



**ST MARY'S SCIENCE
DEPARTMENT:
CHEMISTRY**

F

**GCSE CHEMISTRY HOMEWORK BOOK
TOPIC 2: BONDING, STRUCTURE AND THE
PROPERTIES OF MATTER
STUDENT BOOK**

**YOU MUST ANSWER ALL THREE SECTIONS IN EACH
PART OF THE HOMEWORK TASKS**

NAME	
CLASS	
TEACHER	
FORM	

TASK	MARK	GRADE
1		
2		
3		
4		
5		
OVERALL		

**GCSE
CHEMISTRY
YEAR 9
TOPIC 2**



HOMEWORK SCHEDULE

Please use the following table to ensure each homework task is completed and submitted on time.

Carrying out these homework tasks can only increase your ability to gain a high grade in the GCSE examinations.

Failure to hand in work on time will lead to sanctions to complete this work.

Task	Submission Date	Completed?	On Time?
Task 1 Chemical Bonding			
Task 2 Ionic Bonding			
Task 3 Covalent Bonding			
Task 4 Carbon Allotropes			
Task 5 Metallic Bonding			



SCIENCE DEPARTMENT MARKING CODE

ID = Insufficient detail in answer

W = Wrong understanding of science

IR = Irrelevant information given.

V = This is too vague to get a mark.

AQ = Answer the question asked

R = Read the question/information

M = Maths mistake

BOD = Benefit of the doubt given.

E = Explain the answer further please.

U = Wrong units used.

SF = Wrong significant figures used.

SP = Wrong spelling of a technical term

SR = Same reason given more than once.

A circle means this lost you marks

An underline means this gained you marks

PLEASE READ

This homework booklet has made with custom selected examination questions and activities to assess your understanding in the concepts covered in class. This will increase your familiarity with the style of examination questions.

Carrying out these questions can only increase your ability to gain a high grade in the GCSE examination.

Thank you for your hard work in completing this book, and good luck.

Mr. Turnbull

**TASK 1: CHEMICAL BONDING****SPEC CHECK**

Content	Achieved?
<p>There are three types of strong chemical bonds: ionic, covalent and metallic. For ionic bonding the particles are oppositely charged ions.</p> <p>For covalent bonding the particles are atoms which share pairs of electrons. For metallic bonding the particles are atoms which share delocalised electrons.</p> <p>Ionic bonding occurs in compounds formed from metals combined with non-metals.</p> <p>Covalent bonding occurs in most non-metallic elements and in compounds of non-metals.</p> <p>Metallic bonding occurs in metallic elements and alloys. Students should be able to explain chemical bonding in terms of electrostatic forces and the transfer or sharing of electrons.</p>	

Target Setting

In this assessed piece of work, what target should I look to achieve in completing this task?
Please refer to your marking feedback for your target.

From your previous work, fill in the following boxes with your personal progress in Physics.

What Topics Do I Know Well?

What Topics Do I Need to Revise?

**SECTION A**

This is a revision question on a previous topic.

You should aim to spend **10 minutes** answering this section.

1. This question is about elements in the periodic table.

1.1 What order did scientists use to arrange elements in early periodic tables?

[1 mark]

.....

.....

1.2 In the early periodic tables some elements were placed in the wrong groups.

Mendeleev overcame this in his periodic table.

Give **one** way Mendeleev did this.

[1 mark]

.....

.....

Table 2 shows the boiling points of fluorine, chlorine and bromine.

Table 2

Element	Boiling point in °C
Fluorine	-186
Chlorine	-34
Bromine	+59

1.3 Explain why the boiling points in **Table 2** are low.

[2 marks]

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1.4 Explain the trend in the boiling points in **Table 2**.

[3 marks]

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1.5 Explain why neon is unreactive.

Give the electronic structure of neon in your answer.

[2 marks]

.....

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.....

**SECTION B**

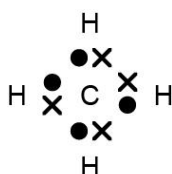
This is a revision question on a previous topic.

You should aim to spend **10 minutes** answering this section.

1. Figure 1 shows how the atoms are bonded in methane.

The dots and crosses represent a subatomic particle. Only the outer energy levels are shown.

Figure 1



1.1 Complete the chemical formula for methane.

[1 mark]

1.2 What type of substance is methane?

[1 mark]

A. compound

B. element

C. metal

D. polymer

1.3 What type of bonding is present in methane

[1 mark]

A. covalent

B. double

C. ionic

D. metallic



1.4 Which particles are represented by dots and crosses in **Figure 1**?

[1 mark]

- A. neutrons
- B. ions
- C. electrons
- D. protons

1.5 Methane is a small molecule.
Which is a property of small molecules?

[1 mark]

- A. conduct electricity
- B. form lattices
- C. high boiling point
- D. low melting point

**SECTION C**

This is a revision question to consolidate your understanding.

You should aim to spend **10 minutes** answering this section.

1. Complete **Table 1**.

[3 marks]

Table 1

Substance	Melting point in °C	Does substance conduct electricity as a solid?	Does substance conduct electricity as a liquid?	Type of structure
A	842	Yes	Yes
B	1610	No	No
C	772	No	Yes



FEEDBACK SHEET

Overall Mark:	/17	GRADE ACHIEVED:	
Section A: Mark	/9	5 <input type="checkbox"/>	1 <input type="checkbox"/>
Section B: Mark	/5	4 <input type="checkbox"/>	U <input type="checkbox"/>
Section C: Mark	/3	3 <input type="checkbox"/>	
		2 <input type="checkbox"/>	

Knowledge and understanding shown	Unsatisfactory	Satisfactory	Good	Outstanding
Strengths:	<input type="checkbox"/> Basic Knowledge of Concepts <input type="checkbox"/> Quality of Written Communication <input type="checkbox"/> Working Scientifically <input type="checkbox"/> Answering Examination Questions <input type="checkbox"/> Analytical Skills Others (Topic Specific)		<input type="checkbox"/> Applications of Concepts <input type="checkbox"/> Mathematical Skills <input type="checkbox"/> Experimental Technique <input type="checkbox"/> Previous Topics <input type="checkbox"/> Problem Solving	
Areas to Improve:	<input type="checkbox"/> Basic Knowledge of Concepts <input type="checkbox"/> Quality of Written Communication <input type="checkbox"/> Working Scientifically <input type="checkbox"/> Answering Examination Questions <input type="checkbox"/> Analytical Skills Others (Topic Specific)		<input type="checkbox"/> Applications of Concepts <input type="checkbox"/> Mathematical Skills <input type="checkbox"/> Experimental Technique <input type="checkbox"/> Previous Topics <input type="checkbox"/> Problem Solving	
Progress:	Unsatisfactory	Satisfactory	Good	Outstanding
Working:	Below	In line with	Above	(your target)
Effort:	Poor	Inconsistent	Good	Excellent

To improve further you need to:

