AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 5.2.2.6

Giant covalent structures

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**8**
Available paper years	**2018–2025**

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.

5.2.2.6 Giant covalent structures

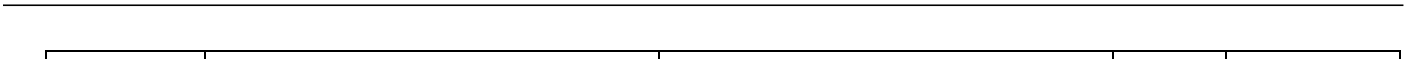
Answer 01 · Mark scheme June 2018 | 8464/C/1H | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1		**max 2** for incorrect reference to particles or bonds		AO1 5.2.3.1
	covalent bonds		1	
	giant structure / macromolecule	allow each C has 4 bonds allow giant covalent structure for **2** marks allow giant ionic / lattice structure for **1** mark ignore lattice	1	
	lots of energy needed to break / overcome	allow disrupt structure ignore heat and high temperature	1	
		if no other marks awarded allow **1** mark for strong / many bonds		
05.2		**max 2** for incorrect reference to particles or bonds		AO1 5.2.2.3
	dissolved (in water) **or** aqueous	allow in solution	1	
	molten / liquid		1	
	so ions are mobile **or** free moving		1	
05.3		**max 2** for incorrect reference to particles or bonds		AO1 5.2.1.5 5.2.2.8
	delocalised electrons (from outer shell)		1	
	(free to) move		1	
	energy transferred (through structure)	ignore conducts thermal energy ignore electricity	1	
		if no other mark awarded allow **1** mark for ions / atoms vibrate		
Total			**9**	

5.2.2.6 Giant covalent structures

Answer 01 · Mark scheme

June 2018 | 8464/C/1H | Original Q5



5.2.2.6 Giant covalent structures

Answer 02 · Mark scheme

June 2018 | 8464/C/1H | Original Q7

Question	Answers	Mark	AO / Spec. Ref.
07.1	**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO3
	Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	AO3
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	AO1 AO2
	No relevant content	0	
	Indicative content: A is sodium oxide B is phosphorus oxide C is magnesium oxide D is silicon dioxide **linked statements:** A is sodium oxide because it has highest pH **or** pH = 14 **or** is a strong alkali B is phosphorus oxide because it has lowest pH **or** pH = 3 **or** is an acid C is magnesium oxide because it has 2nd highest pH **or** pH = 9 **or** is a (weak) alkali D is silicon dioxide because it is neutral **or** pH = 7 **or** A and B are sodium oxide **or** phosphorus oxide because both soluble **or** no solid remains C is magnesium oxide because it will be the colourless solution with solid remaining D is silicon dioxide because it will be the colourless liquid with solid remaining for **level 3** the solids must be correctly identified		5.1.2.3 5.4.2.4

5.2.2.6 Giant covalent structures

Answer 02 · Mark scheme

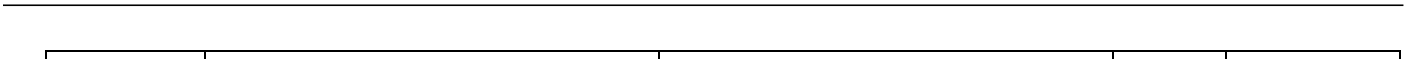
June 2018 | 8464/C/1H | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2		an answer of (pH=) 5 gains **2** marks		
	dilution by a factor of 100	allow pH changes by 1 when solution is diluted by factor of 10 **or** allow pH changes by 2	1	AO1 5.4.2.5
	(pH=) 5		1	AO3 5.4.2.5
Total			**8**	

5.2.2.6 Giant covalent structures

Answer 02 · Mark scheme

June 2018 | 8464/C/1H | Original Q7



5.2.2.6 Giant covalent structures

Answer 03 · Mark scheme November 2020 | 8464/C/1H | Original Q1

01.1	13 14	this order only	1 1	AO2 5.1.1.4 5.1.1.5

01.2	loss of oxygen	allow (Al^{3+}) gain of electrons allow aluminium oxide loses oxygen	1	AO1 5.4.1.1 5.4.1.3

