Extension 2: More Practice with Formulae and Equations

This series of questions are designed to reinforce, and extend, your ability to write formulae and balance equations.

Note that hypochlorite, ClO has a valency of one as does perchlorate ClO_4.

QUESTIONS

A. Write the formulae for:

1) iron(II) chromate
2) platinum(IV) cyanide
3) uranium(VI) fluoride
4) aluminium phosphide
5) sodium dichromate
6) barium hypochlorite
7) potassium permanganate
8) copper(II) perchlorate
9) lead(IV) hydrogensulfate
10) mercury(II) oxide
11) dinitrogen tetrachloride
12) diphosphorus pentaoxide
13) dinitrogen monoxide
14) chlorine monofluoride
15) dichlorine monoxide

B. Balance the following equations (state symbols have been omitted for simplicity):

1) $P_4O_{10} + H_2O \rightarrow H_3PO_4$
2) $NH_4NO_3 \rightarrow N_2O + H_2O$
3) $S + HNO_3 \rightarrow H_2SO_4 + NO_2 + H_2O$
4) $H_3PO_4 + NaCN \rightarrow HCN + Na_3PO_4$
5) $Be_2C + H_2O \rightarrow Be(OH)_2 + CH_4$

C. Assuming the species in the following equations are in their normal states at room temperature and pressure, add the state symbols:

1) $2K + Cl_2 \rightarrow 2KCl$
2) $N_2 + 3H_2 \rightarrow 2NH_3$
3) $CaCO_3 + 2HCl$ (dilute hydrochloric acid) $\rightarrow CaCl_2$ (calcium chloride solution) $+ CO_2 + H_2O$

4) $2Na + 2H_2O \rightarrow 2NaOH + H_2O$
sodium hydroxide solution

5) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2$

D. And now a challenge! Balance this equation:

$HIO_3 + FeI_2 + HCl \rightarrow FeCl_3 + ICl + H_2O$

E. The rules you have been given thus far don't always work. What is the formula of mercury(I) chloride?

ANSWERS

A.

1) iron(II) chromate	$FeCrO_4$
2) platinum(IV) cyanide	$Pt(CN)_4$
3) uranium(VI) fluoride	UF_6
4) aluminium phosphide	AlP
5) sodium dichromate	$Na_2Cr_2O_7$
6) barium hypochloride	$Ba(ClO)_2$
7) potassium permanganate	$KMnO_4$
8) copper(II) perchlorate	$Cu(ClO_4)_2$
9) lead(IV) hydrogensulfate	$Pb(HSO_4)_4$
10) mercury(II) oxide	HgO
11) dinitrogen tetrachloride	N_2Cl_4
12) diphosphorus pentaoxide	P_2O_5
13) dinitrogen monoxide	N_2O
14) chlorine monofluoride	ClF
15) dichlorine monoxide	Cl_2O

B.

1) $P_4O_{10} + 6H_2O \rightarrow 4H_3PO_4$
2) $NH_4NO_3 \rightarrow N_2O + 2H_2O$
3) $S + 6HNO_3 \rightarrow H_2SO_4 + 6NO_2 + 2H_2O$
4) $H_3PO_4 + 3NaCN \rightarrow 3HCN + Na_3PO_4$
5) $Be_2C + 4H_2O \rightarrow 2Be(OH)_2 + CH_4$

C.

1) $2K(s) + Cl_2(g) \rightarrow 2KCl(s)$
2) $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$
3) $CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + CO_2(g) + H_2O(l)$
4) $2Na(s) + 2H_2O(l) \rightarrow 2NaOH(aq) + H_2(g)$
5) $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(l)$

D.

$5HIO_3 + 4FeI_2 + 25HCl \rightarrow 4FeCl_3 + 13ICl + 15 H_2O$

E.

You might have written HgCl, which is understandable, given the method you have been given thus far. But it is actually Hg_2Cl_2 - it forms a *dimer* - two units combine. The dimer is more stable, for reasons we won't cover here. This is relatively unusual, so don't worry!