

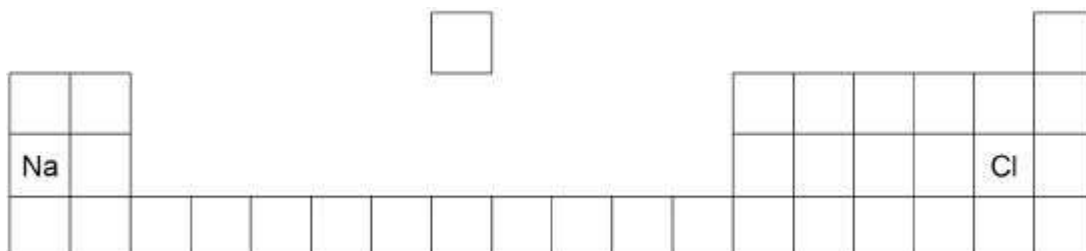
**Year 11 Weekly Homework (week 2)**  
**Chemistry Paper 1**  
**All Questions to be completed**

**Q1.**

This question is about sodium and chlorine.

**Figure 1** shows the positions of sodium and chlorine in the periodic table.

**Figure 1**



- (a) State **one** difference and **one** similarity in the electronic structure of sodium and of chlorine.

Difference \_\_\_\_\_

\_\_\_\_\_

Similarity \_\_\_\_\_

\_\_\_\_\_

**(2)**

- (b) Sodium atoms react with chlorine atoms to produce sodium chloride (NaCl).

Describe what happens when a sodium atom reacts with a chlorine atom.

Write about electron transfer in your answer.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

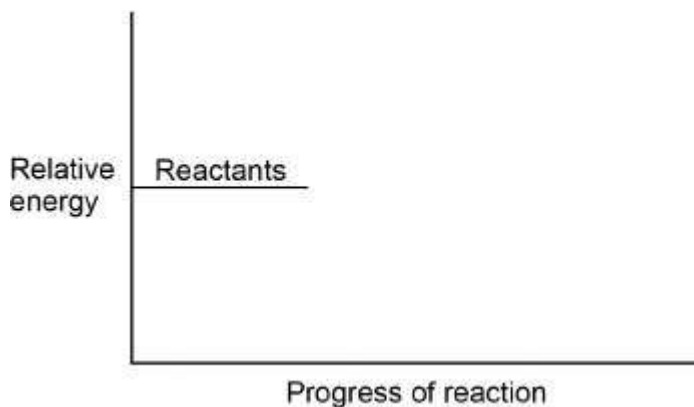
\_\_\_\_\_

\_\_\_\_\_

**(4)**

- (c) The reaction between sodium and chlorine is an exothermic reaction.  
Complete the reaction profile for the reaction between sodium and chlorine.

**Figure 2**



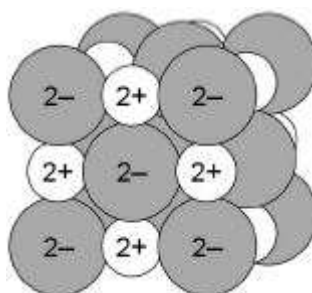
(2)  
(Total 8 marks)

**Q2.**

This question is about structure and bonding.

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

**Figure 1**



What type of bonding is present in calcium oxide?

Tick **one** box.

Covalent

Ionic

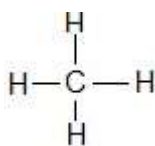
Macromolecular

Metallic

(1)

(b) **Figure 2** shows a particle of methane (CH<sub>4</sub>).

**Figure 2**



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

Tick **one** box.

An ion

A lattice

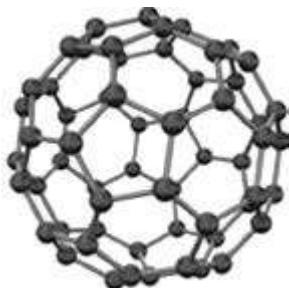
A molecule

A polymer

(1)

(c) **Figure 3** shows the structure of C<sub>60</sub>

**Figure 3**



Complete the sentence.