01.3	 (at high temperature) oxygen reacts with carbon / electrode (so the positive) electrode burns / wears away to produce carbon dioxide	allow anode for (positive) electrode $C + O_2 \rightarrow CO_2$ scores MP1 and MP3	 1 1 1	 AO1 5.4.3.1 5.4.3.2 5.4.3.3

01.4	(delocalised) electron(s) ion(s) (delocalised) electron(s)		1 1 1	AO1 AO2 AO1 5.2.2.3 5.2.2.8 5.2.3.2

Total			**9**

5.2.2.6 Giant covalent structures

Answer 03 · Mark scheme

November 2020 | 8464/C/1H | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.

5.2.2.6 Giant covalent structures

Answer 04 · Mark scheme November 2020 | 8464/C/1H | Original Q2

02.1	any **one** from: • not to scale • not 3 dimensional / D • incorrect arrangement in space • electrons / shells not shown	allow size of atoms incorrect allow atoms are separated ignore properties of water	1	AO2 5.2.1.4
02.2	weak	allow weaker	1	AO1 5.2.2.4
02.3	CH_4O	allow CH_3OH	1	AO2 5.2.1.4
02.4	4		1	AO1 5.2.3.1
02.5	any **two** from: • (very) hard • (very) high melting point • does not conduct electricity	allow strong allow high thermal conductivity ignore shiny	2	AO1 5.2.3.1

5.2.2.6 Giant covalent structures

02.6	graphite silicon dioxide	allow graphene allow silica allow silicon allow polymer(s) **or** allow (named) polymer(s) allow fullerene **or** allow carbon nanotubes ignore buckminsterfullerene	1 1	AO1 5.2.2.6

Total			**8**

5.2.2.6 Giant covalent structures

Answer 04 · Mark scheme

November 2020 | 8464/C/1H | Original Q2

Question	Answers	Mark	AO/ Spec. Ref

5.2.2.6 Giant covalent structures

Answer 05 · Mark scheme

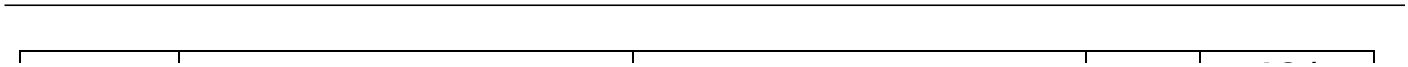
November 2021 | 8464/C/1H | Original Q4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	C_{60}		1	AO1 5.2.3.3
04.2	(graphite has) delocalised electrons (so the delocalised electrons) carry electrical charge through the structure	 allow (so the delocalised electrons) move through the structure	1 1	AO1 5.2.3.2
04.3	carbon atoms have different sizes to iron atoms / ions (so carbon atoms) distort the layers of iron atoms / ions (therefore) the layers cannot slide		1 1 1	AO1 5.2.2.7
04.4	(percentage and mass of other elements) 28.08 (%) = 16.29 (g) (mass of fork) = $\frac{16.29}{28.08} \times 100$ (g) = 58.01 (g) (mass of iron = $\frac{71.92}{100} \times 58.01$) = 41.72 (g)	 allow (mass of fork – mass of other elements) = 41.72 (g) allow 41.7 (g) allow correct use of incorrect calculation of mass and / or percentages	 1 1 1 1	AO2 5.2.2.7
Total			**10**	

5.2.2.6 Giant covalent structures

Answer 05 · Mark scheme

November 2021 | 8464/C/1H | Original Q4



5.2.2.6 Giant covalent structures

Answer 06 · Mark scheme

June 2023 | 8464/C/1H | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	fullerenes and graphene		1	AO1 5.2.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	delocalised electrons (which) move through the structure (and) transfer energy		1 1 1	AO1 5.2.1.5 5.2.2.8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	strong (electrostatic) forces of attraction (between the) oppositely charged ions (so) large amounts of energy needed to break the many / strong bonds / forces	 allow (so) large amounts of energy needed to break the bonds / forces in all directions allow (so) large amounts of energy needed to break the bonds in the lattice	1 1 1	AO1 5.2.1.3 5.2.2.3

