

Classification Of Matter

1 Which sample of matter represents a mixture?

- (1) aqueous ammonia (3) liquid mercury
 (2) gaseous ethane (4) solid iodine

2 Which sample of matter is classified as a substance?

- (1) air (3) milk
 (2) ammonia (4) seawater

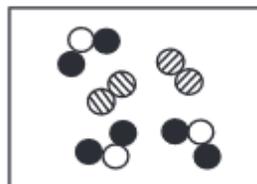
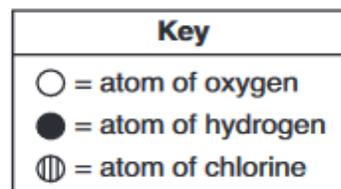
3 At STP, a 50.-gram sample of $\text{H}_2\text{O}(\ell)$ and a 100.-gram sample of $\text{H}_2\text{O}(\ell)$ have

- (1) the same chemical properties
 (2) the same volume
 (3) different temperatures
 (4) different empirical formulas

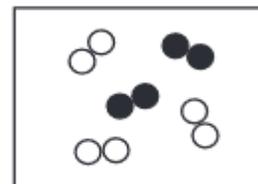
4 Compared to a 15-gram sample of $\text{Cu}(\text{s})$ at 25°C , a 25-gram sample of $\text{Cu}(\text{s})$ at 25°C has

- (1) the same density and the same chemical properties
 (2) the same density and different chemical properties
 (3) a different density and the same chemical properties
 (4) a different density and different chemical properties

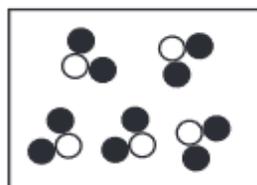
5 Which two particle diagrams each represent a sample of one substance?



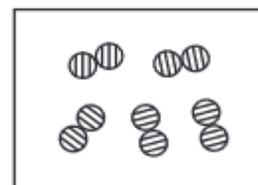
I



III



II



IV

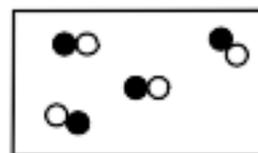
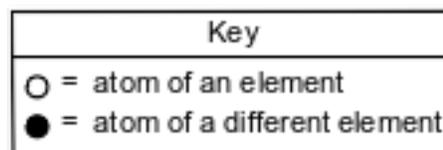
(1) I and II

(3) II and III

(2) I and III

(4) II and IV

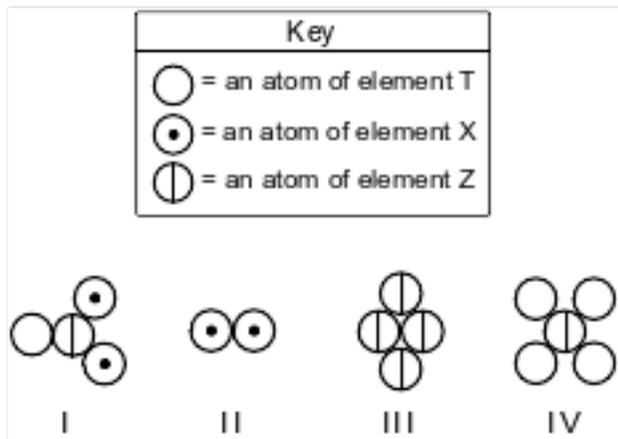
6 Given the particle diagram:



Which type of matter is represented by the particle diagram?

- (1) an element
 (2) a compound
 (3) a homogeneous mixture
 (4) a heterogeneous mixture

7 Given four particle models:



Which two models can be classified as elements?

- (1) I and II (3) II and III
 (2) I and IV (4) II and IV

8 Compared to a 26-gram sample of NaCl(s) at STP, a 52-gram sample of NaCl(s) at STP has

- (1) a different density
 (2) a different gram-formula mass
 (3) the same chemical properties
 (4) the same volume

9 A substance is classified as either an element or a

- (1) compound
 (2) solution
 (3) heterogeneous mixture
 (4) homogeneous mixture

10 At STP, which physical property of aluminum always remains the same from sample to sample?

- (1) mass (3) length
 (2) density (4) volume

11 Which substance can not be broken down by chemical means?

- (1) aluminum (3) aluminum oxide
 (2) ammonia (4) ammonium chloride

Base your answers to questions 12 on the information below.

Nitrogen gas and oxygen gas make up about 99% of Earth's atmosphere. Other atmospheric gases include argon, carbon dioxide, methane, ozone, hydrogen, etc.

The amount of carbon dioxide in the atmosphere can vary. Data for the concentration of CO₂(g) from 1960 to 2000 are shown in the table below.

