Write your name here

Surname	Other names

13+ Scholarship Examination 2025

Subject: Science
Paper: Combined Science
Time: 1 Hour

You must have:
A ruler
A calculator

Total Marks
60

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name.
- Answer **all** questions.
- Answer the questions in the spaces provided
  - *there may be more space than you need.*
- Show all the steps in any calculations and state the units.

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.
- Write your answers neatly and in good English (languages please change this).
- Try to answer every question.
- Check your answers if you have time at the end.

Section 1 : 20 Marks Answer All Questions

Q1.

The apparatus for a simple distillation is shown in Figure 1.

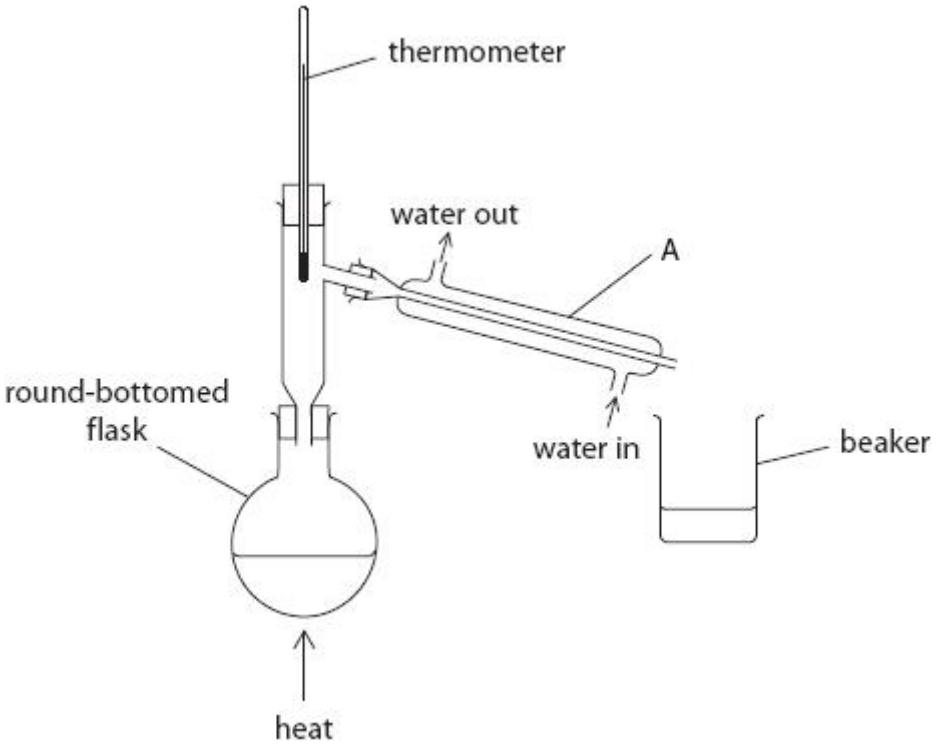

Figure 1

(i) Use words from the box to complete the sentences.

You may use each word once, more than once, or not at all.

condensation	distillate	evaporation
gas	residue	solid

(3)

Simple distillation is used to separate a liquid from a ..... .

In the apparatus labelled A, vapour is cooled to form liquid.

This process is called ..... .

The liquid collected in the beaker is known as the ..... .

(ii) Pure water collects in the beaker.

Explain how the apparatus will show that the liquid collected is pure water.

