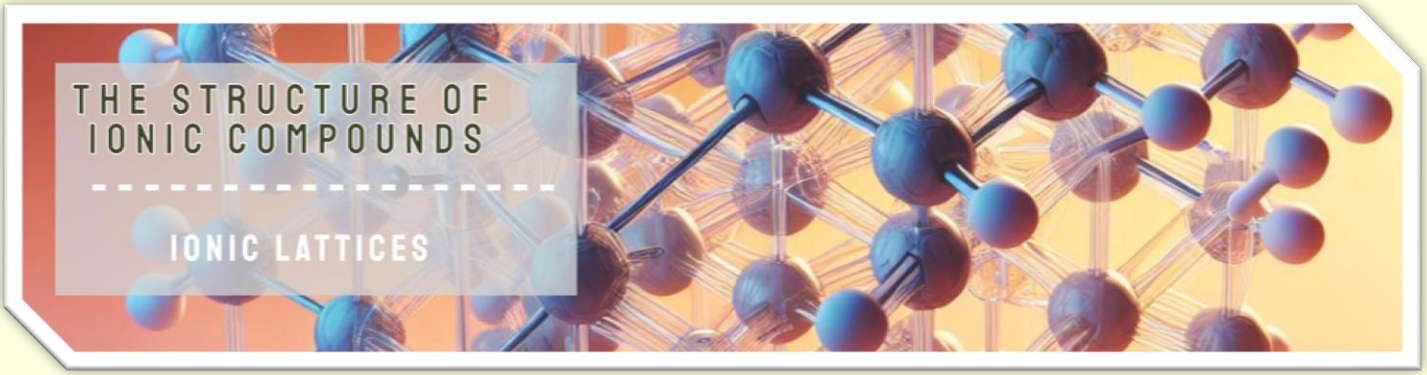



Answer all the questions below and then check your answers.

1. What charge does a sodium ion ($Na^+$) have?

   A) -1 B) 0 C) +1 D) +2

2. Which of the following is a characteristic of an ionic bond?

   A) The sharing of electron pairs.

   B) The transfer of electrons from one atom to another.

   C) A bond formed between two metals.

   D) A bond that occurs only between noble gases.

3. Which of these represents the correct formula for calcium nitrate?

   A) $CaNO_3$ B) $Ca_2NO_3$ C) $Ca(NO_3)_2$ D) $Ca_3N_2$

4. What does the term "crystalline" refer to in the context of ionic compounds?

   A) A substance that is flexible.

   B) A substance with a regular, repeating lattice structure.

   C) A substance that conducts electricity when solid.

   D) A substance that is soluble in water.

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

a. When a metal atom loses electrons, it forms a _____ ion with a _____ charge.

b. An ionic bond is due to the attraction of ions which are formed when one atom _____ electrons and another atom _____ those electrons.

c. The coordination number in an ionic lattice refers to the number of _____ that surround a given ion.

d. A _____ ion is a charged species that contains more than one atom bonded together.

6. Match the ion with its correct formula:

| Polyatomic ion |
|---|
| sulfate |
| carbonate |
| nitrate |
| hydroxide |

| formula |
|---|
| $CO_3^{2-}$ |
| $OH^-$ |
| $SO_4^{2-}$ |
| $NO_3^-$ |

7. Match the metal ion with the correct charge:

| Metal ion |
| --- |
| magnesium |
| aluminium |
| potassium |
| calcium |

| charge |
| --- |
| +1 |
| +2 |
| +3 |
| +2 |

8. Explain how ions are formed using magnesium and chlorine as examples.

9. Describe the structure of an ionic compound using sodium chloride as an example.

10. What is the coordination number in a crystal lattice, and what is the coordination number of sodium in sodium chloride?

11. Write the formulae for the following ionic compounds: aluminum sulfate, potassium carbonate, and calcium phosphate. (3 Marks)

12. Define an ionic bond.

# Answers

1. What charge does a sodium ion ($Na^+$) have?

   A) -1 B) 0 C) +1 D) +2

   Answer: C) +1

2. Which of the following is a characteristic of an ionic bond?

   A) The sharing of electron pairs.

   B) The transfer of electrons from one atom to another.

   C) A bond formed between two metals.

   D) A bond that occurs only between noble gases.

