Q1. (a) The table shows the amount of energy produced by some food components.

Food component	**Energy in kilocalories per gram**
Carbohydrates	4
Dietary fibre	2
Ethanol	7
Fats	9
Sugar-free sweeteners	2.4

(i) Which food component produces the most energy per gram?

.....

(1)

(ii) A packet of vegetable soup contains 25 g of carbohydrates.

Calculate the number of kilocalories produced by the carbohydrates in this packet of soup.

.....

Answer = ... kilocalories

(1)

(iii) Dietary information is usually given in kilocalories.

Which other energy unit is also used?

Draw a ring around your answer.

kilograms **kilojoules** **kilometres**

(1)

(b) (i) Suggest why chips have more energy than the same mass of boiled potatoes.

.....

.....

.....

.....

(2)

(ii) Suggest why eating too many chips could be unhealthy.

.....

.....

(1)
(Total 6 marks)

Q2.

An airship caught fire when it was coming in to land in 1937. The airship was filled with hydrogen. A spark or flame ignited the hydrogen. The hydrogen reacted with oxygen in the air to produce water.

(a) Write a word equation for the reaction of hydrogen with oxygen.

.....

(1)

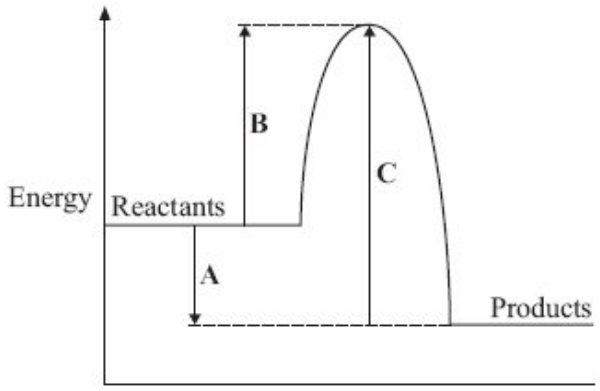
(b) Draw a ring around the correct answer in each box to complete this sentence.

When reactions take place, energy is [released / supplied] to break the existing bonds

and energy is [released / supplied] when new bonds form.

(1)

(c) An energy level diagram for the reaction of hydrogen and oxygen is shown below.



Use the energy level diagram above to help you to answer these questions.

(i) Which energy change, **A**, **B** or **C**, represents the activation energy? ☐

(1)

(ii) Which energy change, **A**, **B** or **C**, shows that the reaction is exothermic? ☐

(1)

(iii) Explain why the hydrogen and oxygen needed a spark or flame to start the reaction.

.....

.....

(1)
(Total 5 marks)

Q3. Energy can be measured in kilojoules (kJ) or in kilocalories (kcal).

The table shows some information about different varieties of crisps.

Variety of crisps	Energy in kJ per 25 g packet
Cheese	548
Salted	550
Chicken	545
Steak	540

(a) Arrange the different varieties of crisps in order of increasing energy. The first one has been done for you.

1 Steak 2 ..... 3 ..... 4 .....

(1)

(b) One variety not given in the table is broccoli.
On the label it states that the energy per 25 g packet is 130 kcal.

1 kcal = 4.2 kJ

Calculate the energy of 25 g of broccoli crisps in kJ.

.....

Energy = ... kJ

(1)
(Total 2 marks)

Q4. During a thunderstorm lightning strikes the Eiffel Tower.

By M. G. Loppé [Public domain], via Wikimedia Commons

In lightning the temperature can reach 30 000 °C. This causes nitrogen and oxygen in the air to react, producing nitrogen oxide. This reaction has a high *activation energy* and is *endothermic*.

(a) Nitrogen and oxygen in the air do not react easily.

What makes nitrogen and oxygen react during thunderstorms?

.....

(1)

(b) Complete the word equation for the reaction of nitrogen with oxygen.

nitrogen + ... → .....

(1)

(c) In an *endothermic* reaction, energy is taken in from the surroundings.

Draw a ring around the correct answer to complete the sentence.

