

# Structure and Properties of Matter Unit Test

## I. Multiple Choice: Select the letter of which best answers the question.

- How many atoms of sodium are found in the compound  $2\text{Na}_2\text{CO}_3$ ?
  - 2
  - 4
  - 6
  - 12
- What type of ion does iodine form?
  - Positive one
  - Positive two
  - Negative one
  - Negative two
- Which of the following sentences is true about isotopes?
  - They have the same number of protons but a different number of electrons.
  - They have the same number of protons but a different number of neutrons.
  - They have the same number of protons and neutrons.
  - They have the same number of protons and electrons.
- Rutherford's experiments into the atom suggested that...
  - Atoms were largely made up of empty space
  - Atoms had a small, dense nucleus
  - Electrons orbited the nucleus
  - All of the above
- Substances which are made up of more than one type of atom chemically bonded together are known as:
  - Elements and molecules
  - Compounds and molecules
  - Compounds and elements
  - Atoms and compounds

## II. Give the orbital notations for:

- Carbon
- Magnesium ion
- Argon
- Fluoride ion
- Aluminium metal

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### III. Write the symbols for each of the following ions:

1. Calcium

4. Hydrogen

2. Bromide

5. Sulfide

3. Barium

### IV. Decide if the statement is true or false:

1. Boron is more electronegative than oxygen

2. Potassium has a greater metallic character than aluminium

3. Boron has a greater atomic radius than fluorine

4. Magnesium has a greater electron affinity than sulfur

5. Phosphorous has a greater ionization energy than sodium

### V. Explain how atoms are different to ions

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# Structure and Properties of Matter Unit Test

**VI. Explain why isotopes of the same element show the same chemical properties**

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**VII. With reference to the forces holding them together, explain how the particles are arranged in solids, liquids and gases.**

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  - Elements and molecules
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## II. Give the orbital notations for:

- Carbon  
 $1s^2 2s^2 2p^2$
- Magnesium ion  
 $1s^2 2s^2 2p^6$
- Argon  
 $1s^2 2s^2 2p^6 3s^2 3p^6$
- Fluoride ion  
 $1s^2 2s^2 2p^6$
- Aluminum metal  
 $1s^2 2s^2 2p^6 3s^2 3p^1$

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## III. Write the symbols for each of the following ions:

1. Calcium



2. Bromide



3. Barium



4. Hydrogen



5. Sulfide



## IV. Decide if the statement is true or false:

1. Boron is more electronegative than oxygen **False**
2. Potassium has a greater metallic character than Aluminum **True**
3. Boron has a greater atomic radius than fluorine **True**
4. Magnesium has a greater electron affinity than sulfur **False**
5. Phosphorous has greater ionization energy than sodium **True**

## V. Explain how atoms are different from ions

Atoms contain the same number of electrons and protons and therefore have a neutral overall charge. Ions are atoms which have either lost or gained electrons, so have an imbalance in the number of protons and electrons. This gives the ion either a positive charge (having more protons than electrons) or negative charge (having more electrons than protons).

## VI. Explain why isotopes of the same element show the same chemical properties

Isotopes of an element have the same atomic number meaning that they have the same number of protons and electrons. The electrons in an element determine how it behaves in a chemical reaction (i.e. their chemical properties). Therefore, since the isotopes each have the same number of electrons, they will have the same chemical properties.

## Structure and Properties of Matter Unit Test

**VII. With reference to the forces holding them together, explain how the particles are arranged in solids, liquids and gases.**

The particles in solids are tightly packed together in a fixed shape and the forces holding the solid's particles together are very strong. Therefore a large amount of energy is necessary to overcome these forces and allow the solid to change state. Liquids are loosely packed together, and are able to flow past one another. The forces holding the particles of the liquid together are much weaker than those found in solids. Liquids, therefore, require much less energy to change to a gas. Gases have negligible forces holding them together as their particles can exist in isolation and are able to spread out to fill their container.