5.2.2.6 Giant covalent structures

Answer 06 · Mark scheme

June 2023 | 8464/C/1H | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4	small molecules	allow simple molecules	1	AO1 5.2.1.4 5.2.2.4
	(with) weak forces between the molecules **or** (with) weak intermolecular forces	allow (with) weak intermolecular bonds do **not** accept incorrect references to covalent bonds	1	
	(so) little energy required to overcome / break the forces between molecules **or** (so) little energy required to overcome / break the intermolecular forces	allow (so) little energy required to separate the molecules allow (so) little energy required to overcome / break the intermolecular bonds ignore less energy	1	

Total Question 7	10

5.2.2.6 Giant covalent structures

Answer 07 · Mark scheme

June 2024 | 8464/C/1H | Original Q3

Question 3

Question	Answers	Mark	AO / Spec. Ref.
03	**Level 2:** Scientifically relevant features are identified; the way(s) in which they are similar/different is made clear and (where appropriate) the magnitude of the similarity/difference is noted.	4–6	AO1 5.2.1.1 5.2.1.2 5.2.1.3 5.2.1.4 5.2.2.3 5.2.2.4
	Level 1: Relevant features are identified and differences noted.	1–3	
	No relevant content	0	
	Indicative content: Similarities • both have strong bonds • particles have full outer shells Differences • sodium chloride is a compound • sodium chloride is made from two elements • oxygen is an element • sodium chloride is a giant structure of ions • oxygen is a small molecule • sodium chloride has ionic bonds • sodium chloride consists of oppositely charged ions • electrons are transferred from sodium atoms to chlorine atoms • oxygen is covalent • oxygen (molecules) are made up of oxygen atoms • joined by double covalent bond • electrons are shared between oxygen atoms • with weak forces between oxygen molecules For **Level 2**, there must be a comparison of either the structure **or** bonding of both sodium chloride **and** oxygen, and a description of magnitude.		

Total Question 3	**6**

5.2.2.6 Giant covalent structures

Answer 08 · Mark scheme

June 2025 | 8464/C/1H | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	(model **A**) does not show the 3D arrangement (of the ions / particles)	allow (model **A**) only shows the 2D arrangement (of the ions / particles) allow (model **A**) does not show lattice arrangement (of the ions / particles) allow (model **A**) only shows two ions / particles	1	AO3 5.2.1.3
	(model **A**) does not show the relative sizes of the ions / particles		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	$Al_2(SO_4)_3$		1	AO2 5.1.1.1 5.2.1.2 5.4.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	aluminium has more delocalised electrons per atom than sodium	allow aluminium has more outer shell electrons per atom than sodium	1	AO2 5.1.1.7 5.2.1.5 5.2.2.8

5.2.2.6 Giant covalent structures

Answer 08 · Mark scheme

June 2025 | 8464/C/1H | Original Q7

Question	Answers	Mark	AO / Spec. Ref.
07.4	**Level 2:** Scientifically relevant features are identified; the way(s) in which they are similar / different is made clear and (where appropriate) the magnitude of the similarity / difference is noted.	3–4	AO1 5.2.1.4 5.2.2.5 5.2.2.6
	Level 1: Relevant features are identified and differences noted.	1–2	
	No relevant content	0	

	Indicative content
	
	Similarities
	• both have covalent bonding
	  ○ both form bonds by sharing electrons
	
	• both have atoms that form 4 bonds
	  ○ in silicon dioxide each silicon atom forms 4 bonds, in poly(ethene) each carbon atom forms 4 bonds
	
	• both substances have strong (covalent) bonds
	
	Differences
	• silicon dioxide has atoms that form 2 bonds
	  ○ in silicon dioxide each oxygen atom forms 2 bonds
	• poly(ethene) has atoms that form 1 bond
	  ○ in poly(ethene) each hydrogen atom forms 1 bond
	
	• silicon dioxide only has covalent bonds
	• poly(ethene) has intermolecular forces between polymer molecules
	
	• silicon dioxide is a giant structure
	• poly(ethene) has very large molecules
	
	For **Level 2** a comparison and reference to magnitude, structure and bonding is required		

Total Question 7	8

5.2.2.6 Giant covalent structures

Answer 01 · Examiner comments

June 2018 | 8464/C/1H | Original Q5

Question 5 (standard / high & high demand)

05.1 The question was well attempted with 80% of students achieving at least one mark. The marks awarded were fairly evenly distributed between the three marking points.