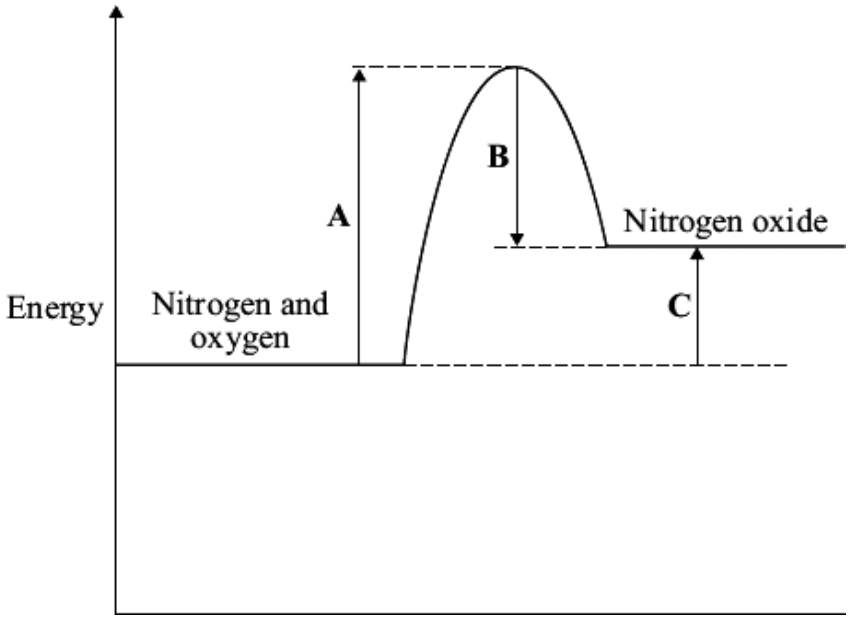
In an *endothermic* reaction, the energy needed to break existing bonds is

less than
more than
the same as

the energy released from forming new bonds.

(1)

(d) The energy level diagram for this reaction is shown.



Use the energy level diagram to help you to answer these questions.

(i) Which energy change, **A**, **B** or **C**, represents the *activation energy*?

(1)

(ii) Which energy change, **A**, **B** or **C**, shows that this reaction is *endothermic*?

(1)
(Total 5 marks)

Q5. Hydrogen peroxide decomposes slowly to give water and oxygen.

The reaction is *exothermic*.

$$2H_2O_2 \rightarrow 2H_2O + O_2$$

(a) In an *exothermic* reaction, energy is given out.

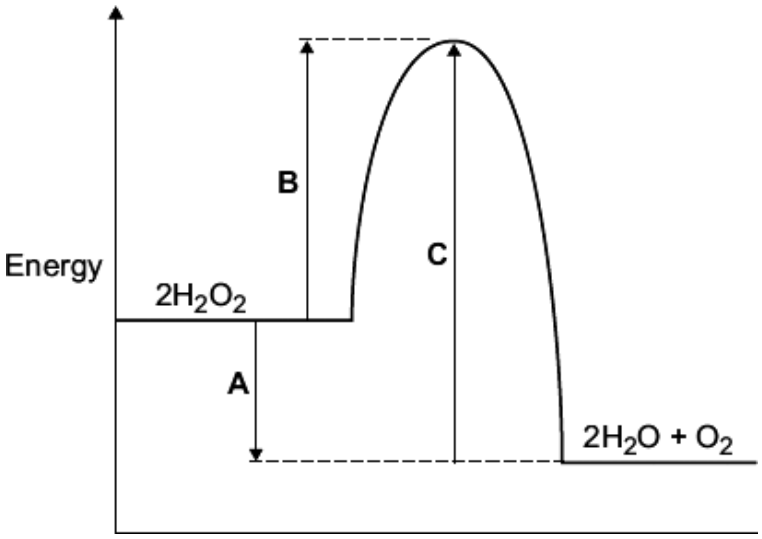
Draw a ring around the correct answer to complete the sentence.

In an *exothermic* reaction, the temperature

- goes down.
- goes up.
- stays the same.

(1)

(b) The energy level diagram for this reaction is shown below.



The energy changes, **A**, **B** and **C**, are shown on the diagram.

Use the diagram to help you answer these questions.

(i) Which energy change, **A**, **B** or **C**, is the activation energy?

(1)

(ii) Which energy change, **A**, **B** or **C**, shows that this reaction is exothermic?

(1)

(iii) Hydrogen peroxide decomposes quickly when a small amount of manganese(IV) oxide is added.

Draw a ring around the correct answer to complete each sentence.

Hydrogen peroxide decomposes quickly because

manganese(IV) oxide is

a catalyst.
an element.
a solid.

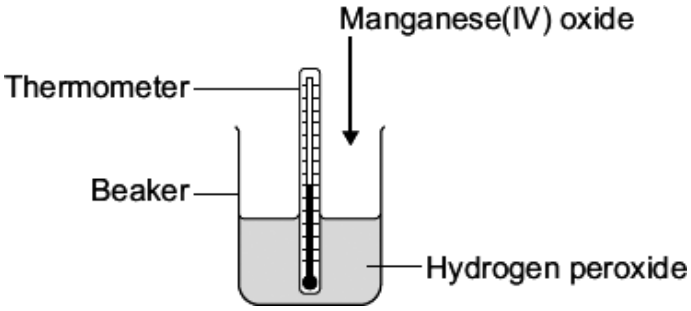
The manganese(IV) oxide has lowered the

activation energy.
boiling point.
temperature.

