

GCSE Chemistry

Worksheet: Relative charges of subatomic particles

TIME 30 min	TOTAL 28 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
-----------------------	--------------------------	------------------------------	-----------------------------------

Topics: Relative charges of subatomic particles

NAME	CLASS	DATE
-------------	--------------	-------------

- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

Atoms contain protons, neutrons and electrons.

Table 1 is incomplete.

Table 1

Particle	Relative charge
Proton	
Neutron	
Electron	

0 1 . 1

Complete Table 1 to show the relative charge of each particle.

.....

.....

.....

.....

.....

.....

[3 marks]

0 1 . 2

Which **two** types of particle are found in the nucleus?

.....

.....

[1 mark]

0 2

An atom of sodium has 11 protons.

0 2 . 1

How many electrons does an atom of sodium have?

Tick (✓) **one** box.

10

☐

11

☐

12

☐

23

☐

[1 mark]

0 2 . 2

Which statement explains why a sodium atom has no overall charge?

Tick (✓) **one** box.

It has equal numbers of protons and neutrons.

☐

It has equal numbers of protons and electrons.

☐

Its neutrons cancel out the charge of its protons.

☐

Its electrons have no charge.

☐

[1 mark]

0 2 . 3

What name is given to the number of protons in an atom?

Tick (✓) **one** box.

Atomic number

☐

Group number

☐

Mass number

☐

Relative atomic mass

☐

[1 mark]

0 3

An atom of aluminium is represented as $^{27}_{13}\text{Al}$.

0 3 . 1

Give the number of protons in this atom.

.....

.....

.....

Number of protons =

[1 mark]

0 3 . 2

Give the number of neutrons in this atom.

.....

.....

.....

Number of neutrons =

[1 mark]

0 3 . 3

Give the number of electrons in this atom.

.....

.....

.....

Number of electrons =

[1 mark]

0 3 . 4

Explain why this atom has no overall electrical charge.

.....

.....

[1 mark]

0 4

An ion of aluminium is represented as $^{27}_{13}\text{Al}^{3+}$.

0 4 . 1

Give the number of protons in this ion.

.....

.....

.....

Number of protons =

[1 mark]

0 4 . 2

Give the number of neutrons in this ion.

.....

.....

.....

Number of neutrons =

[1 mark]

0 4 . 3

Give the number of electrons in this ion.

.....

.....

.....

Number of electrons =

[1 mark]

0 4 . 4

Explain, in terms of electrons, why this ion has a charge of 3+.

.....

.....

.....

.....

[2 marks]

0 5

A magnesium atom has 12 protons. It can lose two electrons to form a magnesium ion.

0 5 . 1

How many electrons does a magnesium atom have?

.....

.....

.....

Number of electrons =

[1 mark]

0 5 . 2

Use the relative charges of protons and electrons to calculate the charge on a magnesium ion.

Show your working.

.....

.....

.....

.....

[2 marks]

0 5 . 3

An oxide ion has 8 protons and a charge of 2-.
How many electrons does an oxide ion have?

.....

.....

.....

Number of electrons =

[1 mark]

0 5 . 4

Explain why a magnesium ion has almost the same mass as a magnesium atom.

.....

.....

[1 mark]

0 6

Table 2 shows the numbers of protons, neutrons and electrons in five particles, **A** to **E**.
Atomic numbers: sulfur = 16, chlorine = 17, argon = 18, potassium = 19

Table 2

Particle	Number of protons	Number of neutrons	Number of electrons
A	17	18	17
B	17	20	18
C	18	22	18
D	19	20	18
E	16	16	18

0 6 . 1

Which particle is a positive ion?
Give a reason for your answer.

.....

.....

.....

.....

[2 marks]

0 6 . 2

Which **two** particles are from the same element?
Give a reason for your answer.

.....

.....

.....

.....

[2 marks]

0 6 . 3

What is the relative charge on particle **E**?

.....

.....

[1 mark]

0 6 . 4

Name the element that particle **D** was formed from.

.....

.....

.....

.....

[1 mark]

0 6 . 5

Particle **C** is an atom.
Explain how the information in Table 2 shows this.

.....

.....

[1 mark]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Chemistry · Worksheet: Relative charges of subatomic particles · 28 marks

Question 1 (4 marks)

01.1 [3 marks]

Answer: proton +1; neutron 0; electron −1

- proton: +1 (1)
- neutron: 0 (1)
- electron: −1 (1)

Notes: Allow 1+ for +1 and 1− for −1. Allow 'no charge' / 'neutral' for 0.

01.2 [1 mark]

Answer: protons and neutrons

- protons and neutrons (both needed) (1)
-

Question 2 (3 marks)

02.1 [1 mark]

Correct: 11

02.2 [1 mark]

Correct: It has equal numbers of protons and electrons.

02.3 [1 mark]

Correct: Atomic number

Question 3 (4 marks)

03.1 [1 mark]

Answer: 13

- 13 (1)
-

03.2 [1 mark]

Answer: 14

- 14 (27 – 13) (1)
-

03.3 [1 mark]

Answer: 13

- 13 (1)
-

03.4 [1 mark]

Answer: It has the same number of protons as electrons, so the positive and negative charges cancel.

- it has the same number of protons (relative charge +1 each) as electrons (relative charge –1 each), so the charges cancel (1)

Notes: Do not accept 'the same number of protons and neutrons'.

Question 4 (5 marks)

04.1 [1 mark]

Answer: 13

- 13 (1)
-

04.2 [1 mark]

Answer: 14

- 14 (27 – 13) (1)
-

04.3 [1 mark]

Answer: 10

- 10 (13 – 3) (1)
-

04.4 [2 marks]

Answer: The atom has lost 3 electrons, so the ion has 13 protons but 10 electrons.

- the atom has lost 3 electrons (1)
- so the ion has 3 more protons than electrons (13 protons, 10 electrons) (1)

Notes: Allow for the second mark: the charge of the 13 protons (+13) is not balanced by the charge of the 10 electrons (–10).

Question 5 (5 marks)

05.1 [1 mark]

Answer: 12

- 12 (1)
-

05.2 [2 marks]

Answer: 2+

- $(12 \times +1) + (10 \times -1) / 12$ protons and 10 electrons (1)
- $= +2 / 2+$ (1)

Notes: A correct answer with no working scores 1 mark.

05.3 [1 mark]

Answer: 10

- 10 (1)
-

05.4 [1 mark]

Answer: Electrons have a very small mass, so losing two electrons makes almost no difference to the mass.

- electrons have a very small (relative) mass, so losing 2 electrons hardly changes the mass (1)
-

Question 6 (7 marks)

06.1 [2 marks]

Answer: D, because it has more protons (19) than electrons (18).

- D (1)
- (it has) more protons than electrons / 19 protons and 18 electrons (1)

Notes: The reason mark depends on D.

06.2 [2 marks]

Answer: A and B, because they have the same number of protons (17).

- A and B (1)
- (they have the) same number of protons / both have 17 protons (1)

Notes: Allow 'same atomic number'.

06.3 [1 mark]

Answer: 2-

- 2- / -2 (1)

Notes: The sign must be shown. Do not accept 2 or 2+.

06.4 [1 mark]

Answer: potassium

- potassium (1)

Notes: Allow K.

06.5 [1 mark]

Answer: It has equal numbers of protons and electrons (18), so it has no overall charge.

- same number of protons and electrons (18) so no overall charge (1)
-