   Answer: B) The transfer of electrons from one atom to another.

3. Which of these represents the correct formula for calcium nitrate?

   A) $CaNO_3$ B) $Ca_2NO_3$ C) $Ca(NO_3)_2$ D) $Ca_3N_2$

   Answer: C) $Ca(NO_3)_2$

4. What does the term "crystalline" refer to in the context of ionic compounds?

   A) A substance that is flexible.

   B) A substance with a regular, repeating lattice structure.

   C) A substance that conducts electricity when solid.

   D) A substance that is soluble in water.

   Answer: B) A substance with a regular, repeating lattice structure.

5. Fill in the Gaps to complete the sentences below:

a. When a metal atom loses electrons, it forms a _____ ion with a _____ charge.

Answer: positive, positive

b. An ionic bond is due to the attraction of ions which are formed when one atom _____ electrons and another atom _____ those electrons.

Answer: loses, gains

c. The coordination number in an ionic lattice refers to the number of _____ that surround a given ion.

Answer: oppositely charged ions

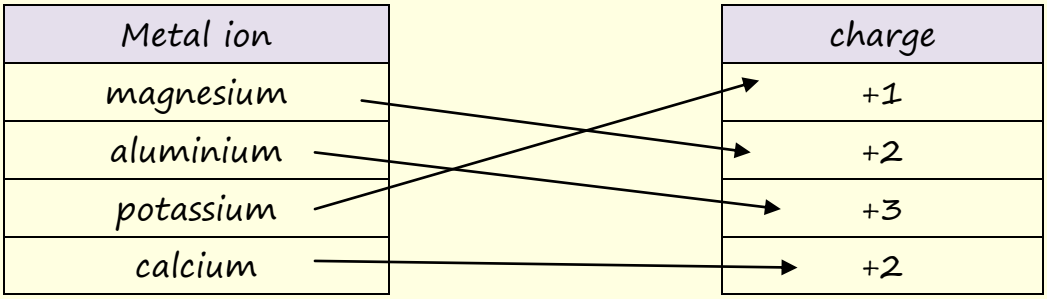
d. A _____ ion is a charged species that contains more than one atom bonded together.

Answer: polyatomic

6. Match the ion with its correct formula:

| Polyatomic ion | formula |
|---|---|
| sulfate | $CO_3^{2-}$ |
| carbonate | $OH^-$ |
| nitrate | $SO_4^{2-}$ |
| hydroxide | $NO_3^-$ |

7. Match the metal ion with the correct charge:




8. Explain how ions are formed using magnesium and chlorine as examples.

Answer: Magnesium (Mg) has two electrons in its outer shell. To achieve a stable electron configuration, it loses these two electrons, forming a $Mg^{2+}$ ion. Chlorine (Cl) has seven electrons in its outer shell and needs one more to achieve stability. It gains the electron from magnesium to form a $Cl^-$ ion. This transfer of electrons results in the formation of oppositely charged ions ($Mg^{2+}$ and $Cl^-$) that attract each other, forming an ionic bond.

9. Describe the structure of an ionic compound using sodium chloride as an example.

Answer: Sodium chloride (NaCl) has a giant ionic lattice structure. In this structure, each sodium ion ($Na^+$) is surrounded by six chloride ions ($Cl^-$), and each chloride ion is surrounded by six sodium ions. This arrangement forms a regular, repeating pattern extending in all directions, creating a crystalline structure. The strong electrostatic forces of attraction between the oppositely charged ions hold the lattice together.

10. What is the coordination number in a crystal lattice, and what is the coordination number of sodium in sodium chloride?

Answer: The coordination number is the number of oppositely charged ions surrounding a particular ion in a crystal lattice. In sodium chloride ($NaCl$), the coordination number of sodium ($Na^+$) is 6 because each sodium ion is surrounded by six chloride ions ($Cl^-$).

11. Write the formulae for the following ionic compounds: aluminium sulfate, potassium carbonate, and calcium phosphate.

Answer:

Aluminium sulfate: $Al_2(SO_4)_3$

Potassium carbonate: $K_2CO_3$

Calcium phosphate: $Ca_3(PO_4)_2$

12. Define an ionic bond.

Answer: An ionic bond is the electrostatic force of attraction between oppositely charged ions, formed when one atom transfers electrons to another.