AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 5.2.2.8

Metals as conductors

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**2**
Available paper years	**2018–2022**

Using this booklet

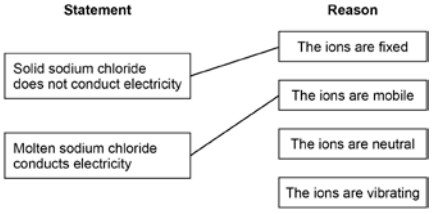
1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

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.

5.2.2.8 Metals as conductors

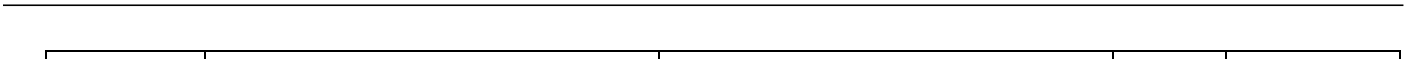
Answer 01 · Mark scheme June 2018 | 8464/C/1F | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	ionic		1	AO1 5.2.1.3
01.2	a molecule		1	AO1 5.2.1.4
01.3	a fullerene		1	AO1 5.2.3.3
01.4	covalent		1	AO1 5.2.3.2
01.5	1		1	AO1 5.2.3.2
01.6	solid		1	AO1 5.2.2.8
01.7	electrons		1	AO1 5.2.2.8
01.8	dissolved		1	AO1 5.2.2.3
01.9		do **not** accept if more than 1 line from 1 box	1 1	AO1 5.2.2.3
Total			**10**	

5.2.2.8 Metals as conductors

Answer 01 · Mark scheme

June 2018 | 8464/C/1F | Original Q1



5.2.2.8 Metals as conductors

Answer 02 · Mark scheme

June 2022 | 8464/C/1F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	**2** Mg + O_2 → 2 MgO	allow multiples	1	AO2 5.1.2.5 5.4.1.1

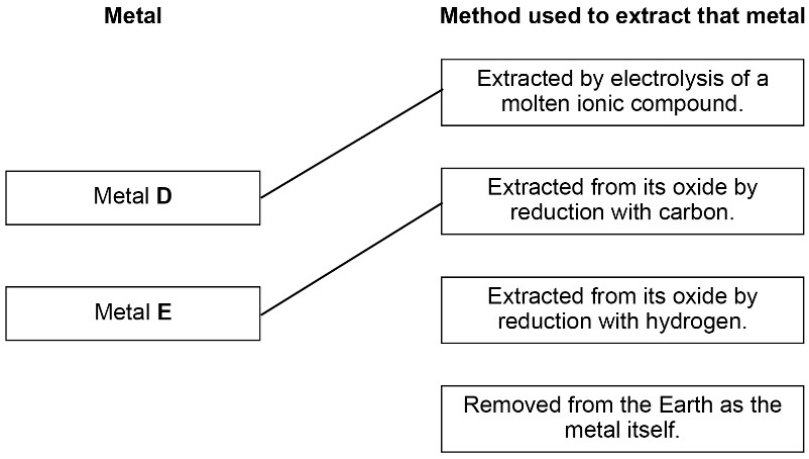
Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	any **one** from: • wear safety glasses / goggles • do not look directly at burning magnesium • wear heat proof glove	allow look through blue glass allow use tongs allow tie hair back	1	AO3 5.4.1.1 5.4.1.2 5.5.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	(M_r =) 24 + (2 × 19) = 62		1 1	AO2 5.1.2.5 5.3.1.2

5.2.2.8 Metals as conductors

Answer 02 · Mark scheme June 2022 | 8464/C/1F | Original Q4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	any **one** from: • argon has a full outer shell • argon has 8 electrons in the outer shell • argon has a stable arrangement of electrons.	allow energy level for shell allow does not need to lose and / or gain electrons	1	AO2
	(so) argon is unreactive	ignore argon is a noble gas	1	AO1 5.1.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	 do **not** accept more than one line from a box on the left		1 1	AO3 5.4.1.2 5.4.1.3 5.4.3.1 5.4.3.2 5.4.3.3

5.2.2.8 Metals as conductors

Answer 02 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	(because) ions (which are) free to move when molten (but are) fixed in solid	 allow reference to charged particles for MP2 and MP3	1 1 1	AO1 5.2.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.7	(sodium contains) delocalised electrons (which) carry (electrical) charge (through the metal / sodium)	allow free electrons ignore throughout for through ignore current / electricity	1 1	AO1 5.2.2.8

Total Question 4		13

5.2.2.8 Metals as conductors

Answer 01 · Examiner comments

June 2018 | 8464/C/1F | Original Q1

Question 1 (low demand)

01.1 47% of students correctly identified that the diagram for calcium oxide showed ionic bonding.

01.2 41% of students recognised that the bonding diagram for methane showed a molecule of methane.

01.3 The diagram of a fullerene was not recognised by 71% of students.

01.4 44% of students correctly identified, from the diagram, that the type of bond in graphite is covalent.

01.5 This question proved to be difficult because it required students to understand that in one covalent bond there is a shared pair of electrons, so one electron comes from each atom. 11% of students gave a correct answer.

01.6 This question was accessible to most students (76%) because the answer should have been obvious from the diagram that showed a solid between the electrodes.

01.7 66% of students knew that copper conducts electricity by the movement of delocalised electrons.

01.8 49% of students could use the labelled diagram to understand that the sodium chloride was dissolved to form the sodium chloride solution.

Answer 01 · Examiner comments

June 2018 | 8464/C/1F | Original Q1

01.9 19% of students knew that solid sodium chloride does not conduct electricity because the ions are fixed, whereas molten sodium chloride conducts electricity because the ions are mobile. Some students did not follow the instructions and drew more than one line from each statement box. 56% of students were awarded at least one mark.

5.2.2.8 Metals as conductors

Answer 02 · Examiner comments

June 2022 | 8464/C/1F | Original Q4

Question 4 (Low and standard demand)

04.1 More than 70% of students correctly balanced the equation. Some students changed the formula, usually from MgO to MgO_2

04.2 Almost three-quarters of students stated a safety precaution that should be taken when heating magnesium and oxygen. The most common correct responses were to wear eye protection and to use tongs.

04.3 Almost one-quarter of students gave the correct answer for the relative formula mass of magnesium fluoride. These students recognised that the subscript 2 means the relative atomic mass of fluorine needed to be doubled before being added to the relative atomic

Answer 02 · Examiner comments

June 2022 | 8464/C/1F | Original Q4

mass of magnesium. Many showed clear steps in their calculation. The most common errors were to either add or multiply 24 and 19.

04.4 Magnesium does not react when heated with argon - argon is unreactive because argon atoms have eight electrons in the outer shell. Common responses referred to magnesium (and argon) both being unreactive, that metals (or solids) do not react with gases or that both elements had full outer shells. This question discriminated well.

04.5 Almost 60% of students gained at least one of the two marks for correctly deducing the method used to extract a metal. The students were given a reactivity series showing the position of these two metals compared to other known metals, carbon and hydrogen.

04.6 Students found difficulty in explaning why sodium chloride conducts electricity when molten but not when a solid. Many indicated that this was due to something being able to move but failed to link this to ions or charged particles. Most referred to moving particles, atoms or electrons.

04.7 Students also found difficulty in explaning why sodium conducts electricity when solid. Delocalised electrons were rarely seen as was the concept of these delocalised electrons carrying charge through the sodium.