



CHELtenham COLLEGE

14+ Entrance Examination Paper 2018 - 2019

Science

Time allowed: 1 hour

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches it must be dark (HB or B). Coloured pens, pencils and highlighter pens must **not** be used.
- **Fill in your name at the bottom of this sheet.**
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
- *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- You are advised to split the time evenly between the Biology, Chemistry and Physics sections.
- Check your answers if you have time at the end.
- **You may use a calculator in this exam paper.**

Candidate's name: _____

Biology Section

1. Louise investigates how exercise affects her pulse rate. She runs around the school field as fast as she can. She then sits down and measures her pulse rate every minute for ten minutes.

The table shows her results.

Time after the exercise stops (mins)	Pulse rate (beats/min)
0	124
1	94
2	78
3	68
4	64
5	62
6	60
7	58
8	62
9	60
10	60

- a) What is Louise's resting pulse rate? (1 mark)

..... beats/min

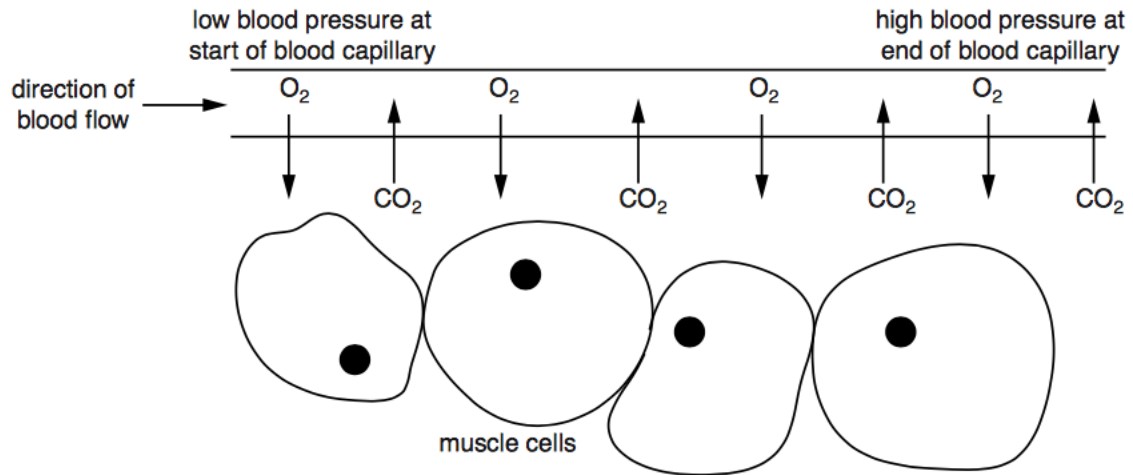
- b) What is Louise's recovery time? (1 mark)

.....minutes

- c) Explain why Louise's pulse rate decreases after exercise? (3 marks)

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2. A student draws a diagram to show the movement of oxygen and carbon dioxide between the blood in the capillaries and muscle cells



He says:

“This explains how oxygen passes from the blood to muscle cells and carbon dioxide passes from muscle cells to blood”

Evaluate his diagram and explanation and suggest how both could be improved. (5 marks)

