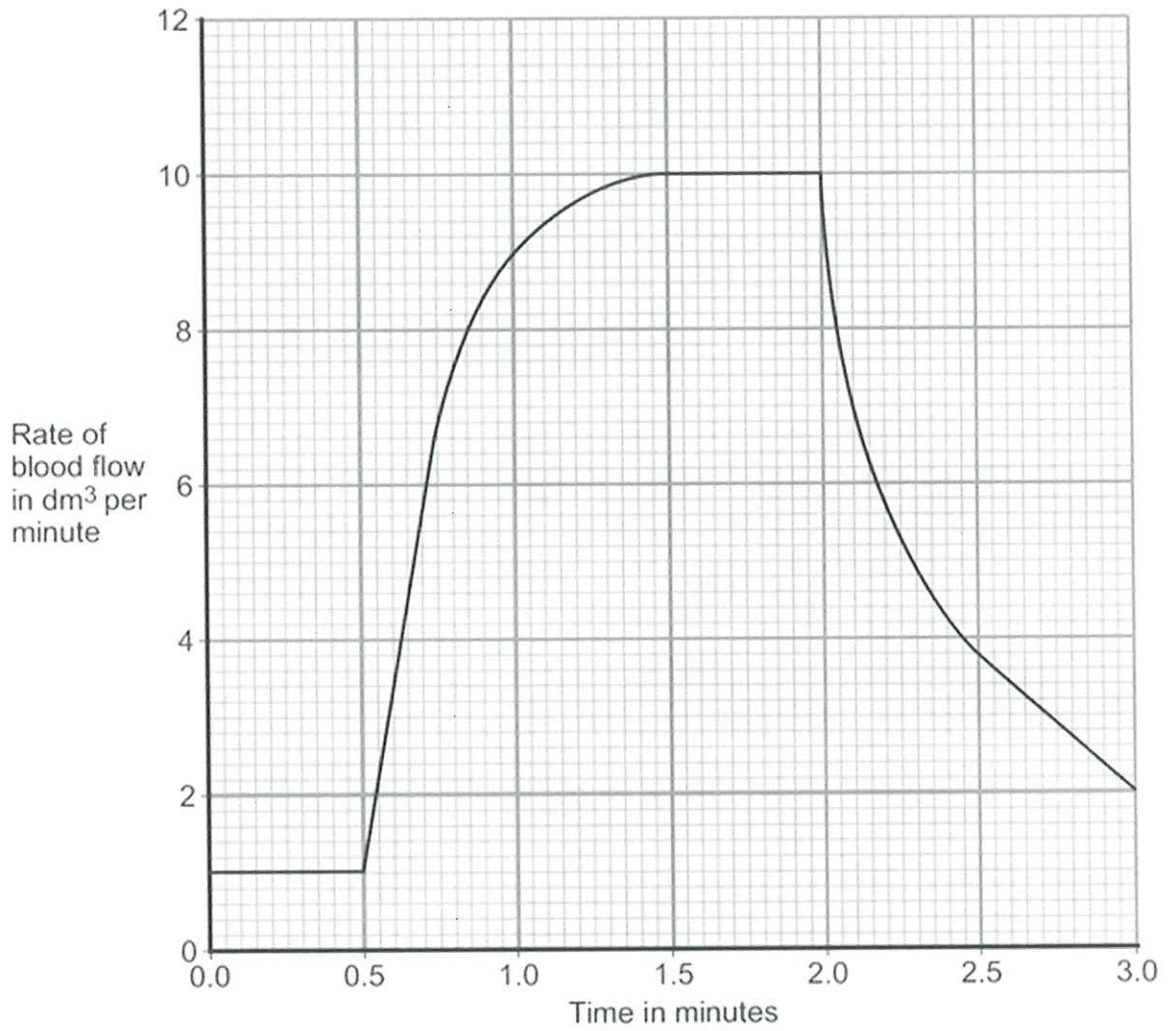


Q2. Figure 2 shows the effect of running on the rate of blood flow through the athlete's muscles.

Figure 2



(i) For how many minutes did the athlete run?

Time = _____ minutes

(1)

Q3. Scientists investigated the effect of pH on the activity of the enzyme catalase in a fungus.

