

Moles And Stoichiometry

- 1 What is the chemical formula for sodium oxalate?
 (1) NaO (3) NaC₂O₄
 (2) Na₂O (4) Na₂C₂O₄
- 2 What is the chemical name of the compound NH₄SCN?
 (1) ammonium thiocyanate
 (2) ammonium cyanide
 (3) nitrogen hydrogen cyanide
 (4) nitrogen hydrogen sulfate
- 3 Which statement explains why NaBr is classified as a compound?
 (1) Na and Br are chemically combined in a fixed proportion.
 (2) Na and Br are both nonmetals.
 (3) NaBr is a solid at 298 K and standard pressure.
 (4) NaBr dissolves in H₂O at 298 K.
- 4 What is the formula for iron(II) oxide?
 (1) FeO (3) Fe₂O
 (2) FeO₂ (4) Fe₂O₃
- 5 Which substance can be broken down by chemical means?
 (1) ammonia (3) antimony
 (2) aluminum (4) argon
- 6 Which formula represents ammonium nitrate?
 (1) NH₄NO₃ (3) NH₄(NO₃)₂
 (2) NH₄NO₂ (4) NH₄(NO₂)₂
- 7 What is represented by the chemical formula PbCl₂(s)?
 (1) a substance
 (2) a solution
 (3) a homogeneous mixture
 (4) a heterogeneous mixture
- 8 What is the chemical formula for ammonium sulfide?
 (1) (NH₄)₂S (3) (NH₄)₂SO₄
 (2) (NH₄)₂SO₃ (4) (NH₄)₂S₂O₃

Base your answers to questions 9 on the information below and on your knowledge of chemistry.

During a laboratory activity, appropriate safety equipment was used and safety procedures were followed. A laboratory technician heated a sample of solid KClO_3 in a crucible to determine the percent composition by mass of oxygen in the compound. The unbalanced equation and the data for the decomposition of solid KClO_3 are shown below.



Lab Data and Calculated Results

Object or Material	Mass (g)
empty crucible and cover	22.14
empty crucible, cover, and KClO_3	24.21
KClO_3	2.07
crucible, cover, and KCl after heating	23.41
KCl	?
O_2	0.80

9 Write a chemical name for the compound that decomposed.

Base your answers to questions 10 on the information below and on your knowledge of chemistry.

Thermal energy is absorbed as chemical reactions occur during the process of baking muffins. The batter for muffins often contains baking soda, $\text{NaHCO}_3(\text{s})$, which decomposes as the muffins are baked in an oven at $200.^\circ\text{C}$. The balanced equation below represents this reaction, which releases $\text{CO}_2(\text{g})$ and causes the muffins to rise as they bake. The $\text{H}_2\text{O}(\ell)$ is released into the air of the oven as it becomes a vapor.



10 Based on Table E, identify the polyatomic ion in the solid product of the reaction.

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

A sample of seawater is analyzed. The table below gives the concentration of some ions in the sample.

Concentration of Some Ions
in a Seawater Sample

Ion	Concentration (M)
Cl^-	0.545
Na^+	0.468
Mg^{2+}	0.054
SO_4^{2-}	0.028
Ca^{2+}	0.010
K^+	0.010

- 11 Write a chemical formula of one compound formed by the combination of K^+ ions with one of these ions as water completely evaporates from the seawater sample.

Base your answers to questions 12 on the information below and on your knowledge of chemistry.

Baking soda, $NaHCO_3$, can be commercially produced during a series of chemical reactions called the Solvay process. In this process, $NH_3(aq)$, $NaCl(aq)$, and other chemicals are used to produce $NaHCO_3(s)$ and $NH_4Cl(aq)$.

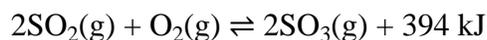
To reduce production costs, $NH_3(aq)$ is recovered from $NH_4Cl(aq)$ through a different series of reactions. This series of reactions can be summarized by the overall reaction represented by the unbalanced equation below.



- 12 Write a chemical name for baking soda.

Base your answers to questions 13 on the information below and on your knowledge of chemistry.

One process used to manufacture sulfuric acid is called the contact process. One step in this process, the reaction between sulfur dioxide and oxygen, is represented by the forward reaction in the system at equilibrium shown below.

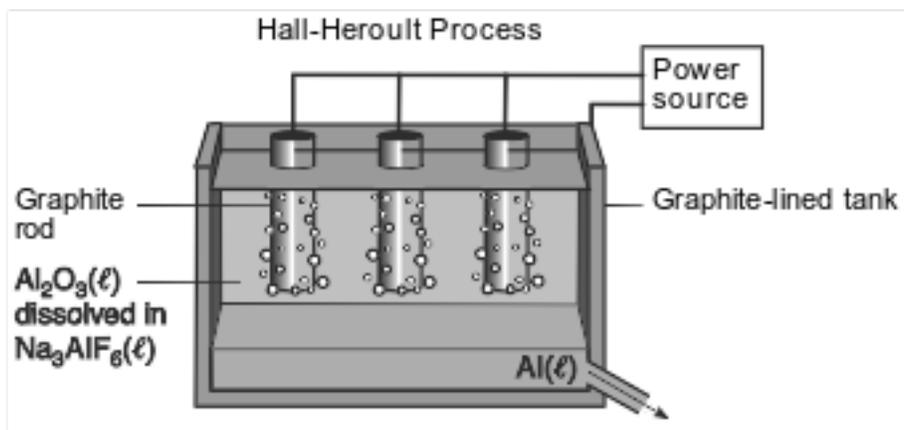


A mixture of platinum and vanadium(V) oxide may be used as a catalyst for this reaction. The sulfur trioxide produced is then used to make sulfuric acid.

- 13 Write the chemical formula for vanadium(V) oxide.

Base your answers to questions 14 on the information below and on your knowledge of chemistry.

In the late 19th century, the Hall-Heroult process was invented as an inexpensive way to produce aluminum. In this process, $Al_2O_3(\ell)$ extracted from bauxite is dissolved in $Na_3AlF_6(\ell)$ in a graphite-lined tank, as shown in the diagram below. The products are carbon dioxide and molten aluminum metal.



14 Write the chemical name for the liquid compound dissolved in the $\text{Na}_3\text{AlF}_6(\ell)$.

Base your answers to questions 15 on the information below.

Calcium reacts with water. This reaction is represented by the balanced equation below. The aqueous product of this reaction can be heated to evaporate the water, leaving a white solid, $\text{Ca}(\text{OH})_2(\text{s})$.



15 Write the chemical name of the base produced in the reaction.

Answer Keys

1 4

2 1

3 1

4 1

5 1

6 1

7 1

8 1

9 Allow 1 credit for potassium chlorate.

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

- carbonate ion
- carbonate
- CO_3^{2-}

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

- KCl
- K_2SO_4

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

- sodium hydrogen carbonate
- sodium bicarbonate
- sodium acid carbonate
- monosodium carbonate
- bicarbonate of soda

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

- V_2O_5
- O_5V_2

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

- aluminum oxide

15 Allow 1 credit for calcium hydroxide.