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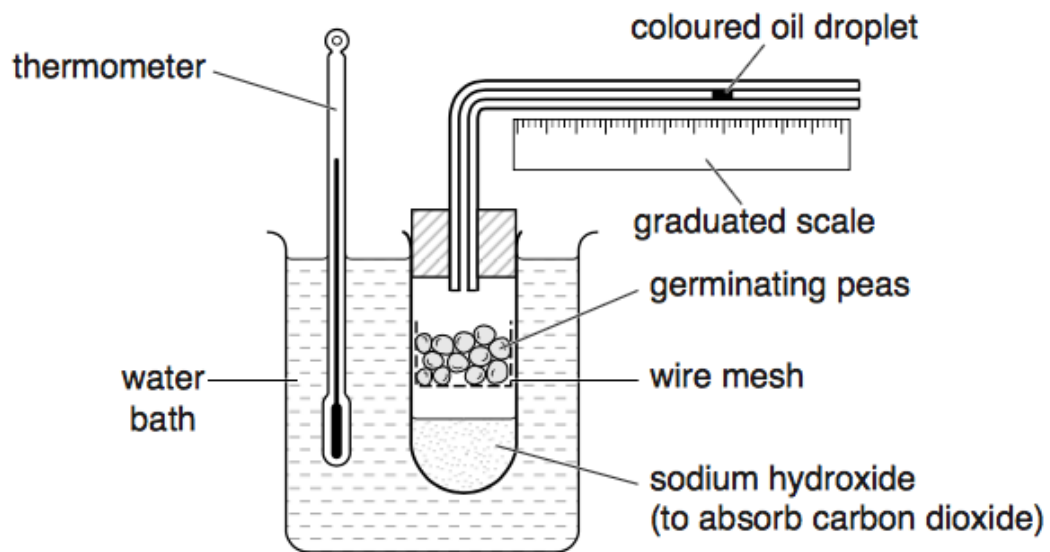
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3. This question is about respiration.

Look at the diagram of a respirometer.

It can be used to investigate the gases involved in aerobic respiration.



Review these tables.

The first table shows the respiratory quotient (RQ) of three food types.

Food Type	Respiratory Quotient - (RQ)
Carbohydrate	1.0
Fat	0.7
Protein	0.9

The second table shows the results from an experiment investigating aerobic respiration in two types of seed.

Type of seed	Volume of oxygen absorbed in cm ³	Volume of carbon dioxide produced in cm ³	Respiratory quotient (RQ)
Pea	0.6	0.6
Peanut	16.3	13.0

Respiratory quotient (RQ) is calculated using the formula:

$$\text{Respiratory Quotient} = \frac{\text{Volume of carbon dioxide produced}}{\text{Volume of oxygen used}}$$

- i) Calculate the RQ for the two types of seed and use your answers to suggest how the food type used is different for the two types of seed. (5 marks)

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The table below shows the concentration of glucose found in plants at different times of the day.

Time of day	6am	9am	Midday	3pm	6pm	Midnight
Concentration of glucose (mg per g)	2	6	18	12	2	2

- ii) Calculate the change in the concentration of glucose from 6am to midday. (1 marks)

..... mg

- iii) Describe the pattern shown in the change in glucose concentration from 6am to midnight. (2 marks)

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- iv) Describe the pattern shown and suggest reasons for why the concentration of glucose in the plant cells changes between: (2 marks)

a) Between 9am and midday:

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b) Between 3pm and 6pm:

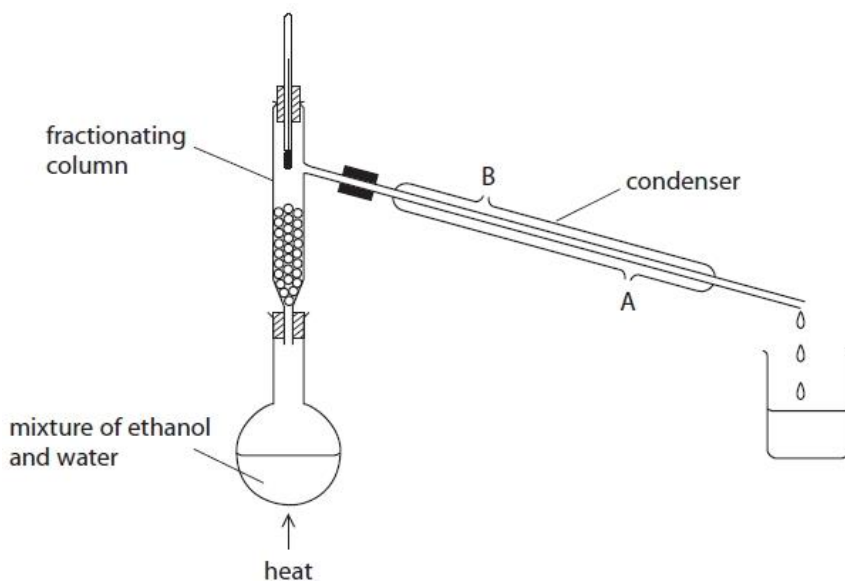
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End of Section – Please turn to next section

