

WJEC Chemistry GCSE

5: Bonding, Structure and Properties

Practice Questions

England Specification

1. (a) Complete the following table.

[3]

Positive ion	Negative ion	Formula
Na^+	Br^-	NaBr
Ba^{2+}	OH^-
.....	SO_4^{2-}	$\text{Fe}_2(\text{SO}_4)_3$
K^+	K_2HPO_4

(b) Explain how a sodium atom and a bromine atom form ions when they react to make sodium bromide. [2]

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2. (a) Potassium reacts with sulfur to form potassium sulfide.

Using the electronic structures below, draw dot and cross diagrams to show how bonding takes place during the formation of potassium sulfide. [3]

potassium = 2,8,8,1

sulfur = 2,8,6

- (b) Using the electronic structures below, draw a dot and cross diagram to show the bonding in a molecule of sulfur difluoride, SF₂. [2]

sulfur = 2,8,6

fluorine = 2,7

3. (a) Sodium reacts with oxygen to give sodium oxide.

(i) Using the electronic structures below, draw dot and cross diagrams to show the transfer of electrons and the formation of ions that occur as sodium oxide is formed. [3]

sodium 2,8,1

oxygen 2,6

(ii) Give the electronic structure of the sodium and oxide ions. [1]

	Electronic structure
sodium ion	
oxide ion	

(b) Name the type of structure present in ammonia, NH_3 , and explain why ammonia has a low melting point. [3]

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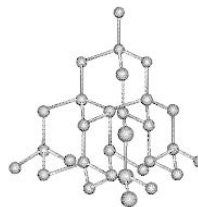
4.

Covalent bonds are formed by the sharing of pairs of electrons.

The following diagrams show the structures of hydrogen and diamond, a form of carbon.



hydrogen



diamond

- (a) Explain why diamond has a higher melting point than hydrogen. [3]

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- (b) Graphite is another form of carbon that has a high melting point. Give **one other** property of graphite and explain this property in terms of structure and bonding. [2]

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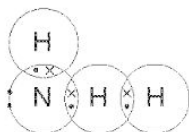
- (c) The bonding in oxygen, O_2 , is also covalent. Draw a dot and cross diagram to show the bonding present in a molecule of oxygen. [2]

O = 2,6

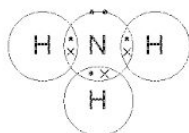
5. (a) (i) Ammonia, NH_3 , is a compound that contains the elements nitrogen and hydrogen. The electronic structure for each element is given below.

N 2,5 H 1

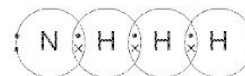
State which of the following dot and cross diagrams, A, B or C, represents the bonding in a molecule of ammonia. [1]



A



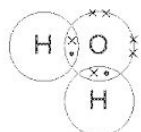
B



C

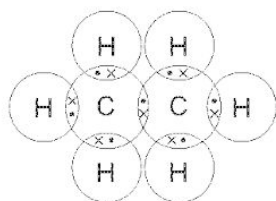
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- (ii) Give the name of the substance represented by the following dot and cross diagram. [1]



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- (b) The dot and cross diagram for a molecule of ethane is given below:



- (i) State the total number of atoms in a molecule of ethane. [1]

- (ii) State the number of bonds that can be formed by a carbon atom. [1]

- (iii) Give the molecular formula for ethane. [1]

6.

(a) Draw a line to link each substance with its structure.

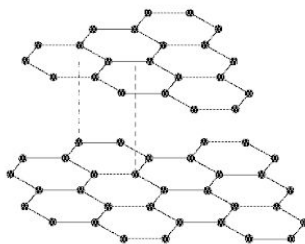
[2]

One has already been done for you.

Substance	Structure
graphite	metallic
potassium	simple covalent
nitrogen	giant covalent
sodium chloride	giant ionic

A line is drawn from the 'nitrogen' box in the Substance column to the 'simple covalent' box in the Structure column.

(b) State which of the substances in part (a) has the structure shown by the following diagram. [1]



Substance

(c) Nitrogen is an example of an **element** with a simple covalent structure.

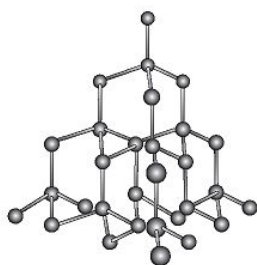
Name a **compound** with the same structure.

[1]

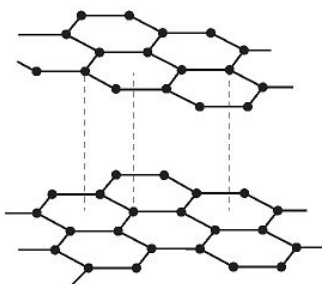
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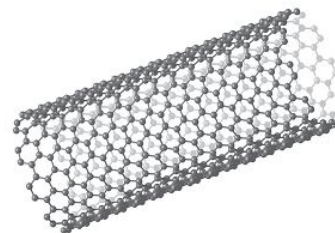
7. The following diagrams show the structures of diamond, graphite and carbon nanotubes.



diamond



graphite



carbon nanotube

(a) Two of the structures shown above conduct electricity. Name both and give the reason why they are able to conduct electricity. [2]