(2)

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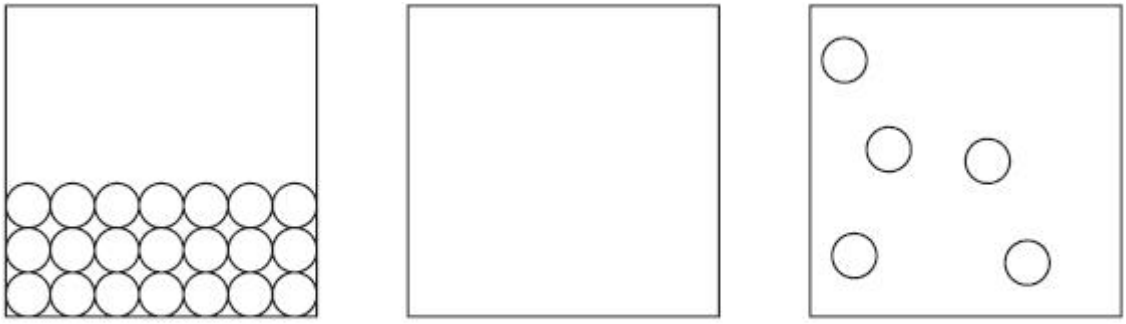
(Total for question = 5 marks)

Q2.

This question is about the three states of matter, solid, liquid and gas.

(a) The diagram shows how particles of a substance are arranged in two of these states.



solid liquid gas

(i) Complete the diagram to show how particles are arranged in the liquid state.

(1)

(ii) Identify the state of matter that contains particles with the least energy.

(1)

.....

(b) The table shows two changes of state.

Complete the table by giving the name of each change of state.

(2)

Change of state	Name
solid to liquid	
solid to gas	

(c) Explain why hot water evaporates more quickly than cold water.

(2)

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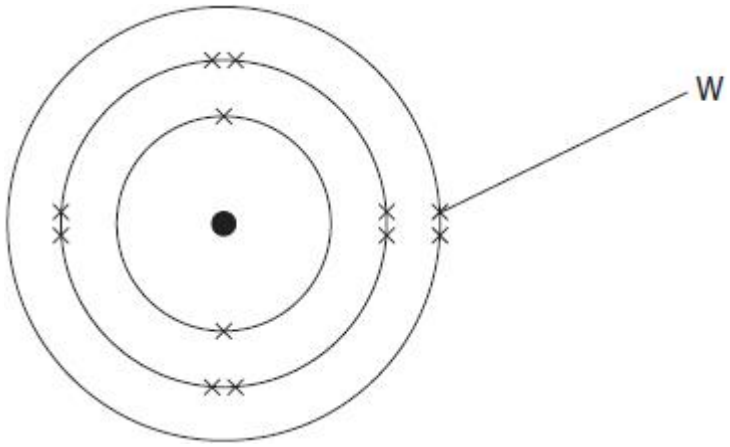
(Total for question = 6 marks)

Q3.

(a) The diagram represents an atom of an element.



(i) What is the particle labelled W?

(1)

- ☐ **A** electron
- ☐ **B** neutron
- ☐ **C** nucleus
- ☐ **D** proton

(ii) An atom of this element contains 13 neutrons.
What is the mass number of this element?

(1)

- ☐ **A** 12
- ☐ **B** 13
- ☐ **C** 25
- ☐ **D** 49

(iii) State why atoms have no overall charge.

(2)

.....

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.....

(iv) What is the charge on the ion usually formed from this element?

(1)

- ☐ **A** 1+
- ☐ **B** 2+
- ☐ **C** 1-
- ☐ **D** 2-

(b) There are two isotopes of the element lithium.

$^{6}_{3}Li$ $^{7}_{3}Li$

(i) State why both isotopes react in the same way.

(1)

.....

.....

.....

.....

(ii) A sample of lithium contains 7.60% $^{6}_{3}Li$ and 92.4% $^{7}_{3}Li$

Calculate the relative atomic mass, A_r , of this sample of lithium.
Give your answer to two decimal places.

(3)

A_r= .....

(Total for question = 9 marks)

Section 2: 20 Marks. Answer All Questions

Q1

(a) Although plants and animals have many different features, they also have some features in common.

The table lists some features.

In each box, place a tick (✓) if the feature is present or a cross (×) if the feature is absent. One has been done for you.