Chemistry Section

1. This apparatus is used to separate a mixture of ethanol (boiling point 78 °C) and water (boiling point 100 °C).



- a) What is the name of this method of separation? (1 mark)

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- b) Why can ethanol and water be separated by this method? (1 mark)

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- c) Suggest why it is best that water should enter the condenser at A rather than B. (1 mark)

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- d) Explain why the first liquid to be collected in the beaker is mostly ethanol (2 marks).

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2. This question is about the elements in Group 1 of the Periodic Table and their reactions with water.

a) State why sodium and potassium are in Group 1 of the Periodic Table. (1 mark)

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b) A reaction occurs when a small piece of sodium is added to a large volume of water in a trough.

Give **two** observations that you would make during this reaction. (2 marks)

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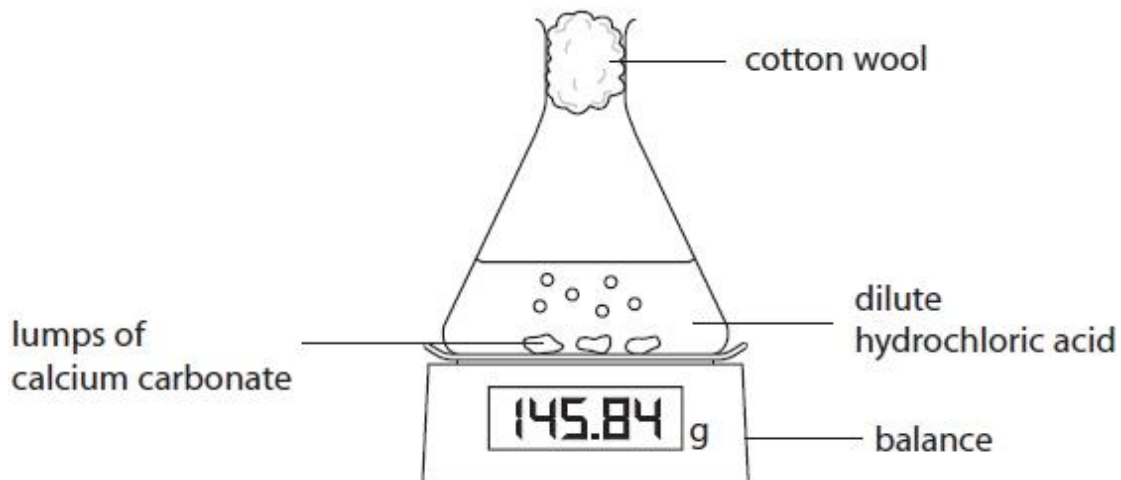
c) Explain why Lithium is less reactive than sodium. (2 marks)

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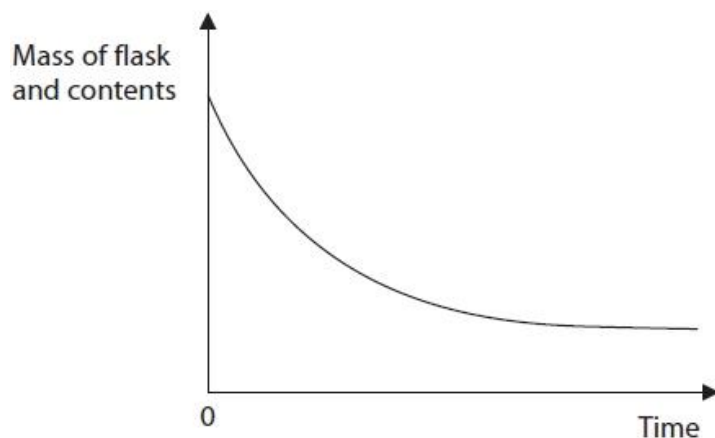
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3. The diagram shows the apparatus used to investigate the rate of reaction between calcium carbonate and an excess of dilute hydrochloric acid.



