

Answer all the questions and they check your answers.

1. What is the definition of an ionic bond?

2. Fill in the gap to complete the sentence

ionic compounds form a regular and repeating _____ structure.

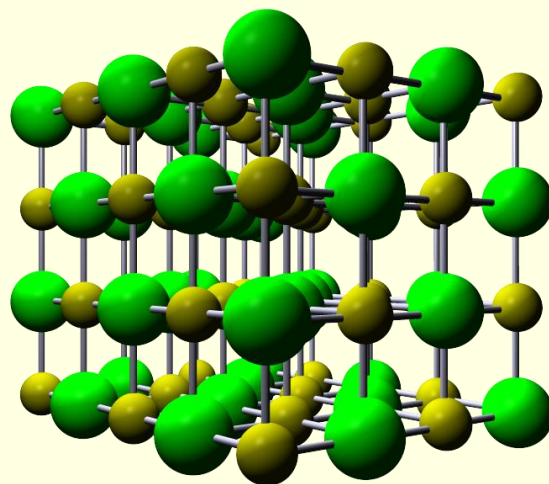
3. Which term describes the highly ordered arrangement of ions in an ionic compound?

4. What is the formula of sodium nitrate?

5. Describe the structure of a typical ionic compound.

6. Explain why ionic compounds have high melting and boiling points.

7. In the context of ionic compounds, what does the term "lattice" refer to?



8. Explain why ionic compounds have high melting and boiling points.

9. Write the formula for calcium sulfate.

A: CaSO_4

10. Complete the table below:

| Polyatomic ion | formula |
|----------------|---------|
| phosphate | |
| Hydroxide | |
| Ammonium | |
| Nitrate | |
| sulfate | |

b. Work out the formulae of the following ionic compounds:

i) Sodium oxide:

ii) Magnesium chloride:

iii) Aluminium sulfate:

iv) Ammonium phosphate:

11. Which of the following is NOT a property of ionic compounds?

a) High melting point b) Conducts electricity when solid

c) Brittle d) Soluble in water

12. Fill in the gaps to complete the sentences below:

Ionic compounds form a _____ lattice structure, held together by _____ forces of attraction between _____ charged ions.

13. Match the following terms with their definitions:

| Term |
|-----------------------|
| <i>lattice</i> |
| <i>ionic bond</i> |
| <i>Crystalline</i> |
| <i>Polyatomic ion</i> |

| Definition |
|---|
| <i>A group of atoms with an overall charge.</i> |
| <i>A regular, ordered arrangement of particles.</i> |
| <i>A three-dimensional arrangement of ions in a solid.</i> |
| <i>A strong electrostatic attraction between oppositely charged ions.</i> |

14. Describe the structure of an ionic lattice.

15 Determine the formula for aluminium nitrate and explain the process.

16. Fill in the gaps and explain the steps to derive the formula for magnesium hydroxide.

To balance the charges, you need _____ OH^- ions for every _____ Mg^{2+} ion.

Therefore, the formula is _____.

17. Compare and contrast the structure and properties of ionic compounds and covalent compounds.

18. Explain how the crystalline structure of ionic compounds influences their physical properties.

Answers

1. What is the definition of an ionic bond?

An ionic bond is the electrostatic attraction between positively and negatively charged ions.

2. Fill in the gap to complete the sentence

Ionic compounds form a regular and repeating _____ structure.
lattice

3. Which term describes the highly ordered arrangement of ions in an ionic compound?

Crystalline

4. What is the formula of sodium nitrate?

NaNO_3

5. Describe the structure of a typical ionic compound.

Ionic compounds form a crystalline lattice structure. This is a regular, ordered arrangement of positive and negative ions in a three-dimensional structure. The strong electrostatic forces of attraction between oppositely charged ions hold the lattice together.

6. Explain why ionic compounds have high melting and boiling points.

Ionic compounds have high melting and boiling points due to the strong electrostatic forces of attraction between oppositely charged ions in the lattice. A large amount of energy is required to overcome these forces and break down the lattice structure.