The table below shows the scientists' results.

| pH | Enzyme activity in arbitrary units | | | | | |
|-----|------------------------------------|--------|--------|--------|--------|------|
| | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Mean |
| 3.0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4.0 | 6 | 5 | 8 | 4 | 7 | 6 |
| 5.0 | 38 | 65 | 41 | 42 | 39 | |
| 5.5 | 80 | 86 | 82 | 84 | 88 | 84 |
| 6.0 | 100 | 99 | 96 | 103 | 102 | 100 |
| 6.5 | 94 | 92 | 90 | 93 | 91 | 92 |
| 7.0 | 61 | 63 | 61 | 62 | 63 | 62 |
| 8.0 | 22 | 22 | 21 | 24 | 21 | 22 |

(i) Calculate the mean enzyme activity at pH 5.0.

Mean = _____ arbitrary units

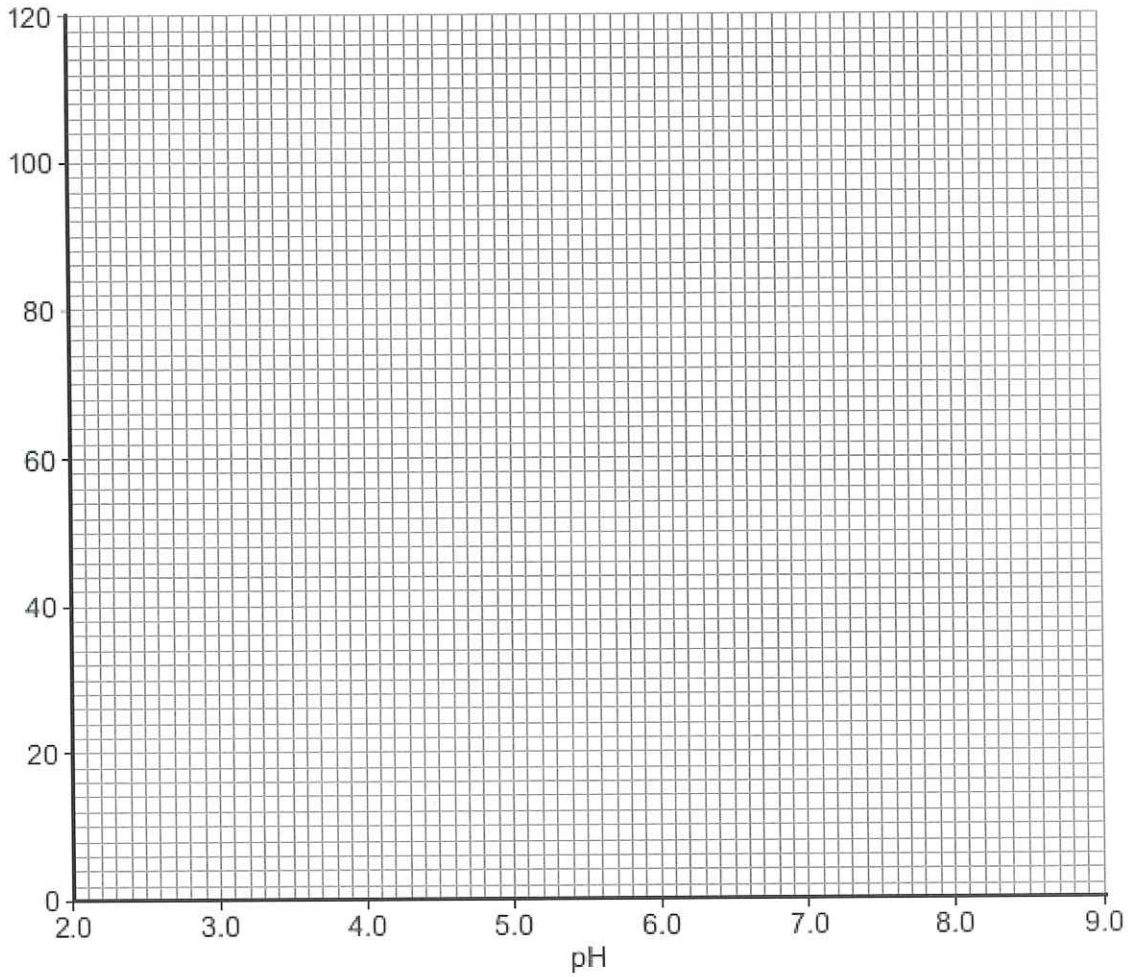
(2)

(ii) On the graph paper in **Figure 3**, draw a graph to show the scientists' results.

Remember to:

- add a label to the vertical axis
- plot the mean values of enzyme activity
- draw a line of best fit.

Figure 3



(4)

(iii) At what pH does the enzyme work best?