(2)

(c) A student did an experiment to find the amount of energy produced when hydrogen peroxide solution is decomposed using manganese(IV) oxide.

The apparatus the student used is shown in the diagram.



The student first measured the temperature of the hydrogen peroxide. Then the student added the manganese(IV) oxide, stirred the mixture and recorded the highest temperature.

(i) Suggest why the student stirred the mixture before recording the highest temperature.

.....

.....

(1)

(ii) The biggest error in this experiment is heat loss.

Suggest how the student could change the apparatus so that less heat is lost.

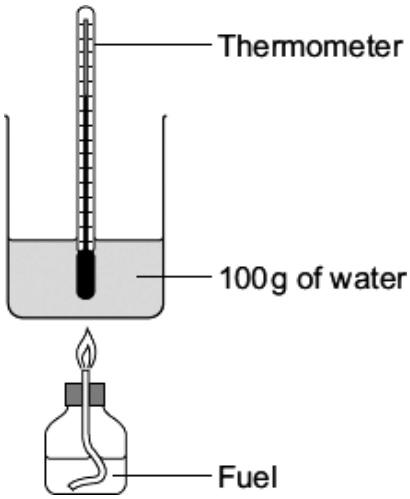
.....

.....

(1)
(Total 7 marks)

Q6. (a) A student burned three liquid fuels and compared the amounts of energy they produced.

The diagram shows the apparatus the student used.



The heat produced when each fuel was burned increased the temperature of 100 g of water.

The table shows the student's results.

Fuel	Mass of fuel burned in g	Temperature increase in °C	Type of flame
A	1	5	smoky
B	1	4	not smoky
C	1	5	not smoky

(i) The student suggested that fuel **C** was the best fuel.

Give **two** reasons why.

1 .....

.....

2 .....

.....

(2)

(ii) Use the following equation to calculate the energy change for burning 1 g of fuel **A**.

energy change in joules = 100 × 4.2 × temperature increase for 1 g of fuel

.....

.....

Answer = ... J

(1)

(b) (i) Draw a ring around the correct answer to complete the sentence.

Energy is usually measured in joules.

Some food labels give energy measured in

calories.
degrees.
minutes.

(1)

(ii) Suggest why knowing about the energy in food can help towards a healthier lifestyle.

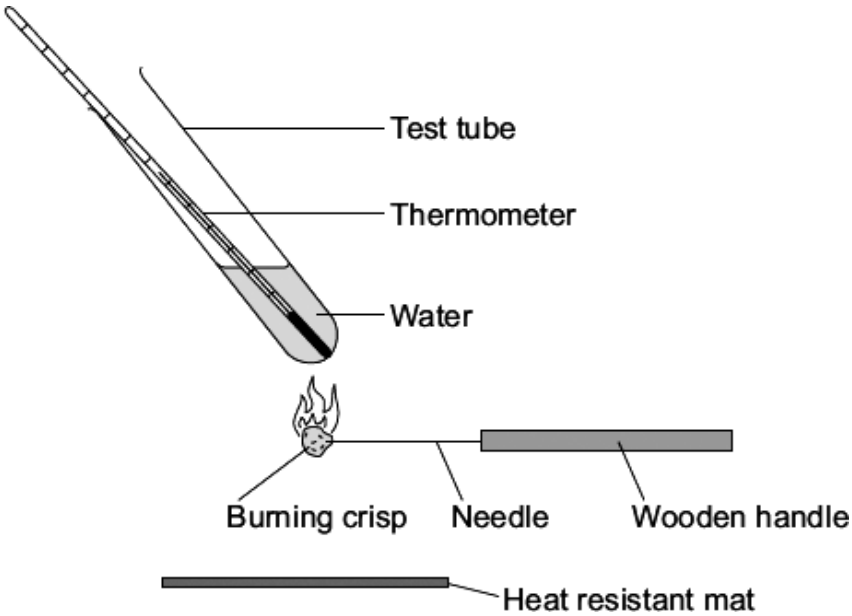
.....

.....

.....

(1)
(Total 5 marks)

Q7. A student investigated the amount of energy released when four different makes of plain salted crisps were burned.



The following method was used for each make of plain salted crisp. The pieces of crisp were all the same size.

- The starting temperature of the water was measured.
- The piece of crisp was burned underneath the test tube.
- The final temperature of the water was measured.

(a) The results of the investigation are shown in the table.

	Make 1	**Make 2**	**Make 3**	**Make 4**
Final temperature of the water in °C	26	25	29	25
Starting temperature of the water in °C	19	20	20	21
Temperature rise of the water in °C	7	5	9	

(i) Calculate the temperature rise for **make 4**.

.....

Temperature rise = ... °C

(1)

(ii) Which make of crisp, **1**, **2**, **3** or **4**, releases the most energy?

Make .....

Give a reason for your answer.

.....

.....

