

**This is BCE # 1. It is OK to use your textbook, but if you can answers the questions without it that is OK too.**

**I recommend you print out this page and bring it to class. [Click here](#) to show a set of five BCE1 student responses, randomly selected from all of the student responses thus far, in a new window.**

**john , here are your responses to the BCE and the Expert's response.**

**1. Provide brief definitions for each of the following terms,**

**a) atom**

**smallest unit of matter**

**An atom is the smallest unit of matter. It is composed of a nucleus (that contains protons and neutrons) where most of the mass is located and electrons that have a very small mass and are located outside of the nucleus. If we are to imagine an atom in our minds a spherical shape is reasonable.**

**b) molecule**

**smallest unit of matter composed of two or more atoms covalently bonded together**

**A molecule is also a small unit of matter. It is composed of two or more nonmetallic atoms that are 'joined' together by a covalent bond.**

**c) element**

**a pure substance composed of one type of atom with the same number of protons**

**An element is a term used to describe matter in a pure form, that contains only one kind of atom. An example of an element is carbon, oxygen, or chlorine. Water, cardboard, or potatoes would not be examples of an element.**

**d) compound**

**a pure substance composed of tow more atoms of two or more elements inwhich the composition of the elements is the same**

**A compound is a term used to describe matter in a pure form, that contains particles composed of two or more elements chemically combined in a fixed ratio. Substances like water, carbon dioxide, sodium chloride and sugar are examples of compounds. cardboard, potatoes, or an ant would not be examples of compounds.**

**e) formula**

**a symbolic representation of the elements written using symbols that reflects the ratio of the elements in the substance**

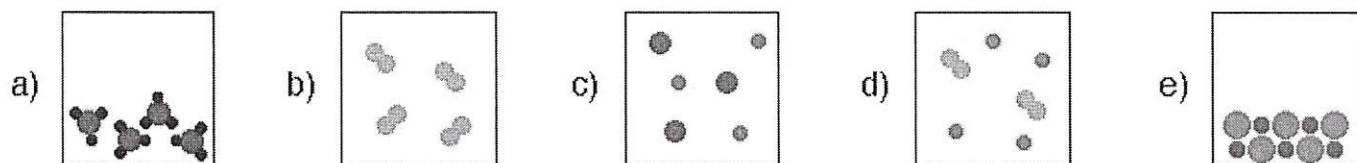
A symbolic way to represent pure matter, such as an element or a compound. The formula for the element oxygen is  $O_2$ . The formula for the compound carbon dioxide is,  $CO_2$ .

## f) solution

### a homogeneous mixture of two or more substances

A solution is an example of matter that is not pure, but contains a homogeneous mixture of more than one type of element or compound. A homogeneous mixture is uniform throughout. All components of a homogeneous mixture appear to be in the same phase. Finally, it is relatively easy to separate the components of a solution back into their original pure state. An example of a solution would be sodium chloride dissolved in water. Another example of a solution is the atmosphere. Milk or orange juice would not be examples of a solution.

2. Here are five boxes that contain matter depicted at the particulate level (level of atoms and molecules).



Use the boxes above to answer each of the following questions:

i) Which of the box(es) represents a sample of an element? Select all that apply. (Note: look at your definition above to help you decide.)

b

*10% a only ~25% picked more than one container.  
50% b only  
15% c only*

Figure a is a compound not an element because each molecule contains a red element and two black elements. Figure b is an element, that exists as diatomic molecules. Figure c is a homogeneous mixture of two different monoatomic elements. Figure d is a homogeneous mixture of two different elements, a monoatomic element and a diatomic element. Figure e is an example of an ionic compound, composed of a small cation and a larger anion.

ii) Which of the box(es) represents a sample of a compound? Select all that apply. (Note: look at your definition above to help you decide.)

a e

*28% a only 25% a & e ~29% picked two or more other combinations none > 4.3%  
3% b only 2% c only 10% d only*

Figure a is a compound because each molecule contains a red element and two black elements. Figure b is an element, that exists as diatomic molecules. Figure c is a homogeneous mixture of two different monoatomic elements. Figure d is a homogeneous mixture of two different elements, a monoatomic element and a diatomic element. Figure e is an example of an ionic compound, composed of a small cation and a larger anion.

iii) Which of the box(es) represents a sample of a pure substance in the liquid phase? Select all that apply.

*21% a only 17% e only  
27% b only 23% more than two combinations (2.5% picked b, c & d  
9% c only 5.5% picked a & e)  
2.5% d only*



a

Figure a is a pure substance (compound) in the liquid phase. Figure b is a pure substance (element) in the gas phase. Figure c is a homogeneous mixture of two different monoatomic elements in the gas phase. Figure d is a homogeneous mixture of two different elements, a monoatomic element and a diatomic element in the gas phase. Figure e is a pure substance (compound) in the solid phase.

iv) Which of the boxes represents a sample of a solution? Select all that apply.

c d

*20% include 'a' = 5.5% (a,c,d,e) = 5.5% (a,e) = 5% a only = 5% other  
 26% c & d = 6% c, d & e  
 10% d only  
 17% e only  
 7% include b*

Figure a is a pure substance (compound) in the liquid phase. Figure b is a pure substance (element) in the gas phase. Figure c is a solution (homogeneous mixture) of two different monoatomic elements in the gas phase. Figure d is a solution (homogeneous mixture) of two different elements, a monoatomic element and a diatomic element in the gas phase. Figure e is a pure substance (compound) in the solid phase.

3. Below are two images representing a sample of water in two different phases at the level of atoms and molecules (the particulate level).

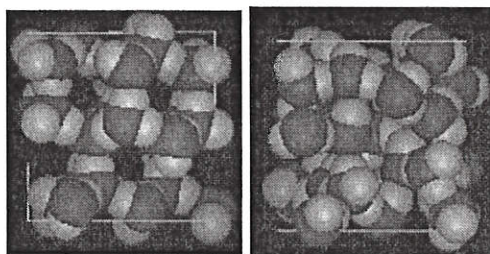


Figure I.

Figure II.

a) Assuming the volume of the two figures is the same, which Figure has the lowest density.

Figure I *90%*

Explain how you arrived at your answer.

Figure I depicts a cube with the smaller number of molecules compared to Figure II

Figure I depicting the solid phase of this substance would have the lowest density. Since both figures have the same volume and the same type of matter, there appears to be less matter in Figure I compared to Figure II. Density is defined as mass/volume. If volume is the same, the volume with the smallest mass of matter will have the smallest/lowest density.

b) Identify the phase (gas, liquid or solid) depicted in Figure I.

*14% gas  
 66% liquid  
 22% solid*

**Solid** The substance in Figure I is shown in the solid phase. Note how organized the particles are in the figure. Also the particles are very close together. There does appear to be 'hole' which is an interesting observations. More about that in class.

c) Identify the phase depicted in Figure II.

*2% gas 31% liquid 67% solid*

**Liquid** The substance in Figure II is shown in the liquid phase. Note how disorganized the particles are in the figure. Also the particles are very close together.

d) Provide the symbol of the element for each type of atom in the figure.

Atom	Symbol
Red Atom	oxygen O (oxygen)
White Atom	hydrogen H (hydrogen)

*58% O 25% H*

*56% H 26% O*

e) What is the formula for the compound?

$H_2O$   $H_2O$  (water) *86%*

4. Is there anything about the questions that you feel you do not understand? List your concerns/questions.

nothing

5. If there is one question you would like to have answered in lecture, what would that question be?

nothing