Choose the answer from the box.

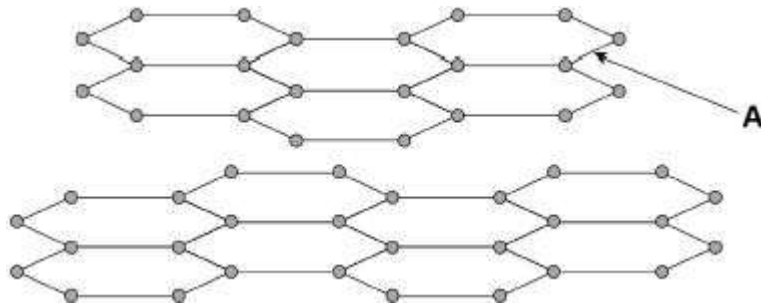
**diatomic    giant ionic    a fullerene    giant metallic**

The structure of C<sub>60</sub> is \_\_\_\_\_.

(1)

**Figure 4** shows the structure of graphite.

**Figure 4**



(d) What type of bond is labelled **A** in **Figure 4**?

Tick **one** box.

- covalent
- double
- ionic
- metallic

(1)

(e) 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?

Tick **one** box.

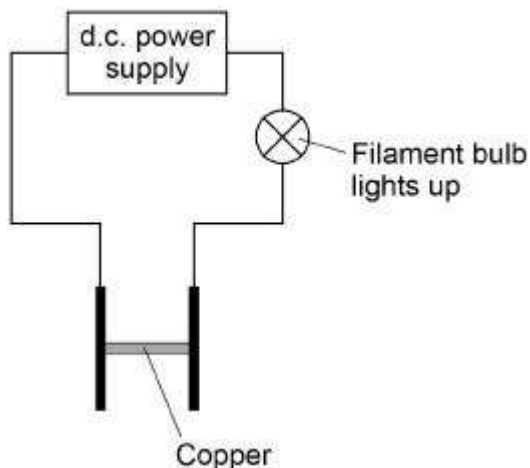
- 1
- 2
- 3
- 4

(1)

An electric current is passed through copper.

**Figure 5** shows the apparatus used.

**Figure 5**



(f) Complete the sentence.

Choose the answer from the box.

gas	liquid	solid	solution
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**Figure 5** shows that copper conducts electricity as a \_\_\_\_\_.

(1)

(g) Complete the sentence.

Choose the answer from the box.

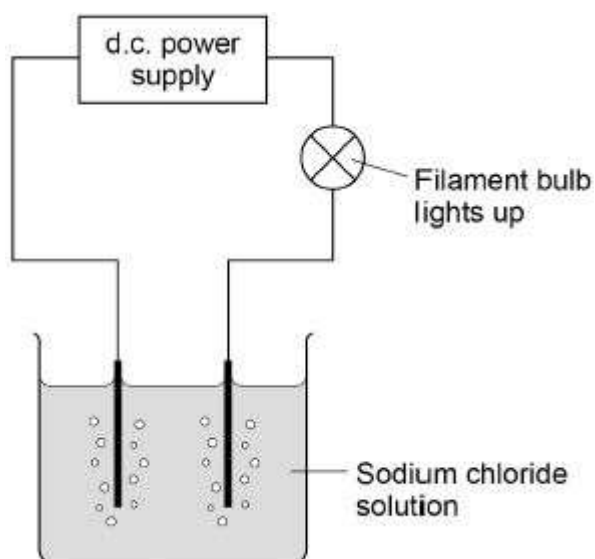
atoms	electrons	ions	molecules
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Copper conducts electricity because of the movement of delocalised \_\_\_\_\_.

