

SEVENOAKS SCHOOL



YEAR 9 (13+) SCHOLARSHIP

May 2024
for entry in September 2024

SCIENCE 2

Your Name: _____

Your School: _____

Time allowed: 1 hour

Equipment needed: Pen, pencil and ruler.
You may use an eraser and a calculator if needed.

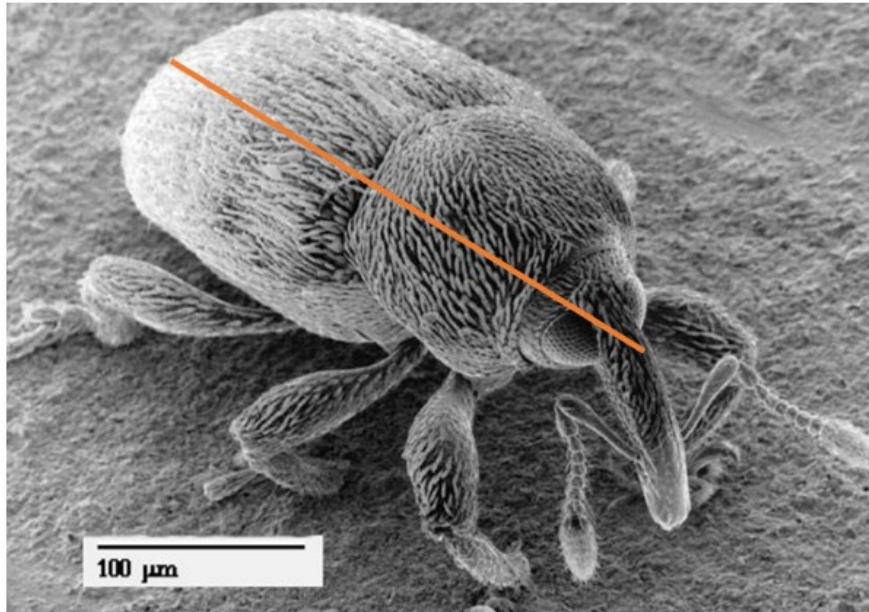
Information for candidates:

1. Write your name and school on this page.
2. Write all of your answers on the question papers in the space provided.
If you need additional paper then please ask the invigilator. Please put your name on the sheets of paper you use.
3. The marks for each question or part question are shown in square brackets [] after the question.
4. Answer **ALL QUESTIONS**.
5. The total mark for this paper is 45.

BIOLOGY

Question 1

The following picture is of a snout beetle viewed using an electron microscope.



- a. Calculate the actual size of the snout beetle using the orange line. Give your answer in μm . [1]

_____ μm

- b. Snout beetles are arthropods. Give one feature that is common to all arthropods. [1]