(1)

(iv) Predict the activity of the enzyme at pH 9.0.

_____ arbitrary units

(1)

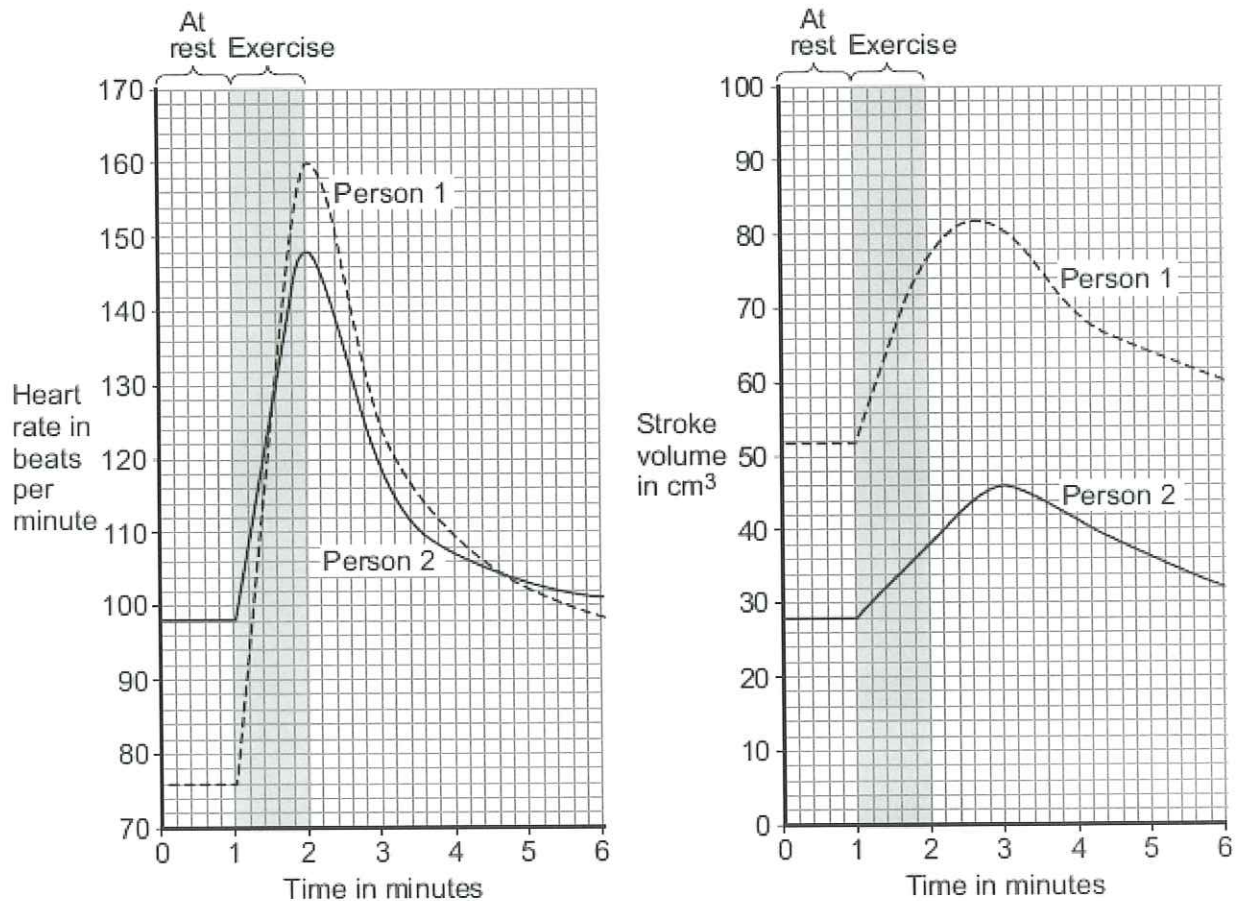
Q4.

During exercise, the heart beats faster and with greater force.

The 'heart rate' is the number of times the heart beats each minute. The volume of blood that travels out of the heart each time the heart beats is called the 'stroke volume'.

In an investigation, **Person 1** and **Person 2** ran as fast as they could for 1 minute. Scientists measured the heart rates and stroke volumes of **Person 1** and **Person 2** at rest, during the exercise and after the exercise.

The graph below shows the scientists' results.



- (a) The 'cardiac output' is the volume of blood sent from the heart to the muscles each minute.

$$\text{Cardiac output} = \text{Heart rate} \times \text{Stroke volume}$$

At the end of the exercise, **Person 1's** cardiac output = $160 \times 77 = 12\,320 \text{ cm}^3$ per minute.