7. In the context of ionic compounds, what does the term "lattice" refer to?

A lattice refers to the regular, repeating arrangement of ions in a crystalline solid.

8. Explain why ionic compounds have high melting and boiling points.

Ionic compounds have high melting and boiling points because the electrostatic forces between the oppositely charged ions in the lattice are very strong, requiring a lot of energy to overcome.

9. Write the formula for calcium sulfate.

A: CaSO_4

10. Complete the table below:

| Polyatomic ion | formula |
|----------------|---------|
| phosphate | |
| Hydroxide | |
| Ammonium | |
| Nitrate | |
| sulfate | |

b. Work out the formulae of the following ionic compounds:

i) Sodium oxide: Na_2O

ii) Magnesium chloride: MgCl_2

iii) Aluminium sulfate: $\text{Al}_2(\text{SO}_4)_3$

iv) Ammonium phosphate: $(\text{NH}_4)_3\text{PO}_4$

11. Which of the following is NOT a property of ionic compounds?

a) High melting point b) Conducts electricity when solid

c) Brittle d) Soluble in water Answer: b

12. Fill in the gaps to complete the sentences below:

Ionic compounds form a _____ lattice structure, held together by _____ forces of attraction between _____ charged ions.

Answer: crystalline, electrostatic, oppositely

13. Match the following terms with their definitions:

| Term | Definition |
|----------------|--|
| lattice | A group of atoms with an overall charge. |
| Ionic bond | A regular, ordered arrangement of particles. |
| Crystalline | A three-dimensional arrangement of ions in a solid. |
| Polyatomic ion | A strong electrostatic attraction between oppositely charged ions. |

14. Describe the structure of an ionic lattice.

An ionic lattice is a three-dimensional, repeating structure of ions. In this ordered arrangement, each positive ion is surrounded by negative ions and each negative ion is surrounded by positive ions, creating a stable and strong crystalline structure due to the electrostatic attractions.

15. Determine the formula for aluminium nitrate and explain the process.

The formula for aluminium nitrate is $\text{Al}(\text{NO}_3)_3$. The aluminium ion has a +3 charge (Al^{3+}), and each nitrate ion has a -1 charge (NO_3^-). To balance the charges, three nitrate ions are needed to balance one aluminium ion, resulting in the formula $\text{Al}(\text{NO}_3)_3$.

16. Fill in the gaps and explain the steps to derive the formula for magnesium hydroxide.

To balance the charges, you need _____ OH^- ions for every _____ Mg^{2+} ion.

Therefore, the formula is _____.

Identify the charges of the ions: Mg^{2+} and OH^- .

To balance the charges, you need 2 OH^- ions for every 1 Mg^{2+} ion.

Therefore, the formula is $\text{Mg}(\text{OH})_2$.

17. Compare and contrast the structure and properties of ionic compounds and covalent compounds.

Ionic compounds have a lattice structure formed by the electrostatic attraction between oppositely charged ions. They generally have high melting and boiling points due to the strong attractions within the lattice, and they conduct electricity when molten or dissolved in water because the ions are free to move. Covalent compounds, on the other hand, consist of atoms sharing electron pairs, forming molecules. They typically have lower melting and boiling points than ionic compounds because the intermolecular forces are

weaker compared to the ionic bonds. Covalent compounds do not conduct electricity in any state because there are no free ions or electrons to carry the charge.

18. Explain how the crystalline structure of ionic compounds influences their physical properties.

The crystalline structure of ionic compounds results in high melting and boiling points because the ions are held together by strong electrostatic forces in a highly ordered lattice. This ordered structure also makes ionic compounds brittle; when a force is applied, like charges can be forced next to each other, causing repulsion and the crystal to shatter. The regularity of the lattice structure contributes to the high density and hardness of ionic compounds. Additionally, ionic compounds tend to be soluble in polar solvents like water, where the polar molecules can disrupt the lattice and dissolve the ions.