2.2 Bonding & Substance Properties

Question Paper

Course	AQA GCSE Chemistry
Section	2. Bonds, Structure & Properties of Matter
Topic	2.2 Bonding & Substance Properties
Difficulty	Medium

Time Allowed 60

Score /47

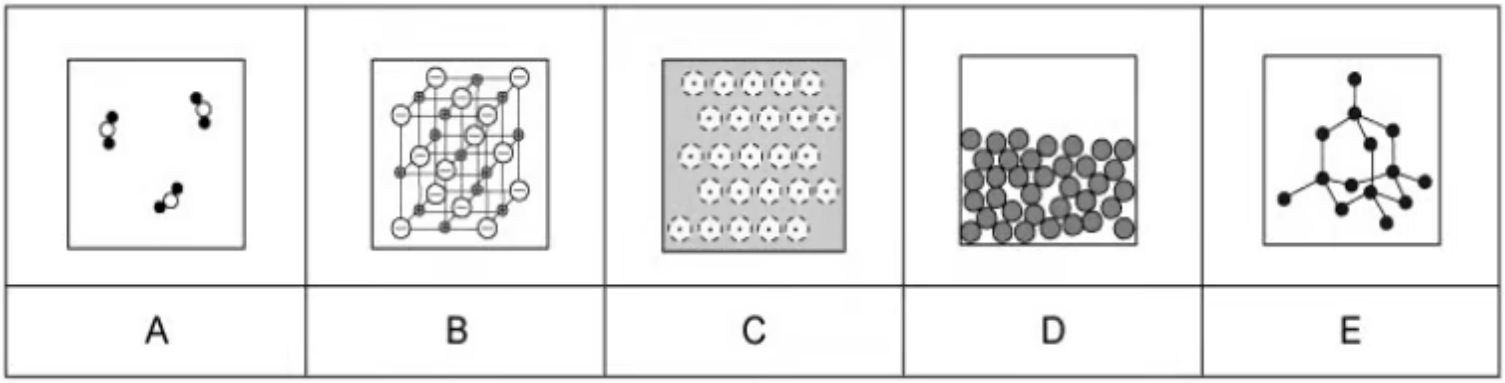
Percentage /100

Question 1a

This question is based on the structure of different substances.

Identify each substance in **Figure 1** by writing the letter next to the corresponding sentence.

Figure 1



This substance is a liquid: _____

This substance is a gas: _____

This substance is a metal: _____

This substance is diamond: _____

This substance is ionic: _____

[5 marks]

Question 1b

Magnesium is a reactive metal that combusts in air to form magnesium oxide.

Balance the equation for the reaction below and give the meaning of the state symbols (s) and (g).

$$\_\_\_\ Mg\,(s) + \_\_\_\ O_2\,(g) \rightarrow \_\_\_\ MgO\,(s)$$

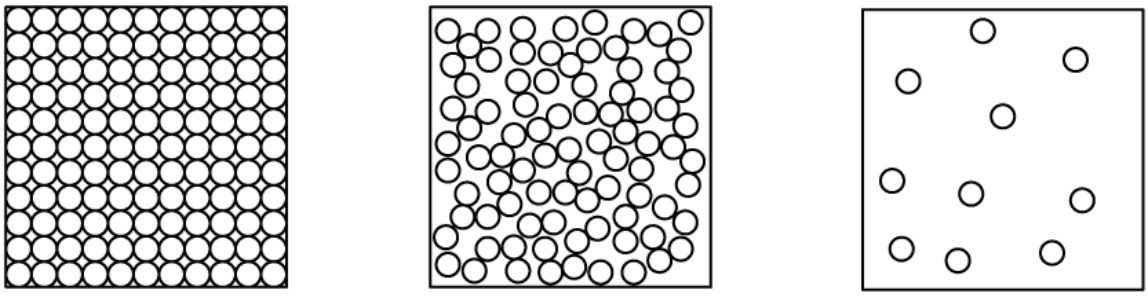
[3 marks]

Question 1c

Higher:

The following particle diagrams in **Figure 2** are routinely used to represent the three phases of matter:

Figure 2



State **three** limitations of these models.

[3 marks]

Question 2a

A student was investigating a calcium salt labelled **Y.**

The student found that **Y:**

- has a very high melting point
- does not conduct electricity
- is water soluble and the solution produced conducts electricity

What type of bonding is present in salt **Y**?

