

# Eton College King's Scholarship Examination 2015

## SCIENCE 2 (Data Analysis)

(30 minutes)

*Candidate Number:* \_\_\_\_\_

*Write your candidate number, **not your name**, in the space provided above.*

*You should attempt **ALL** the questions. Write your answers in the spaces provided.  
Continue on a separate sheet of paper if you need more space to complete your answer to any question.*

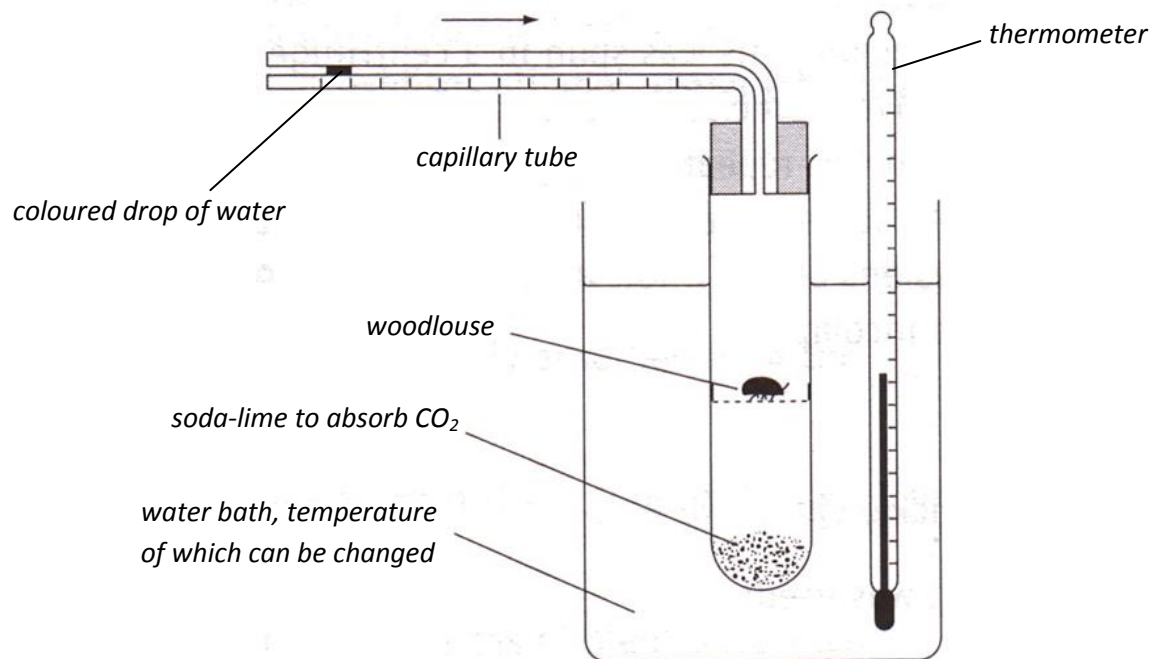
*The maximum mark for each question or part of a question is shown in square brackets.*

*In questions involving calculations, all your working must be shown.*

For examiners' use only.

<b>Total [30]</b>	
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1. A student carried out an investigation into the rate of respiration in a woodlouse. He used the apparatus shown below to measure oxygen uptake:



- (a) Explain why the coloured water moves towards the boiling tube.

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[3]

Table 1.1, below, shows the distance moved by the coloured water during one set of experiments, carried out at 20°C. The student only started recording the data ten minutes after setting up the equipment.

<i>Time (mins)</i>	<i>Distance moved (mm)</i>			<i>Mean distance moved (mm)</i>
0	0	0	0	
1	2	3	3	
2	5	6	7	
3	9	9	9	
4	11	12	11	
5	14	16	14	

**Table 1.1**

(b) Suggest why the student waited for ten minutes after setting up the apparatus before he began data collection.

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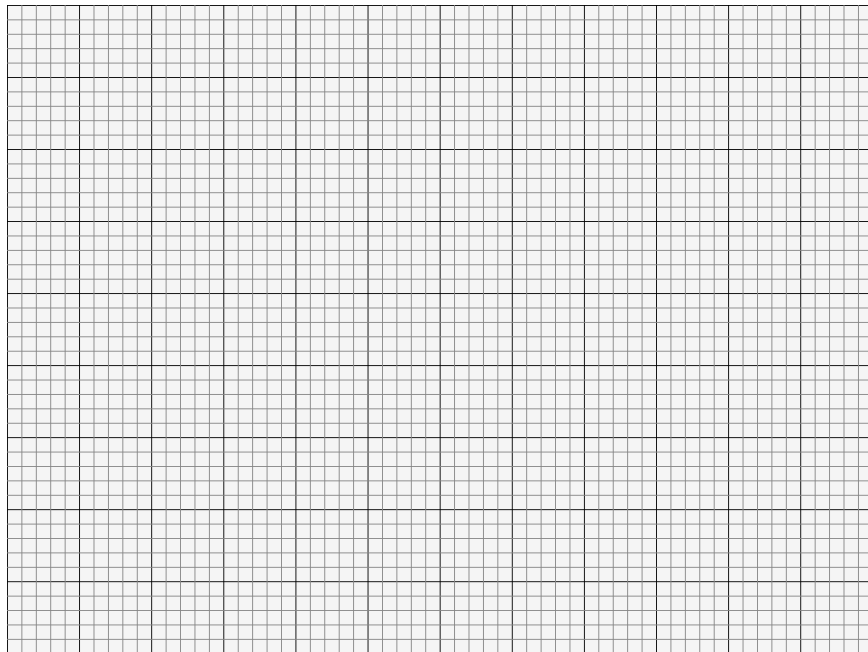
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[2]

(c) Calculate the mean values to an appropriate degree of precision and add them to table 1.1.

