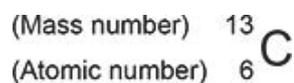


**Questions are for both separate science and combined science students unless indicated in the question**

**Q1.**

This question is about carbon and carbon compounds.

An atom of carbon is represented as:



- (a) What is the number of protons in this atom of carbon?

Tick (✓) **one** box.

1       6       7       13

(1)

- (b) What is the number of neutrons in this atom of carbon?

Tick (✓) **one** box.

1       6       7       13

(1)

- (c) What is the number of electrons in this atom of carbon?

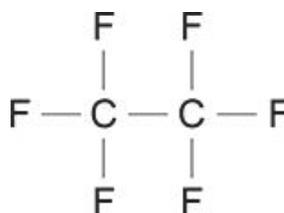
Tick (✓) **one** box.

1       6       7       13

(1)

- (d) **Figure 1** shows the structure of a carbon compound.

**Figure 1**



Complete the formula of the carbon compound.



(1)

(e) Methane:

- is a carbon compound
- exists as small molecules
- has a low boiling point.

What is the reason for the low boiling point of methane?

Tick (✓) **one** box.

Covalent bonds **and** intermolecular forces are weak.

Only covalent bonds are weak.

Only intermolecular forces are weak.

(1)

(f) Buckminsterfullerene (C<sub>60</sub>) is a form of carbon.

Buckminsterfullerene was the first fullerene to be discovered.

What is the shape of a buckminsterfullerene molecule?

Tick (✓) **one** box.

Cubic

Cylindrical

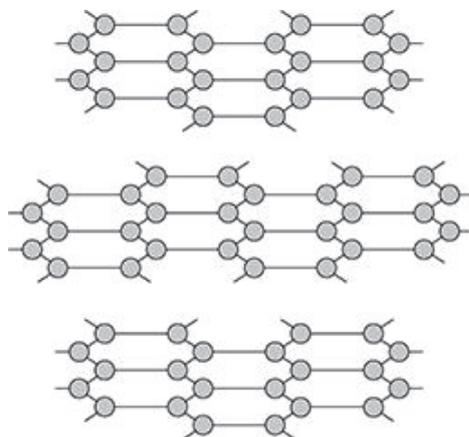
Spherical

(1)

- (g) Graphite is a form of carbon.

**Figure 2** represents the structure of graphite.

**Figure 2**



**Key**

● = carbon atom

How many covalent bonds does each carbon atom form in graphite?

Tick (✓) **one** box.

1

2

3

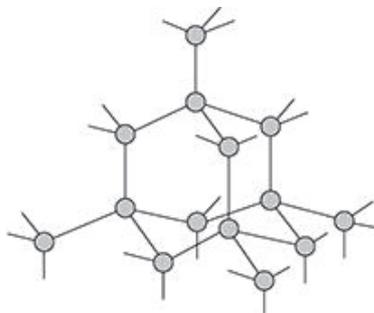
4

(1)

- (h) Diamond is another form of carbon.

**Figure 3** represents the structure of diamond.

**Figure 3**



**Key**

● = carbon atom

Describe the structure and bonding in diamond.

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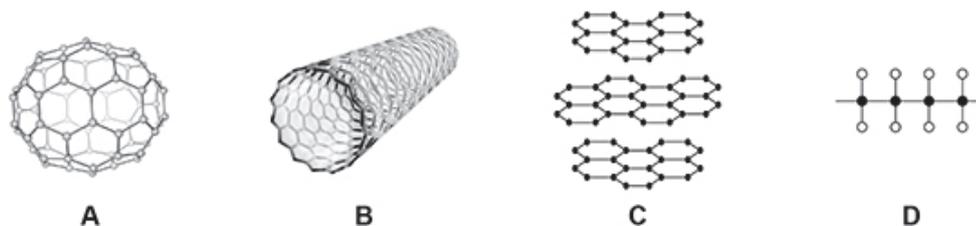
(3)

(Total 10 marks)

**Q2.**

This question is about carbon and compounds of carbon.

**Figure 1** shows diagrams that represent different structures.

**Figure 1**

Use **Figure 1** to answer parts (a) and (b).

(a) Which diagram represents graphite?

Tick (✓) **one** box.