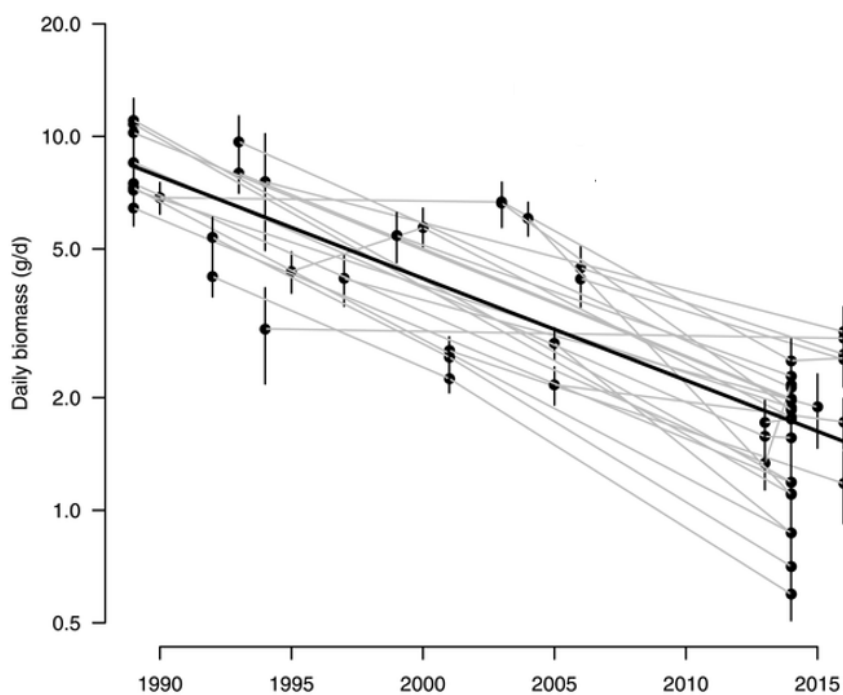
Question 3

A 27-year-long study in a German nature reserve was carried out using large insect traps called Malaise traps.



The traps were left in 63 different areas of the reserve during the spring, summer and early autumn and the total mass of the insects caught in each net was measured when they were emptied at regular intervals.

The following graph shows the data collected from the study:



c. Give two possible causes for the reduction in the mass of flying insects over this time period. [2]

- d. One possible effect of this trend could be a reduction in seed production by flowering plants. Explain why this might be the case? [2]

- e. What other consequences to wildlife or the environment might result from a reduction in the number of flying insects? [2]

- f. Mammals, such as humans, excrete urea in the form of urine, whereas insects excrete uric acid in the form of a white paste. This is because uric acid does not need to be dissolved in water for it to be removed from the body. Explain why this might be a beneficial adaptation for insects? [2]

Total for BIOLOGY: 15 marks

CHEMISTRY

Question 1

A student tested four unknown metals (the names are all imaginary) with different metal salt solutions. She put a tick (✓) if there was a reaction and a cross (✗) if there was no change. Some of her results are shown in the table.

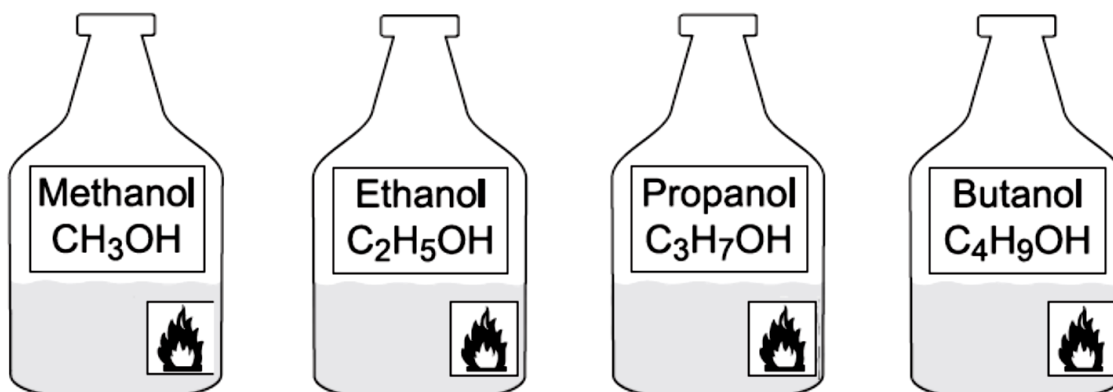
	Merconium Chloride solution	Supposium Chloride solution	Immodium Chloride solution	Brainium Chloride solution
Merconium	✗		✗	
Supposium	✓	✗	✓	✓
Immodium			✗	✗
Brainium				✗

- a. Complete the table. [3]
- b. Arrange the metals in an order of reactivity (most reactive first). [2]