[2]

(d) Plot a suitable graph to show mean distance moved against time on the grid below.



[5]

(e) Calculate the rate of movement per hour, expressing your answer in appropriate units.

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[2]

(f) The bore of the capillary tubing had a diameter of 2.5mm. Using this information, and your answer to (e), calculate the rate of oxygen uptake per hour, expressing your answer in appropriate units.

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[2]

(g) Suggest an advantage of using narrow capillary tubing instead of standard (larger bore) glass tubing in the experiment.

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[2]

The student repeated the experiments at 30°C and then 40°C. His results are summarised in table 1.2, below.

<i>Temperature (°C)</i>	<i>Rate of oxygen uptake (mm<sup>3</sup>/hour)</i>
30	1252.0
40	1815.4

**Table 1.2**

(h) Calculate the percentage change in rate of oxygen uptake from 30°C to 40°C, showing your working.

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[2]

(i) Explain why the woodlouse took up oxygen faster at 40°C.

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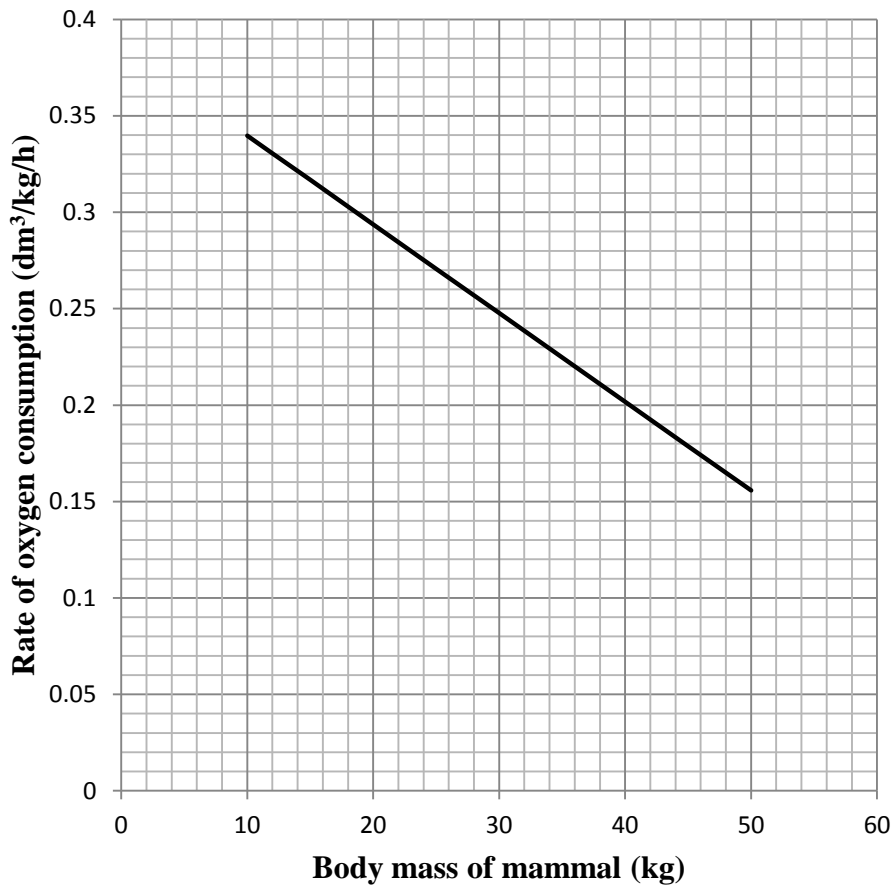
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[2]

In a different experiment a scientist used similar but more sophisticated equipment to determine the rate of oxygen uptake by a range of different mammals. Graph 1.1, below, shows the findings of his investigation.



**Graph 1.1**

(j) Describe the relationship seen in graph 1.1, and suggest explanations for the observed trend.

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[4]

(k) Add the missing values to table 1.3, below, using the information provided in graph 1.1.

<b>Animal</b>	<b>Body mass (kg)</b>	<b>Rate of oxygen consumption (dm<sup>3</sup>/kg/h)</b>
Cat	3	0.68
Dog	12	
Sheep	40	

**Table 1.3**

[1]

(l) Which mammal requires the most oxygen per day? State the volume of oxygen it uses in a day.

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[3]

**[End of paper]**