(1)

(h) **Figure 6** shows the apparatus used to investigate the effect of electricity on sodium chloride solution.

**Figure 6**



Complete the sentence.

Choose the answer from the box.

dissolved      gaseous      molten

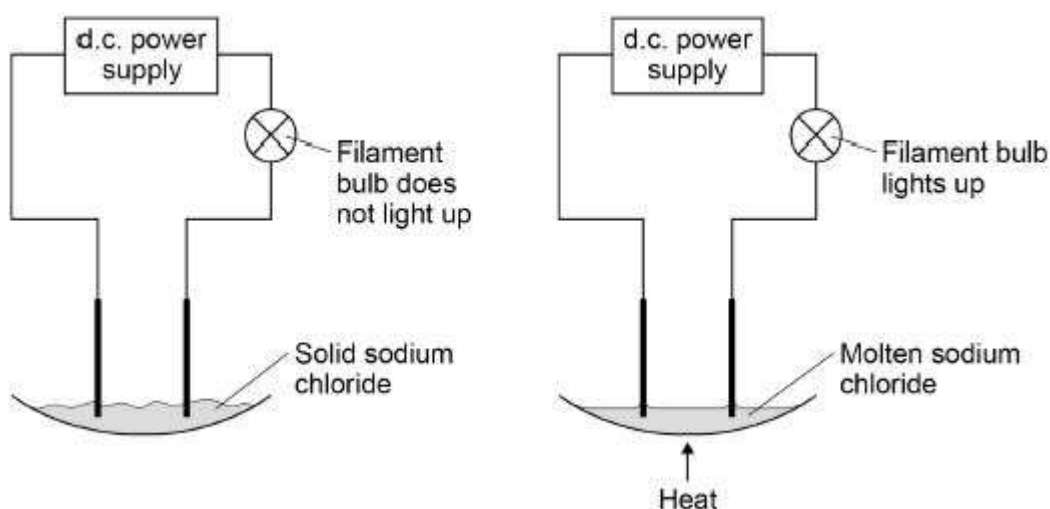
**Figure 6** shows that sodium chloride conducts electricity when \_\_\_\_\_ .

(1)

- (i) Sodium chloride is made up of ions.

**Figure 7** shows the apparatus used to investigate the effect of electricity on solid sodium chloride and molten sodium chloride.

**Figure 7**



The table below shows the results.

	<b>Solid sodium chloride</b>	<b>Molten sodium chloride</b>
<b>Observation</b>	The filament bulb does not light up	The filament bulb lights up
<b>Deduction</b>	Does not conduct electricity	Does conduct electricity

Draw **one** line from each statement to the correct reason.

**Statement**

**Reason**

Solid sodium chloride does not conduct electricity.

The ions are fixed.

The ions are mobile.

Molten sodium chloride  
conducts electricity.

The ions are neutral.

The ions are vibrating.

(2)  
(Total 10 marks)

**Q3.**

This question is about atoms and chemical elements.

Mendeleev's periodic table has groups of elements with similar properties.

Figure 1 shows part of Mendeleev's periodic table.

**Figure 1**

<b>1</b>	1 H							
<b>2</b>	7 Li	9.4 Be	11 B	12 C	14 N	16 O	19 F	
<b>3</b>	23 Na	24 Mg	27.3 Al	28 Si	31 P	32 S	35.5 Cl	
<b>4</b>	39 K	40 Ca	44	48 Ti	51 V	52 Cr	55 Mn	56 Fe, 59 Co, 59 Ni, 63 Cu

(a) Compare Mendeleev's periodic table with the modern periodic table.

Which group is missing from Mendeleev's periodic table?

Tick **one** box.

- Group 1
- Group 2
- Group 7
- Group 0

(1)

(b) In the early periodic tables some elements were placed in the wrong groups.

Mendeleev overcame some of these problems in his periodic table.

Give **two** ways Mendeleev did this.

1. \_\_\_\_\_

2.