The mass of the flask and contents is measured at regular time intervals.

The graph shows the results obtained.



- a) What is the purpose of the cotton wool in the neck of the flask? (1 mark)

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- b) Explain why the mass of the flask and contents decreases with time. (1 mark)

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- c) Explain, using the particle collision theory, how the rate of reaction changes with an increase in concentration of hydrochloric acid. (2 marks)

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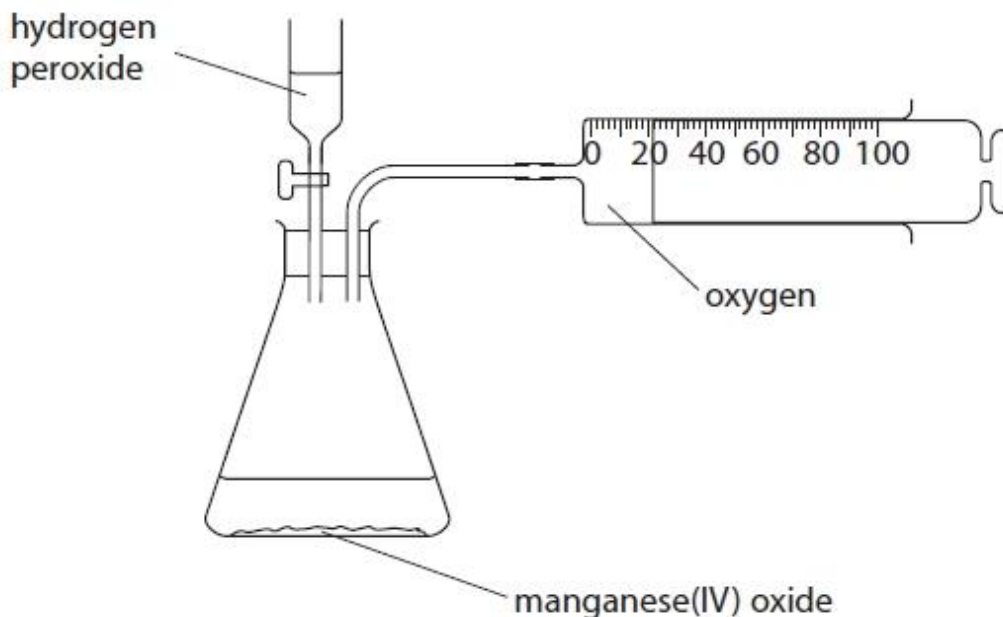
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4. The apparatus in the diagram is used to collect the oxygen produced by the decomposition of hydrogen peroxide, H_2O_2 . Water is also produced.



- a) Write a word equation for the decomposition of hydrogen peroxide. (1 mark)

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- b) Write a symbol equation for the decomposition of hydrogen peroxide. (1 mark)