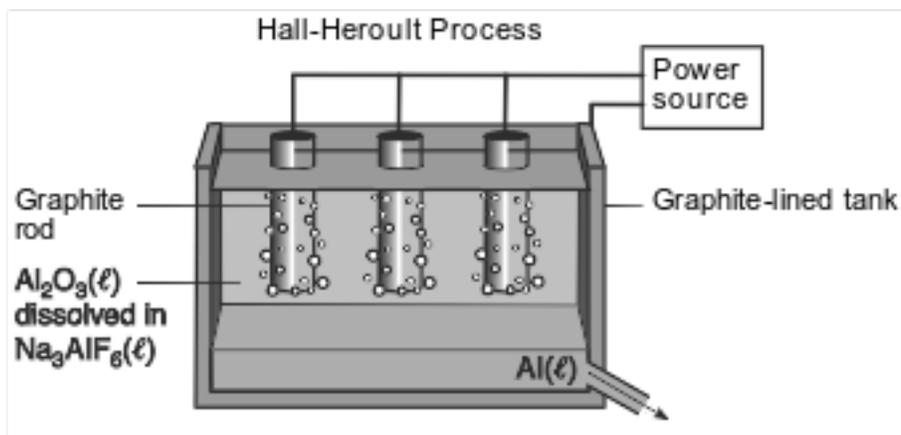
Atmospheric Concentration of CO₂(g)

Year	Concentration (ppm)
1960	316.9
1980	338.7
2000	369.4

12 Explain why the atmosphere is classified as a mixture.

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

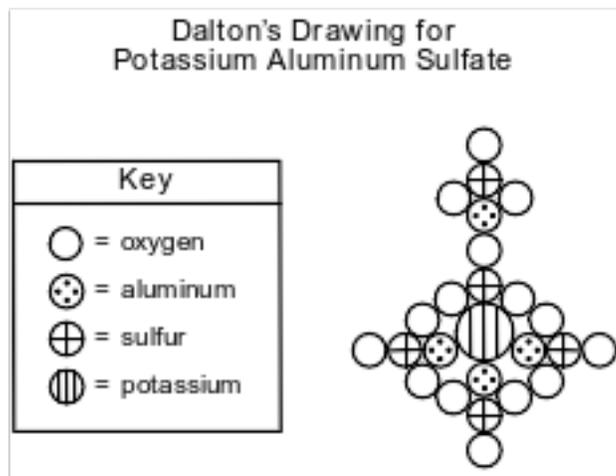
In the late 19th century, the Hall-Heroult process was invented as an inexpensive way to produce aluminum. In this process, $\text{Al}_2\text{O}_3(\ell)$ extracted from bauxite is dissolved in $\text{Na}_3\text{AlF}_6(\ell)$ in a graphite-lined tank, as shown in the diagram below. The products are carbon dioxide and molten aluminum metal.



- 13 Compare the chemical properties of a 300.-kilogram sample of $\text{Al}_2\text{O}_3(\ell)$ with the chemical properties of a 600.-kilogram sample of $\text{Al}_2\text{O}_3(\ell)$.

Base your answers to questions 14 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.

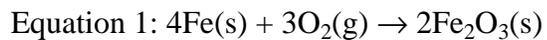


Today, it is known that the chemical formula for potassium aluminum sulfate is $\text{KAl}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$. It is a hydrated compound because water molecules are included within its crystal structure. There are 12 moles of H_2O for every 1 mole of $\text{KAl}(\text{SO}_4)_2$.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

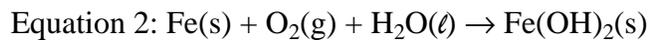
- 14 Describe, in terms of composition, one way in which Dalton's perception of potassium aluminum sulfate differs from what is known today about the compound.

Base your answers to questions 15 on the information below.

Iron has been used for thousands of years. In the air, iron corrodes. One reaction for the corrosion of iron is represented by the balanced equation below.



In the presence of water, iron corrodes more quickly. This corrosion is represented by the unbalanced equation below.



15 Identify one substance in the passage that can not be broken down by a chemical change.

Answer Keys

1 1

2 2

3 1

4 1

5 4

6 2

7 3

8 3

9 1

10 2

11 1

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

- The gases in a mixture can be separated by physical means.
- The gases in the atmosphere are separate elements or compounds that are not chemically combined with each other.
- The proportions of the gases in the atmosphere can vary.
- more than one substance

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

- Both samples have the same chemical properties.

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

- Dalton's drawing did not include the element hydrogen.
- He perceived 5 sulfur atoms, but the formula actually has 2 sulfur atoms.
- Dalton's drawing had more aluminum.
- It did not include water.

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

- Fe
- oxygen