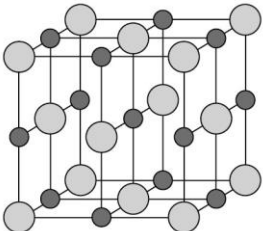
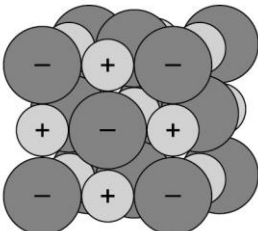
<input type="checkbox"/> Carry out independent revision. <input type="checkbox"/> Complete outstanding work. <input type="checkbox"/> Make corrections as indicated by the teacher. <input type="checkbox"/> Attend intervention for this topic <input type="checkbox"/> Include more information in responses. <input type="checkbox"/> Include more key words in responses. <input type="checkbox"/> Attend departmental revision sessions. <input type="checkbox"/> Read the questions carefully. <input type="checkbox"/> Explain your answers in more detail. <input type="checkbox"/> Carry out revision on Seneca Learning.	<input type="checkbox"/> Revise the equations. <input type="checkbox"/> Check the units on answers. <input type="checkbox"/> Check the correct amount of sig figs on answers. <input type="checkbox"/> Check to convert values correctly. <input type="checkbox"/> Show your full working out. <input type="checkbox"/> Check your calculations. <input type="checkbox"/> Revise the science investigative skills. <input type="checkbox"/> Revise the key concepts of the topics. <input type="checkbox"/> Thoroughly check your work for mistakes. Other:
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Student response



TASK 2: IONIC BONDING

SPEC CHECK

Content	Achieved?
<p>When a metal atom reacts with a non-metal atom electrons in the outer shell of the metal atom are transferred. Metal atoms lose electrons to become positively charged ions. Non-metal atoms gain electrons to become negatively charged ions. The ions produced by metals in Groups 1 and 2 and by non-metals in Groups 6 and 7 have the electronic structure of a noble gas (Group 0).</p> <p>The electron transfer during the formation of an ionic compound can be represented by a dot and cross diagram, e.g. for sodium chloride</p> $\text{Na} \cdot + \begin{array}{c} \times \times \\ \times \text{Cl} \times \\ \times \times \end{array} \longrightarrow \left[\text{Na} \right]^+ \left[\begin{array}{c} \times \times \\ \times \text{Cl} \times \\ \times \times \end{array} \right]^-$ <p>(2,8,1) (2,8,7) (2,8) (2,8,8)</p> <p>Students should be able to draw dot and cross diagrams for ionic compounds formed by metals in Groups 1 and 2 with non-metals in Groups 6 and 7.</p> <p>The charge on the ions produced by metals in Groups 1 and 2 and by non-metals in Groups 6 and 7 relates to the group number of the element in the periodic table.</p> <p>Students should be able to work out the charge on the ions of metals and non-metals from the group number of the element, limited to the metals in Groups 1 and 2, and non-metals in Groups 6 and 7.</p>	
<p>An ionic compound is a giant structure of ions. Ionic compounds are held together by strong electrostatic forces of attraction between oppositely charged ions. These forces act in all directions in the lattice and this is called ionic bonding.</p> <p>The structure of sodium chloride can be represented in the following forms:</p> <div style="display: flex; align-items: center;"> <div style="margin-right: 20px;">  <p>Key Na⁺ Cl⁻</p> </div> <div>  </div> </div>	
<p>Students should be able to:</p> <ul style="list-style-type: none"> deduce that a compound is ionic from a diagram of its structure in one of the specified forms. describe the limitations of using dot and cross, ball and stick, two and three-dimensional diagrams to represent a giant ionic structure. work out the empirical formula of an ionic compound from a given model or diagram that shows the ions in the structure. <p>Students should be familiar with the structure of sodium chloride but do not need to know the structures of other ionic compounds.</p>	

**SECTION A**

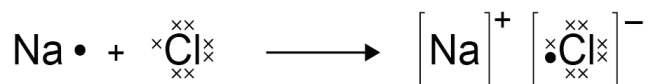
This is a revision question on a previous topic.

You should aim to spend **10 minutes** answering this section.

1. In the formation of sodium chloride, electrons are transferred from the sodium to the chlorine. The dot and cross diagram below shows this.

1.1 Write the electronic structure of each particle below.

[1 mark]



Draw dot and cross diagrams similar to the one in question 5 to show the formation of the following ionic compounds. In each case, include the formula of the compound

1.2 Lithium fluoride

[3 marks]

1.3 Magnesium oxide

[3 marks]

1.4 Magnesium fluoride

[3 marks]



SECTION B

This is a revision question on a previous topic.

You should aim to spend **10 minutes** answering this section.

1. Barium fluoride is an ionic compound consisting of barium and fluoride ions.

Barium is in Group 2.

1.1 Complete the symbol for a barium ion.

[1 mark]

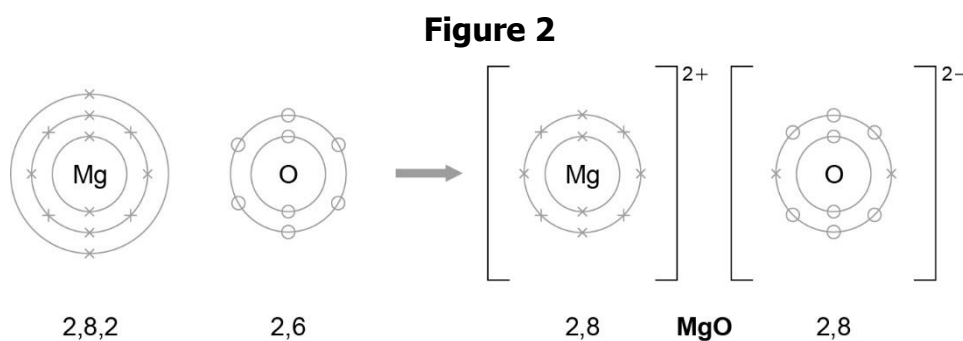
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Ba
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Fluorine is in Group 7.

1.2 Write the symbol for a fluoride ion.

[1 mark]

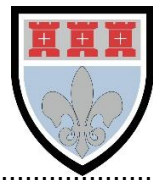
The diagrams in **Figure 2** represent the outer energy levels of a magnesium atom, an oxygen atom, a magnesium ion and an oxide ion.



1.3 Describe, as fully as you can, what happens when magnesium reacts with oxygen to produce magnesium oxide.

You should use the words atom, electron, and ion in your answer.

[6 marks]



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SECTION C

This is a revision question to consolidate your understanding.

You should aim to spend **10 minutes** answering this section.

1. Sodium chloride is an ionic compound.

1.1 Explain why ionic compounds are usually solid at room temperature.

[2 marks]

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1.2 Recent research has developed a new type of substance, ionic liquids.

Ionic liquids have melting points at close to or below room temperature.

Ionic liquids are used in batteries as they conduct electricity.

Explain why ionic liquids are used in batteries but solid ionic compounds are not.

[3 marks]

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1.3 A student was investigating a compound, **X**.

The student decided that compound **X** was an ionic compound.