Students rarely achieved full marks (14%), often because they confused the type of particles or bonding involved. While many could identify that covalent bonds were used and lots of energy was needed to break these bonds, they found it difficult to describe the structure involved.

A common response was that diamond contains four carbon atoms rather than each carbon atom having four bonds, which would have been sufficient to be awarded the second marking point.

05.2 The diagram showed a structure made up of ions. These have to be free moving to conduct electricity.

7% of students achieved full marks. Generally students missed out on full marks because they only included one way to produce ions, dissolving or melting. There was confusion among students between the terms liquid and solution. Many said that sodium chloride needs to be ‘molten’ or ‘liquid’, presumably often meaning molten or dissolved (in water).

The most common mistake in responses was that students thought that electrons were involved in the conduction of electricity in this situation.

05.3 49% of students achieved at least one mark, usually for marking points one or two. Higher attaining-students frequently achieved two marks for ‘delocalised electrons free to move’.

Marking point three was rare and was often poorly expressed. Lots of responses repeated the question stem with phrases such as ‘so it conducts thermal energy’ or ‘thermal energy passes between the particles’. Very few students mentioned energy being transferred. A common statement was that ‘delocalised electrons carry electric charge’ but not (thermal) energy.

5.2.2.6 Giant covalent structures

Answer 02 · Examiner comments

June 2018 | 8464/C/1H | Original Q7

Question 7 (standard / high & high demand)

07.1 In this 'extended response' question many students used the information effectively and gave very good explanations. 73% of students were able to achieve at least one mark, while 18% of students gave answers sufficient enough to meet the demands of the level 3 descriptor.

Some misunderstood the solubility data and gave SiO_2 as the most soluble. Many understood how pH related to acid, alkali and neutral. Although a common error was the confusion between whether sodium oxide was alkaline or acidic so many gave C and D correct from the solubility data but A and B incorrect.

In long descriptions, students would often contradict chemical identification or properties due to a lack of organisation within their response. A number gave the identity of the substances as elements instead of oxides. Some did not link the letters with any of the four substances listed in the question, choosing others compounds.

07.2 Students struggled with the concept that is if an acid is diluted by a factor of 10 then the pH increases by 1. Very few showed any attempt at the correct method, with 12% of students achieving one or two marks. Most students simply multiplied the 3 by 100 to give an answer of 300.

5.2.2.6 Giant covalent structures

Answer 05 · Examiner comments November 2021 | 8464/C/1H | Original Q4

Question 4 (standard, standard / high and high demand)

04.1 The formula of Buckminsterfullerene was known by just over half of students.

04.2 Approximately one quarter of students gained one mark for delocalised electrons. Few gained the second mark for stating that these delocalised electrons carry electrical charge through the structure.

Answer 05 · Examiner comments November 2021 | 8464/C/1H | Original Q4

04.3 A small number of students knew that layers cannot slide in an alloy and understood that the carbon atoms distort the layers of iron atoms. Very few students recognised that carbon and iron atoms have different sizes.

04.4 Just under one fifth of students successfully completed this calculation. In calculations students must show all their working.

5.2.2.6 Giant covalent structures

Answer 06 · Examiner comments

June 2023 | 8464/C/1H | Original Q7

Question 7 (standard/high and high demand)

07.1 60% of students identified that fullerenes and graphene both contain atoms in hexagonal rings. Diamond / graphite was the most common distractor selected.

07.2 In this question students were asked to explain why the structure of copper allows the conduction of thermal energy. Just under one half of students gained one mark for stating that delocalised electrons were responsible with approximately a quarter of these students then describing that these electrons move through the structure. The idea that these electrons transfer energy through the metal was infrequently recognised for the third marking point. Many answers confused the carrying of movement of electrical charge rather than thermal energy.

