SCIENCE FOUNDATIONS

Ionic and covalent bonding

Difficulty level: Intermediate

Science Foundations

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Overview of the concept

This is how you explain why table salt dissolves in water and conducts electricity when melted, while sugar melts into a sticky liquid and does neither. Salt is held together by the pull between charged particles, and water pulls those charges apart. Sugar is held together by shared electrons, so it stays as whole molecules that water cannot split into charges. Knowing ionic and covalent bonding tells you why some substances dissolve, conduct, and melt easily while others behave completely differently.



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Rule

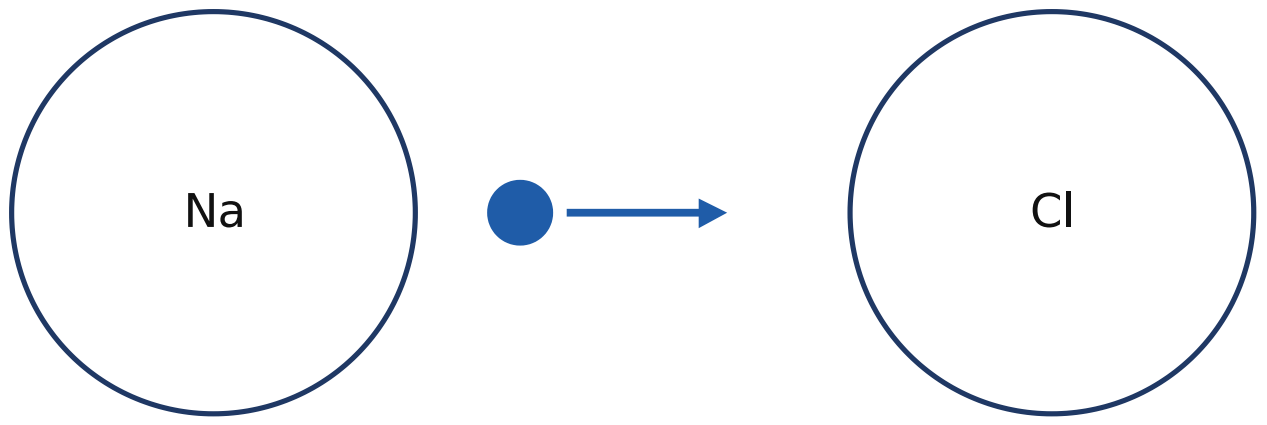
Ionic and covalent bonding: a metal plus a non-metal usually bonds by transferring electrons, which is ionic bonding.

Two non-metals usually bond by sharing electrons, which is covalent bonding. Ionic compounds usually have high melting points and conduct when dissolved.

Worked examples

EXAMPLE 1

Q Classify sodium chloride, NaCl.



SOLUTION

Na is a metal, Cl is a non-metal.

A metal plus a non-metal is ionic.

The result is ionic bonding.

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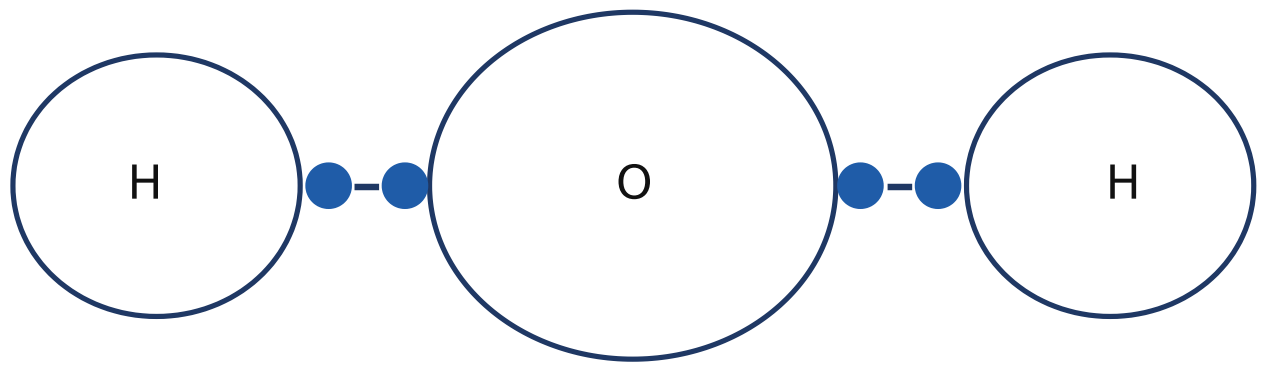
EXAMPLE 2

Q Classify water, H_2O.



SOLUTION

Hydrogen and oxygen are both non-metals.

Two non-metals together is covalent.

The result is covalent bonding.

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Practice questions

1 An electron moves from a sodium atom to a chlorine atom. Is this ionic or covalent?

- **A** Ionic
- **B** Covalent
- **C** Metallic
- **D** Hydrogen bonding

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2 A carbon atom is joined to four hydrogen atoms, sharing electron pairs. Is this ionic or covalent?

- **A** Ionic
- **B** Covalent
- **C** Metallic
- **D** Hydrogen bonding

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3 What happens to electrons in ionic bonding?

- A Transferred
- B Shared
- C Destroyed
- D Split in half

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4 What happens in covalent bonding?

- A Shared
- B Transferred
- C Destroyed
- D Stored in the nucleus

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5 Which type usually has a high melting point?

- A Covalent
- B Metallic
- C Ionic
- D Both ionic and covalent

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6 Which type conducts when dissolved?

- A Ionic
- B Covalent
- C Metallic
- D Neither type

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7 Metal plus non-metal usually gives what?

A Covalent

B Metallic

C Neither type

D Ionic

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8 Two non-metals usually give what?

A Ionic

B Covalent

C Metallic

D Neither type

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9

Is magnesium oxide ionic?

A Yes

B No

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10

Is methane covalent?

A Yes

B No

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ANSWER KEY

1. Ionic

2. Covalent

3. Transferred

4. Shared

5. Ionic

6. Ionic

7. Ionic

8. Covalent

9. Yes

10. Yes

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