(4)

Feature	Plants	Animals
can move from place to place	×	✓
can carry out photosynthesis		
are multicellular		
have cells with cell walls		
store carbohydrate as glycogen		

(b) Organisms that cause disease are known as pathogens.

Give **two** groups of organisms that include pathogens.

(2)

.....

.....

(Total for Question 1 = 6 marks)

(Total for Question = 6 marks)

Q2.

(a) The table shows some of the levels of organisation within an organism.

Complete the table by inserting a tick (✓) to show the level of organisation of each example. The first one has been done for you.

(4)

	Level of organisation		
Example	**Organelle**	**Organ**	**System**
nucleus	✓		
circulation			
chloroplast			
leaf			
bulb			

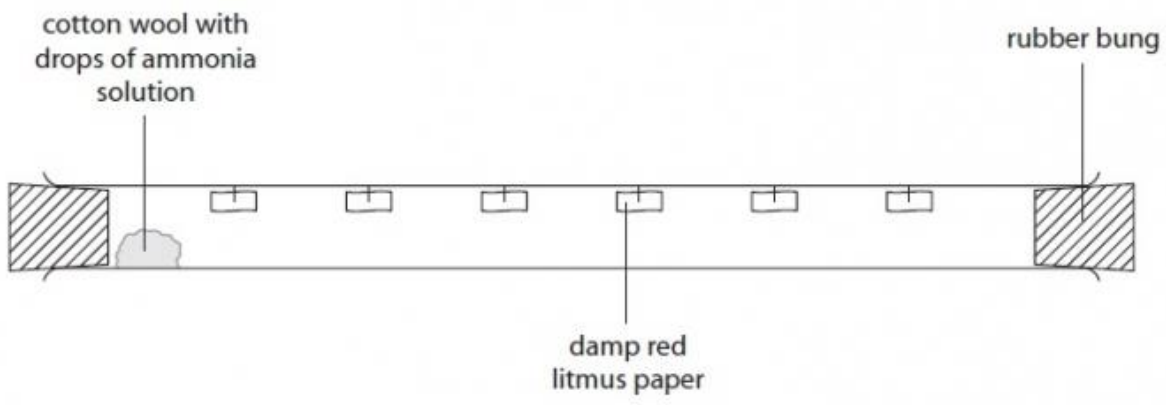
(b) Place the following human structures in order of size from the smallest to the largest.

(Total for question = 4 marks)

Q4.

Lily investigated the effect of concentration of a substance on the rate of diffusion.
In a fume cupboard she set up a glass tube with small squares of damp red litmus paper spaced at 4 cm intervals along its length.
She added 1 drop of ammonia solution to some cotton wool and used tweezers to place the cotton wool at one end of the tube. She closed the tube with a bung. She timed how long it took for each square of litmus paper to change colour.

She then set up an identical tube and repeated the experiment, but this time she used 3 drops of ammonia solution.

