AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 5.1.2.2

# Development of the periodic table

## Mark schemes and examiner comments

| | |
|---|---|
| Tier | **Foundation** |
| Question groups | **4** |
| Available paper years | **2019–2023** |

## Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

**Name:** _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

### 5.1.2.2 Development of the periodic table

**Answer 01 · Mark scheme** June 2019 | 8464/C/1F | Original Q3

| | | | | |
|---|---|---|---|---|
| **03.1** | atomic weight of element | | 1 | AO1<br>5.1.2.2 |
| **03.2** | gaps | allow spaces / blanks<br><br>do **not** accept undiscovered elements | 1 | AO1<br>5.1.2.2 |
| **03.3** | noble gases | | 1 | AO1<br>5.1.2.4 |
| **03.4** | 18<br><br>22 | this order only | 1<br><br>1 | AO2<br>5.1.1.5 |
| **03.5** | isotopes | | 1 | AO1<br>5.1.1.5 |
| **03.6** | 2,8,8 | | 1 | AO2<br>5.1.1.5 |
| **03.7** | stable arrangement (of electrons) | allow full outer shell<br>allow eight electrons in the outer shell<br>allow does not need to gain or lose electrons | 1 | AO1<br>5.1.2.4 |
| **Total** | | | **8** | |

### 5.1.2.2 Development of the periodic table

**Answer 01 · Mark scheme**

June 2019 | 8464/C/1F | Original Q3

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| | | | | |

### 5.1.2.2 Development of the periodic table

**Answer 02 · Mark scheme** November 2020 | 8464/C/1F | Original Q5

| | | | | |
|---|---|---|---|---|
| **05.1** | atomic weight | | 1 | AO1<br>5.1.2.2 |
| **05.2** | (because) properties were similar<br>**or**<br>(because) iodine has similar / same properties as bromine / chlorine / fluorine | allow symbols | 1 | AO3<br>5.1.2.2 |
| **05.3** | solid | | 1 | AO3<br>5.1.2.5<br>5.2.2.1 |
| **05.4** | scale on the y-axis up to 180<br><br>bar for sodium at 98 (°C)<br><br>bar for potassium at 63 (°C) | ignore scale beyond 180<br><br>allow a tolerance of ± half a small square<br><br>allow a tolerance of ± half a small square | 1<br><br>1<br><br>1 | AO2<br>5.1.2.4<br>5.2.2.1 |
| **05.5** | <br><br>lithium (atom) loses one electron<br><br>chlorine (atom) gains one electron<br><br>any **one** from:<br>• ions are formed<br>• lithium forms positive ion<br>• chlorine forms negative ion<br>• form a full outer shell(s) / level(s) | max **2** marks if reference to incorrect particle / bonding<br><br><br><br><br><br>allow ionic bonding<br><br><br><br>allow noble gas structure is formed | <br><br>1<br><br>1<br><br>1 | <br><br>AO2<br><br>AO2<br><br>AO1<br><br>5.1.2.3<br>5.2.1.2 |

### 5.1.2.2 Development of the periodic table



| | | | | |
|---|---|---|---|---|
| **05.6** | any **two** from:<br>• reactivity of elements increases going down the group<br>• potassium has more shells<br>• potassium can lose an (outer) electron more easily<br>• potassium has an outer shell / electron further away from the nucleus<br>• potassium has more shielding (of the outer shell / electron)<br>• potassium has a weaker attraction between nucleus and outer shell / electron | allow energy levels for shells<br>allow converse for lithium | 2 | AO1<br>AO2<br>5.1.2.3<br>5.1.2.5 |