Give three properties of ionic compounds that the student may have found.

[3 marks]

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FEEDBACK SHEET

Overall Mark:	/26	GRADE ACHIEVED:	
Section A: Mark	/10	5 <input type="checkbox"/>	1 <input type="checkbox"/>
Section B: Mark	/8	4 <input type="checkbox"/>	U <input type="checkbox"/>
Section C: Mark	/8	3 <input type="checkbox"/>	
		2 <input type="checkbox"/>	

Knowledge and understanding shown	Unsatisfactory	Satisfactory	Good	Outstanding
Strengths:	<input type="checkbox"/> Basic Knowledge of Concepts <input type="checkbox"/> Quality of Written Communication <input type="checkbox"/> Working Scientifically <input type="checkbox"/> Answering Examination Questions <input type="checkbox"/> Analytical Skills Others (Topic Specific) <input type="checkbox"/> Applications of Concepts <input type="checkbox"/> Mathematical Skills <input type="checkbox"/> Experimental Technique <input type="checkbox"/> Previous Topics <input type="checkbox"/> Problem Solving			
Areas to Improve:	<input type="checkbox"/> Basic Knowledge of Concepts <input type="checkbox"/> Quality of Written Communication <input type="checkbox"/> Working Scientifically <input type="checkbox"/> Answering Examination Questions <input type="checkbox"/> Analytical Skills Others (Topic Specific) <input type="checkbox"/> Applications of Concepts <input type="checkbox"/> Mathematical Skills <input type="checkbox"/> Experimental Technique <input type="checkbox"/> Previous Topics <input type="checkbox"/> Problem Solving			
Progress:	Unsatisfactory	Satisfactory	Good	Outstanding
Working:	Below	In line with	Above	(your target)
Effort:	Poor	Inconsistent	Good	Excellent

To improve further you need to:

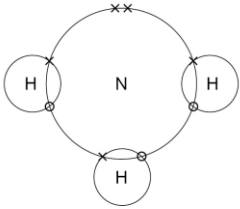
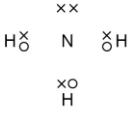

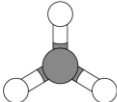
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Student response



TASK 3: COVALENT BONDING

SPEC CHECK

Content	Achieved?
<p>When atoms share pairs of electrons, they form covalent bonds. These bonds between atoms are strong. Covalently bonded substances may consist of small molecules. Students should be able to recognise common substances that consist of small molecules from their chemical formula. Some covalently bonded substances have very large molecules, such as polymers. Some covalently bonded substances have giant covalent structures, such as diamond and silicon dioxide. The covalent bonds in molecules and giant structures can be represented in the following forms:</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>For ammonia (NH₃)</p>  </div> <div style="text-align: center;"> <p>and/or</p>  </div> </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;"> <div style="text-align: center;"> <p>and/or</p>  </div> <div style="text-align: center;"> <p>and/or</p>  </div> </div> <p>Polymers can be represented in the form:</p> $\left(\begin{array}{cc} \text{H} & \text{H} \\ & \\ -\text{C} & -\text{C}- \\ & \\ \text{H} & \text{H} \end{array} \right)_n$ <p>poly(ethene)</p> <p>where n is a large number.</p>	
<p>Students should be able to:</p> <ul style="list-style-type: none"> draw dot and cross diagrams for the molecules of hydrogen, chlorine, oxygen, nitrogen, hydrogen chloride, water, ammonia and methane. represent the covalent bonds in small molecules, in the repeating units of polymers and in part of giant covalent structures, using a line to represent a single bond. describe the limitations of using dot and cross, ball and stick, two and three-dimensional diagrams to represent molecules or giant structures. deduce the molecular formula of a substance from a given model or diagram in these forms showing the atoms and bonds in the molecule. 	

**SECTION A**

This is a revision question on a previous topic.

You should aim to spend **10 minutes** answering this section.

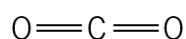
1. In some molecules, more than one pair of electrons is shared between two atoms.

In these cases, the molecules contain a double (two shared pairs of electrons) or a triple (three shared pairs of electrons) covalent bond.

For each of the molecules below, state the molecular formula and draw a dot and cross diagram.

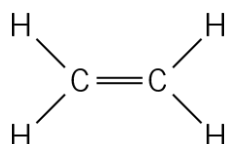
Use the displayed formula to help you.

1.1 carbon dioxide



[2 Marks]

1.2 ethane

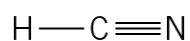


[2 Marks]

1.3 nitrogen $\text{N}\equiv\text{N}$

[2 Marks]

1.4 hydrogen cyanide.



[2 Marks]



1.5 Draw the dot and cross diagram and displayed formula for the molecule ethyne, C_2H_2 .

[2 Marks]

**SECTION B**

This is a revision question on a previous topic.

You should aim to spend **10 minutes** answering this section.

1. Hydrogen sulfide is a gas at room temperature.

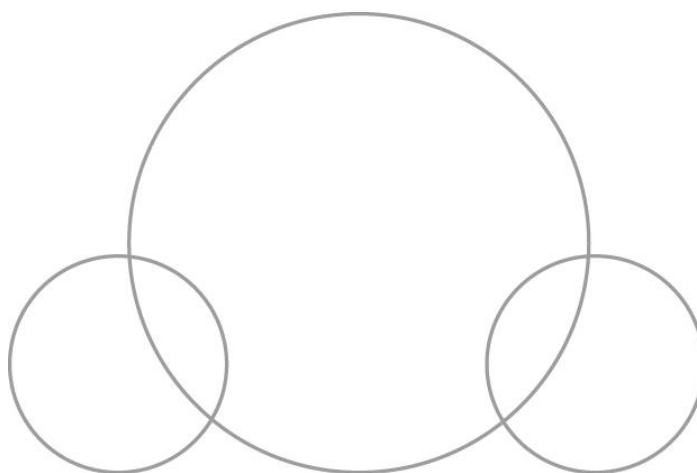
Figure 2 represents the outer energy levels of hydrogen and sulfur atoms.

Complete the diagram to show the bonding in hydrogen sulfide. Show the outer electrons only.

1.1 Hydrogen and sulfur are represented as H and S in the periodic table.

[2 marks]

Figure 2



1.2 The boiling point of hydrogen sulfide is low. Explain why.

[3 Marks]

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SECTION C

This is a revision question to consolidate your understanding.

You should aim to spend **10 minutes** answering this section.

1. This question is about bonding and atomic structure.

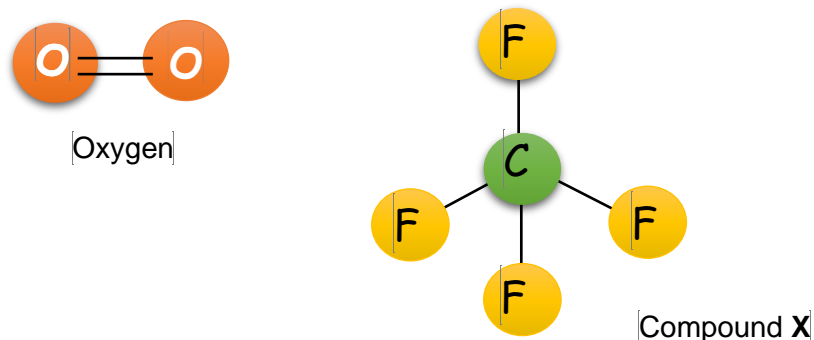
1.1 Draw **one** line from each type of bonding to the description of bonding.