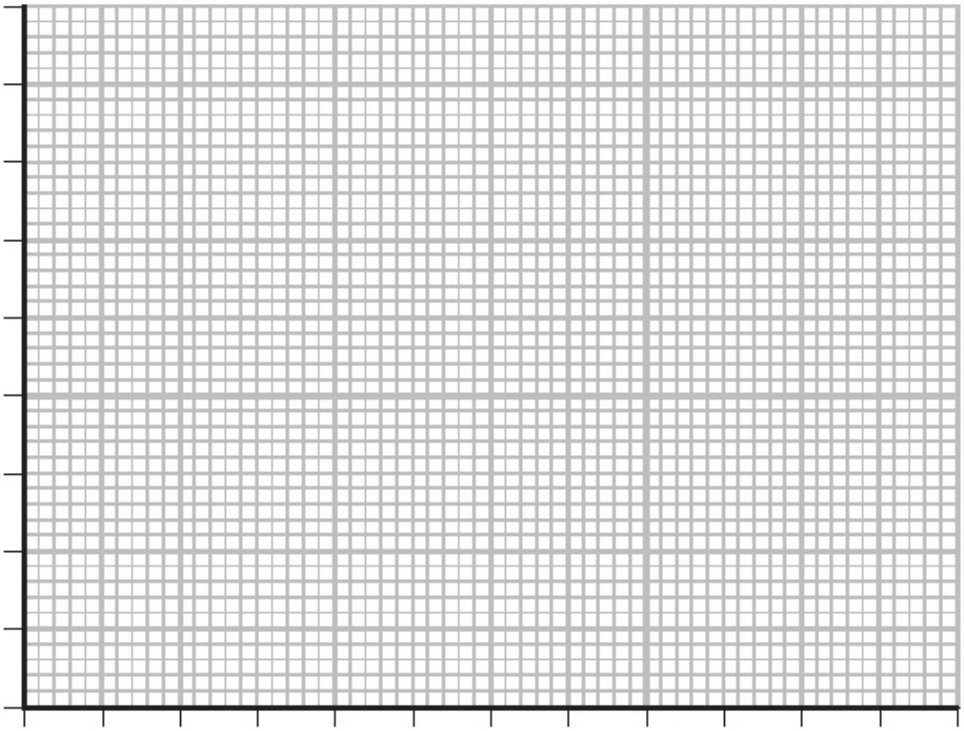


Her results are shown in the table.

Number of drops of ammonia solution	Time taken for litmus paper to change colour in seconds					
	4 cm	8 cm	12 cm	16 cm	20 cm	24 cm
1	7	13	19	26	32	37
3	3	7	10	13	16	20

(a) Plot these results on the grid. Use straight lines to join the points.

(6)



(a) Describe the results shown by the graph. **(2)**

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(d) Calculate the average rate of diffusion, in centimetres per second of ammonia, from the 3 drops of ammonia solution between the litmus papers at 4 cm and 24 cm. Show your working.

(2)

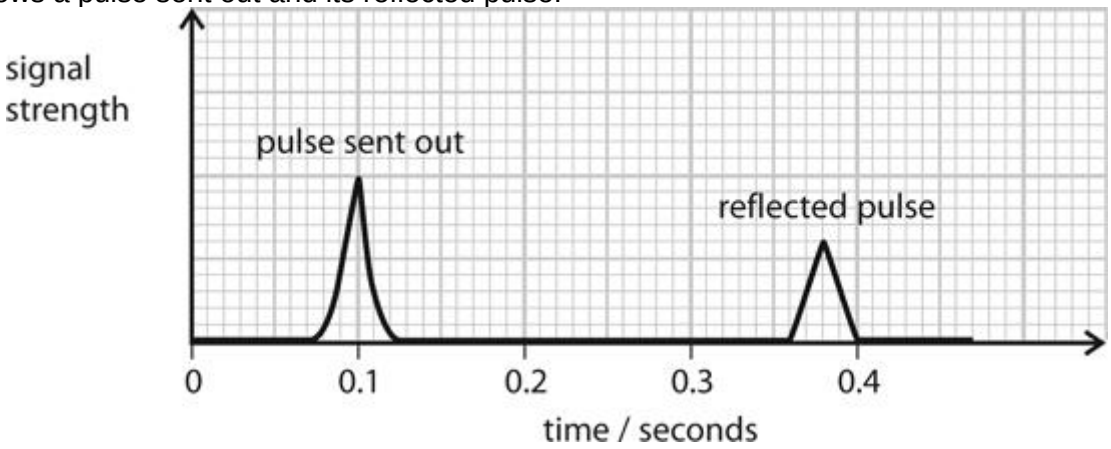
Answer ..... cm/s

Section 3: 20 Marks. Answer All Questions

Q1.

This fishing boat has sonar equipment.