Use information from the figure above to complete the following calculation of **Person 2's** cardiac output at the end of the exercise.

At the end of the exercise:

Person 2's heart rate = _____ beats per minute

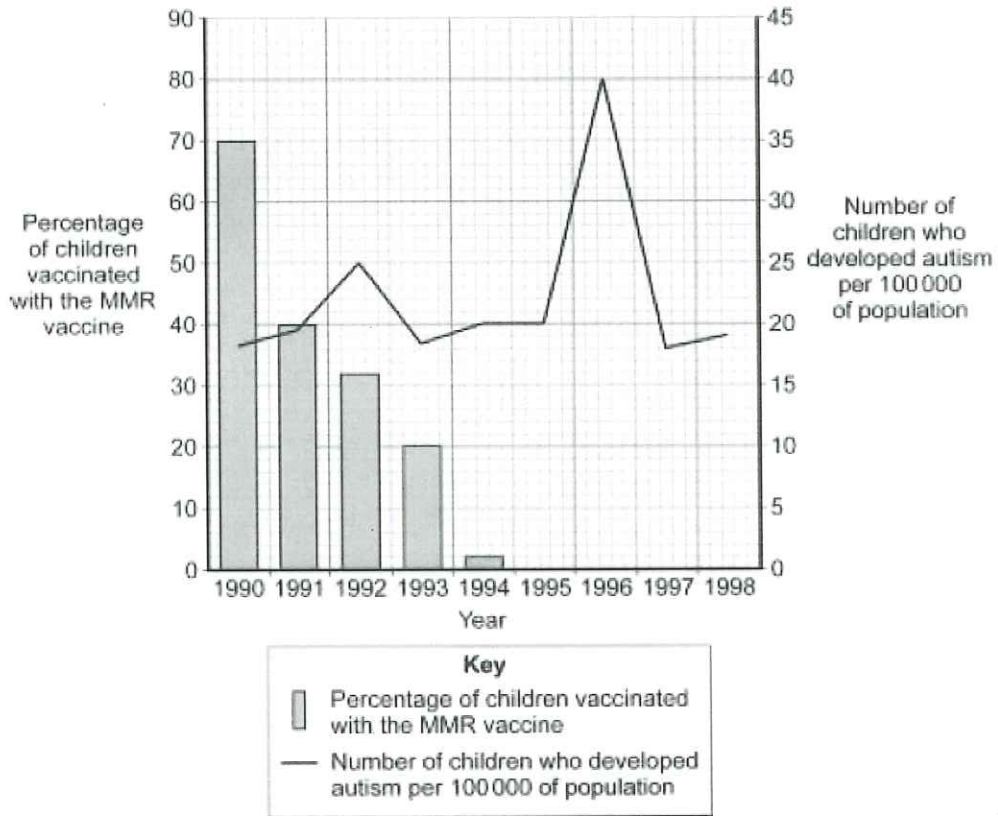
Person 2's stroke volume = _____ cm^3

Person 2's cardiac output = _____ cm^3 per minut

Q5. In the 1990s many people thought that the MMR vaccine caused autism in some children. This is why the Japanese government stopped using the MMR vaccine.

The graph gives information about the percentage of Japanese children who developed autism during the 1990s.

The data in the graph support the



view

that there is **no** link between MMR vaccination and autism.

Explain why.

(4)

Q6.

The table shows the results of using amylase to break down starch at different temperatures and the time it took.

| Temperature in °C | Time taken until there was no starch in the sample in minutes | | | |
|-------------------|---|--------|--------|------|
| | Test 1 | Test 2 | Test 3 | Mean |
| 15 | 6.1 | 9.4 | 10.0 | 8.5 |
| 20 | 4.8 | 5.0 | 4.6 | 4.8 |
| 25 | 3.0 | 2.5 | 3.0 | 3.2 |
| 30 | 1.5 | 2.0 | 2.0 | |

(a) One of the results in the table above is anomalous.

Draw a ring around the anomalous result.

