

Chemical Bonding

- Which statement describes $\text{H}_2\text{O}(\ell)$ and $\text{H}_2\text{O}_2(\ell)$?
 - Both are compounds that have the same properties.
 - Both are compounds that have different properties.
 - Both are mixtures that have the same properties.
 - Both are mixtures that have different properties.
- Carbon monoxide and carbon dioxide have
 - the same chemical properties and the same physical properties
 - the same chemical properties and different physical properties
 - different chemical properties and the same physical properties
 - different chemical properties and different physical properties
- Chemical properties can be used to
 - determine the temperature of a substance
 - determine the density of a substance
 - differentiate between two compounds
 - differentiate between two neutrons
- Compared to the physical and chemical properties of the compound NO_2 , the compound N_2O has
 - different physical properties and different chemical properties
 - different physical properties and the same chemical properties
 - the same physical properties and different chemical properties
 - the same physical properties and the same chemical properties
- A sample of a substance has these characteristics: (cid:129) melting point of 984 K (cid:129) hard, brittle solid at room temperature (cid:129) poor conductor of heat and electricity as a solid (cid:129) good conductor of electricity as a liquid or in an aqueous solution
This sample is classified as
 - a metallic element
 - a radioactive element
 - a molecular compound
 - an ionic compound
- Which formulas represent one ionic compound and one molecular compound?
 - N_2 and SO_2
 - Cl_2 and H_2S
 - BaCl_2 and N_2O_4
 - NaOH and BaSO_4
- Which terms identify two different categories of compounds?
 - covalent and molecular
 - covalent and empirical
 - ionic and molecular
 - ionic and empirical
- Which two terms represent major categories of compounds?
 - ionic and nuclear
 - ionic and molecular
 - empirical and nuclear
 - empirical and molecular

9 The table below shows properties of two compounds at standard pressure.

Selected Properties of Two Compounds

| Compound | Melting Point (°C) | Boiling Point (°C) | Electrical Conductivity |
|----------|--------------------|--------------------|--|
| 1 | 775 | 1935 | good as a liquid or in an aqueous solution |
| 2 | - 112.1 | 46 | poor as a liquid |

Which statement classifies the two compounds?

- (1) Both compounds are ionic. (3) Compound 1 is ionic, and compound 2 is molecular.
- (2) Both compounds are molecular. (4) Compound 1 is molecular, and compound 2 is ionic.
- 10 A solid sample of a compound and a liquid sample of the same compound are each tested for electrical conductivity. Which test conclusion indicates that the compound is ionic?
- (1) Both the solid and the liquid are good conductors.
 (2) Both the solid and the liquid are poor conductors.
 (3) The solid is a good conductor, and the liquid is a poor conductor.
 (4) The solid is a poor conductor, and the liquid is a good conductor.

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

A laboratory technician is given the table below and a sample of one of the three substances listed in the table. The technician makes an aqueous solution with a portion of the sample. When a conductivity tester is lowered into the solution, the lightbulb on the tester glows brightly. Another portion of the sample is placed in a heat-resistant container that is placed in an oven at 450.°C. The sample melts.

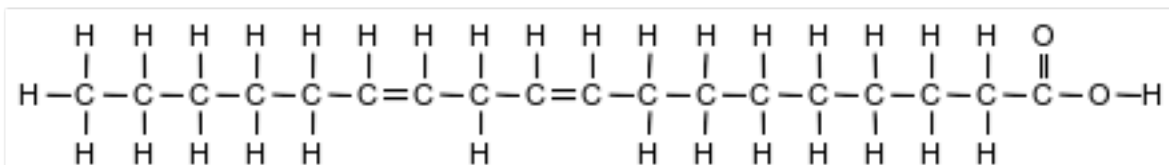
Some Properties of Three Substances

| Property | Substance | | |
|---|----------------|--------------------|----------------|
| | Sodium nitrate | Potassium chromate | Sulfur |
| solubility in water at 20.°C | soluble | soluble | insoluble |
| electrical conductivity of aqueous solution | good | good | not applicable |
| melting point (°C) | 307 | 974 | 115 |

- 11 State evidence that makes it necessary to use more than one property to identify the substance given to the technician.

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

Fatty acids, a class of compounds found in living things, are organic acids with long hydrocarbon chains. Linoleic acid, an unsaturated fatty acid, is essential for human skin flexibility and smoothness. The formula below represents a molecule of linoleic acid.



- 12 Identify the type of chemical bond between the oxygen atom and the hydrogen atom in the linoleic acid molecule.

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

The table below contains selected information about chlorine and two compounds containing chlorine. One piece of information is missing for each of the substances in the table.

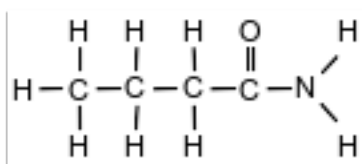
Chlorine and Two Compounds Containing Chlorine

| Name | Formula | Molar Mass (g/mol) | Phase at STP |
|--------------------|-------------------|--------------------|--------------|
| chlorine | Cl ₂ | 71 | ? |
| calcium chloride | CaCl ₂ | ? | solid |
| 1,2-dichloroethene | ? | 97 | liquid |

- 13 Explain, in terms of electrons, why the compound containing calcium and chlorine is classified as an ionic compound.

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

The formula below represents a molecule of butanamide.



- 14 State the type of chemical bond between a hydrogen atom and the nitrogen atom in the molecule.

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

Potassium phosphate, K₃PO₄, is a source of dietary potassium found in a popular cereal. According to the Nutrition-Facts label shown on the boxes of this brand of cereal, the accepted value for a one-cup serving of this cereal is 170. milligrams of potassium. The minimum daily requirement of potassium is 3500 milligrams for an adult human.

15 Identify two types of chemical bonding in the source of dietary potassium in this cereal.

Answer Keys

1 2

2 4

3 3

4 1

5 4

6 3

7 3

8 2

9 3

10 4

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

- Sodium nitrate and potassium chromate are both soluble in water and are good conductors in solution. Therefore, the melting points are needed to identify the substance.
- Solubility alone cannot be used because two of the substances are soluble in water.
- Two of the substances melt below 450.°C.
- Electrical conductivity is not sufficient to differentiate the two salts.

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

- covalent
- polar covalent
- polar covalent bond
- sigma bond

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

- Electrons are transferred from the metal to the nonmetal.
- Calcium loses electrons and chlorine gains electrons.
- Electrons were transferred.

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

- polar covalent bond
- covalent
- polar covalent

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

- polar covalent and ionic
- ionic and covalent
- polar and ionic