The boat's sonar sends out pulses of ultrasound.
The pulses are reflected from the seabed.
The boat's sonar detects the reflected pulses.
The graph shows a pulse sent out and its reflected pulse.



(i) How long did the pulse take to travel to the seabed and then back to the boat?

(1)

time = ... s

(ii) The speed of ultrasound in water is 1500 m/s.
Calculate the depth of the sea under the boat.

(3)

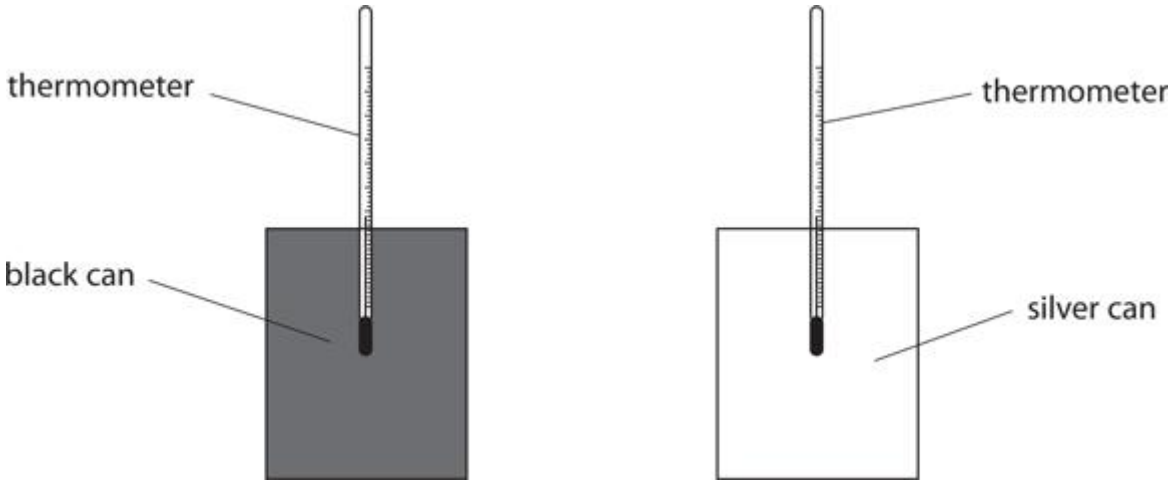
distance = speed × time

depth = ... m

Q2.

Some students investigate the cooling of different coloured cans.

They use two cans each fitted with a thermometer.



Hot water is poured into the cans and the temperature of the water in each can is measured every two minutes.

The students want to find out if a black can cools quicker than a silver can.

Which row of the table shows the conditions they should use?

Put a cross (☒) in the box next to your answer.

(1)

	the volume of water in each can should be	the size of cans should be
☒ **A**	the same	the same
☒ **B**	the same	different
☒ **C**	different	the same
☒ **D**	different	different

Q3.
The dwarf planet Pluto was discovered in the Solar System.

The table shows a timeline for this.

year	event
1905	an astronomer begins to search for Pluto
1915	an astronomer takes a photograph which includes Pluto, but he does not notice Pluto
1930	an astronomer takes two photographs at different times and notices Pluto because it has moved
2006	astronomers decide that Pluto is not really big enough to be a planet

(i) When was Pluto discovered?
Put a cross (☒) in the box next to your answer.

(1)

☒ **A** before 1905
☒ **B** 1905
☒ **C** 1930
☒ **D** 2006

(ii) The astronomers photographed Pluto using light waves.

energy	information	mass	matter	sound

Use words from the box to complete the sentence.