(2)

(b) The energy needed by a student is about 9000 kJ each day.

(i) One large bag of crisps states that the energy released by the crisps is 240 kcal.

Calculate the energy of this bag of crisps in kJ.

1 kcal = 4.2 kJ

.....

.....

Answer = ... kJ

(2)

(ii) Eating too many crisps is thought to be bad for your health.

Use the information above and your knowledge to explain why.

.....

.....

.....

.....

(2)
(Total 7 marks)

Q8. (a) The table shows the amount of energy produced by some food components.

Food component	**Energy in kilocalories per gram**
Carbohydrate	4
Dietary fibre	2
Ethanol	7
Fat	9
Sugar-free sweetener	2.4

(i) Which food component produces the most energy per gram?

.....

(1)

(ii) A packet of vegetable soup contains 25 g of carbohydrate.

Calculate the number of kilocalories produced by the carbohydrate in this packet of soup.

.....

.....

Answer = ... kilocalories

(1)

(iii) Energy produced by food components is usually given in kilocalories.

Which other energy unit is also used ?

Draw a ring around your answer.

kilograms **kilojoules** **kilometres**

(1)

(b) (i) Suggest why chips have more energy than the same mass of boiled potatoes.

.....

.....

.....

.....

(2)

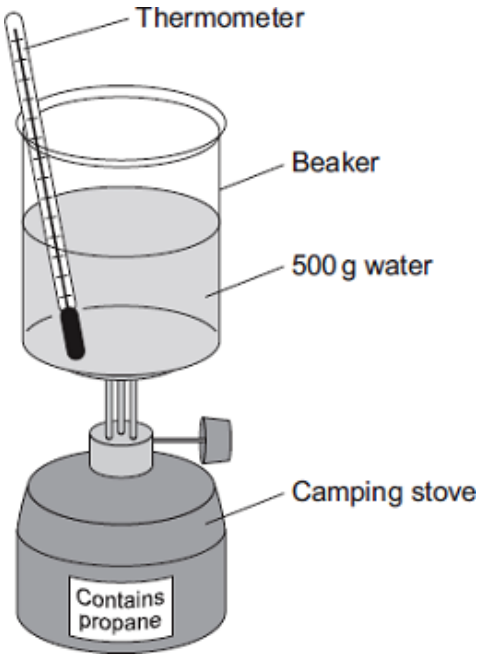
(ii) Suggest why eating too many chips could be unhealthy.

.....

.....

(1)
(Total 6 marks)

Q9. A camping stove uses propane gas.



(a) A student did an experiment to find the energy released when propane is burned.

The student:

- put 500 g water into a beaker
- measured the temperature of the water
- heated the water by burning propane for 1 minute
- measured the temperature of the water again.

The student found the temperature change was 20 °C.

The student can calculate the energy released, in joules (J), using the equation:

energy released (J) = mass of water (g) × 4.2 × temperature change (°C)

(i) Use the student's result to calculate the energy released in joules (J).

.....

.....

Energy released = ... J

(2)

(ii) State **two** safety precautions that the student should take during the experiment.

1 .....

.....

2 .....

.....

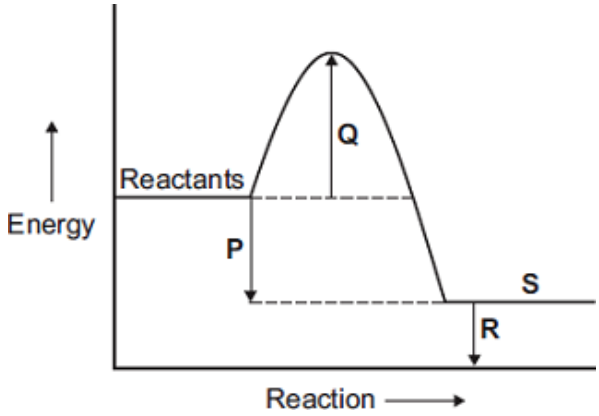
(2)

(iii) Tick (✓) **two** boxes which describe how the student could make his result more accurate.

	Tick (✓)
Stir the water before measuring the temperature.	
Heat the water until it boils.	
Place a lid on the beaker.	
Use a larger beaker for the water.	

(2)

(b) The change in energy when propane is burned can be shown in an energy level diagram.



Draw **one** line from each description to the correct letter.

Description	**Letter**
	P
products	
	Q
activation energy	
	R
energy released by the reaction	
	S

(3)

(c) Propane and hydrogen are both used as fuels.

Some information about propane and hydrogen is given in the table.

Fuel	Resource	Products formed when fuel burned
propane	crude oil	carbon dioxide and water
hydrogen	water	water

Use the information in the table to suggest **two** disadvantages that propane has as a fuel compared to hydrogen.

1 .....

.....

2 .....

.....

(2)
(Total 11 marks)