[2 marks]

Type of bonding	Description of bonding
Covalent bonding	Positive ions surrounded by delocalised electrons
Metallic bonding	Strong electrostatic forces of attraction
Ionic bonding	Sharing of electrons

Figure 2 shows the structure of two small molecules, oxygen and compound X.

Figure 2



1.2 Oxygen (O_2) is described as a diatomic element.

Suggest what is meant by the term "diatomic element".

[1 mark]

.....

.....

1.3 Give the molecular formula of compound X

[1 mark]

.....

.....



1.4 Complete the sentence by putting a ring around the correct word.

[1 mark]

Chemicals with small molecules usually have a **low / medium / high** melting point.



FEEDBACK SHEET

Overall Mark:	/20	GRADE ACHIEVED:	
Section A: Mark	/10	5 <input type="checkbox"/>	1 <input type="checkbox"/>
Section B: Mark	/5	4 <input type="checkbox"/>	U <input type="checkbox"/>
Section C: Mark	/5	3 <input type="checkbox"/>	
		2 <input type="checkbox"/>	

Knowledge and understanding shown	Unsatisfactory	Satisfactory	Good	Outstanding
Strengths:	<input type="checkbox"/> Basic Knowledge of Concepts <input type="checkbox"/> Quality of Written Communication <input type="checkbox"/> Working Scientifically <input type="checkbox"/> Answering Examination Questions <input type="checkbox"/> Analytical Skills Others (Topic Specific)		<input type="checkbox"/> Applications of Concepts <input type="checkbox"/> Mathematical Skills <input type="checkbox"/> Experimental Technique <input type="checkbox"/> Previous Topics <input type="checkbox"/> Problem Solving	
Areas to Improve:	<input type="checkbox"/> Basic Knowledge of Concepts <input type="checkbox"/> Quality of Written Communication <input type="checkbox"/> Working Scientifically <input type="checkbox"/> Answering Examination Questions <input type="checkbox"/> Analytical Skills Others (Topic Specific)		<input type="checkbox"/> Applications of Concepts <input type="checkbox"/> Mathematical Skills <input type="checkbox"/> Experimental Technique <input type="checkbox"/> Previous Topics <input type="checkbox"/> Problem Solving	
Progress:	Unsatisfactory	Satisfactory	Good	Outstanding
Working:	Below	In line with	Above	(your target)
Effort:	Poor	Inconsistent	Good	Excellent

To improve further you need to:

- | | |
|--|--|
| <ul style="list-style-type: none"> <input type="checkbox"/> Carry out independent revision. <input type="checkbox"/> Complete outstanding work. <input type="checkbox"/> Make corrections as indicated by the teacher. <input type="checkbox"/> Attend intervention for this topic <input type="checkbox"/> Include more information in responses. <input type="checkbox"/> Include more key words in responses. <input type="checkbox"/> Attend departmental revision sessions. <input type="checkbox"/> Read the questions carefully. <input type="checkbox"/> Explain your answers in more detail. <input type="checkbox"/> Carry out revision on Seneca Learning. | <ul style="list-style-type: none"> <input type="checkbox"/> Revise the equations. <input type="checkbox"/> Check the units on answers. <input type="checkbox"/> Check the correct amount of sig figs on answers. <input type="checkbox"/> Check to convert values correctly. <input type="checkbox"/> Show your full working out. <input type="checkbox"/> Check your calculations. <input type="checkbox"/> Revise the science investigative skills. <input type="checkbox"/> Revise the key concepts of the topics. <input type="checkbox"/> Thoroughly check your work for mistakes. <p>Other:</p> |
|--|--|

Student response



TASK 4: CARBON ALLOTROPES

SPEC CHECK

Content	Achieved?
<p>When atoms share pairs of electrons, they form covalent bonds. These bonds between atoms are strong. Covalently bonded substances may consist of small molecules. Students should be able to recognise common substances that consist of small molecules from their chemical formula. Some covalently bonded substances have very large molecules, such as polymers. Some covalently bonded substances have giant covalent structures, such as diamond and silicon dioxide. The covalent bonds in molecules and giant structures can be represented in the following forms:</p> <p style="text-align: center;">For ammonia (NH₃)</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> </div> <div style="text-align: center;"> <p>and/or</p> $\begin{array}{ccc} & \times \times & \\ \text{H} \times & \text{N} & \times \text{H} \\ & \times \text{O} & \\ & \text{H} & \end{array}$ </div> </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;"> <div style="text-align: center;"> <p>and/or</p> $\begin{array}{c} \text{H} - \text{N} - \text{H} \\ \\ \text{H} \end{array}$ </div> <div style="text-align: center;"> <p>and/or</p> </div> </div> <p>Polymers can be represented in the form:</p> $\left(\begin{array}{cc} \text{H} & \text{H} \\ & \\ -\text{C} & - & \text{C}- \\ & \\ \text{H} & \text{H} \end{array} \right)_n$ <p>poly(ethene)</p> <p>where n is a large number.</p>	



Target Setting

In this assessed piece of work, what target should I look to achieve in completing this task?
Please refer to your marking feedback for your target.

From your previous work, fill in the following boxes with your personal progress in Physics.

What Topics Do I Know Well?

What Topics Do I Need to Revise?