07.3 This question proved to be a good discriminator but students found the question difficult. Students were asked to explain why copper oxide has a high melting point. There was a lot of confusion over types of bonding and forces, with students often contradicting themselves during their response. The majority of those who gained 1 mark usually scored MP3 for stating that large amounts of energy is needed to break the strong forces.

07.4 Students had to describe why water has a low melting point. This question also proved to be a good discriminator. If a student refers to breaking the ‘forces’ or ‘bonds’ for then it must be clear they are referring to the intermolecular forces with no possible confusion that it is covalent bonds being broken. Students must explain that little energy is needed to break the bonds, less energy is insufficient. Nearly 40% of students gained at least 1 mark which was usually gained for stating that little energy is required to overcome the intermolecular forces. Few students described water as existing as small molecules which have weak intermolecular forces.

5.2.2.6 Giant covalent structures

Answer 06 · Examiner comments

June 2023 | 8464/C/1H | Original Q7

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

5.2.2.6 Giant covalent structures

Answer 07 · Examiner comments

June 2024 | 8464/C/1H | Original Q3

Question 3 (standard demand)

03 This was an 'extended response' style of question. Such questions are marked holistically. There are overall generic descriptions for the two levels of response at the top of the mark scheme, giving a hierarchy of response. Within each level there are 3 marks.

Students were asked to compare the structure and bonding of sodium chloride and oxygen; diagrams which represent the structures were given. The indicative content was not an exhaustive list and examiners used professional judgement with other content.

At Level 1, students needed to identify some relevant features of each substance and note some differences. To enter Level 2 students needed to clearly show the way(s) in which the structure and bonding of the two substances are similar/different and note the magnitude of the similarity/difference. Examples of magnitude include strong (bond), weak (forces), giant (structure of ions), small (molecule) and two or one (elements). To access Level 2 a minimum of four comments on the relevant features were required, at least one of which must include a comparison, and a reference to magnitude had to have been made. To gain 5 or 6 marks there needed to be a minimum of two comparative statements, a reference to magnitude and statement(s) referring to the structures.

Students often gave sufficient relevant features; many included properties, which was ignored. Those responses that did not access Level 2 usually did not include *both* a comparison *and* reference to magnitude. There were, however, some excellent and concise 6-mark descriptions that included a minimum of two comparisons, one of which included the structures and magnitudes of both substances.

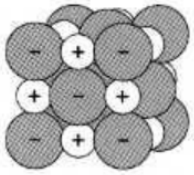
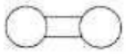
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5.2.2.6 Giant covalent structures

Answer 07 · Examiner comments June 2024 | 8464/C/1H | Original Q3

0 8 **Table 8** shows diagrams which represent the structures of two substances.

Table 8

Substance	Structure
Sodium chloride NaCl metal + non	
Oxygen O_2 non	

Compare the structure and bonding of sodium chloride and oxygen.

[6 marks]

Sodium chloride is ionic bonding which is between a metal and a non metal. They use electrostatic forces to transfer electrons. They create giant structures and have a high melting point. ①
Oxygen is a non metal which is used for covalent bonding as it's for two non metals. They have strong covalent bonds but have weak intermolecular forces. They can conduct electricity. ① They can also conduct electricity but only when molten

This response (from a Foundation tier paper) includes references to magnitude (*weak* intermolecular forces and *strong* bonds) and sufficient indicative content to access Level 2 (bullet points 4, 10, 11, 15). However, there is no comparison (simply a list of statements referring to sodium chloride and then a list for oxygen), so the response does not meet the Level 2 descriptor. They have identified a number of relevant features, so the response was awarded 3 marks, top of Level 1.

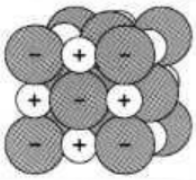
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5.2.2.6 Giant covalent structures

Answer 07 · Examiner comments June 2024 | 8464/C/1H | Original Q3

0 8 **Table 8** shows diagrams which represent the structures of two substances.

Table 8

Substance	Structure
Sodium chloride NaCl	
Oxygen O_2	

Compare the structure and bonding of sodium chloride and oxygen.

[6 marks]

Oxygen is an element and Sodium Chloride is a compound which is arranged in a lattice structure with positive and negative [redacted] ions. Oxygen has Sodium Chloride has ~~strong~~ ionic bonds.