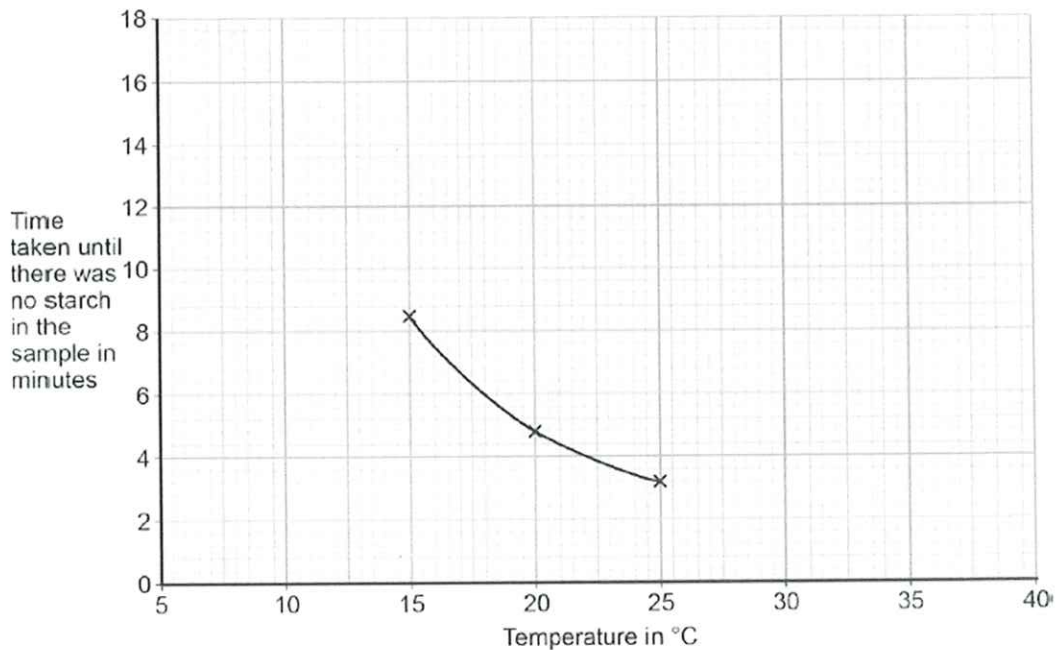
(1)

(b) Calculate the mean for 30 °C.

(1)

(c) **Figure 2** shows a graph of the student's results.

Figure 2



Use the graph to predict how long it would take to break down all of the starch at 10 °C.

Time = _____ minutes

Q7. Two students investigated the effect of caffeine concentration on reaction time.

This is the method used.

1. Student **A** drinks a cup of coffee.
2. Student **B** holds a ruler above Student **A**'s hand.
3. Student **B** drops the ruler.
4. Student **A** catches the ruler as quickly as she can.
5. The distance the ruler falls is recorded.

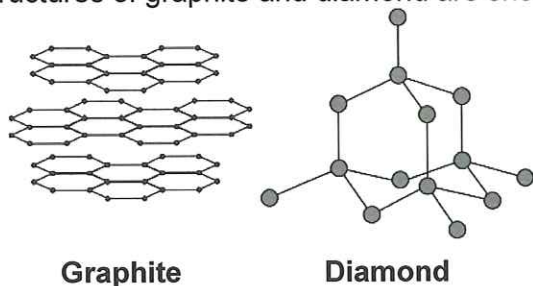
Suggest how this method could be improved to produce valid results.

(6)

CHEMISTRY QUESTIONS Q1.

Graphite and diamond are different forms of the element carbon.
Graphite and diamond have different properties.

The structures of graphite and diamond are shown below.



- (a) Graphite is softer than diamond.

Explain why.

(4)

- (b) Graphite conducts electricity, but diamond does not.

Explain why.

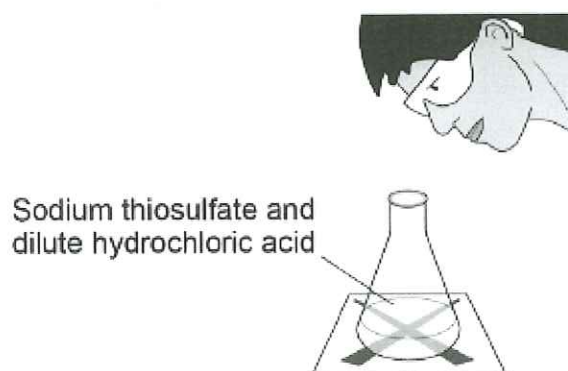
(3)

(Total 7 marks)

A student investigated the effect of concentration on the rate of the reaction between sodium thiosulfate and dilute hydrochloric acid.

Figure 1 shows the apparatus the student used.