(2)

Atoms were thought to be tiny spheres that could not be divided.

(c) Draw **one** line from each scientist to the discovery the scientist made.

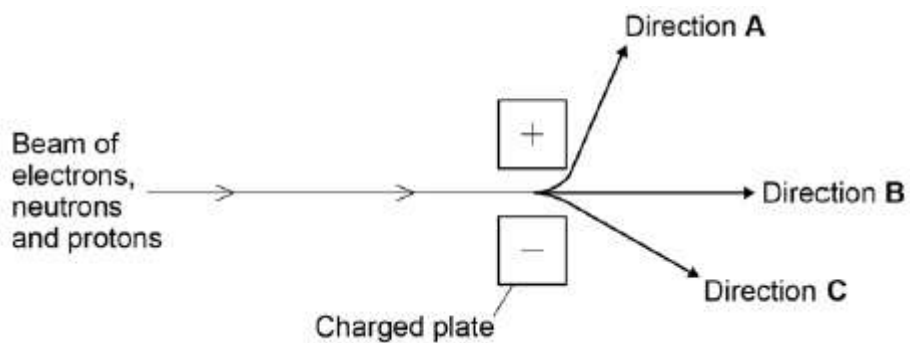
Scientist	Discovery the scientist made
	Discovered electrons
Neils Bohr	Electrons orbit the nucleus
	Existence of neutrons
James Chadwick	Mass of atom concentrated at centre
	Proton found in nucleus

(2)

(d) A beam of electrons, neutrons and protons can be separated by passing them through an electric field.

**Figure 2** shows the directions of the three particles after entering the electric field.

**Figure 2**



Charged particles are attracted to the oppositely charged plate in the electric field.

Which direction, **A**, **B** or **C**, does each particle follow?

Complete the table.



Particle	Direction
Electron	
Neutron	
Proton	

(2)

- (e) Calculate the mass of one atom of sodium.

Use the equation:

$$\text{mass of one atom of sodium} = \frac{\text{relative atomic mass}}{\text{Avogadro constant}}$$

$$\text{Avogadro constant} = 6.02 \times 10^{23}$$

Give your answer to 2 significant figures.

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Mass = \_\_\_\_\_ g

(3)

- (f) The radius of a sodium atom is 227 picometres.

$$1 \text{ picometre} = 10^{-12} \text{ metres (m)}$$

The radius of a nucleus is  $\frac{1}{10\,000}$  of that of the atom.

Which calculation shows the radius of a sodium atom's nucleus?

Tick **one** box.

$227 \times 10\,000 \text{ m}$	<input type="checkbox"/>
$227 \times \frac{1}{10\,000} \text{ m}$	<input type="checkbox"/>
$227 \times 10^{-12} \times 10\,000 \text{ m}$	<input type="checkbox"/>
$227 \times 10^{-12} \times \frac{1}{10\,000} \text{ m}$	<input type="checkbox"/>

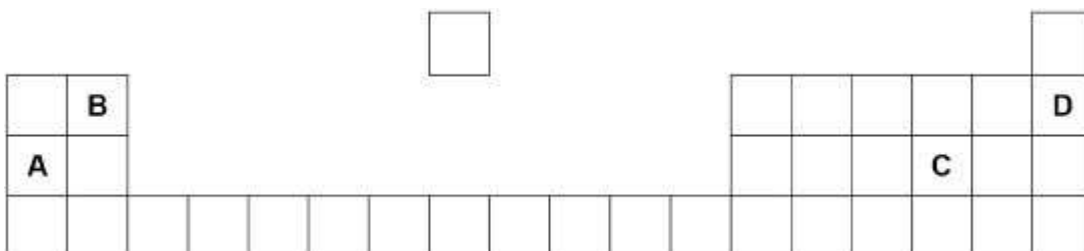
(1)

**Q4.**

This question is about the elements in Group 2 of the periodic table.