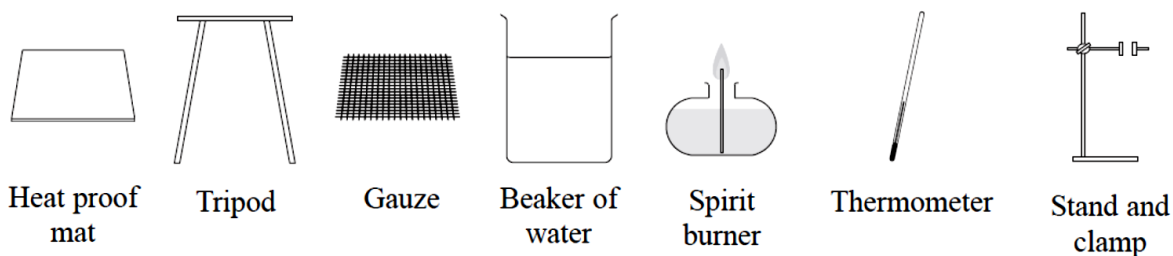
Question 2

Rohan wanted to carry out an investigation, on the combustion of alcohols. He wanted to find out if there is any relationship between the number of carbon atoms in the molecules of four alcohols, and the heat energy released when the alcohols are burned in air.

The alcohols available to Rohan were:



a. Here is the equipment available to Rohan:



i. In the space below, draw a diagram to show how Rohan should have assembled his equipment to carry out the task (some or all of the items may be required). [2]

ii. Here are four steps Rohan took to carry out the task – **BUT NOT IN ORDER**.

Step 1 – Measure the water temperature after the alcohol has burned for 20 seconds.

Step 2 – Weigh out 2 g of each alcohol, in turn, into the spirit burner.

Step 3 – Pour 100 cm³ water into the beaker, and set up as shown in the diagram.

Step 4 – Ignite each alcohol in turn, and allow it to burn for 20 seconds.

What is the **correct** order in which to carry out these four steps? [1]

iii. There is at least one step missing from Rohan's list. What else should Rohan have done before starting his tests? [1]

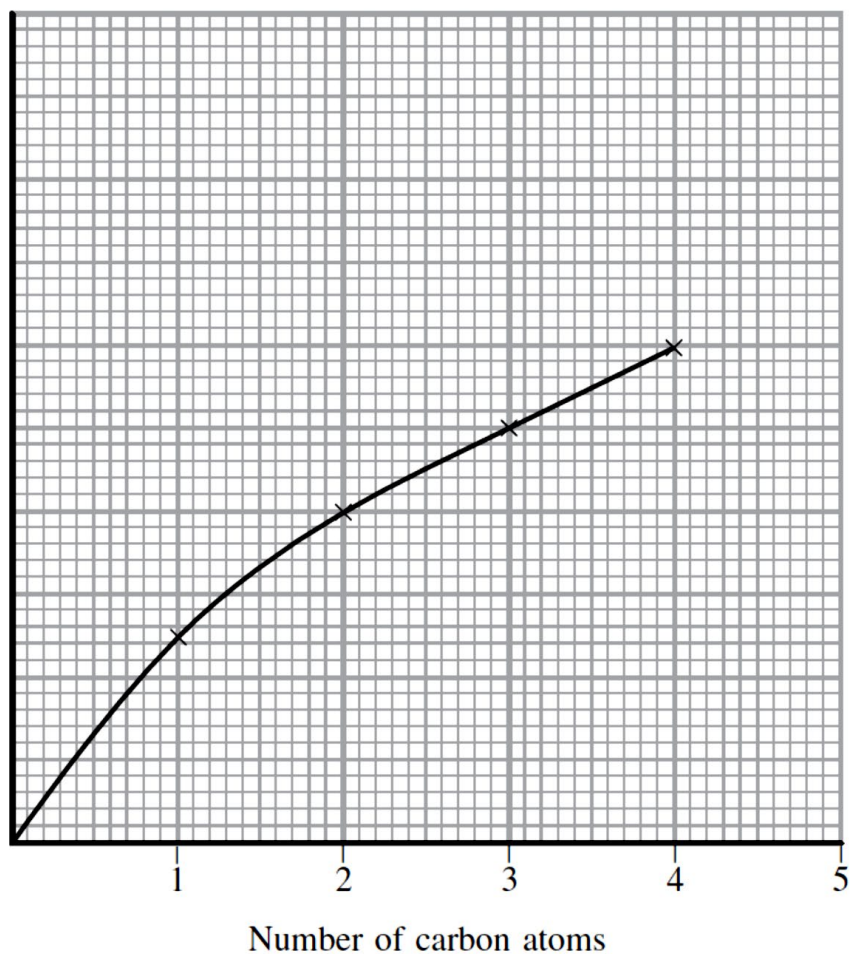
iv. Give **one** safety precaution Rohan should have taken to carry out the tests in a safe way. [1]