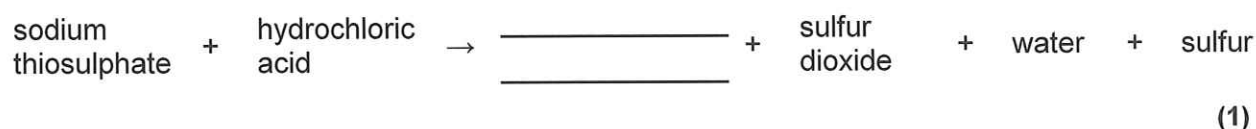
Figure 1



(a) The symbol equation for the reaction is:



Complete the word equation for the reaction.

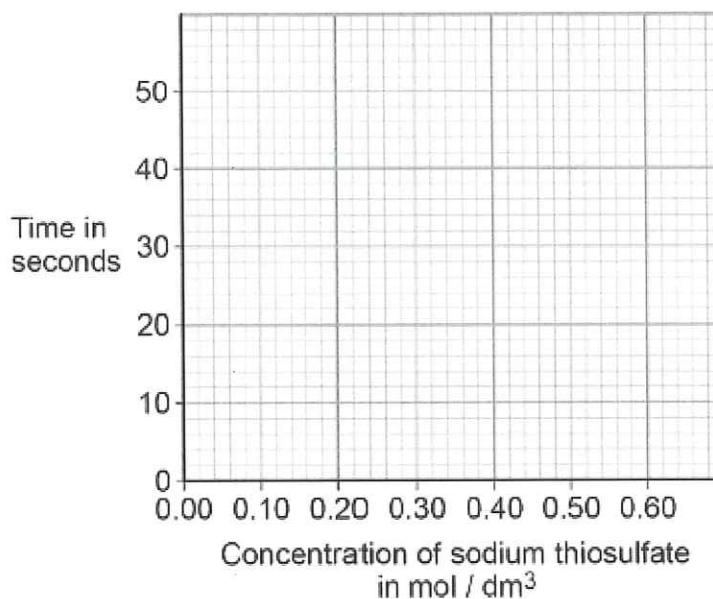


(b) The table shows the results.

| Concentration of sodium thiosulfate in mol/dm ³ | Time for student to no longer see the cross in seconds |
|--|--|
| 0.10 | 41 |
| 0.20 | 21 |
| 0.30 | 20 |
| 0.40 | 10 |
| 0.50 | 8 |

Plot the data from the table on **Figure 2**.

Draw a line of best fit. **Figure 2**



(3)

- (c) The student determined the time for a concentration of 0.15 mol/dm^3
 What is the concentration when the reaction is 20 seconds faster?
 You should show your working on **Figure 2**.

Concentration = _____ mol/dm^3

(2)

- (d) Estimate the time taken for the reaction when the concentration of sodium thiosulfate is 0.60 mol/dm^3

Time taken = _____ s

(1)(Total 7 marks)

Q4.

The three states of matter are solid, liquid and gas.

- (a) Lithium reacts with water to produce lithium hydroxide solution and hydrogen.

Use the correct state symbols from the box to complete the chemical equation.

