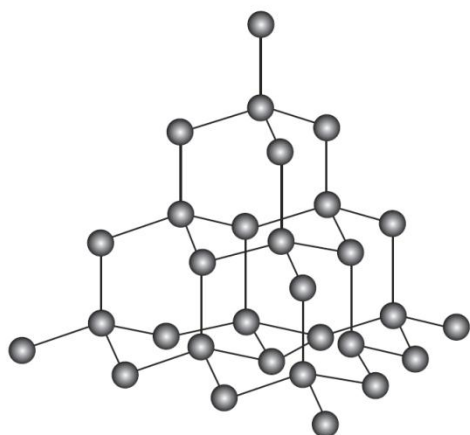


QUESTION (2011:2)

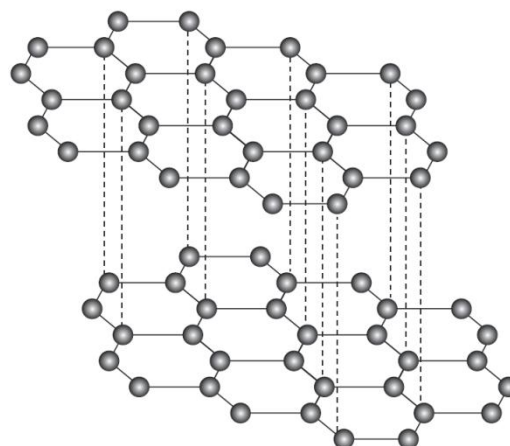
- (a) Complete the table below by stating the type of solid, the type of particle present, and the bonding (attractive forces) between particles in the solid state.

Solid	Type of solid	Type of particle	Attractive forces between particles
Na			
P ₄			
MgO			
SO ₃			

- (b) The diagrams below show 3-D structural representations of diamond and graphite. Diamond and graphite are both made up of carbon atoms, but these atoms are arranged differently in each solid.



Structure of diamond



Structure of graphite

- (i) Describe the electrical conductivity and hardness of diamond and graphite.

Diamond

electrical conductivity:

hardness:

Graphite

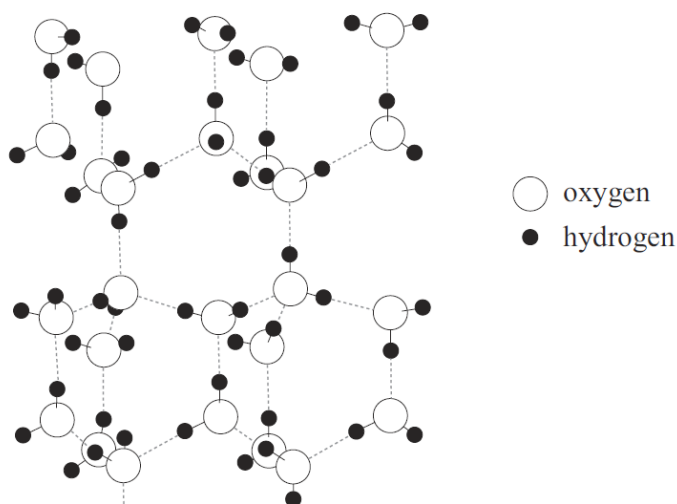
electrical conductivity:

hardness:

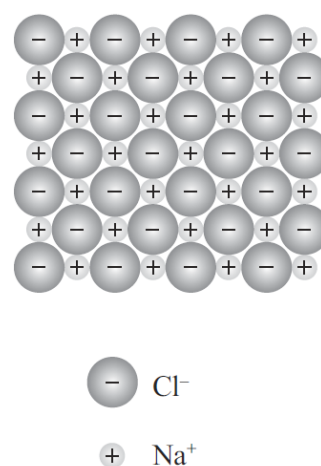
- (ii) Discuss the electrical conductivity and hardness of both diamond and graphite, using your knowledge of structure and bonding.

QUESTION (2011:3)

The diagrams below show structural representations of the two solids ice, H₂O, and sodium chloride, NaCl.



Structure of ice



Structure of sodium chloride

- (a) Ice melts at 0°C and sodium chloride melts at 801°C.
- (i) On **each** diagram above, circle ONE of the forces of attraction which must be overcome for the substance to melt.
Give a reason for your choice.
- Ice:
Sodium chloride:
- (ii) Discuss the low melting point of ice and the high melting point of sodium chloride, using your knowledge of structure and bonding.
- (b) Sodium chloride dissolves in water.
Discuss **how** and **why** sodium chloride dissolves in water, using your knowledge of structure and bonding.
Include a labelled diagram in your answer.

Now for use with AS 91164

QUESTION (2010:3)

- (a) State the type of particles (atoms / ions / molecules) present in the two solids MgCl_2 and SiO_2 .
 (b) The following table shows some physical properties of these two solids.