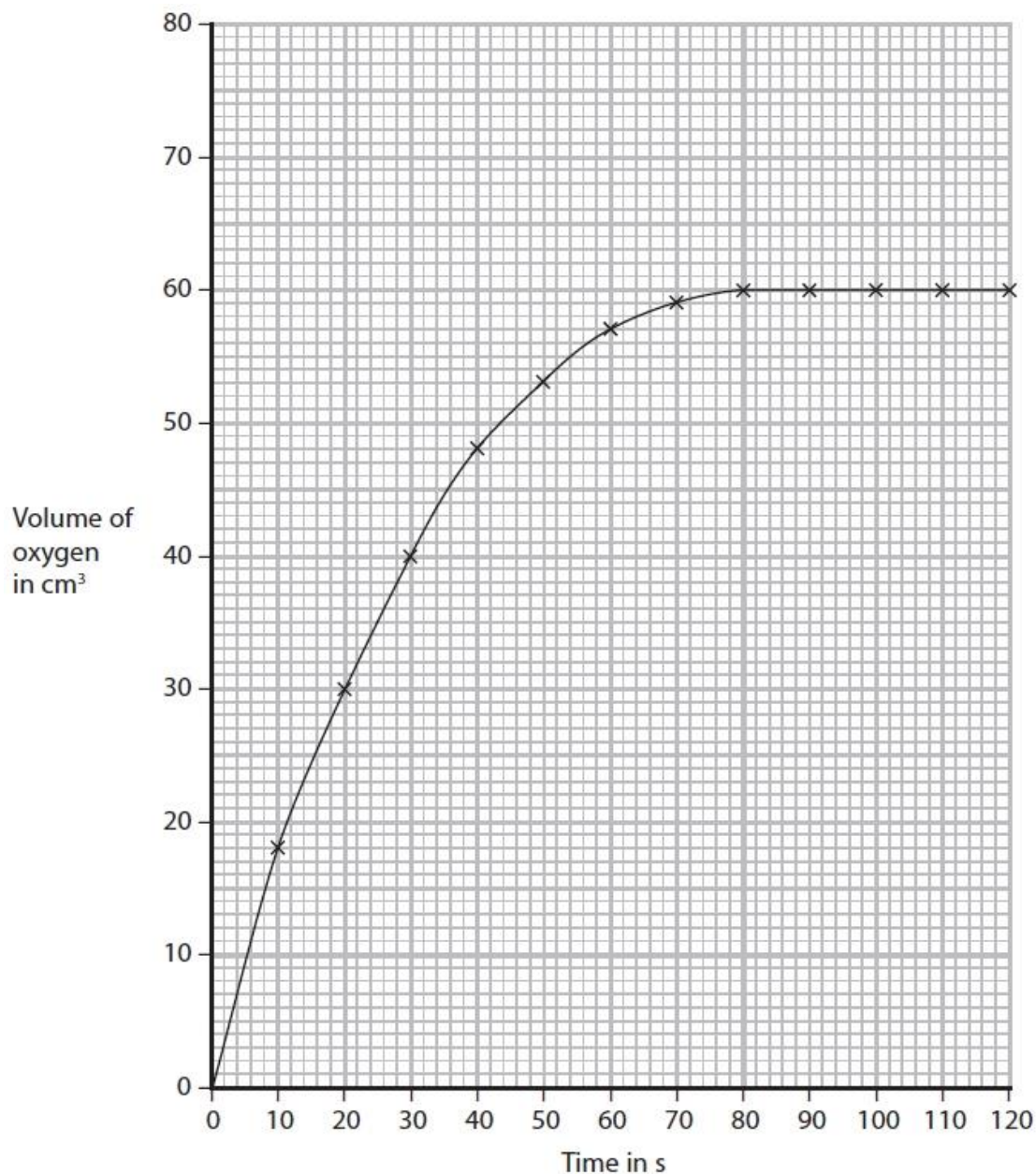
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- c) Manganese(IV) oxide is a catalyst for this reaction.

State and explain the effect of a catalyst on the rate of this reaction. (2 marks)

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- d) The graph shows the results from an experiment using a solution of hydrogen peroxide of concentration 0.50 Molar (M) at 25 °C.