| | | | |
|----|---|---|---|
| aq | g | l | s |
|----|---|---|---|



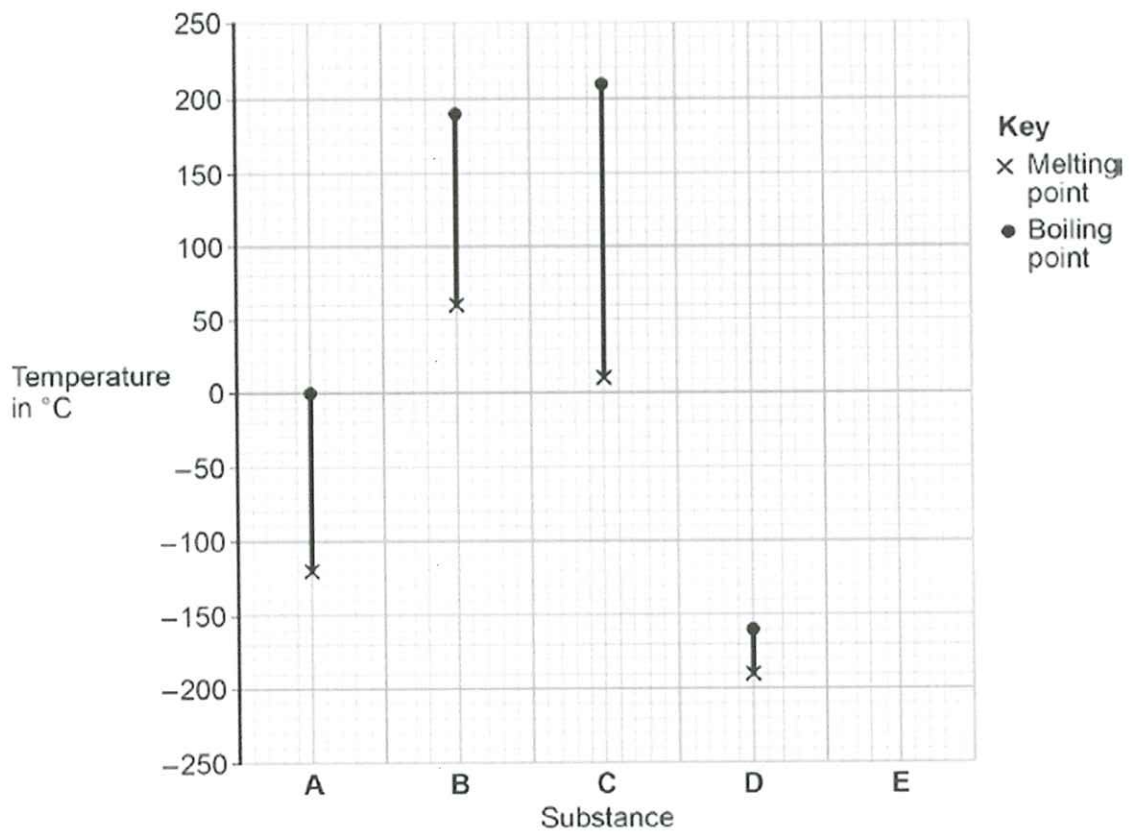
lithium + water \rightarrow lithium hydroxide + hydrogen

(2)

- (b) **Figure 1** shows the melting points and the boiling points of four substances, **A, B, C**

and D.

Figure 1



Which substance is liquid over the greatest temperature range?

Tick **one** box.

A

B

C

D

(1)

(c) Which **two** substances are gases at 50 °C? Tick **one** box.

A and B

B and C

C and D

A and D

(1)

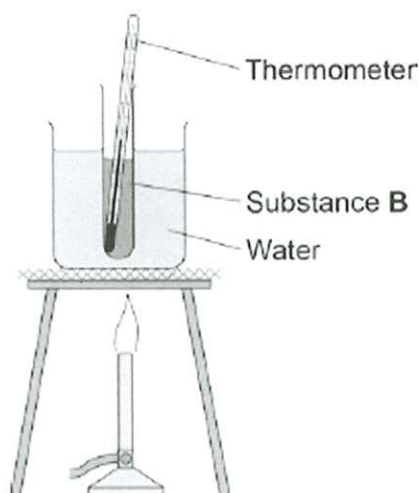
- (d) A different substance, **E**, has:
- a melting point of $-50\text{ }^{\circ}\text{C}$
 - a boiling point of $+120\text{ }^{\circ}\text{C}$

Plot these two values on **Figure 1**.

(2)

- (e) **Figure 2** shows the apparatus a student used to determine the melting point and the boiling point of substance **B** in **Figure 1**.

Figure 2



Explain why the student could not use this apparatus to determine the boiling point of substance **B**.