(a) **Figure 1** shows the positions of four elements, **A**, **B**, **C**, and **D**, in the periodic table.

**Figure 1**



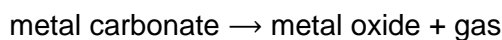
Which element is in Group 2?

Tick **one** box.

A       B       C       D

(1)

Group 2 metal carbonates break down when heated to produce a metal oxide and a gas.



(b) Name the two products when calcium carbonate ( $\text{CaCO}_3$ ) is heated.

\_\_\_\_\_ and \_\_\_\_\_

(2)

(c) What type of reaction happens when a compound breaks down?

Tick **one** box.

burning

decomposition

neutralisation

reduction

(1)

(d) The metal carbonate takes in energy from the surroundings to break down.

What type of reaction takes in energy from the surroundings?

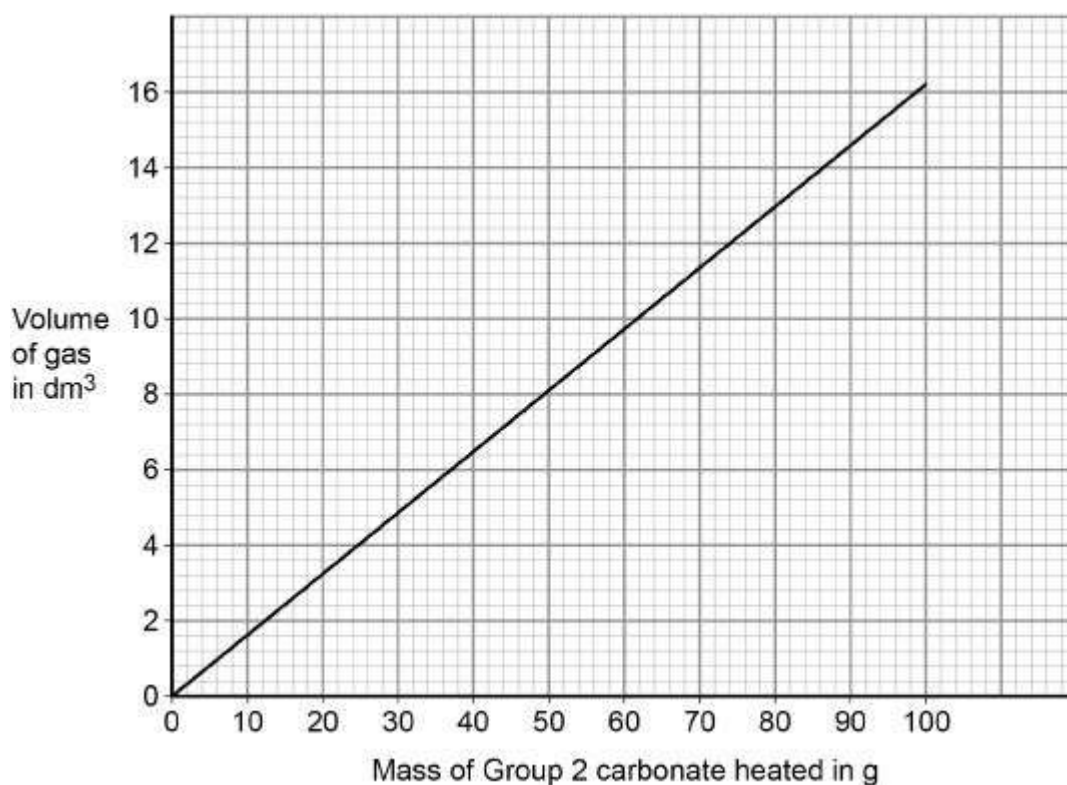
Tick **one** box.

- combustion
- electrolysis
- endothermic
- exothermic

(1)

- (e) **Figure 2** shows the volume of gas produced when a Group 2 metal carbonate is heated.