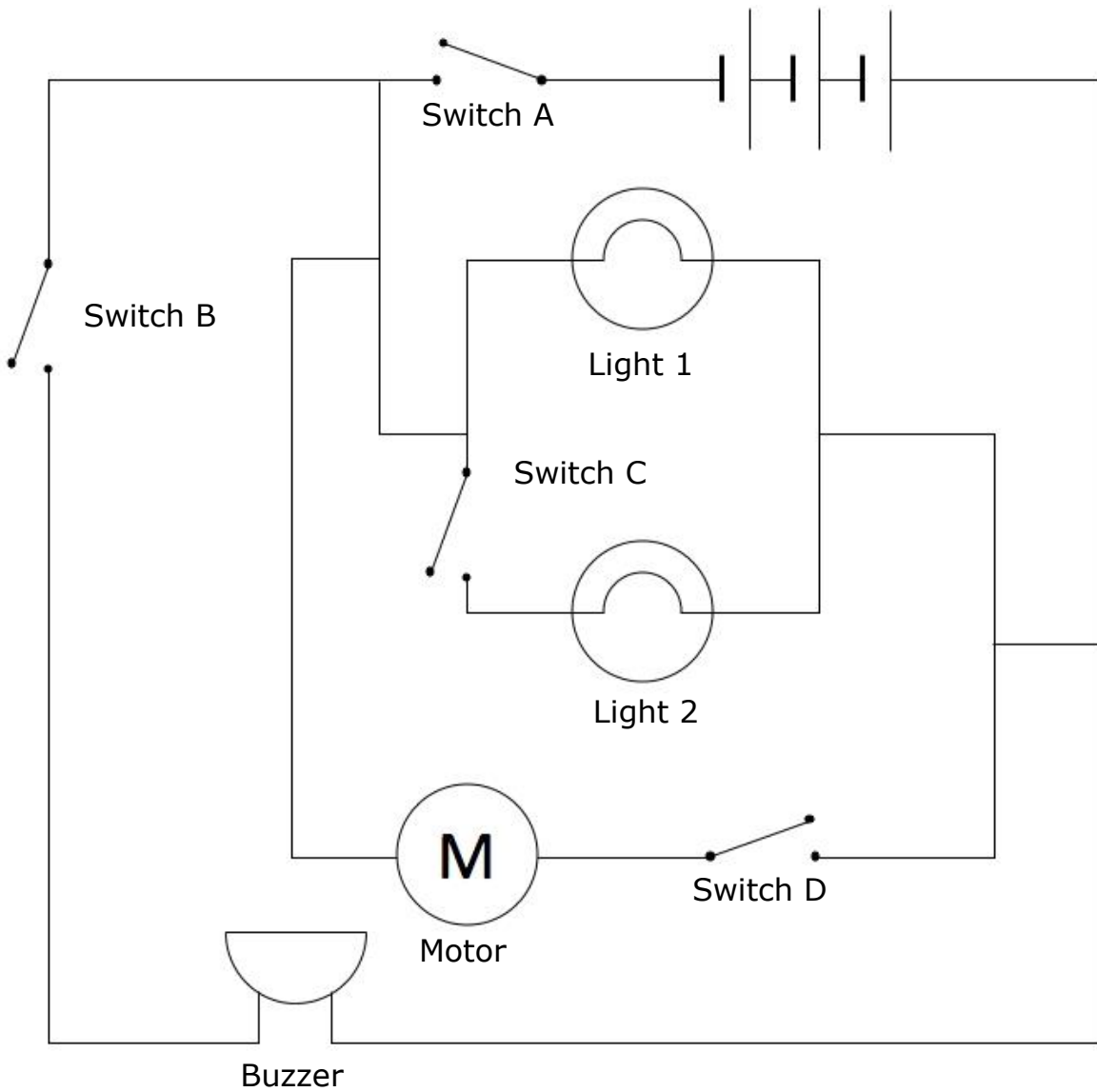


- (i) On the same axes, sketch the curve you would expect with the same volume of hydrogen peroxide solution with a concentration of 0.25 Molar (M) at 25 °C. Label this curve **A**. (1 mark)
- (ii) On the same axes, sketch the curve you would expect with the same volume of a 0.5 Molar (M) solution of hydrogen peroxide at 35 °C. Label this curve **B**. (1 mark)

