H_4 (c—c)
8. 2 · Butene 2 C_4H_8 (c—c)