**Figure 2**



The student collected 5.2 dm<sup>3</sup> of gas.

What mass of the Group 2 metal carbonate is heated?

Mass = \_\_\_\_\_ g

(1)

- (f) Calculate the mass of the Group 2 carbonate needed to produce 24 dm<sup>3</sup> of gas.

Use your answer from part (e) to help you.

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Mass = \_\_\_\_\_ g

(2)

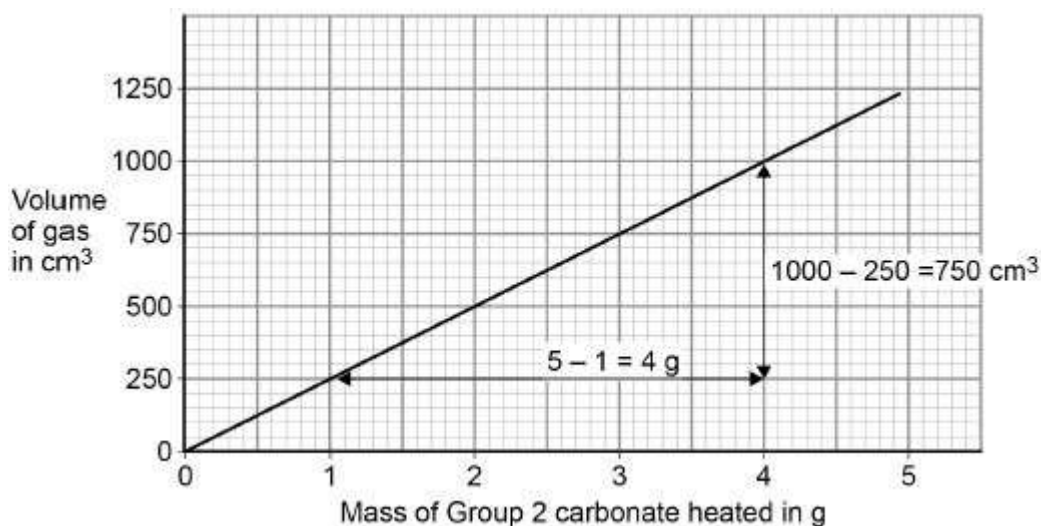
- (g) A student heated different masses of a Group 2 carbonate. The student measured the volume of gas produced.

**Figure 3** shows a graph of the student's results.

The student calculates the gradient of the line in **Figure 3**

The student makes **two** mistakes.

**Figure 3**



Correct formula for gradient =  $\frac{\text{Increase in volume of gas}}{\text{Increase in mass of Group 2 metal carbonate heated}}$

Student's calculation =  $\frac{4}{750} = 0.00533 \text{ cm}^3 \text{ per g}$

Identify the **two** mistakes the student makes.

Calculate the correct gradient of the line.

Mistake 1 \_\_\_\_\_

Mistake 2 \_\_\_\_\_

Calculation \_\_\_\_\_

Gradient = \_\_\_\_\_ cm<sup>3</sup> per g

(4)

- (h) A student repeated the experiment with a different Group 2 metal carbonate ( $\text{XCO}_3$ ).

The relative formula mass ( $M_r$ ) of  $\text{XCO}_3$  is 84

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

Calculate the relative atomic mass ( $A_r$ ) of **X**.

Name metal **X**.

Use the periodic table.

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Relative atomic mass ( $A_r$ ) = \_\_\_\_\_

Metal **X** is \_\_\_\_\_

(4)

(Total 16 marks)

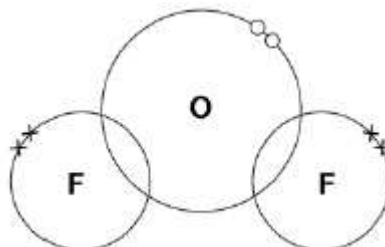
### Q5.

This question is about oxygen.