This response (from a Foundation tier paper) is set out as a comparison with sufficient indicative content to access Level 2 (bullet points 5, 3, 9 and 8) but there is no reference to magnitude (strong/weak, giant/small or one/two element(s)). Therefore, similarly to the previous example, the response does not meet the Level 2 descriptor. It was awarded 3 marks.

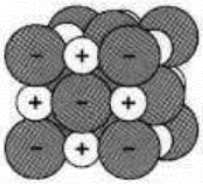
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5.2.2.6 Giant covalent structures

Answer 07 · Examiner comments June 2024 | 8464/C/1H | Original Q3

0 3 **Table 2** shows diagrams which represent the structures of two substances.

Table 2

Substance	Structure	
Sodium chloride NaCl		Ionic
Oxygen O_2		covalent

Compare the structure and bonding of sodium chloride and oxygen.

[6 marks]

In NaCl, ionic bonding occurs. Sodium will transfer its outer electron to chlorine to form a positive ion and when chlorine receives this transfered electron, it will form a 1^- ion. Due to the ions being oppositely charged, strong electrostatic forces holds them together. In O_2 however, covalent bonding occurs as it is non metal and O_2 will form a double covalent bond as it shares 2 electrons from their outer shell with each other in order to get a full outer shell and maine it stable.

This response (from a Higher tier paper) is set out as a comparison (use of 'however' on line 8) with sufficient indicative content to access Level 2 (bullet points 8, 9, 10, 11, 13 and 14). Bullet points 1 and 2 are mentioned for oxygen but not sodium chloride. In addition to the comparison a reference to magnitude (*strong* electrostatic forces) is included so 4 marks are awarded. Statement(s) referring to the *structure* of sodium chloride and/or oxygen were required for 5+ marks.

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Answer 08 · Examiner comments

Question 7 (Standard, Standard/High and High demand)

07.1 Very few students gained full credit in this question. The most common creditworthy statement was 'A shows the 2D arrangement' or 'B shows the 3D arrangement'. Many referred to atom, molecule or subatomic particle instead of ion; some students thought that the + and – charges meant the spheres were protons and electrons. There were many descriptions of what the models showed rather than a comparison of how they represented ionic bonding. Relative size of the ions seems to be a difficult concept; some wrote about not seeing the actual size of the particles in A whereas you could in B.

07.2 Very few knew how to construct a formula from the constituent ions. Those who were successful in writing the formula of aluminium sulfate either used the lowest common multiple or 'swap and drop' methods. Many answers placed the two ions together and reported the remaining charge, rather than forming a neutral formula. $AlSO_4$ was the most common incorrect answer.

07.3 Many students recognised that 'more delocalised electrons' was why aluminium metal conducts electricity better than sodium metal. However, this answer needed 'per atom' to be creditworthy. Some students answered in terms of properties, bond strength and reactivity.

07.4 This was an 'extended response' style of question. Such questions are marked holistically. There are overall generic descriptions for the two levels of response at the top of the mark scheme, giving a hierarchy of response. Within each level there are 2 marks.

Students were asked to compare the structure and bonding of silicon dioxide and poly(ethene). In the indicative content the first 4 black bullet points in the 'differences' relate to bonding, the last 2 to structure.

At Level 1, students needed to identify some relevant features. To enter Level 2 a comparison, reference to magnitude and reference to the structure and bonding of silicon dioxide or poly(ethene) were required.

Students found this question challenging and a significant proportion did not attempt it. Neither the structure nor bonding of these two compounds were well known. Silicon dioxide has a giant structure was common, but some did not state whether this was ionic or covalent. Poly(ethene) contains covalent bonds was common but long chain molecules very rare. Few knew the intermolecular forces were between chains of poly(ethene). There were many contradictions such as giant ionic and giant covalent and many wrote that silicon dioxide contained carbon or carbon dioxide bonded to silicon or formed a simple molecule containing 3 atoms. There were many two-paragraph answers and very few comparisons which would have lifted many responses from Level 1 to Level 2 and lots of references to properties.