Structures and

Reason

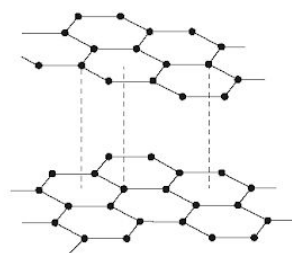
(b) Name the structure above that is used as a lubricant and give a reason why it is suitable for this use. [2]

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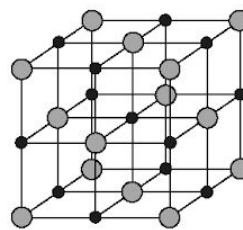
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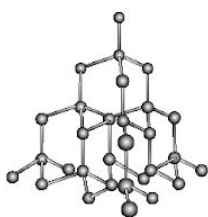
The following diagrams, **A**, **B**, **C** and **D**, show the structures of some substances.



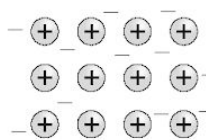
A



B



C



D

(a) Give the letter of the structure which represents diamond. [1]

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(b) Name an element that has the structure D. [1]

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(c) Give the letter of a structure which is able to conduct electricity. [1]

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(d) Give the letter of the structure that represents sodium chloride. [1]

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9.

Lithium chloride is a solid with a high melting point. It conducts electricity only when molten or in solution.

Describe the bonding present in lithium chloride and explain the properties given above.

[6 QWC]

Li = 2,1

Cl = 2,8,7

You may include a diagram in your answer.

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10.

(a) The table below shows some properties of three elements in the Periodic Table.

Element	Melting point (°C)	Boiling point (°C)	Appearance	Malleable or brittle?	Electrical conductivity
aluminium	660	2519	shiny solid	malleable	good
silicon	1414	3265	shiny solid	brittle	semiconductor
phosphorus	44	280	white solid	brittle	poor

Describe how the information in the table shows that silicon is difficult to classify as a metal or a non-metal. [2]

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(b) Give the **symbol** of the element which is found in Group 2 and Period 3 of the Periodic Table. [1]

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(c) (i) The chemical formula of copper(II) nitrate is $\text{Cu}(\text{NO}_3)_2$. Give the number of nitrogen atoms in the formula $\text{Cu}(\text{NO}_3)_2$. [1]

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(ii) Give the chemical formula of silver oxide. [1]

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(d) Nano-scale silver particles are added to socks to reduce the effects of smelly feet. Recent research has found that these particles can easily leak into waste water during washing.

(i) State the property of nano-scale silver particles that makes them useful in socks. [1]

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(ii) Suggest a reason why some scientists are concerned about nano-scale silver particles entering waste water. [1]

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11. (a) Give the electronic structure of sodium, Na. [1]

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(b) Draw a diagram to show the metallic bonding in sodium. [2]

(c) (i) Sodium reacts vigorously with water.

Give two observations you would make when a small piece of sodium is added to a trough of water. [1]

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(ii) Name the products of this reaction. [1]

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(d) As you go down Group 1 of the Periodic Table the elements become more reactive.

State the main difference you would see if potassium instead of sodium was added to water. [1]

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(e) Explain why Group 1 metal reactivity increases down the group. [2]

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12.

- (a) Lithium, sodium, potassium and rubidium are the first four members of Group 1 in the Periodic Table.

The following table gives the melting points and boiling points of lithium, potassium and rubidium.

Element	Melting point (°C)	Boiling point (°C)
lithium	180	1330
sodium	-	-
potassium	64	774
rubidium	39	688

Using the information in the table, choose from below the pair of values most likely to be the melting point and the boiling point of sodium. [1]

Pair A	Pair B	Pair C	Pair D
59 910	113 735	98 890	134 1498

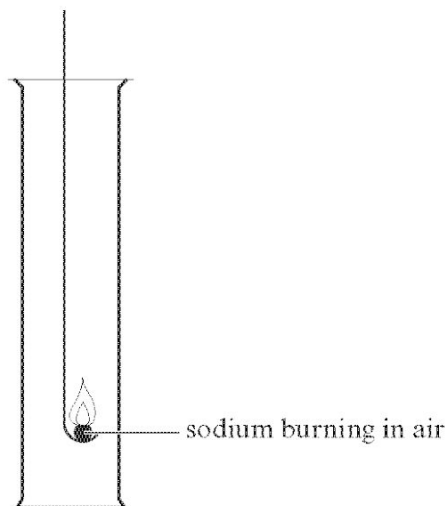
Pair

- (b) State why sodium is stored in oil. [1]

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Sodium burns vigorously in air.



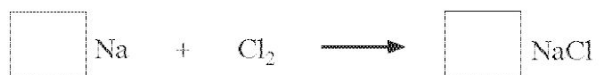
- (i) Give the colour of the flame. [1]

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- (ii) Give the **word** equation for the reaction that takes place when sodium burns in air. [2]

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- (iii) Sodium also reacts vigorously with chlorine. Balance the symbol equation for the reaction between sodium and chlorine. [1]



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13.

Nano-silver particles can be used in socks, plasters and disinfectant sprays.

Explain why nano-silver is suitable for use in these examples and state why some people are concerned about the use of nanoparticles in everyday life. [3]

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