

Ionic Bonding: Jigsaw Puzzle

Simulation: edtechsims.com/ionic-jigsaw

Name: _____ Class: _____ Date: _____



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Part A: Deriving Rules

On the sim: Try the guided activity in the simulation, then suggest some rules.

What are some things we should keep in mind when writing names and formulae of ionic compounds? The first one has been done for you.

#	Rule	Correct Example	Wrong Example
1	An ionic compound must have both positive and negative ions.	Na^+ and Cl^-	Na^+ and Na^+ Cl^- and Cl^-
2			
3			
4			
5			

Part B: Guided Practice

For each pair of ions below, work out the simplest ratio needed so that total positive charge equals total negative charge, then write the resulting formula.

#	Cation	Anion	Simplest Ratio (cation : anion)	Formula
1	Na ⁺ (charge 1+)	Cl ⁻ (charge 1-)		
2	Mg ²⁺ (charge 2+)	Cl ⁻ (charge 1-)		
3	Al ³⁺ (charge 3+)	Cl ⁻ (charge 1-)		
4	Na ⁺ (charge 1+)	O ²⁻ (charge 2-)		
5	Mg ²⁺ (charge 2+)	O ²⁻ (charge 2-)		
6	Al ³⁺ (charge 3+)	N ³⁻ (charge 3-)		
7	Mg ²⁺ (charge 2+)	N ³⁻ (charge 3-)		
8	Al ³⁺ (charge 3+)	O ²⁻ (charge 2-)		

Part C: Build Your Own

Choose any cation and any anion from the table below. Work out the simplest ratio and write the formula. Try to find four different compounds.

Cations	Na ⁺	K ⁺	Li ⁺	Mg ²⁺	Ca ²⁺	Al ³⁺
Anions	Cl ⁻	F ⁻	Br ⁻	O ²⁻	S ²⁻	N ³⁻

#	Cation Chosen	Anion Chosen	Ratio Used	Formula
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

Part D: Naming and Formulae

Answer each question using what you know about ionic compound naming and charge balancing.

#	Given	Your Answer
1	Formula: CaCl_2 — write its name	
2	Formula: Al_2O_3 — write its name	
3	Formula: MgO — write its name	
4	Al^{3+} and sulfate (SO_4^{2-}) — write the formula for aluminium sulfate	
5	K^+ and F^- — write the formula and name for potassium fluoride	

Part E: Check Your Understanding

Circle the letter of the correct answer for each question.

E1 Which pair of elements is most likely to form an ionic bond?

- A. Carbon and hydrogen
- B. Sodium and chlorine
- C. Oxygen and oxygen
- D. Nitrogen and hydrogen

E2 How many Cl^- ions bond to one Al^{3+} ion?

- A. 1
- B. 2
- C. 3
- D. 4

E3 What is the correct name for CaCl_2 ?

- A. Calcium dichloride
- B. Calcium chloride
- C. Dicalcium chloride
- D. Calcium(II) chloride

E4 What is the correct name for Al_2O_3 ?

- A. Aluminium(III) oxide
- B. Aluminium oxide
- C. Aluminium trioxide
- D. Alum trioxide

E5 Aluminium forms Al^{3+} and sulfate forms SO_4^{2-} . What is the correct formula for aluminium sulfate?

- A. AlSO_4
- B. $\text{Al}_2(\text{SO}_4)_3$
- C. $\text{Al}_3(\text{SO}_4)_2$
- D. $\text{Al}(\text{SO}_4)_3$

Answer Key: Ionic Bonding Jigsaw Puzzle

Part A

Possible rules for rows 2–5 (accept any four valid rules with suitable examples):

- The cation must be written before the anion.
- The total number of positive charges = the total number of negative charges.
- Positive ions are typically the name of the metals.
- Negative ions typically end with -ide.
- The number of ions is written as subscripts (not superscripts / not in front of the symbols).

Part B

#	Cation	Anion	Ratio	Formula
1	Na ⁺	Cl ⁻	1 : 1	NaCl
2	Mg ²⁺	Cl ⁻	1 : 2	MgCl ₂
3	Al ³⁺	Cl ⁻	1 : 3	AlCl ₃
4	Na ⁺	O ²⁻	2 : 1	Na ₂ O
5	Mg ²⁺	O ²⁻	1 : 1	MgO
6	Al ³⁺	N ³⁻	1 : 1	AlN
7	Mg ²⁺	N ³⁻	3 : 2	Mg ₃ N ₂
8	Al ³⁺	O ²⁻	2 : 3	Al ₂ O ₃

Part C

Answers will vary. Check that each pair of ions balances in charge and is written in its simplest ratio.

Part D

- 1 Calcium chloride
- 2 Aluminium oxide
- 3 Magnesium oxide
- 4 Al₂(SO₄)₃
- 5 KF — potassium fluoride

Part E

- 1 B
- 2 C
- 3 B
- 4 B
- 5 B