**SECTION A**

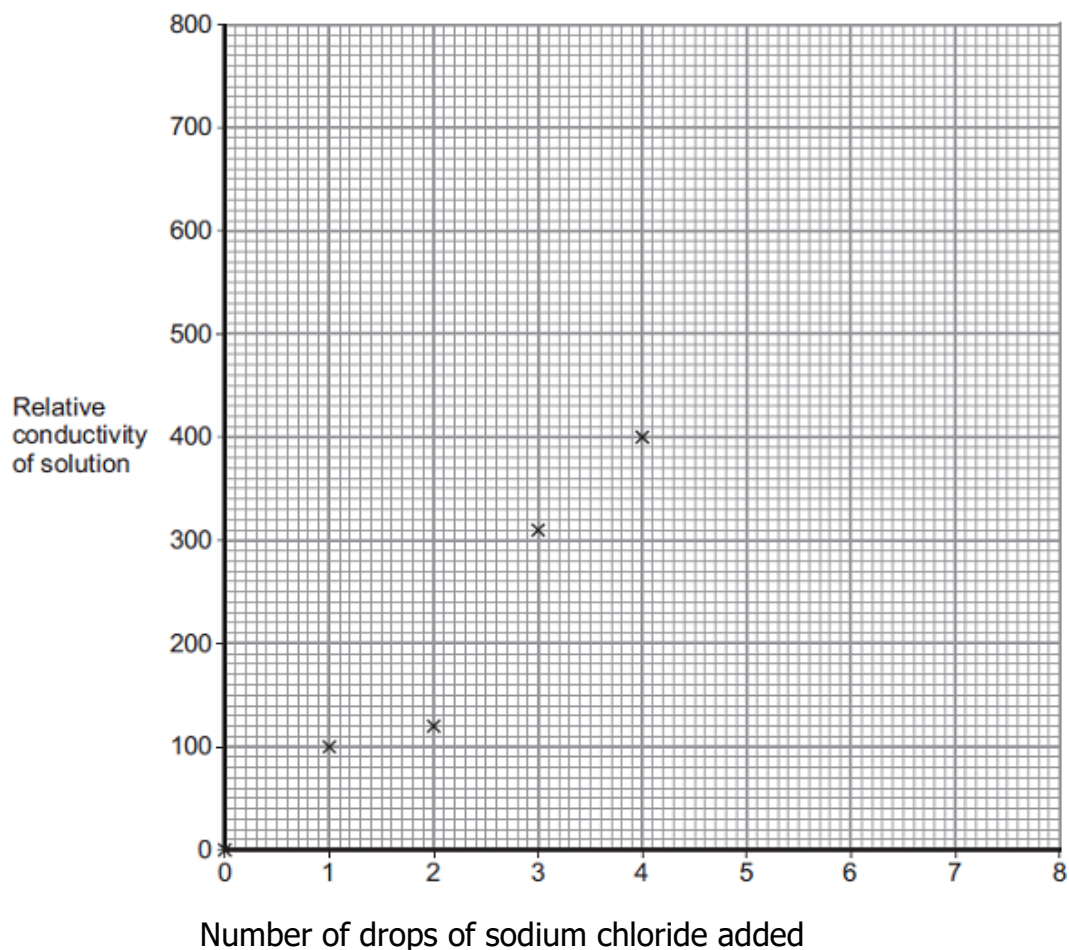
This is a revision question on a previous topic.

You should aim to spend **10 minutes** answering this section.

1. A student investigated the conductivity of different concentrations of sodium chloride solution. The student's results are shown below.

Number of drops of sodium chloride solution added	Relative conductivity of solution
0	0
1	100
2	120
3	310
4	400
5	510
6	590
7	710
8	800

The student plotted some of the results on the graph shown in **Figure 3** below.





1.1 On the graph:

- Plot the remaining results
- Draw a line of best fit.

[2 marks]

1.2 Draw a ring around the anomalous point.

[1 mark]

1.3 The student compared the conductivity of sodium chloride solution with the conductivity of potassium chloride solution.

State **one** variable the student should keep constant when measuring the conductivity of the two solutions.

[1 mark]

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1.4 Explain why sodium chloride solution conducts electricity.

[3 marks]

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**SECTION B**

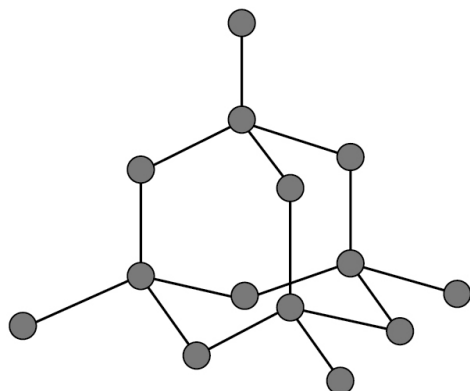
This is a revision question on a previous topic.

You should aim to spend **10 minutes** answering this section.

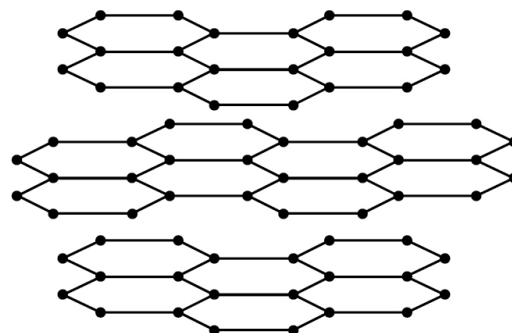
1. This question is about carbon.

Figure 10 shows the arrangement of carbon atoms in diamond and graphite.

Figure 10



Diamond



Graphite

1.1 Describe the structure in diamond.

[2 marks]

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1.2 Explain why graphite is soft.

[3 marks]

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1.3 Explain why graphite conducts electricity.

[2 marks]

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**SECTION C**

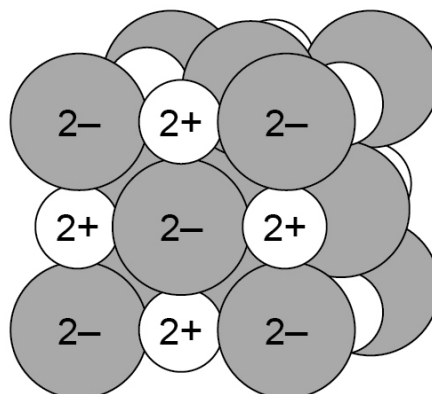
This is a revision question to consolidate your understanding.

You should aim to spend **10 minutes** answering this section.

1. This question is about structure and bonding.

1.1 **Figure 1** shows part of the structure of calcium oxide (CaO).

Figure 1



What type of bonding is present in calcium oxide?

[1 mark]

Tick **one** box.

Covalent

Ionic

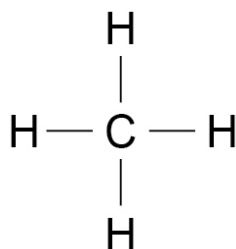
Macromolecular

Metallic



1.2 Figure 2 shows a particle of methane (CH_4).

Figure 2



What type of particle is present in **Figure 2**?

[1 mark]

Tick **one** box.

An ion

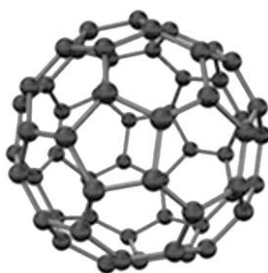
A lattice

A molecule

A polymer

1.3 Figure 3 shows the structure of C_{60}

Figure 3



Complete the sentence.

