

Atoms Isotopes Ions

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

Name _____ Class _____ Date _____

1. Worked example

A lithium atom has mass number 7 and atomic number 3. State the number of protons, neutrons and electrons. (3 marks)

Step 1 · Protons = atomic number

3 protons

Step 2 · Neutrons = mass number – atomic number

$7 - 3 = 4$ neutrons

Step 3 · Electrons = protons (neutral atom)

3 electrons

Answer: 3 protons, 4 neutrons, 3 electrons

Check: Mass number counts protons + neutrons only; electrons have almost no mass.

2. Now try one with the steps

Chlorine-35 and chlorine-37 are isotopes. Compare their nuclei. (3 marks)

Step 1 · Same

Step 2 · Different

Step 3 · So

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 the approximate radius of an atom. [1]

3. Define atomic number. [1]
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4. Define isotopes. [2]
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5. Carbon-14 has 6 protons. State the number of neutrons in its nucleus. [1]
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6. Explain why an atom has no overall charge. [1]
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7. Explain why most of the mass of an atom is in its nucleus. [1]
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8. A sodium atom has mass number 23 and atomic number 11. State its numbers of protons, neutrons and electrons. [3]
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9. Describe what happens to an atom when it loses an outer electron. [2]
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10. Compare the nuclei of uranium-235 and uranium-238. [2]
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11. 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 atom's radius is. [1]
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12. Describe what happens to an electron when an atom absorbs electromagnetic radiation. [2]
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13. If a model nucleus were 1 cm across, estimate how wide the whole atom would be, in metres. [2]

14. Explain why isotopes of the same element have the same chemical reactions but different masses. [2]

4. Before you hand it in

Neutrons = mass number

Neutrons = mass number – atomic number.

"Isotopes have different numbers of protons."

Isotopes have the same protons but different neutrons.

"An ion has gained or lost protons."

Ions form when atoms gain or lose electrons.

Thinking the nucleus fills most of the atom

The nucleus is about 10 000 times smaller in radius than the atom: an atom is mostly empty space.