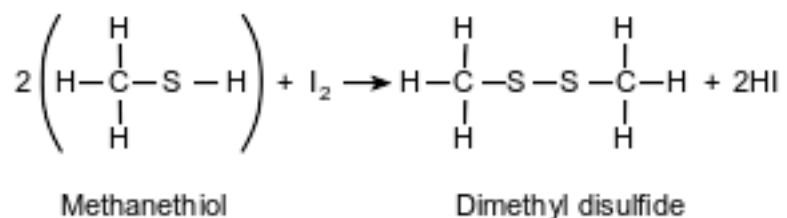


Properties In A Group

- Which element has chemical properties that are most similar to potassium?
(1) calcium (3) nitrogen
(2) cesium (4) sulfur
- In the ground state, all atoms of Group 15 elements have the same number of
(1) valence electrons (3) neutrons
(2) electron shells (4) protons
- In which group on the Periodic Table would a nonmetallic element belong if atoms of this element tend to gain two electrons to complete their valence shell?
(1) 14 (3) 16
(2) 15 (4) 17
- Which properties are characteristic of Group 2 elements at STP?
(1) good electrical conductivity and electronegativities less than 1.7
(2) good electrical conductivity and electronegativities greater than 1.7
(3) poor electrical conductivity and electronegativities less than 1.7
(4) poor electrical conductivity and electronegativities greater than 1.7
- Which two elements have the most similar chemical properties?
(1) beryllium and magnesium
(2) hydrogen and helium
(3) phosphorus and sulfur
(4) potassium and strontium
- In the formula XSO_4 , the symbol X could represent the element
(1) Al (3) Mg
(2) Ar (4) Na
- Element X reacts with copper to form the compounds CuX and CuX_2 . In which group on the Periodic Table is element X found?
(1) Group 1 (3) Group 13
(2) Group 2 (4) Group 17
- In the formula for the compound XCl_4 , the X could represent
(1) C (3) Mg
(2) H (4) Zn
- Which elements have the most similar chemical properties?
(1) boron and carbon
(2) oxygen and sulfur
(3) aluminum and bromine
(4) argon and silicon
- Which element has atoms that can form halide ions?
(1) iodine (3) strontium
(2) silver (4) xenon
- Which elements have the most similar chemical properties?
(1) Si, As, and Te (3) Mg, Sr, and Ba
(2) N_2 , O_2 , and F_2 (4) Ca, Cs, and Cu

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

A thiol is very similar to an alcohol, but a thiol has a sulfur atom instead of an oxygen atom in the functional group. The equation below represents a reaction of methanethiol and iodine, producing dimethyl disulfide and hydrogen iodide.



- 12 Explain, in terms of electron configuration, why sulfur atoms and oxygen atoms form compounds with similar molecular structures.

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

In the late 1800s, Dmitri Mendeleev developed a periodic table of the elements known at that time. Based on the pattern in his periodic table, he was able to predict properties of some elements that had not yet been discovered. Information about two of these elements is shown in the table below.

Some Element Properties Predicted by Mendeleev

Predicted Elements	Property	Predicted Value	Actual Value
eka-aluminum (Ea)	density at STP	5.9 g/cm ³	5.91 g/cm ³
	melting point	low	30.°C
	oxide formula	Ea ₂ O ₃	
	approximate molar mass	68 g/mol	
eka-silicon (Es)	density at STP	5.5 g/cm ³	5.3234 g/cm ³
	melting point	high	938°C
	oxide formula	EsO ₂	
	approximate molar mass	72 g/mol	

- 13 Write a chemical formula for the compound formed between Ea and Cl.

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

Three elements, represented by D, E, and Q, are located in Period 3. Some properties of these elements are listed in the table below. A student's experimental result indicates that the density of element Q is 2.10 g/cm³, at room temperature and standard pressure.

Properties of Samples of Three Elements
at Room Temperature and Standard Pressure

Element	Phase	Mass (g)	Density (g/cm ³)	Oxide Formula
D	solid	50.0	0.97	D ₂ O
E	solid	50.0	1.74	EO
Q	solid	50.0	2.00	QO ₂ or QO ₃

14 Identify the group on the Periodic Table to which element D belongs.

Base your answers to questions 15 on the information below and on your knowledge of chemistry.

The diagram below represents three elements in Group 13 and three elements in Period 3 and their relative positions on the Periodic Table.

Al	Si	P
Ga		
In		

Some elements in the solid phase exist in different forms that vary in their physical properties. For example, at room temperature, red phosphorus has a density of 2.16 g/cm³ and white phosphorus has a density of 1.823 g/cm³.

15 Identify one element from the diagram that will combine with phosphorus in the same ratio of atoms as the ratio in aluminum phosphide.

Answer Keys

1 2

2 1

3 3

4 1

5 1

6 3

7 4

8 1

9 2

10 1

11 3

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

- Sulfur and oxygen atoms both have 6 valence electrons.
- Atoms of both elements need the same number of electrons to complete their outer shells.

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

- EaCl_3
- GaCl_3

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

- Group 1
- alkali metals

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

- Ga
- indium
- element 31
- element 49