Choose the answer from the box.

diatomic

giant ionic

a fullerene

giant metallic

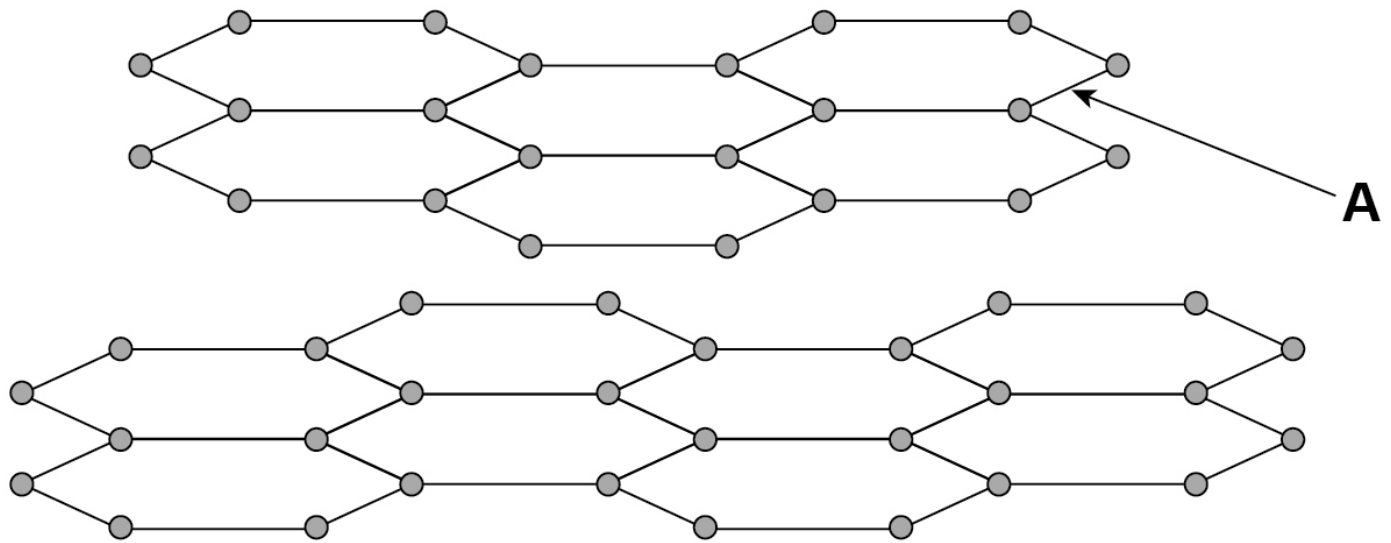
[1 mark]

The structure of C_{60} is _____



Figure 4 shows the structure of graphite.

Figure 4



1.4 What type of bond is labelled **A** in **Figure 4**?

[1 mark]

Tick **one** box.

covalent

double

ionic

metallic

1.1 In graphite, each carbon atom forms bonds with other carbon atoms as shown in Figure 4

How many electrons does **one** carbon atom use to form **one** bond?

[1 mark]

Tick **one** box.

1

2

3

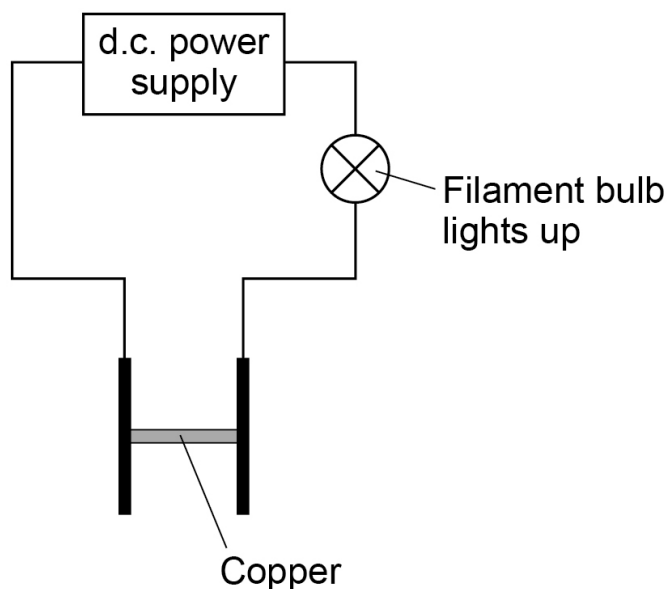
4



An electric current is passed through copper.

Figure 5 shows the apparatus used.

Figure 5



1.6 Complete the sentence.

Choose the answer from the box.

gas	liquid	solid	solution
-----	--------	-------	----------

[1 mark]

Figure 5 shows that copper conducts electricity as a _____.

1.7 Complete the sentence.

Choose the answer from the box.

atoms	electrons	ions	molecules
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[1 mark]

Copper conducts electricity because of the movement of delocalised _____.



FEEDBACK SHEET

Overall Mark:	/21	GRADE ACHIEVED:	
Section A: Mark	/7	5 <input type="checkbox"/>	1 <input type="checkbox"/>
Section B: Mark	/7	4 <input type="checkbox"/>	U <input type="checkbox"/>
Section C: Mark	/7	3 <input type="checkbox"/>	
		2 <input type="checkbox"/>	

Knowledge and understanding shown	Unsatisfactory	Satisfactory	Good	Outstanding
Strengths:	<input type="checkbox"/> Basic Knowledge of Concepts <input type="checkbox"/> Quality of Written Communication <input type="checkbox"/> Working Scientifically <input type="checkbox"/> Answering Examination Questions <input type="checkbox"/> Analytical Skills Others (Topic Specific)			
Areas to Improve:	<input type="checkbox"/> Applications of Concepts <input type="checkbox"/> Mathematical Skills <input type="checkbox"/> Experimental Technique <input type="checkbox"/> Previous Topics <input type="checkbox"/> Problem Solving			
Progress:	Unsatisfactory	Satisfactory	Good	Outstanding
Working:	Below	In line with	Above	(your target)
Effort:	Poor	Inconsistent	Good	Excellent

To improve further you need to:

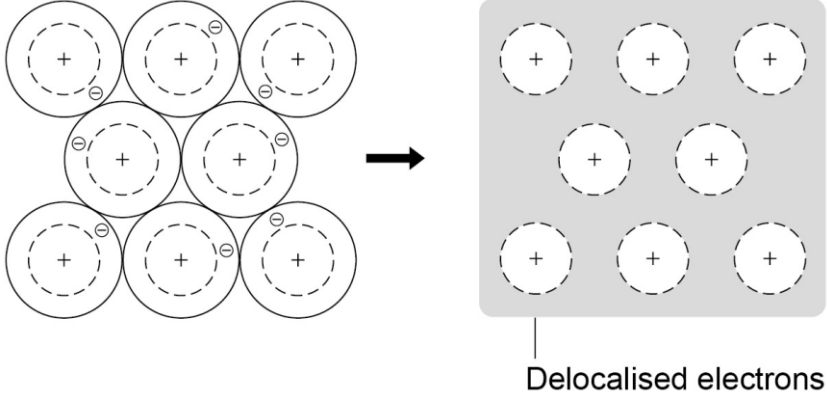
<input type="checkbox"/> Carry out independent revision. <input type="checkbox"/> Complete outstanding work. <input type="checkbox"/> Make corrections as indicated by the teacher. <input type="checkbox"/> Attend intervention for this topic <input type="checkbox"/> Include more information in responses. <input type="checkbox"/> Include more key words in responses. <input type="checkbox"/> Attend departmental revision sessions. <input type="checkbox"/> Read the questions carefully. <input type="checkbox"/> Explain your answers in more detail. <input type="checkbox"/> Carry out revision on Seneca Learning.	<input type="checkbox"/> Revise the equations. <input type="checkbox"/> Check the units on answers. <input type="checkbox"/> Check the correct amount of sig figs on answers. <input type="checkbox"/> Check to convert values correctly. <input type="checkbox"/> Show your full working out. <input type="checkbox"/> Check your calculations. <input type="checkbox"/> Revise the science investigative skills. <input type="checkbox"/> Revise the key concepts of the topics. <input type="checkbox"/> Thoroughly check your work for mistakes. Other:
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Student response



TASK 5: METALLIC BONDING

SPEC CHECK

Content	Achieved?
<p>Metals consist of giant structures of atoms arranged in a regular pattern. The electrons in the outer shell of metal atoms are delocalised and so are free to move through the whole structure. The sharing of delocalised electrons gives rise to strong metallic bonds. The bonding in metals may be represented in the following form:</p>  <p style="text-align: center;">Delocalised electrons</p>	

Target Setting

In this assessed piece of work, what target should I look to achieve in completing this task? Please refer to your marking feedback for your target.