Students often contradicted themselves, sometimes seemingly when later adding to their answer. The most common contradiction was correctly stating that silicon dioxide had a giant covalent structure and later stating that it had intermolecular forces. A common expression was 'is a covalent bond'.

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5.2.2.6 Giant covalent structures

Answer 08 · Examiner comments June 2025 | 8464/C/1H | Original Q7

0 7 . 4 Silicon dioxide and the polymer poly(ethene) are solid substances.

Compare silicon dioxide with the polymer, poly(ethene).

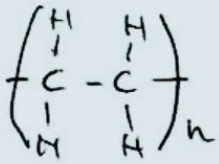
Answer in terms of structure and bonding.

[4 marks]

Silicon dioxide is a allotrope of carbon it is a giant covalent structure. it is held together by strong covalent bonds meaning it has a high melting and boiling point as lot's of energy is needed to break the bonds. Silicon dioxide can transfer electricity as it has delocalised electron.

Poly(ethene) is a Hydrocarbon made up of 2 carbon atoms each bonded to 2 Hydrogen atoms. ~~Carbon~~

Extra space it's a lighter Hydrocarbon which means it has a lower boiling/melting point. It's held together via covalent bonding.



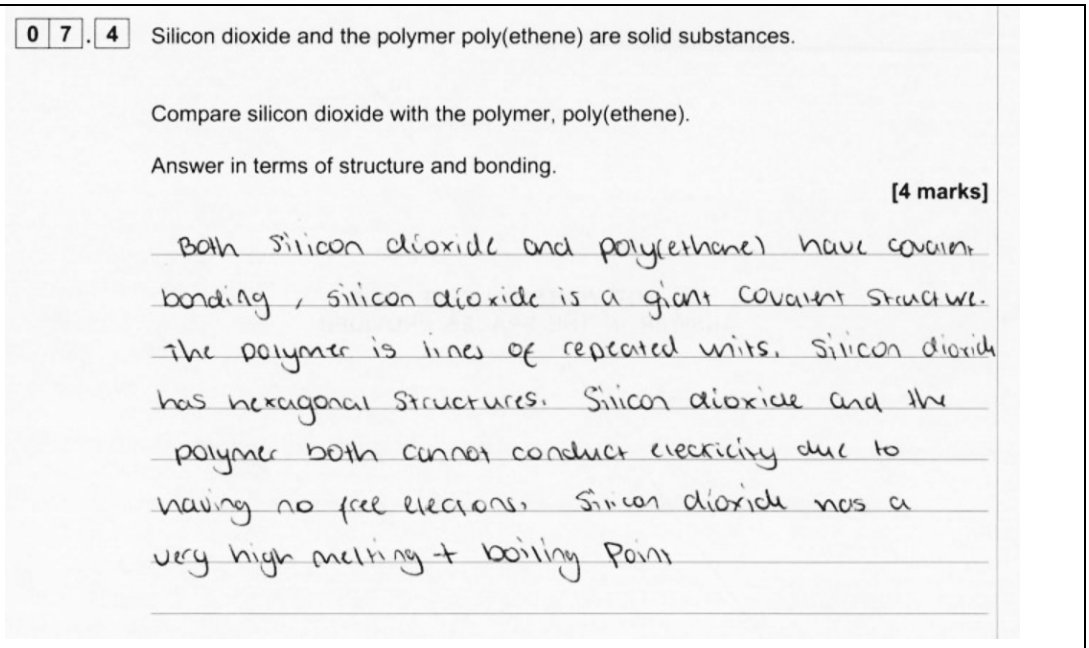
END OF QUESTIONS

This response includes references to magnitude (*giant* structure and *strong* covalent bonds) and sufficient indicative content to access Level 2; strong bonds, both have covalent bonding and giant structure. There are also some incorrect statements. However, there is no comparison (simply a paragraph referring to silicon dioxide and then one for poly(ethene)), so the response does not meet the Level 2 descriptor. They have identified a number of relevant features, so the response was awarded 2 marks, in Level 1.

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5.2.2.6 Giant covalent structures

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0 7 . 4 Silicon dioxide and the polymer poly(ethene) are solid substances.