End of Section – Please turn to next section

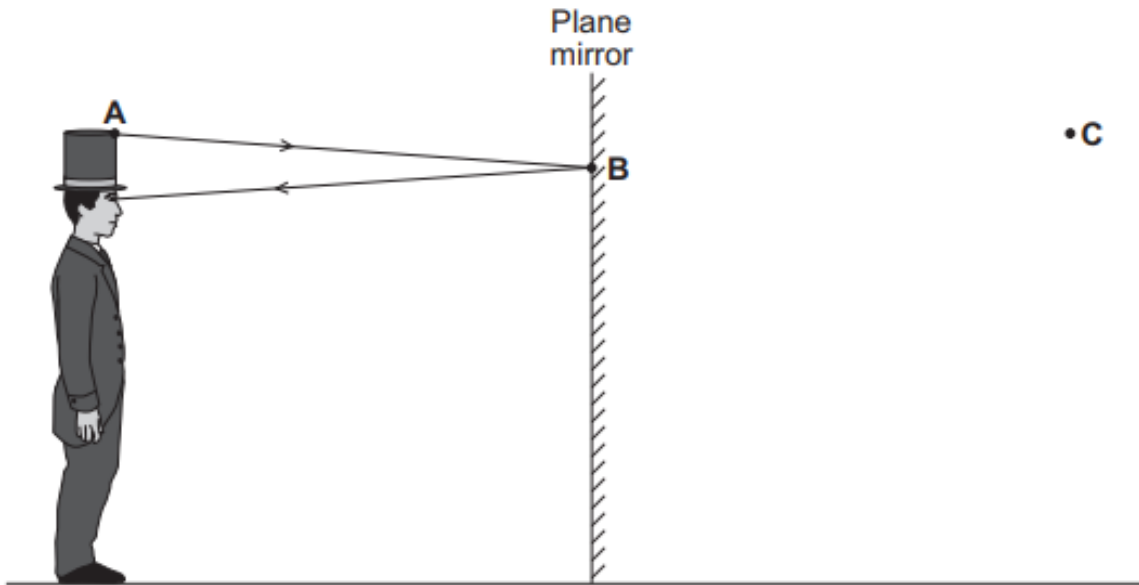
Physics Section

1. Study the following circuit diagram.



Which switches do you need to close to switch on: (4 marks)		
a.	Light 1 only	
b.	Light 1 AND light 2 only	
c.	Light 1 AND buzzer only	
d.	Light 1, light 2 and motor only	

A person can see an image of himself in a tall plane mirror.



The diagram shows how the person can see his hat

- a) Which point A, B or C shows the position of the image of his hat? (1 mark)

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- b) On the diagram use a ruler to draw a light ray to show how the person can see his shoe. (3 marks)

- c) Visible light is a part of the electromagnetic spectrum. Name another part of the spectrum. (1 mark)

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3. The water in a swimming pool has a mass of 7,000,000kg.

a) The density of water is $1,000\text{kg/m}^3$. What is the volume of water in the pool? (4 marks)

Volume

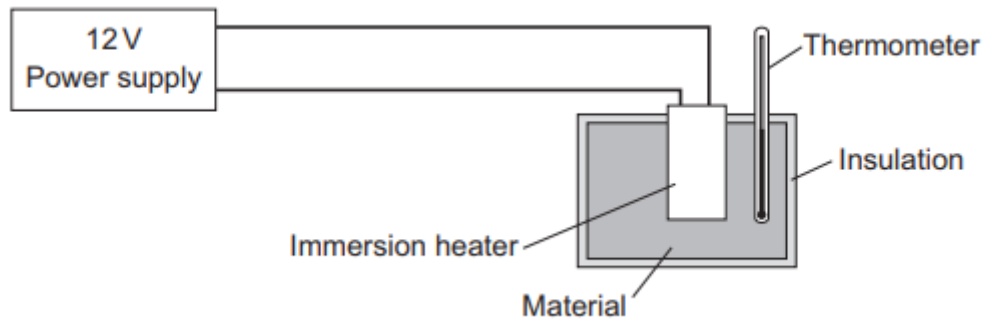
b) If the pool is 25m long and 14m wide, how deep is the pool? (2 marks)