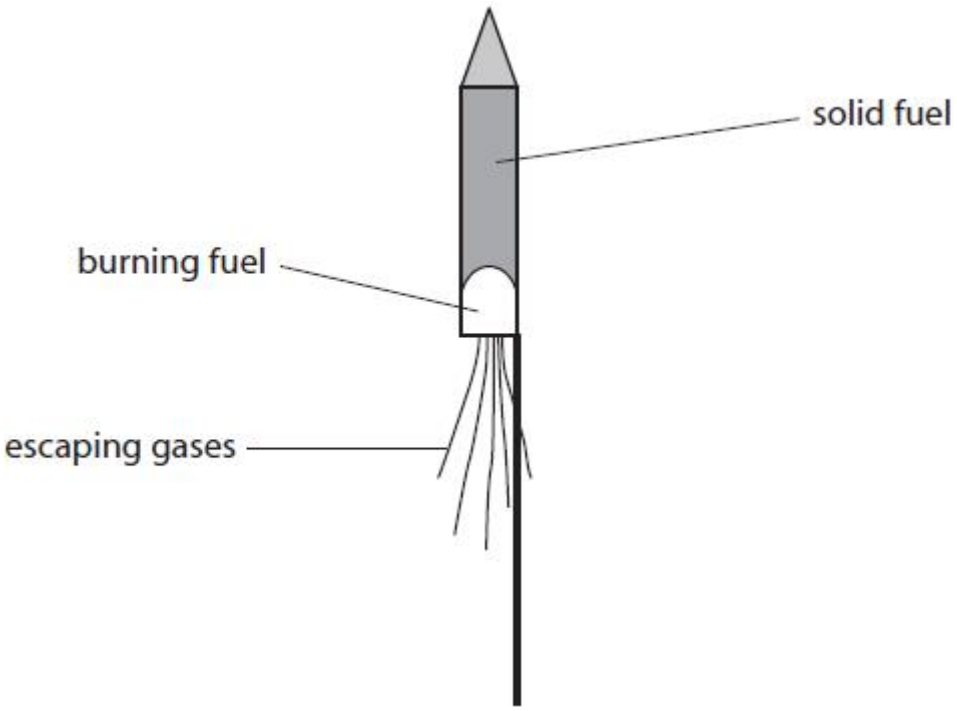
(2)

Light waves transfer ..... and ..... .

Q4.

A firework rocket contains a solid fuel inside a cardboard tube.

The burning of the fuel creates a thrust to propel the rocket upwards.



(i) Scientists can refer to several different quantities when describing the motion of the rocket.

mass	energy	speed	force

Only one of these quantities is a vector.
Complete this sentence using **one** of the words from the box.

(1)

The vector quantity is .....

(ii) Before the fuse is lit, the total weight of a rocket including fuel is 0.7N.

The gravitational field strength is 10 N/kg.
Complete the sentence by putting a cross (☒) in the box next to your answer.
The total mass of the rocket including fuel is

(1)

- ☐ **A** 0.007 kg
- ☐ **B** 0.07 kg
- ☐ **C** 0.7 kg
- ☐ **D** 7 kg

(iii) There is a resultant force on the rocket of 0.5 N upwards when it takes off.

The arrow on the diagram shows the size and direction of the force of gravity acting on the rocket when it takes off.

Add another arrow to the diagram to show the thrust produced by the burning fuel at the time the rocket takes off.
You should label the arrow with the size of the thrust.

(2)

Q5.
The photograph shows an athlete doing the high jump.

(i) Which forms of energy does the athlete have at the top of his jump?
Put a cross (☒) in the box next to your answer.

(1)

- ☐ **A** only gravitational potential
- ☐ **B** gravitational potential and kinetic
- ☐ **C** kinetic and light
- ☐ **D** only kinetic

(ii) The athlete gets the energy he needs for his jump from his food. Complete the sentence.

(1)

The form of energy stored in food is.....

Q6.

One way of producing electricity from a renewable source is tidal power.

A dam is built across the mouth of a river.

Tidal water gets trapped behind the dam.

The trapped water is used to generate electricity.

Discuss the advantages and disadvantages of using tidal power rather than other methods of generating electricity.

(6)

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TOTAL FOR PAPER = 60 MARKS