v. Suggest one thing Rohan should have done to make his experiment a fair test. [1]

vi. Suggest **one** change that could be made to the experiment to obtain more accurate results. [1]

b. The graph below shows Rohan's results.

Heat energy released in kJ/g



i. What conclusions can you draw from the shape of the graph? [2]

ii. Show on the graph how Rohan could predict the value for the heat energy released for an alcohol containing 5 carbon atoms. [1]

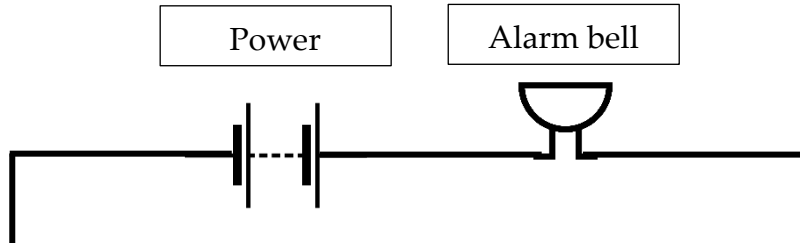
Total for CHEMISTRY: 15 marks

PHYSICS

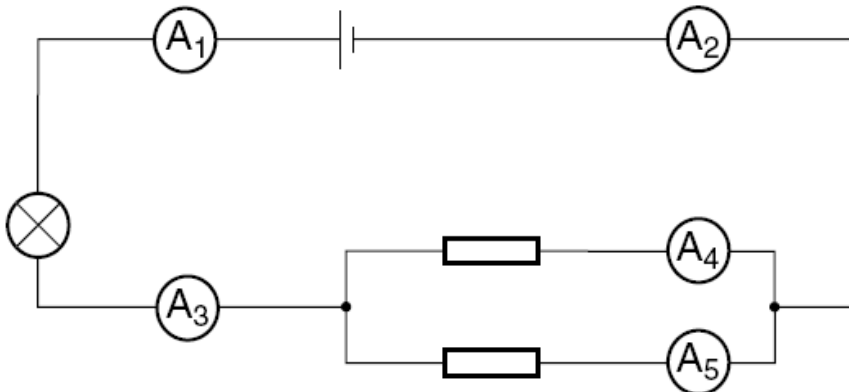
Question 1

The diagram below shows part of an electrical circuit for the burglar alarm of a house. The house has three external doors, each of which will press a switch if it is opened. There also needs to be a “master switch” to turn the alarm system on or off.

- a. Complete the diagram to show a possible alarm circuit for the house. (Remember to label each switch to say which one it is.) [5]



- b. The diagram below shows a circuit containing five ammeters (which measure electrical current). Ammeter A_3 reads 2.0 A and ammeter A_4 reads 1.5 A.



Give the readings on the other three ammeters. [3]

$A_1 =$ _____

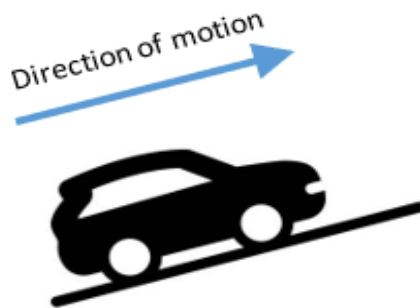
$A_2 =$ _____

$A_5 =$ _____

Question 2

An electric car is driving up a hill at constant speed, as shown in the diagram to the right.

- a. Draw and label the forces currently acting on the car. [4]



- b. Describe the energy transfers taking place (remember that the car is travelling **at constant speed**). [3]

Total for PHYSICS: 15 marks