- (a) One oxygen atom shares one pair of electrons with each fluorine atom in oxygen difluoride ( $\text{OF}_2$ ).

Complete the dot and cross diagram of oxygen difluoride below.

You should show only the electrons in the outer shells.



(2)

- (b) Oxygen difluoride ( $\text{OF}_2$ ) has a melting point of  $-224\text{ }^\circ\text{C}$  and a boiling point of  $-145\text{ }^\circ\text{C}$

What is the state of oxygen difluoride at room temperature?

Explain your answer in terms of structure and bonding.

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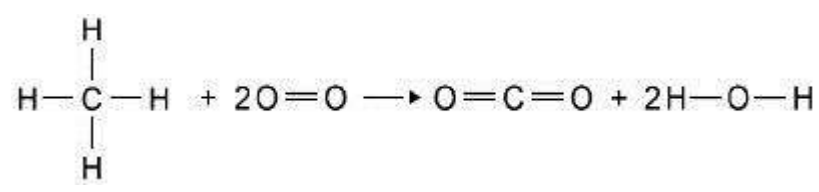
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(4)

(c) The equation shows the reaction of methane with oxygen.



The table shows the bond energies.

Bond	C-H	O=O	C=O	O-H
Bond dissociation energy in kJ per mole	412	496	803	463

Calculate the overall energy change for the combustion of one mole of methane.

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Energy change = \_\_\_\_\_ kJ mol<sup>-1</sup>

(3)

(Total 9 marks)

**Q6.**

This question is about compounds of oxygen.

The reaction between carbon and oxygen is exothermic.

- (a) What does exothermic reaction mean?

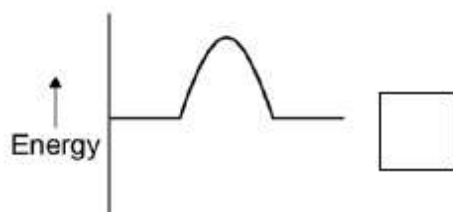
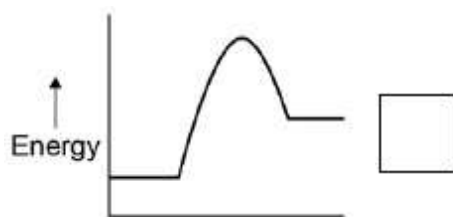
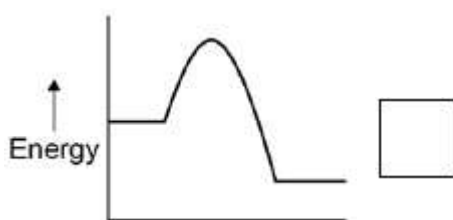
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(1)

- (b) Which is the correct reaction profile (energy level diagram) for an exothermic reaction?

Tick **one** box.



(1)

- (c) The percentage by mass of oxygen in carbon dioxide (CO<sub>2</sub>) is calculated by the equation:

$$\text{percentage by mass} = \frac{\text{number of atoms of O} \times \text{Relative atomic mass of oxygen (O)}}{\text{relative molecular mass of carbon dioxide (CO}_2\text{)}} \times 100$$

Relative atomic masses (*A<sub>r</sub>*): C = 12 O = 16

Calculate the percentage by mass of oxygen in carbon dioxide (CO<sub>2</sub>).

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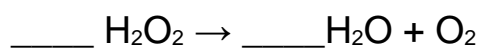
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Percentage by mass of oxygen = \_\_\_\_\_ %

(3)

Hydrogen peroxide decomposes to produce water and oxygen.

(d) Balance the chemical equation.



(1)

(e) 6.8 g of hydrogen peroxide decomposes to produce 3.6 g of water.

Calculate the mass of oxygen produced when 68 g of hydrogen peroxide decomposes.

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Mass of oxygen = \_\_\_\_\_ g

(2)

**(Total 8 marks)**