From your previous work, fill in the following boxes with your personal progress in Physics.

What Topics Do I Know Well?

What Topics Do I Need to Revise?



SECTION A

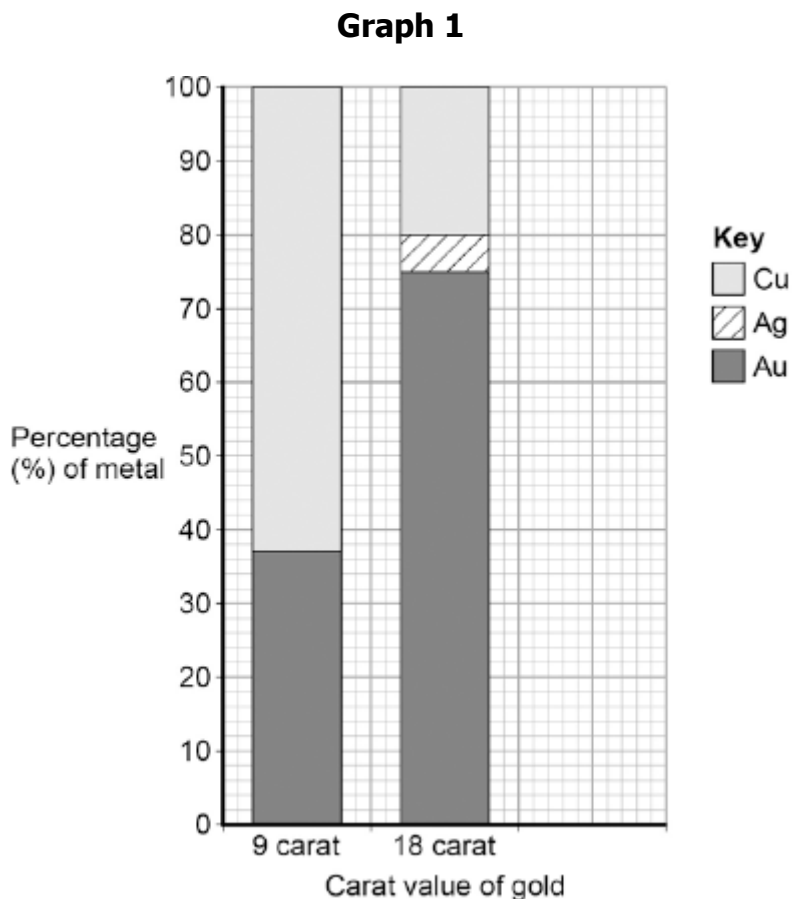
This is a revision question on a previous topic.

You should aim to spend **10 minutes** answering this section.

1. This question is about mixtures of metals.

Gold is mixed with other metals to make jewellery.

Graph 1 below shows the composition of different carat values of gold.



1.1 What is the carat value for 92 % gold?

1 mark]

Tick **one** box.

12 20 22 24

1.2 What is the ratio of gold to copper (Cu) in 9 carat gold?

[1 mark]

Gold : copper ratio = _____ : _____



1.3 What is the composition of 18 carat gold?

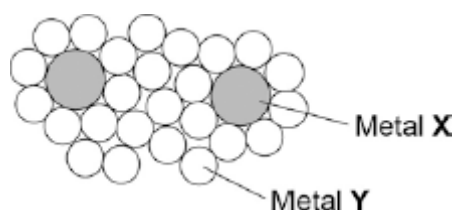
[3 marks]

1.4 Suggest **two** reasons why 9 carat gold is often used instead of pure gold to make jewellery.

[2 marks]

1.5 **Figure 1** shows the structure of a different mixture of metals.

Figure 1



What percentage of the atoms in the metal mixture are atoms of **X**?

Give your answer to 2 significant figures.

[2 marks]

Percentage of **X** atoms in mixture (to two significant figures) = _____ %

1.6 What are mixtures of metals called?

[1 mark]

Tick **one** box.

Alloy

Compound

Element

Polymer



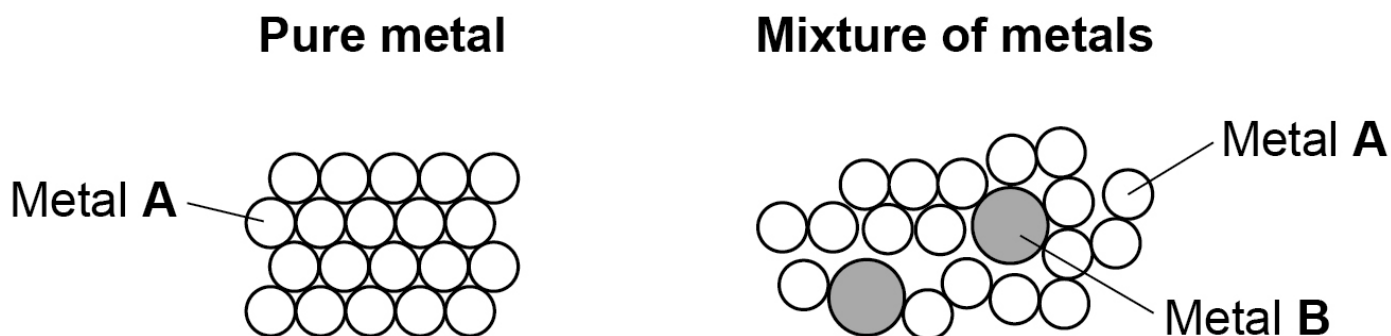
SECTION B

This is a revision question on a previous topic.

You should aim to spend **10 minutes** answering this section.

1. **Figure 2** shows the arrangement of atoms in a pure metal and in a mixture of metals.

Figure 2



1.1 Calculate the percentage of metal **B** atoms in the mixture of metals shown in **Figure 2**.

[2 marks]

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.....

Percentage of metal **B** atoms = %

1.2 Why is the mixture of metals in **Figure 2** harder than the pure metal?

[1 mark]

Tick **one** box.

The atoms in the mixture are different shapes.

The layers in the mixture are distorted.

The layers in the mixture slide more easily.

