

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:

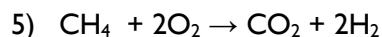
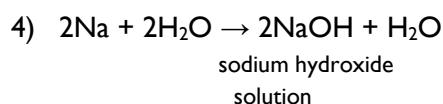
- 1) iron(II) chromate
- 2) platinum(IV) cyanide
- 3) uranium(VI) fluoride
- 4) aluminium phosphide
- 5) sodium dichromate
- 6) barium hypochlorite
- 7) potassium permanganate
- 8) copper(II) perchlorate
- 9) lead(IV) hydrogensulfate
- 10) mercury(II) oxide
- 11) dinitrogen tetrachloride
- 12) diphosphorus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

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

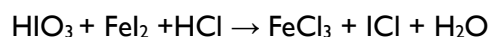
- 1) $\text{P}_4\text{O}_{10} + \text{H}_2\text{O} \rightarrow \text{H}_3\text{PO}_4$
- 2) $\text{NH}_4\text{NO}_3 \rightarrow \text{N}_2\text{O} + \text{H}_2\text{O}$
- 3) $\text{S} + \text{HNO}_3 \rightarrow \text{H}_2\text{SO}_4 + \text{NO}_2 + \text{H}_2\text{O}$
- 4) $\text{H}_3\text{PO}_4 + \text{NaCN} \rightarrow \text{HCN} + \text{Na}_3\text{PO}_4$
- 5) $\text{Be}_2\text{C} + \text{H}_2\text{O} \rightarrow \text{Be}(\text{OH})_2 + \text{CH}_4$

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

- 1) $2\text{K} + \text{Cl}_2 \rightarrow 2\text{KCl}$
- 2) $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$
- 3) $\text{CaCO}_3 + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{CO}_2 + \text{H}_2\text{O}$
dilute hydrochloric acid calcium chloride solution



D. And now a challenge! Balance this equation:



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 | $\text{Pt}(\text{CN})_4$ |
| 3) uranium(VI) fluoride | UF_6 |
| 4) aluminium phosphide | AlP |
| 5) sodium dichromate | $\text{Na}_2\text{Cr}_2\text{O}_7$ |
| 6) barium hypochloride | $\text{Ba}(\text{ClO})_2$ |
| 7) potassium permanganate | KMnO_4 |
| 8) copper(II) perchlorate | $\text{Cu}(\text{ClO}_4)_2$ |
| 9) lead(IV) hydrogensulfate | $\text{Pb}(\text{HSO}_4)_4$ |
| 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 |

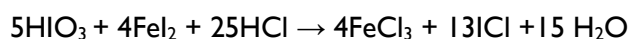
B.

- 1) $\text{P}_4\text{O}_{10} + 6\text{H}_2\text{O} \rightarrow 4\text{H}_3\text{PO}_4$
- 2) $\text{NH}_4\text{NO}_3 \rightarrow \text{N}_2\text{O} + 2\text{H}_2\text{O}$
- 3) $\text{S} + 6\text{HNO}_3 \rightarrow \text{H}_2\text{SO}_4 + 6\text{NO}_2 + 2\text{H}_2\text{O}$
- 4) $\text{H}_3\text{PO}_4 + 3\text{NaCN} \rightarrow 3\text{HCN} + \text{Na}_3\text{PO}_4$
- 5) $\text{Be}_2\text{C} + 4\text{H}_2\text{O} \rightarrow 2\text{Be}(\text{OH})_2 + \text{CH}_4$

C.

- 1) $2\text{K}(\text{s}) + \text{Cl}_2(\text{g}) \rightarrow 2\text{KCl}(\text{s})$
- 2) $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$
- 3) $\text{CaCO}_3(\text{s}) + 2\text{HCl}(\text{aq}) \rightarrow \text{CaCl}_2(\text{aq}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$
- 4) $2\text{Na}(\text{s}) + 2\text{H}_2\text{O}(\text{l}) \rightarrow 2\text{NaOH}(\text{aq}) + \text{H}_2(\text{g})$
- 5) $\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l})$

D.



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!