

- 9 Identify the type of chemical bond that forms when potassium reacts with bromine to form a salt.
- 10 Explain, in terms of element classification, why K_2O is an ionic compound.

Base your answers to questions 11 on the information below and on your knowledge of chemistry.

In a laboratory investigation, ammonium chloride was dissolved in water. Laboratory procedures and corresponding observations made by a student during the investigation are shown in the table below.

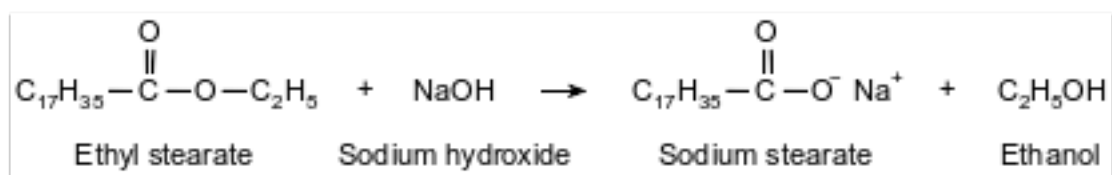
Dissolving $NH_4Cl(s)$ in $H_2O(l)$

Procedure	Observation
1. Measure the temperature of 10.0 milliliters (10.0 grams) of $H_2O(l)$ in a test tube.	1. The temperature of the $H_2O(l)$ was $25.8^\circ C$.
2. Add 5.0 grams of the solute, $NH_4Cl(s)$, to the $H_2O(l)$.	2. The $NH_4Cl(s)$ settled to the bottom of the test tube.
3. Stir the contents of the test tube for 4 minutes.	3. A small amount of $NH_4Cl(s)$ remained at the bottom of the test tube.
4. Measure the temperature of the $NH_4Cl(aq)$ solution.	4. The temperature of the solution was $11.2^\circ C$.

- 11 Identify two types of bonds in the solute.

Base your answers to questions 12 on the information below.

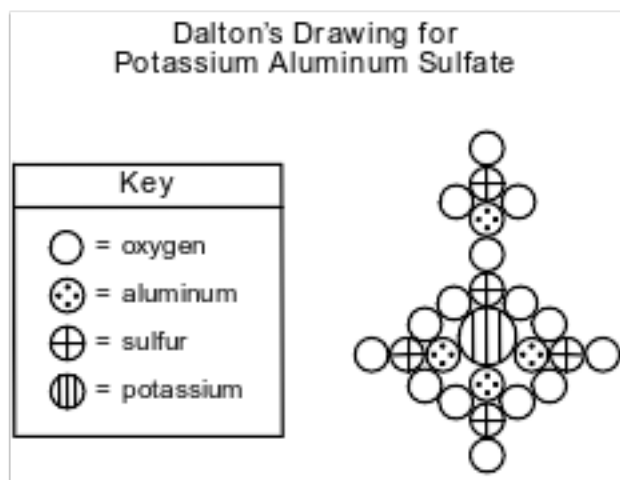
One type of soap is produced when ethyl stearate and sodium hydroxide react. The soap produced by this reaction is called sodium stearate. The other product of the reaction is ethanol. This reaction is represented by the balanced equation below.



- 12 Identify the two types of bonds in the compound sodium stearate.

Base your answers to questions 13 on the information below.

John Dalton, an early scientist, sketched the structure of compounds using his own symbols for the elements known at the time. Dalton's symbols for four elements and his drawing of potassium aluminum sulfate are represented by the diagram below.



Today, it is known that the chemical formula for potassium aluminum sulfate is $\text{KAl}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$. It is a hydrated compound because water molecules are included within its crystal structure. There are 12 moles of H_2O for every 1 mole of $\text{KAl}(\text{SO}_4)_2$. The compound contains two different positive ions. The gram-formula mass of $\text{KAl}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ is 474 grams per mole.

- 13 Identify one positive ion in the hydrated compound. Your response must include both the chemical symbol and charge of the ion.

Base your answers to questions 14 on the information below.

During a fireworks display, salts are heated to very high temperatures. Ions in the salts absorb energy and become excited. Spectacular colors are produced as energy is emitted from the ions in the form of light.

The color of the emitted light is characteristic of the metal ion in each salt. For example, the lithium ion in lithium carbonate, Li_2CO_3 , produces a deep-red color. The strontium ion in strontium carbonate, SrCO_3 , produces a bright-red color. Similarly, calcium chloride is used for orange light, sodium chloride for yellow light, and barium chloride for green light.

- 14 Identify the two types of chemical bonds found in the salt used to produce a deep-red color.

Answer Keys

1 1

2 2

3 4

4 2

5 1

6 2

7 4

8 Allow 1 credit. Acceptable responses include, but are not limited to:

- The reaction between a metal and a nonmetal can produce an ionic compound.
- Silver is a metal and chlorine is a nonmetal.

9 Allow 1 credit. Acceptable responses include, but are not limited to:

- ionic bond
- ionic

10 Allow 1 credit. Acceptable responses include, but are not limited to:

- A metal reacts with a nonmetal to produce an ionic compound.
- Potassium is a metal and oxygen is a nonmetal.

11 Allow 1 credit. Acceptable responses include, but are not limited to:

- ionic bonds and polar covalent bonds
- covalent and ionic

12 Allow 1 credit. Acceptable responses include, but are not limited to:

- covalent bonds and ionic bonds
- polar and nonpolar
- single and double

13 Allow 1 credit. Acceptable responses include, but are not limited to:

- K^+
- Al^{3+}

14 Allow 1 credit. Acceptable responses include, but are not limited to:

- ionic bonds and polar covalent bonds
- covalent and ionic