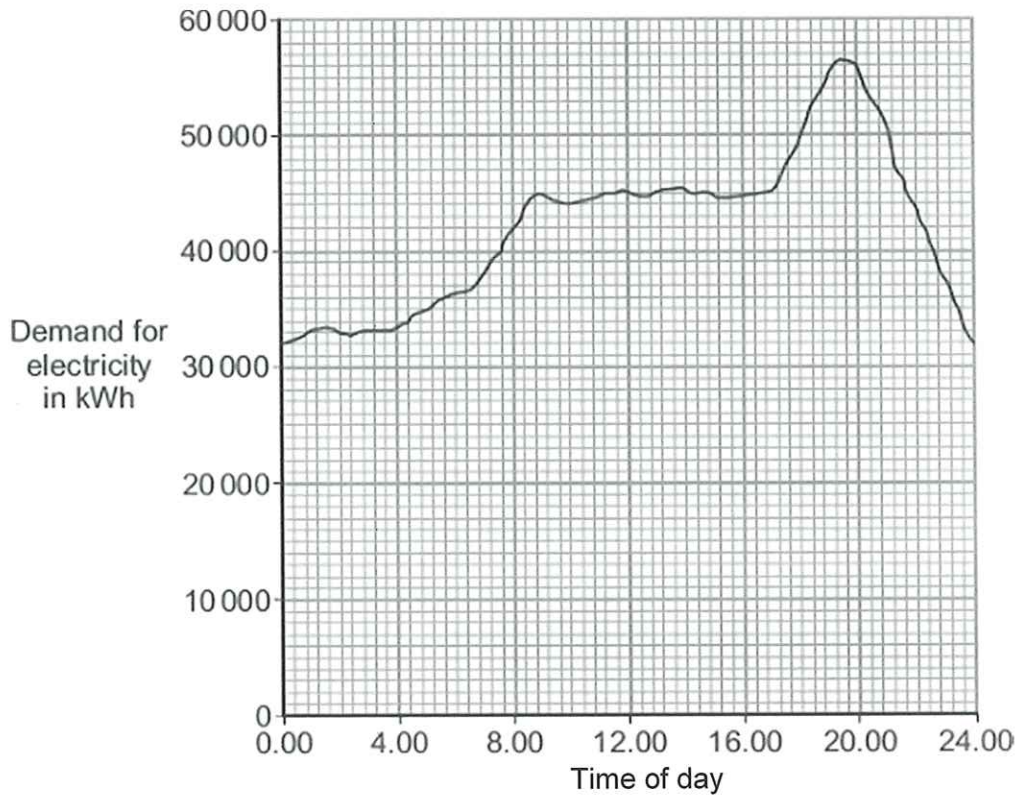
(2)

- (f) Suggest **one** reason why the student could not use this apparatus to determine the exact melting point of substance **B**.

(1)(Total 9 marks)

Physic Questions Q1.

- (a) The graph shows how the demand for electricity in the UK changes during one 24-hour period.



The table gives the start-up times for two types of power station.

| Type of power station | Start-up time |
|-----------------------|---------------|
| Gas | A few minutes |
| Nuclear | Several days |

How would these two types of power station be used to meet the demand for electricity during this 24-hour period?

(3)

- (b) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

A farmer plans to generate all the electricity needed on her farm, using either a biogas generator or a small wind turbine.

The biogas generator would burn methane gas. The methane gas would come from rotting the animal waste produced on the farm. When burnt, methane produces carbon dioxide.

The biogas generator would cost £18 000 to buy and install. The wind turbine would cost £25 000 to buy and install.

The average power output from the wind turbine would be the same as the continuous output from the biogas generator.

Evaluate the advantages and disadvantages of the two methods of generating electricity.

Conclude, with a reason, which system would be better for the farmer to buy and install.

(6)
(Total 9 marks)

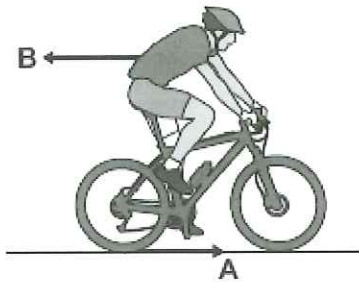
Q2.

- (a) **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

A householder wants to reduce her energy bills. She collected information about a number of ways of reducing energy used. The information is shown in the table.

- (a) **Figure 1** shows the horizontal forces acting on a moving bicycle and cyclist.

Figure 1



- (i) What causes force **A**?

Draw a ring around the correct answer.

friction

gravity

weight

(1)

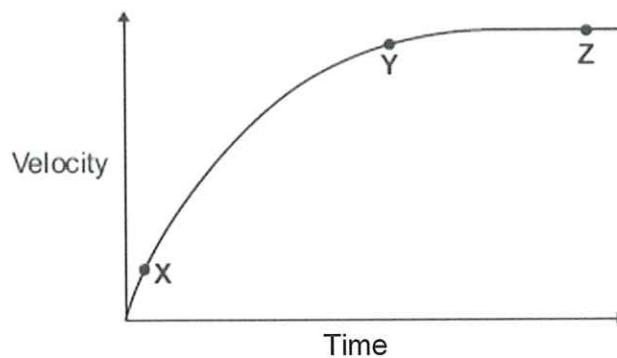
- (ii) What causes force **B**?

(1)

- (iii) **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Figure 2 shows how the velocity of the cyclist changes during the first part of a journey along a straight and level road. During this part of the journey the force applied by the cyclist to the bicycle pedals is constant.

Figure 2



Describe how **and** explain, in terms of the forces **A** and **B**, why the velocity of the cyclist changes:

- between the points **X** and **Y**
- and between the points **Y** and **Z**, marked on the graph in **Figure 2**.
