Questions

Q1.

The table shows some information about a selection of elements and compounds.

	Graphene	Graphite	Diamond	Magnesium oxide	Potassium bromide	Iron
Melting temperature / K	> 4000	3950	3820	3125	1007	1808
Density / $g\,cm^{-3}$	not measured	2.2 to 2.8	3.51	3.58	2.75	7.86
Compressive strength / GPa	not measured	2.3 and 15.3	443	152	15	170

The compressive strength is a measure of the energy required to break some of the bonds within a substance.

Deduce possible reasons why there are two widely different values for the compressive strength of graphite.
Both the values (2.3 and 15.3 GPa) are valid experimental results.

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(Total for question = 2 marks)

Q2.

The table shows some information about a selection of elements and compounds.

	Graphene	Graphite	Diamond	Magnesium oxide	Potassium bromide	Iron
Melting temperature / K	> 4000	3950	3820	3125	1007	1808
Density / g cm^{-3}	not measured	2.2 to 2.8	3.51	3.58	2.75	7.86
Compressive strength / GPa	not measured	2.3 and 15.3	443	152	15	170

Deduce **two** possible reasons why the density of iron (7.86 g cm^{-3}) is much greater than the density of graphite (2.2 to 2.8 g cm^{-3}).

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Q3.

This question is about crystalline solids.

Graphite is also a crystalline solid at room temperature.
Unlike diamond, graphite conducts electricity.

Describe the key feature of the bonding of the carbon atoms in graphite that results in it being an electrical conductor.

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(Total for question = 2 marks)

Q4.

The table shows some information about a selection of elements and compounds.

	Graphene	Graphite	Diamond	Magnesium oxide	Potassium bromide	Iron
Melting temperature / K	> 4000	3950	3820	3125	1007	1808
Density / $g\,cm^{-3}$	not measured	2.2 to 2.8	3.51	3.58	2.75	7.86
Compressive strength / GPa	not measured	2.3 and 15.3	443	152	15	170

Graphene, graphite and diamond are all forms of solid carbon.
Explain, in terms of structure and bonding, why graphene and graphite are good electrical conductors but diamond is a poor electrical conductor.

You may include labelled diagrams in your answer.

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Q5.

The table shows some information about the structure and bonding in four substances.

Substance	Structure	Bonding	Melting temperature / K
silicon(IV) oxide	giant	covalent	1883
potassium chloride			1043
iron		metallic	1808
iodine		covalent	387

Explain why the melting temperature of silicon(IV) oxide is much higher than that of iodine, even though the bonding in both is covalent.

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(Total for question = 3 marks)

Q6.

This question is about atomic structure and the Periodic Table.

The melting temperatures of two elements in Period 3 are given in the table.

Element	silicon	chlorine
Melting temperature / K	1683	172

Explain, in terms of the structure and bonding of each element, the difference between these values.

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(Total for question = 3 marks)

Q7.

This question is about crystalline solids.

Iodine and diamond are crystalline solids at room temperature.

Explain why diamond has a much higher melting temperature than iodine.

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(Total for question = 5 marks)