Depth

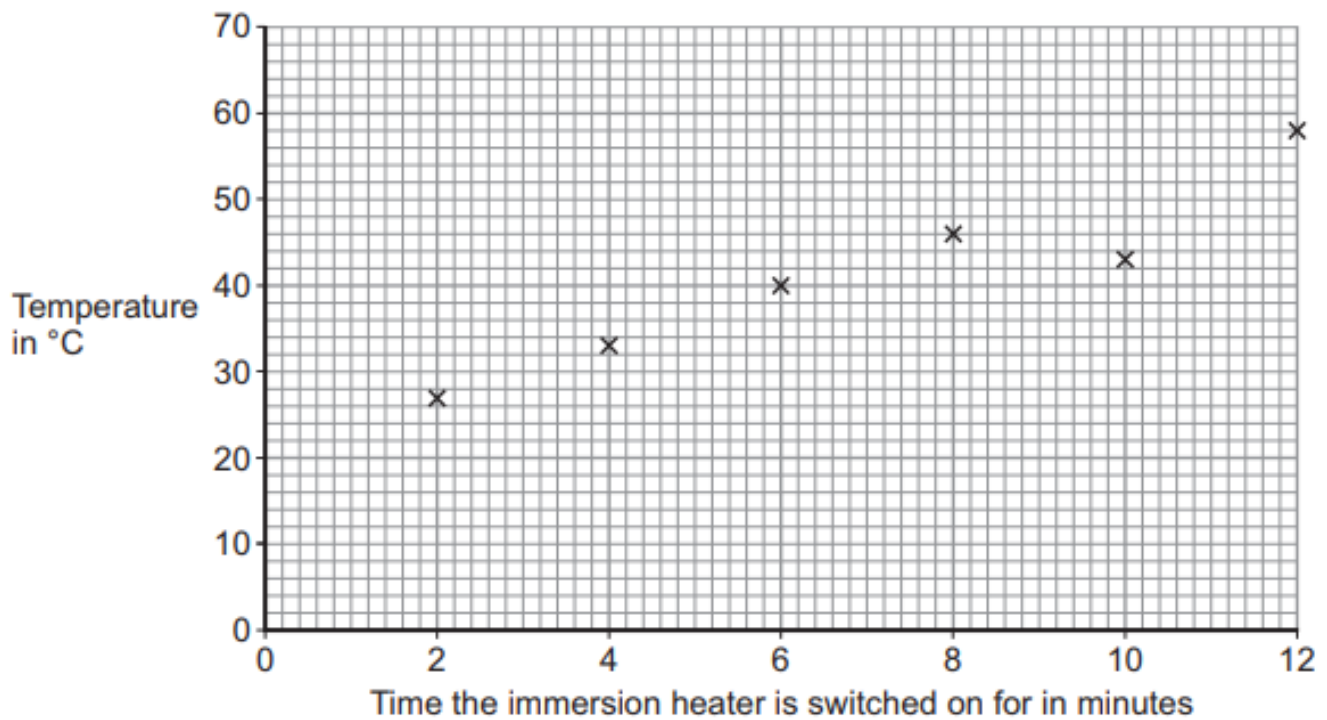
c) Comment on this answer. (1 mark)

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4. A student sets up the apparatus below.



The student turns on the power supply and measures the temperatures of the material at certain times. This information is plotted on this graph:



- Plot a straight line of best fit through the points. (1 mark)
- What was the temperature of the room? (1 mark)
- What is the gradient of your line of best fit? (You don't need to include a unit) (2 marks)

End of Examination