Solid	MgCl_2	SiO_2
Melting point / °C	712	1700
Solubility in water	soluble	insoluble

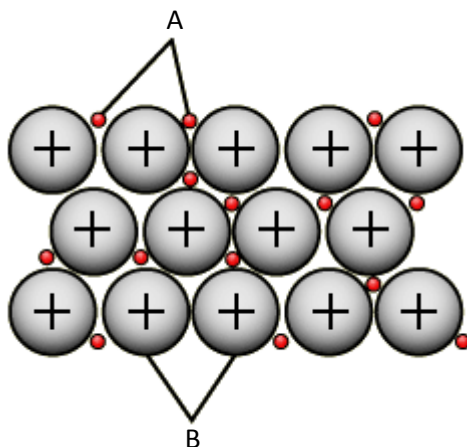
Compare and contrast these physical properties (melting point and solubility in water) of these two solids.

Your answer must include:

- reference to the type of solid
- the type of particle
- the attractive forces between the particles, for each of the two solids.

QUESTION (2010:4)

The diagrams below show the structure of a metallic solid.



- (a) Name the particles in the diagrams above.

Particle	A	B
Name of particle		

- (b) Copper is a good conductor of electricity and is ductile. It is often used to make electrical wires.

Use the diagrams above to discuss how the structure of copper allows it to be made into electrical wires.

In your answer you should:

- Describe the particles in copper and the attractive forces between the particles.
- Relate its structure to both properties outlined above.

AS 90308 (expired) - Types of particles and properties 2004 – 2011

Now for use with AS 91164

QUESTION (2009:3)

- (a) Complete the table below by stating the type of solid, the type of particle present and identifying the bonding (attractive forces) between the particles in the **solid** state. The first one has been done for you.

Solid	Type of solid	Type of particle	Bonding between particles
Chlorine Cl ₂	Molecular	Molecule	Weak intermolecular forces
Silicon dioxide SiO ₂			
Copper chloride CuCl ₂			
Potassium K			
Carbon dioxide CO ₂			

- (b) Use the information given below to answer the question that follows.

- **Diamond** is a covalent network solid. It has a very high melting point of 3550°C.
- **Magnesium oxide**, MgO, is an ionic solid. It has a high melting point of 2800°C.
- **Sulfur dichloride**, SCl₂, is a molecular substance. It has a low melting point of –80°C.

Discuss the melting points of these three substances by referring to the **particles** and the **forces between the particles** in the solids.

QUESTION (2009:4)

Discuss the electrical conductivity of the following THREE substances using your knowledge of structure and bonding.

Sulfur, S₈, does not conduct electricity in the solid state nor in the liquid state.

Magnesium chloride, MgCl₂, conducts electricity when it is dissolved in water, but not in the solid state.

Lead, Pb, **conducts** electricity in the solid state and when molten (liquid).

QUESTION (2008:2)

Complete the table below by stating the type of particle present in each of the solids, and identifying the bonding (attractive forces) between particles.

Solid	Melting point (°C)	Type of particle	Bonding between particles
S ₈	119		
MgCl ₂	712		
Mg	650		
Diamond	3550		

AS 90308 (expired) - Types of particles and properties 2004 – 2011

Now for use with AS 91164

QUESTION (2008:5)

Two of the following substances can conduct electricity.

copper chloride diamond graphite iodine silicon dioxide

- (a) Write the names of these two substances.
(b) Discuss, with reference to structure and bonding, why the substances chosen in (a) are able to conduct electricity. Include any conditions that are required.

QUESTION (2007:3)

- (a) Identify the type of particle and describe the bonding (attractive forces between the particles) for each of the solids in the table below.

Solid	Type of solid	Type of particle	Description of bonding
(i) Silver (Ag)	metallic		
(ii) Sulfur (S ₈)	molecular		
(iii) Silicon dioxide (SiO ₂)	covalent network		

- (b) Silicon dioxide (SiO₂) has a melting point of 1700°C and sulfur (S₈) has a melting point of 113°C. Explain the difference in the melting points of these two substances in terms of structure and bonding.

QUESTION (2007:4)

Discuss the following properties of lithium chloride (LiCl), with reference to the particles in the solid and forces between the particles.

- Solid will not conduct electricity.
- Melting point of solid is 610°C.
- Solid dissolves in water but not in cyclohexane.

QUESTION (2007:5)

Use your knowledge of structure and bonding to discuss the following physical properties of diamond and graphite.

- Hardness
- Electrical conductivity
- Melting point

QUESTION (2006:2)

The following table contains oxides of elements from the third row of the Periodic Table. Complete the table below by:

- stating the type of particle found in each substance as an **atom**, **ion** or **molecule**
- specifying the attractive force that exists between the particles in the solid state of the substance.

Solid	Type of particle	Attractive force between particles
Sodium oxide		
Sulfur trioxide		
Silicon dioxide		
Aluminium oxide		

QUESTION (2006:5)

The **physical properties** of some crystalline solids are stated below. For each example, explain why the substance has the property stated by relating the **property** to the **structure and bonding** within the solid.