[1 mark]

Question 2b

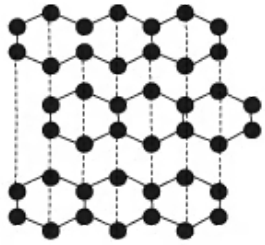
Explain why the solid **Y** does **not** conduct electricity but its aqueous solution does.

[2 marks]

Question 2c

Figure 1 shows the bonding arrangement of an element.

Figure 1



What is the element?

Tick (✔) **one** box.

Element	
Chromium	
Carbon	
Silicon	
Graphite	

[1 mark]

Question 2d

The image in **Figure 1** is an allotrope.

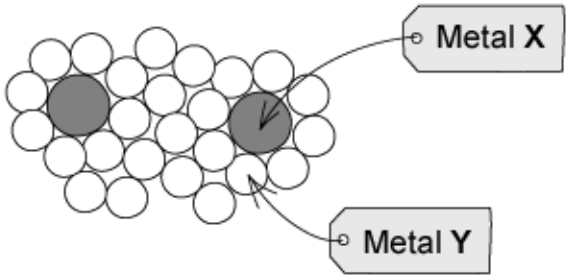
Why does this allotrope conduct electricity?

[3 marks]

Question 2e

Figure 2 shows the particle diagram of an alloy.

Figure 2



Explain why this alloy is harder than pure metal Y.

[2 marks]

Question 2f

What kind of substances are alloys?

Tick (✔) **one** box.

Elements	
Mixtures	
Compounds	

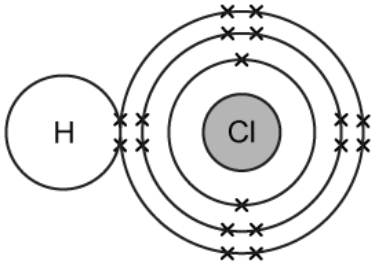
[1 mark]

Question 3a

The hydrogen halides (HF, HCl, HBr and HI) are compounds used to produce acids.

Figure 1 represents a molecule of hydrogen chloride.

Figure 1



What do the crosses (**X**) represent?

[1 mark]

Question 3b

What type of bonding is present in this molecule?

[1 mark]

Question 3c

Predict whether hydrogen chloride is a solid, liquid or gas at room temperature and pressure.

Explain your answer.

[3 marks]

Question 4a

This question is based on the chemistry of polymers.

Polyvinyl chloride (PVC) is a commonly used polymer.

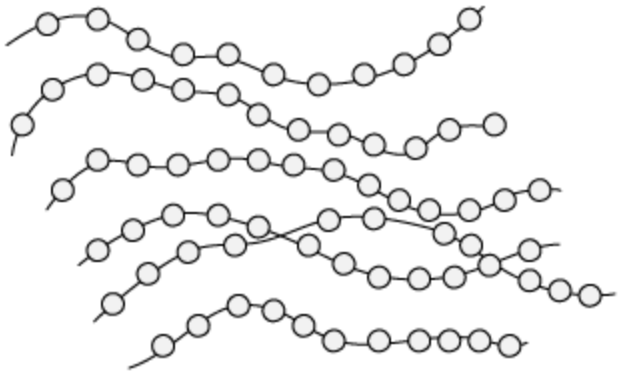
State the term used to describe the units from which polymers are made and name the type of bonding between these units.

[2 marks]

Question 4b

Figure 1 represents short chains of PVC.

Figure 1



Although hard material is used in water pipes and drains, PVC softens and melts when heated.

Use the diagram and your knowledge of structure and bonding to explain why this occurs.

[3 marks]

Question 4c

The basic unit of polyvinyl chloride is C_2H_3Cl.

The polymer chain consists of many of these base units bonded together.

In the space provided, draw a section of a chain of PVC showing three units joined together.

[3 marks]

Question 5a

Marble slabs for kitchen countertops are cut from huge blocks of marble which are extracted from quarries. The extraction process involves cutting the marble blocks with a metal cable connected to a rotary motor. Water is sprayed onto the marble for cooling.

The cable used is made from a steel alloy.

Suggest **two** advantages of using an alloy instead of a pure metal for this process.

[2 marks]

Question 5b

For particularly dense marble, or marble which contains grains of other rock types, the cutting cable is encrusted with diamond dust.

Suggest a reason why.

[1 mark]

Question 5c

Diamond has a very high melting points.

Explain why in terms of the bonding arrangement.

[4 marks]

Question 6a

Explain why diamond has a higher melting and boiling point than carbon dioxide.

[3 marks]

Question 6b

Metals are good conductors of electricity.

Explain why.

[3 marks]