SCIENCE FOUNDATIONS

Valence electrons

Difficulty level: Intermediate

Science Foundations

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Overview of the concept

This is how you predict whether an atom will grab, give away, or share electrons, which decides whether it ends up in salt, in water, or in the metal of a coin. Sodium gives one electron away and chlorine grabs one, which is why the two snap together into salt. Oxygen shares electrons with hydrogen to make water instead. Knowing valence electrons tells you how an atom behaves in a reaction, just from counting the electrons in its outer shell.



Rule

Valence electrons: the valence electrons are the electrons in the outermost shell of an atom.

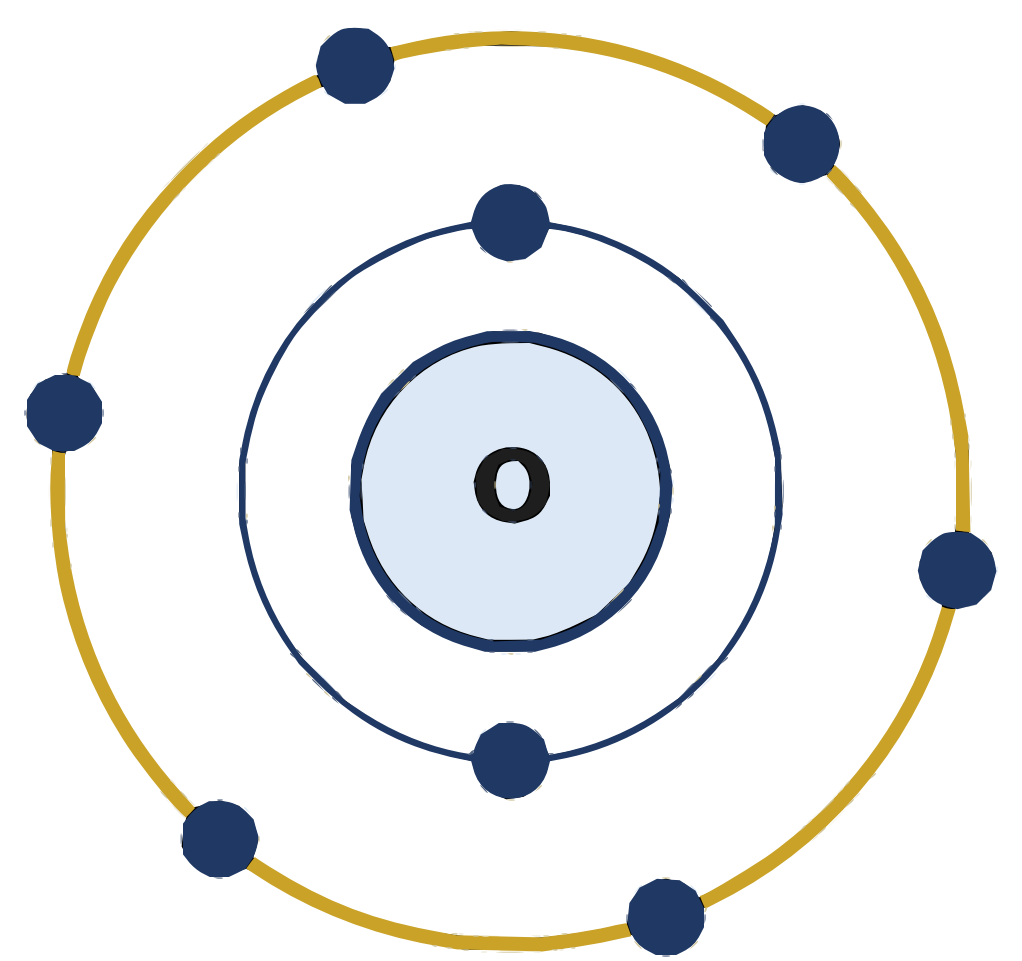
They are the electrons an atom uses when it bonds, and a full outer shell holds 8 electrons, except the first shell, which holds 2.

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Worked examples

EXAMPLE 1

Q How many valence electrons does oxygen have?



SOLUTION

Write the configuration: 2, 6.

Take the outer shell: the second shell with 6 electrons.