- Solid sodium chloride does not conduct electricity. However, if it is melted, sodium chloride will conduct electricity.
- Potassium chloride will not dissolve in non-polar solvents, but will dissolve in water.
- Copper is easily shaped to form wires.

QUESTION (2006:6)

The following table shows the melting and boiling points of chlorides of some elements of the third row of the Periodic Table.

	Sodium chloride NaCl	Magnesium chloride MgCl ₂	Phosphorus trichloride PCl ₃	Sulfur dichloride SCl ₂
Melting point /°C	801	712	-91	-80
Boiling point/°C	1465	1418	74	59

- Describe the **trend** in melting and boiling points of chlorides across the third row of the periodic table by referring to the data in the table above.
- Discuss reasons for the differences in melting and boiling points of all FOUR chlorides, shown in the table above, by referring to the **particles** and **forces between the particles** in the solids.

AS 90308 (expired) - Types of particles and properties 2004 – 2011

Now for use with AS 91164

QUESTION (2005:3)

Complete the following table by:

- (a) stating the type of particle found in each solid substance as atoms, ions or molecules,
- (b) specifying the attractive force existing between the particles of each solid substance,
- (c) describing the relative melting point of each substance as either high or low.

Solid substance	Type of particle in solid – atoms, ions or molecules	Attractive force between particles	Relative melting point of substance – high or low.
calcium chloride (CaCl ₂)			
diamond (C)			
ice (H ₂ O)			

QUESTION (2005:4)

- (a) Complete the table by classifying substances B to F as: *ionic, metallic, molecular or covalent network*. As an example, the classification for substance A has been done for you.

Substance	Melting point (°C)	Conductivity	Hardness of solid	Classification
A	770	conducts when molten but not when solid	brittle	ionic
B	1083	high	malleable	
C	-190	none	brittle	
D	1700	none	hard	
E	-57	none	brittle	
F	801	conducts when molten but not when solid	brittle	

- (b) Explain why substance A will conduct electricity when molten, but not when solid.

QUESTION (2005:5)

For each of the three uses of different crystalline solids below, discuss the property identified by relating the property to the structure and bonding within the solid.

- (a) Silver (Ag) is easily shaped and may be used to make jewellery.
- (b) Copper (Cu) is a good conductor of electricity and is used for electrical wires.
- (c) Silicon dioxide (SiO₂) has a very high melting point and is used to make glass.

QUESTION (2005:6)

Some properties of two solids are shown in the table below.

Solid	Melting point (°C)	Solubility
iodine (I ₂)	Sublimes when gently heated	Soluble in cyclohexane
potassium iodide (KI)	681	Soluble in water

Discuss the properties of iodine and potassium iodide, in terms of the structure and bonding within each solid.

QUESTION (2004:3)

Melting points of the chlorides of selected third-row elements are given in the table below.

Name of substance	Formula	Melting point (°C)	Type of bonding
sodium chloride	NaCl	801	
magnesium chloride	MgCl ₂	712	
silicon chloride	SiCl ₄	-68	
sulfur dichloride	SCl ₂	-80	

- (a) Describe the trend shown by the melting points of third-row chlorides in the table above.
- (b) This trend in melting points is due to the type of bonding involved in each of the substances.

For each of the substances below, describe the type of bonding that must be broken to melt the substance.

QUESTION (2004:4)

Complete the following table by:

- (a) stating the type of particle found in the solid substance as atoms, ions or molecules,
- (b) specifying the attractive force that is broken when the solid substance melts,
- (c) describing the attractive force existing between the particles of the solid as weak or strong.

Name of solid substance	Type of particle in solid – atoms, ions or molecules	Attractive force broken when solid melts	Attractive force between particles – weak or strong
Sulfur (S ₈)			
Copper (Cu)			
magnesium oxide (MgO)			
diamond (C)			

QUESTION (2004:5)

Explain, in terms of structure AND bonding within each solid, why the solid has the property described.

Property	Explanation in terms of structure and bonding within the solid
Solid magnesium chloride, MgCl ₂ , is a poor conductor of electricity. However, when melted, magnesium chloride is a good electrical conductor.	
Chlorine, Cl ₂ , has a low melting point of –101°C.	
A piece of zinc, Zn, can be easily re-shaped without breaking into smaller pieces.	

QUESTION (2004:6)

Carbon and silicon are both elements found in Group 14 of the periodic table. Both elements show a combining power of +4 in forming oxides, with the respective formulae CO_2 and SiO_2 . Some properties of these oxides are as follows:

Oxide	Melting point ($^{\circ}\text{C}$)	Conductivity of solid	Hardness of solid
CO_2	sublimes at -78	Poor	brittle
SiO_2	1700	Poor	Very hard

Discuss the structure and bonding within carbon dioxide and silicon dioxide, and relate these to the properties shown in the table above.

Answers

QUESTION (2009:4) means Q4 on the 2009 AS 90308

See NCEA site for assessment schedules