

GCSE Chemistry

Worksheet: Electronic structure

TIME 30 min	TOTAL 30 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Electronic structure

NAME	CLASS	DATE
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- 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

Electrons occupy the lowest available energy levels (shells). For the first 20 elements, the first shell holds up to 2 electrons, and the second and third shells hold up to 8 electrons each.

0 1 . 1

Which electronic structure is possible for an atom in its lowest energy state?

Tick (✓) **one** box.

2,9

☐

2,8,1

☐

3,8

☐

2,8,9

☐

[1 mark]

0 1 . 2

Give the electronic structure of an atom that has 17 electrons.

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.....

.....

[1 mark]

0 2

Aluminium has the atomic number 13.

0 2 . 1

Give the electronic structure of an atom of aluminium.

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[1 mark]

0 2 . 2

How many electrons are in the outer shell of an atom of aluminium?

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[1 mark]

0 2 . 3

How many occupied energy levels (shells) does an atom of aluminium have?

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[1 mark]

0 3

The electrons in an atom occupy the lowest available energy levels.

0 3 . 1

An aluminium atom has 13 electrons.

Give the electronic structure of an aluminium atom.

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[1 mark]

0 3 . 2

An atom of element **Q** has the electronic structure 2,8,6.

How many electrons are in the outer energy level of an atom of **Q**?

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[1 mark]

0 3 . 3

What is the atomic number of element **Q**?

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[1 mark]

0 3 . 4

Potassium has the atomic number 19.

Give the electronic structure of a potassium atom.

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[1 mark]

0 3 . 5

A lithium atom has 3 electrons.

Explain why the electronic structure of lithium is 2,1.

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[1 mark]

0 4

The electronic structures of the first 20 elements follow a pattern.

0 4 . 1

Give the electronic structure of an atom of each element.

carbon (atomic number 6)

magnesium (atomic number 12)

argon (atomic number 18)

calcium (atomic number 20)

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[4 marks]

0 4 . 2

Which **two** of these elements have the same number of electrons in the outer energy level of their atoms?

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[1 mark]

0 5

Table 1 shows the electronic structures of four elements, **W**, **X**, **Y** and **Z**.

Table 1

Element	Electronic structure
W	2,8,1
X	2,6
Y	2,8,7
Z	2,8,8

0 5 . 1

Which element is a very reactive metal? Give a reason for your answer, in terms of electronic structure.

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[2 marks]

0 5 . 2

Which element is unreactive? Give a reason for your answer.

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[2 marks]

0 5 . 3

Element U has the electronic structure 2,7.
Which element in Table 1 has the most similar chemical properties to U? Give a reason for your answer.

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[2 marks]

0 6

The electrons in an atom are arranged in energy levels (shells).

0 6 . 1

Describe how electrons are arranged in energy levels (shells) in the atoms of the first 20 elements.
Explain how this arrangement is related to the element's position in the periodic table.

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[4 marks]

0 7

This question is about the electronic structures of atoms of elements **Q**, **R**, **T** and **W**. All four elements are in the first 20 elements of the periodic table.

0 7 . 1

An atom of **Q** has three occupied energy levels. It has one electron in its outer energy level.

Give the electronic structure **and** the atomic number of **Q**.

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.....

.....

[2 marks]

0 7 . 2

An atom of **R** has four more electrons than an atom of **Q**.

Give the electronic structure of **R**.

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[1 mark]

0 7 . 3

An atom of **T** has two occupied energy levels. Its outer energy level is full.

What is the atomic number of **T**?

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[1 mark]

0 7 . 4

An atom of **W** has three occupied energy levels. Its outer energy level contains the same number of electrons as its first energy level.
Give the electronic structure of **W**.

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[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: Electronic structure · 30 marks

Question 1 (2 marks)

01.1 [1 mark]

Correct: 2,8,1

01.2 [1 mark]

Answer: 2,8,7

- 2,8,7 (1)
-

Question 2 (3 marks)

02.1 [1 mark]

Answer: 2,8,3

- 2,8,3 (1)
-

02.2 [1 mark]

Answer: 3

- 3 (1)
-

02.3 [1 mark]

Answer: 3

- 3 (1)
-

Question 3 (5 marks)

03.1 [1 mark]

Answer: 2,8,3

- 2,8,3 (1)

03.2 [1 mark]

Answer: 6

- 6 (1)

03.3 [1 mark]

Answer: 16

- 16 (1)

03.4 [1 mark]

Answer: 2,8,8,1

- 2,8,8,1 (1)

03.5 [1 mark]

Answer: The first energy level can only hold 2 electrons, so the third electron goes into the second energy level.

- the first energy level / shell can hold only 2 electrons (so the third electron is in the second level) (1)

Question 4 (5 marks)

04.1 [4 marks]

Answer: carbon 2,4; magnesium 2,8,2; argon 2,8,8; calcium 2,8,8,2

- carbon: 2,4 (1)
- magnesium: 2,8,2 (1)
- argon: 2,8,8 (1)
- calcium: 2,8,8,2 (1)

04.2 [1 mark]

Answer: magnesium and calcium

- magnesium and calcium (1)
-

Question 5 (6 marks)

05.1 [2 marks]

Answer: W; it has one electron in its outer shell, which is easily lost.

- W (1)
- it has one electron in its outer shell, which is (easily) lost (1)

05.2 [2 marks]

Answer: Z; it has a full outer shell (a stable arrangement of electrons).

- Z (1)
- it has a full outer shell / stable arrangement of electrons (1)

05.3 [2 marks]

Answer: Y; both have 7 electrons in their outer shell.

- Y (1)
- U and Y both have 7 electrons in their outer shell (they are in the same group) (1)

Question 6 (4 marks)

06.1 [4 marks]

Answer: Electrons occupy the lowest available energy levels; the first shell holds up to 2 and the second and third up to 8 each; the number of occupied shells is the period number and the number of outer electrons is the group number.

Levels of response

- **Level 2 (3–4)** A clear, logically linked answer covering the key points accurately.
- **Level 1 (1–2)** One or two relevant points with little linking.
- **No marks (0)** Nothing relevant or worthy of credit.

Indicative content

- electrons occupy the lowest available energy levels (innermost shells) first
- the first shell can hold up to 2 electrons; the second and third shells can each hold up to 8
- the number of occupied energy levels (shells) in an atom is equal to its period number
- the number of electrons in the outer shell is equal to its group number (for Groups 1–7);
Group 0 atoms have a full outer shell

Question 7 (5 marks)

07.1 [2 marks]

Answer: 2,8,1; atomic number 11

- 2,8,1 (1)
 - 11 (1)
-

07.2 [1 mark]

Answer: 2,8,5

- 2,8,5 (1)

Notes: Allow ECF from an incorrect structure for Q.

07.3 [1 mark]

Answer: 10

- 10 (1)
-

07.4 [1 mark]

Answer: 2,8,2

- 2,8,2 (1)
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