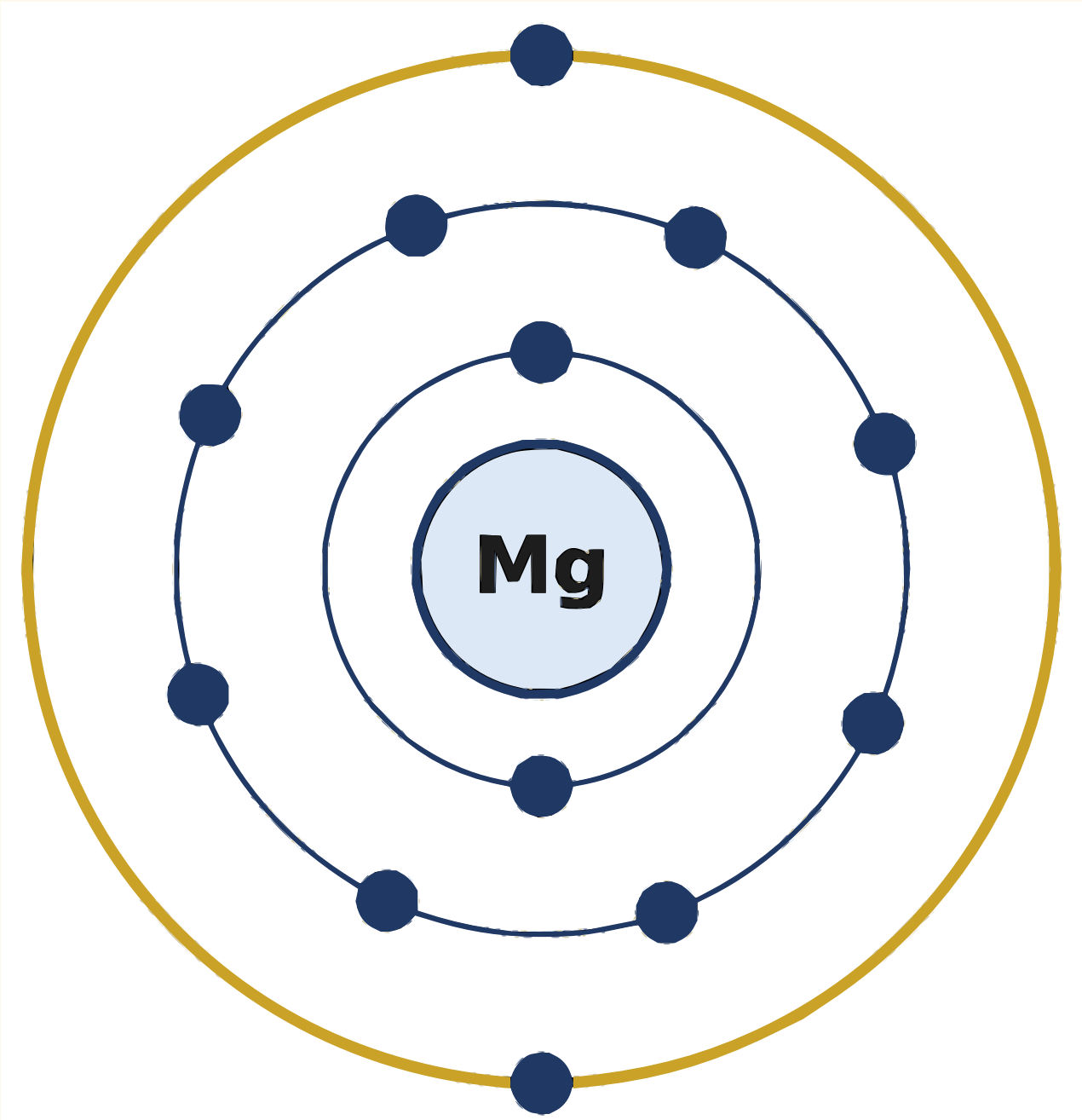
State the count.

The result is 6 valence electrons.

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EXAMPLE 2

Q How many valence electrons does magnesium have?



SOLUTION

Write the configuration: 2, 8, 2.

Take the outer shell: the third shell with 2 electrons.

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State the count, and check it against the group number, the column of the periodic table the element sits in: magnesium is in group 2, so 2 valence electrons.

The result is 2 valence electrons.

Practice questions

1 **Fluorine is 2, 7. Valence electrons?**

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2 **How many electrons can the first shell hold?**

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3 **Sodium has 1 valence electron. How many electrons does it give away when it bonds?**

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4 Chlorine has 7 valence electrons. How many more does it need to fill its outer shell?

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5 Magnesium has 2 valence electrons. What group is it in?

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6 What is a valence electron?

- A An electron in the outer shell
- B A proton in the nucleus
- C An electron in the first shell
- D A neutron in the outer shell

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7

Which shell holds valence electrons?

A The outer shell

B The first shell

C The nucleus

D The innermost shell

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8

How many valence electrons make a full outer shell (except shell 1)?

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9 Why do atoms bond?

A To reach a full outer shell

B To gain more protons

C To lose their nucleus

D To fill the first shell only

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10 Does calcium (2, 8, 8, 2) have 2 valence electrons?

A Yes

B No

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ANSWER KEY

1. 7

2. 2

3. 1

4. 1

5. 2

6. An electron in the outer shell

7. The outer shell

8. 8

9. To reach a full outer shell

10. Yes

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