

Atomic Structure

GCSE Chemistry · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

An atom of fluorine is written $^{19}_9\text{F}$. State the numbers of protons, neutrons and electrons. (3 marks)

Step 1 · Protons = atomic number (bottom number)

9 protons

Step 2 · Neutrons = mass number – atomic number

$19 - 9 = 10$ neutrons

Step 3 · Neutral atom, so electrons = protons

9 electrons

Answer: 9 protons, 10 neutrons, 9 electrons

Check: $9 + 10 = 19 = \text{mass number}$ ✓

2. Now try one with the steps

A magnesium ion is Mg^{2+} . Magnesium has atomic number 12 and mass number 24. State the numbers of each subatomic particle in the ion. (3 marks)

Step 1 · Protons do not change when an ion forms

Step 2 · Neutrons

Step 3 · $2+$ means two electrons lost

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. State the relative charge of a proton, a neutron and an electron. [3]

2. State what the atomic number of an element tells you. [1]

3. Explain why an atom has no overall charge. [2]
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4. Potassium has atomic number 19 and mass number 39. Calculate the number of neutrons in a potassium atom. [1]
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5. Sodium has atomic number 11 and mass number 23. State the numbers of protons, neutrons and electrons in a sodium atom. [3]
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6. Define the term isotopes. [2]
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7. Explain why isotopes of an element have the same chemical properties. [2]
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8. Aluminium has atomic number 13. Calculate the number of electrons in an Al^{3+} ion. [1]
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9. Sulfur has atomic number 16. Calculate the number of electrons in a sulfide ion, S^{2-} . [1]
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10. Chlorine is 75% chlorine-35 and 25% chlorine-37. Calculate its relative atomic mass. [2]
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11. Boron is 20% boron-10 and 80% boron-11. Calculate its relative atomic mass. [2]
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12. Magnesium is 79% magnesium-24, 10% magnesium-25 and 11% magnesium-26. Calculate its relative atomic mass to 1 decimal place. [2]
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13. An atom has a radius of 1×10^{-10} m and its nucleus a radius of 1×10^{-14} m. Calculate how many times larger the radius of the atom is than the radius of the nucleus. [1]

14. Explain why almost all of the mass of an atom is in the nucleus. [2]

4. Before you hand it in

"The mass number is the number of neutrons."

Mass number = protons + neutrons. Neutrons = mass number – atomic number.

"Isotopes have different numbers of protons."

Isotopes have the same protons and different neutrons.

Changing the number of protons when an ion forms

Keep the protons; a positive ion has fewer electrons, a negative ion more.

Taking a simple mean of isotope masses

Relative atomic mass is a weighted mean: multiply each mass by its abundance.