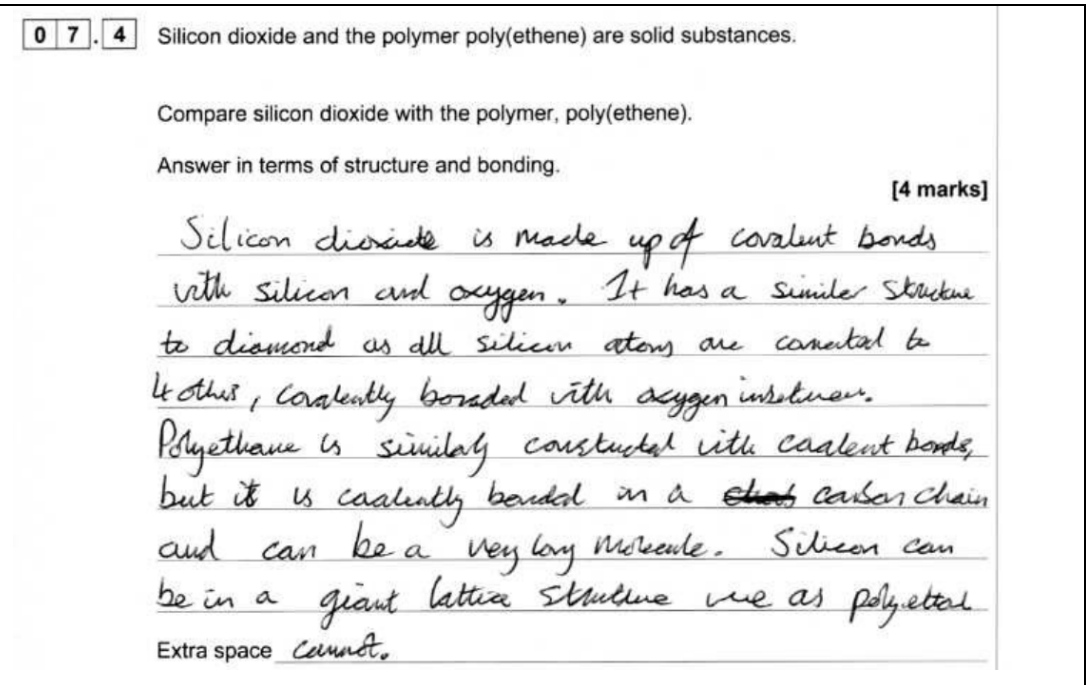
Compare silicon dioxide with the polymer, poly(ethene).

Answer in terms of structure and bonding.

[4 marks]

Both silicon dioxide and poly(ethene) have covalent bonding, silicon dioxide is a giant covalent structure. The polymer is lines of repeated units. Silicon dioxide has hexagonal structures. Silicon dioxide and the polymer both cannot conduct electricity due to having no free electrons. Silicon dioxide has a very high melting + boiling point

In the first two lines of this response there is a reference to magnitude (*giant* structure) and sufficient indicative content; both have covalent bonding and giant structure and a comparison so the response meets the Level 2 descriptor. With a comparison, reference to magnitude and to the structure and bonding of silicon dioxide, this response was awarded 3 marks, in Level 2.



0 7 . 4 Silicon dioxide and the polymer poly(ethene) are solid substances.

Compare silicon dioxide with the polymer, poly(ethene).

Answer in terms of structure and bonding.

[4 marks]

Silicon dioxide is made up of covalent bonds with silicon and oxygen. It has a similar structure to diamond as all silicon atoms are covalent to 4 others, covalently bonded with oxygen inbetween. Polyethene is similarly constructed with covalent bonds, but it is covalently bonded in a ~~chain~~ carbon chain and can be a very long molecule. Silicon can be in a giant lattice structure like as polymers cannot.

Extra space

This response includes references to magnitude (*giant* structure and *very long* molecule) and sufficient indicative content; both have covalent bonding, very long molecule and giant structure and there is a comparison, so the response meets the Level 2 descriptor. With 2 comparisons, a reference to magnitude and to the structure and bonding of silicon dioxide and of poly(ethene), this response was awarded the maximum 4 marks.

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5.2.2.6 Giant covalent structures

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Contact us

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