The mixture has a giant structure.

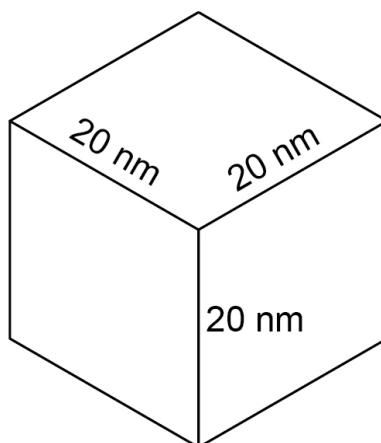


1.3 A nanoparticle of pure metal A is a cube.

Each side of the cube has a length of 20 nm.

Figure 3 shows the cube.

Figure 3



What is the volume of the nanoparticle?

[1 mark]

Tick **one** box.

20 nm³

60 nm³

400 nm³

8000 nm³



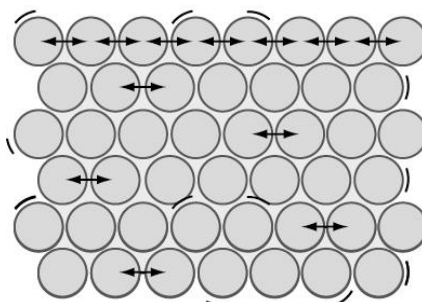
SECTION C

This is a revision question to consolidate your understanding.

You should aim to spend **10 minutes** answering this section.

1. **Figure 1** represents the particles in a solid.

Figure 1
solid



Describe what happens to particles when a substance changes state.

You should refer to the arrangement, energy and movement of the particles in all three states of matter.

[6 Marks]

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FEEDBACK SHEET

Overall Mark:	/20	GRADE ACHIEVED:	
Section A: Mark	/10	5 <input type="checkbox"/>	1 <input type="checkbox"/>
Section B: Mark	/4	4 <input type="checkbox"/>	U <input type="checkbox"/>
Section C: Mark	/6	3 <input type="checkbox"/>	
		2 <input type="checkbox"/>	

Knowledge and understanding shown	Unsatisfactory	Satisfactory	Good	Outstanding
Strengths:	<input type="checkbox"/> Basic Knowledge of Concepts <input type="checkbox"/> Quality of Written Communication <input type="checkbox"/> Working Scientifically <input type="checkbox"/> Answering Examination Questions <input type="checkbox"/> Analytical Skills Others (Topic Specific)		<input type="checkbox"/> Applications of Concepts <input type="checkbox"/> Mathematical Skills <input type="checkbox"/> Experimental Technique <input type="checkbox"/> Previous Topics <input type="checkbox"/> Problem Solving	
Areas to Improve:	<input type="checkbox"/> Basic Knowledge of Concepts <input type="checkbox"/> Quality of Written Communication <input type="checkbox"/> Working Scientifically <input type="checkbox"/> Answering Examination Questions <input type="checkbox"/> Analytical Skills Others (Topic Specific)		<input type="checkbox"/> Applications of Concepts <input type="checkbox"/> Mathematical Skills <input type="checkbox"/> Experimental Technique <input type="checkbox"/> Previous Topics <input type="checkbox"/> Problem Solving	
Progress:	Unsatisfactory	Satisfactory	Good	Outstanding
Working:	Below	In line with	Above	(your target)
Effort:	Poor	Inconsistent	Good	Excellent

To improve further you need to:

- | | |
|--|--|
| <ul style="list-style-type: none"> <input type="checkbox"/> Carry out independent revision. <input type="checkbox"/> Complete outstanding work. <input type="checkbox"/> Make corrections as indicated by the teacher. <input type="checkbox"/> Attend intervention for this topic <input type="checkbox"/> Include more information in responses. <input type="checkbox"/> Include more key words in responses. <input type="checkbox"/> Attend departmental revision sessions. <input type="checkbox"/> Read the questions carefully. <input type="checkbox"/> Explain your answers in more detail. <input type="checkbox"/> Carry out revision on Seneca Learning. | <ul style="list-style-type: none"> <input type="checkbox"/> Revise the equations. <input type="checkbox"/> Check the units on answers. <input type="checkbox"/> Check the correct amount of sig figs on answers. <input type="checkbox"/> Check to convert values correctly. <input type="checkbox"/> Show your full working out. <input type="checkbox"/> Check your calculations. <input type="checkbox"/> Revise the science investigative skills. <input type="checkbox"/> Revise the key concepts of the topics. <input type="checkbox"/> Thoroughly check your work for mistakes. <p>Other:</p> |
|--|--|

Student response



The Periodic Table of Elements

1	2	3	4	5	6	7	0																												
7 Li lithium 3	9 Be beryllium 4	11 Na sodium 11	12 C carbon 6	13 Al aluminium 13	14 N nitrogen 7	15 P phosphorus 15	16 O oxygen 8	17 F fluorine 9	18 Ar argon 18																										
19 K potassium 19	20 Ca calcium 20	23 Sc scandium 21	24 Ti titanium 22	27 V vanadium 23	28 Cr chromium 24	29 Mn manganese 25	30 Fe iron 26	31 Co cobalt 27	32 Ni nickel 28	33 Cu copper 29	34 Zn zinc 30	35 Ga gallium 31	36 Ge germanium 32	37 As arsenic 33	38 Se selenium 34	39 Br bromine 35	40 Kr krypton 36																		
39 K potassium 19	40 Ca calcium 20	85 Rb rubidium 37	86 Sr strontium 38	87 Y yttrium 39	88 Zr zirconium 40	89 Nb niobium 41	90 Mo molybdenum 42	91 Tc technetium [97]	92 Ru ruthenium 44	93 Rh rhodium 45	94 Pd palladium 46	95 Ag silver 47	96 Cd cadmium 48	101 In indium 49	102 Sn tin 50	103 Sb antimony 51	104 Te tellurium 52	105 I iodine 53	106 Xe xenon 54																
133 Cs caesium 55	137 Ba barium 56	139 La* lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	182 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	210 Po polonium 84	210 At astatine 85	210 Rn radon 86	223 Fr francium 87	226 Ra radium 88	227 Ac* actinium 89	267 Rf rutherfordium 104	267 Db dubnium 105	269 Sg seaborgium 106	270 Bh bohrium 107	270 Hs hassium 108	278 Mt meitnerium 109	281 Ds darmstadtium 110	281 Rg roentgenium 111	285 Cn copernicium 112	286 Nh nihonium 113	289 Fl flerovium 114	289 Mc moscovium 115	289 Lv livermorium 116	293 Ts tennessine 117	294 Og oganesson 118

1	H	1
	hydrogen	

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

* The Lanthanides (atomic numbers 58 – 71) and the Actinides (atomic numbers 90 – 103) have been omitted. Relative atomic masses for Cu and Cl have not been rounded to the nearest whole number.



Acknowledgements

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All relevant information has been credited in the document.

This document has been produced for educational purposes only.

This document has been produced for the AQA GCSE Science Specification.