A       B       C       D

(1)

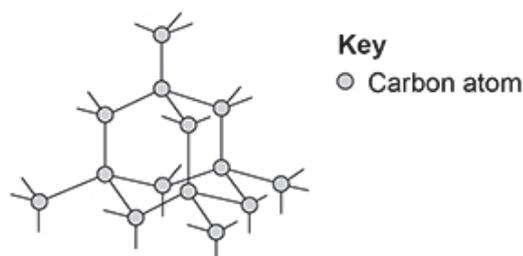
(b) Which diagram represents poly(ethene)?

Tick (✓) **one** box.

A       B       C       D

(1)

**Figure 2** represents the structure of diamond.

**Figure 2**

(c) How many covalent bonds does each carbon atom form in diamond?

\_\_\_\_\_

(1)

(d) Which is a property of diamond?

Tick (✓) **one** box.

Conducts electricity

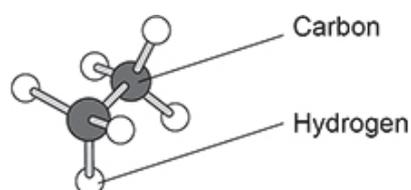
Low melting point

Very hard

(1)

(e) **Figure 3** shows a model of a molecule.

**Figure 3**



Complete the molecular formula of the molecule.

Molecular formula = C\_\_\_ H\_\_\_

(1)

Carbonic acid is a compound of carbon.

The formula of carbonic acid is H<sub>2</sub>CO<sub>3</sub>

(f) Which ion is produced by carbonic acid in aqueous solution?

Tick (✓) **one** box.

H<sup>+</sup>

OH<sup>-</sup>

O<sup>2-</sup>

(1)

(g) Calculate the relative formula mass ( $M_r$ ) of carbonic acid ( $\text{H}_2\text{CO}_3$ ).

Relative atomic masses ( $A_r$ ): H = 1 C = 12 O = 16

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Relative formula mass ( $M_r$ ) = \_\_\_\_\_

(2)

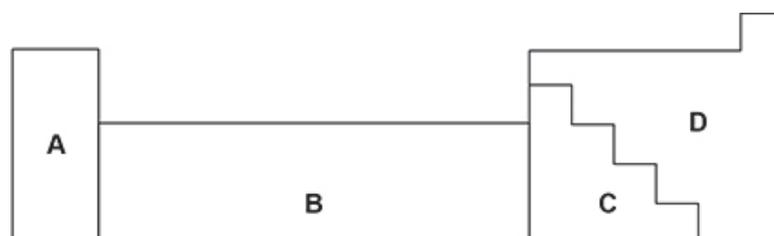
(Total 8 marks)

**Q3.**

This question is about metals and non-metals.

**Figure 1** shows an outline of part of the periodic table.

**Figure 1**



- (a) Element **Q** is a dull solid with a melting point of 44 °C.

Element **Q** does not conduct electricity.

Which section of the periodic table in **Figure 1** is most likely to contain element **Q**?

Tick (✓) **one** box.

A       B       C       D

(1)

- (b) Element **R** forms ions of formula  $R^{2+}$  and  $R^{3+}$

Which section of the periodic table in **Figure 1** is most likely to contain element **R**?

Tick (✓) **one** box.

A       B       C       D

(1)

- (c) Give **two** differences between the physical properties of the elements in Group 1 and those of the transition elements. **(chemistry only)**

1 \_\_\_\_\_

\_\_\_\_\_

2 \_\_\_\_\_

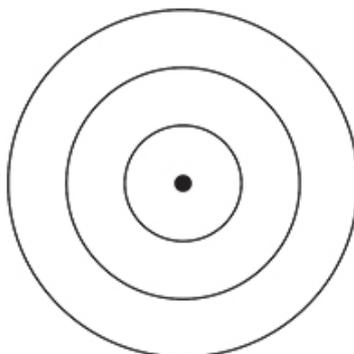
\_\_\_\_\_

(2)

- (d) Complete **Figure 2** to show the electronic structure of an aluminium atom.

Use the periodic table.

**Figure 2**



(1)

- (e) Aluminium is a metal.

Describe how metals conduct electricity.

Answer in terms of electrons.

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(3)

- (f) Name the type of bonding in compounds formed between metals and non-metals.

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(1)

- (g) Magnesium oxide is a compound formed from the metal magnesium and the non-metal oxygen.

Describe what happens when a magnesium atom reacts with an oxygen atom.

You should refer to electrons in your answer.

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(4)

(Total 13 marks)