| | | | |
|---|---|---|---|
| **Total** | | | **11** |

### 5.1.2.2 Development of the periodic table

**Answer 02 · Mark scheme**

November 2020 | 8464/C/1F | Original Q5

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|

### 5.1.2.2 Development of the periodic table

**Answer 03 · Mark scheme**

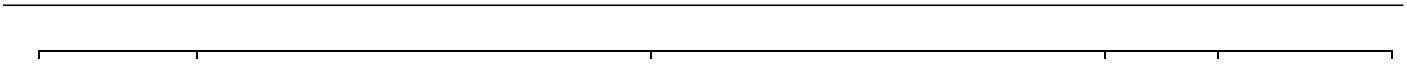
November 2021 | 8464/C/1F | Original Q6

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **06.1** | (Group) 0<br>**or**<br>noble gases | | 1 | AO2<br>5.1.2.2 |
| **06.2** | B | | 1 | AO2<br>5.1.1.3 |
| **06.3** | A | | 1 | AO3<br>5.1.1.3 |
| **06.4** | (atoms with the) same number of protons | allow atoms with the same atomic number<br><br>allow atoms of the same element<br><br>ignore the same number of electrons | 1 | AO1<br>5.1.1.5 |
| | (but with) different numbers of neutrons | ignore (but with) different mass numbers<br><br>do **not** accept (but with) different relative atomic mass | 1 | |
| **06.5** | $\frac{(39 \times 93.1) + (41 \times 6.9)}{100}$ | | 1 | AO2<br>5.1.1.6 |
| | = 39.138 | | 1 | |
| | = 39.1 | allow correctly rounded answer to **1** decimal place from an incorrect calculation using all the values given in the question | 1 | |
| **Total** | | | **8** | |

### 5.1.2.2 Development of the periodic table

**Answer 03 · Mark scheme**

November 2021 | 8464/C/1F | Original Q6



### 5.1.2.2 Development of the periodic table

Answer 04 · Mark scheme

June 2023 | 8464/C/1F | Original Q1

## Question 1

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| 01.1 | (number of protons) 4<br><br>(number of neutrons) 5 | | 1<br><br>1 | AO2<br>5.1.1.4<br>5.1.1.5 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| 01.2 | +2 | | 1 | AO2<br>5.1.1.7<br>5.2.1.2 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| 01.3 | gas | | 1 | AO1<br>5.2.2.1 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| 01.4 | freezing | | 1 | AO1<br>5.2.2.1 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| 01.5 | heat | allow evaporate / boil | 1 | AO1<br>5.2.2.1 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| 01.6 |  | | 1 | AO1<br>5.1.1.3 |

### 5.1.2.2 Development of the periodic table

**Answer 04 · Mark scheme**



| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **01.7** | chadwick | | 1 | AO1<br>5.1.1.3 |

| | |
|---|---|
| **Total Question 1** | **8** |

### 5.1.2.2 Development of the periodic table

**Answer 03 · Examiner comments** November 2021 | 8464/C/1F | Original Q6

**Question 6 (standard demand)**

**06.1** Just under half of students knew that Group 0, the noble gases, had not been discovered when Mendeleev's version of the periodic table was published.

**06.2** The plum pudding model was identified by nearly three fifths of students.

**06.3** Chadwick discovered the neutron. Students found difficulty in making the link between this discovery and the figure which represented an atom containing neutrons. Approximately one third of students gained the mark.

**06.4** The question required students to answer in terms of 'subatomic particles'; the answer was that isotopes are atoms with the same number of protons but different numbers of neutrons. Less than one fifth of students gained a mark.

**06.5** Just over one fifth of students gained the first mark by showing that the weighted average had to be divided by 100. The evaluation of this gained the second mark which then needed to be correctly rounded to one decimal place.

**Answer 04 · Examiner comments** June 2023 | 8464/C/1F | Original Q1

**Question 1 (low demand)**

01.1 Three-quarters of the students correctly deduced the number of protons and the number of neutrons in the beryllium atom. Some students gave the numbers the opposite way around.

01.2 The relative charge on a beryllium ion was given by just over 50% of the students. A charge of 1+ proved to be a good distractor.

01.3 More than 95% of the students were able to identify the arrangement of atoms as a representation of the gas state.

01.4 More than 80% of the students were able to identify the states from the diagram and to link them to freezing, as the process when a liquid changes into a solid.

01.5 About two-thirds of the students were able to identify the states and knew that heating was required to change the states. Condensing was a very common incorrect response which is the reverse process of the direction being asked about.

01.6 Just over three-quarters of students knew the correct order for the development of the model of the atom was tiny sphere, plum pudding and then nuclear model. The most common incorrect distractor also started with the tiny sphere model.

### 5.1.2.2 Development of the periodic table

**Answer 04 · Examiner comments** June 2023 | 8464/C/1F | Original Q1

01.7 Just under half of the students knew that the existence of neutrons was discovered by Chadwick. Mendeleev was the most common incorrect answer.