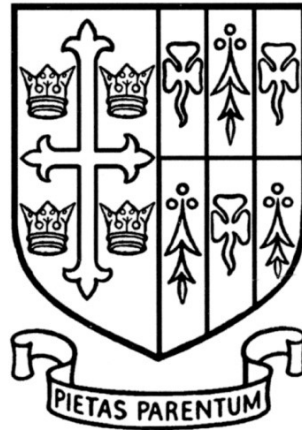


ST EDWARD'S OXFORD



14+ Entrance Examination

**For Entry in
September 2018**

Science

1 hour

Candidate Name:

Questions

Q1.

This question is about the element beryllium.

(a) Use words from the box to complete the sentences about beryllium.

Each word may be used once, more than once or not at all.

(7)

electrons	negative	neutral	neutrons
nucleus	positive	protons	shells

An atom of beryllium has a central that contains

particles called and

.....

Around these particles there are orbiting

in

An atom of beryllium has no charge because it contains equal numbers

of and

The particles with the lowest mass in an atom of beryllium are called

.....

(b) Beryllium forms a compound with the formula $\text{Be}(\text{OH})_2$

(i) How many different elements are there in $\text{Be}(\text{OH})_2$?

(1)

.....

(ii) What is the total number of atoms in the formula $\text{Be}(\text{OH})_2$?

(1)

.....

(Total for Question = 9 marks)

Q2.

Bromine is an element in Group 7 of the Periodic Table.

(a) Which of these is the formula for a molecule of bromine?

(1)

A 2Br

B Br^2

C Br2

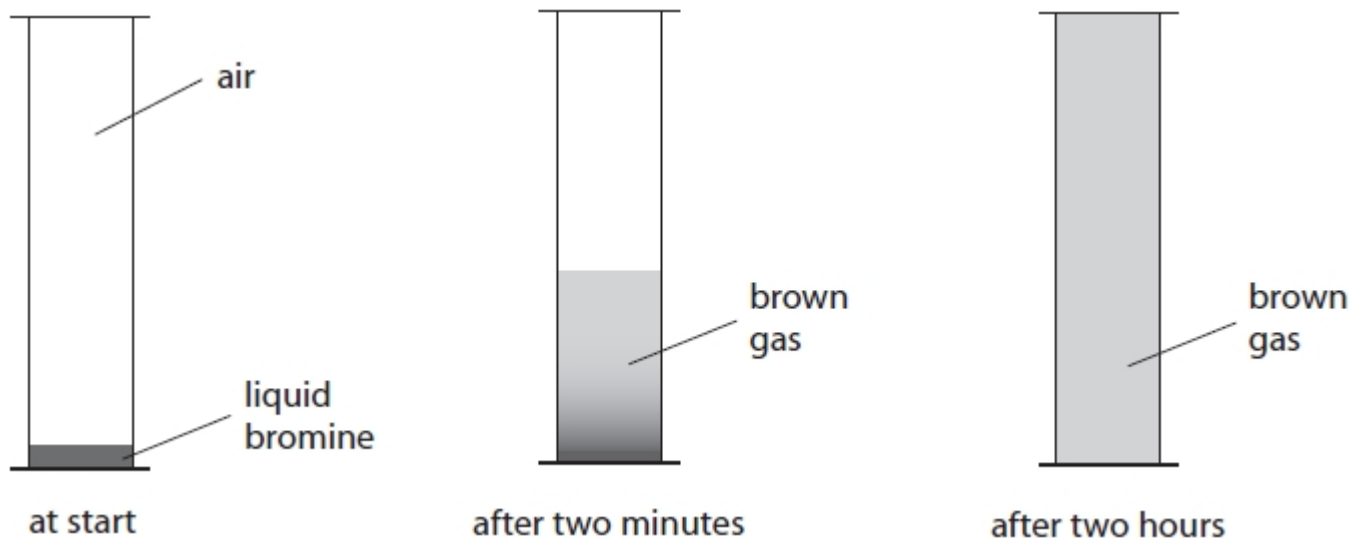
D Br_2

(b) A small amount of liquid bromine is placed in a gas jar containing air.

The jar is then sealed.

After two minutes, a brown gas is seen just above the surface of the liquid.

After two hours, the whole gas jar is full of the brown gas.



(i) Which of these is the process that causes the brown gas to fill the gas jar?

(1)

- A condensation
- B diffusion
- C evaporation
- D sublimation

(ii) Explain, using the particle theory, the observations seen in the gas jar.

(2)

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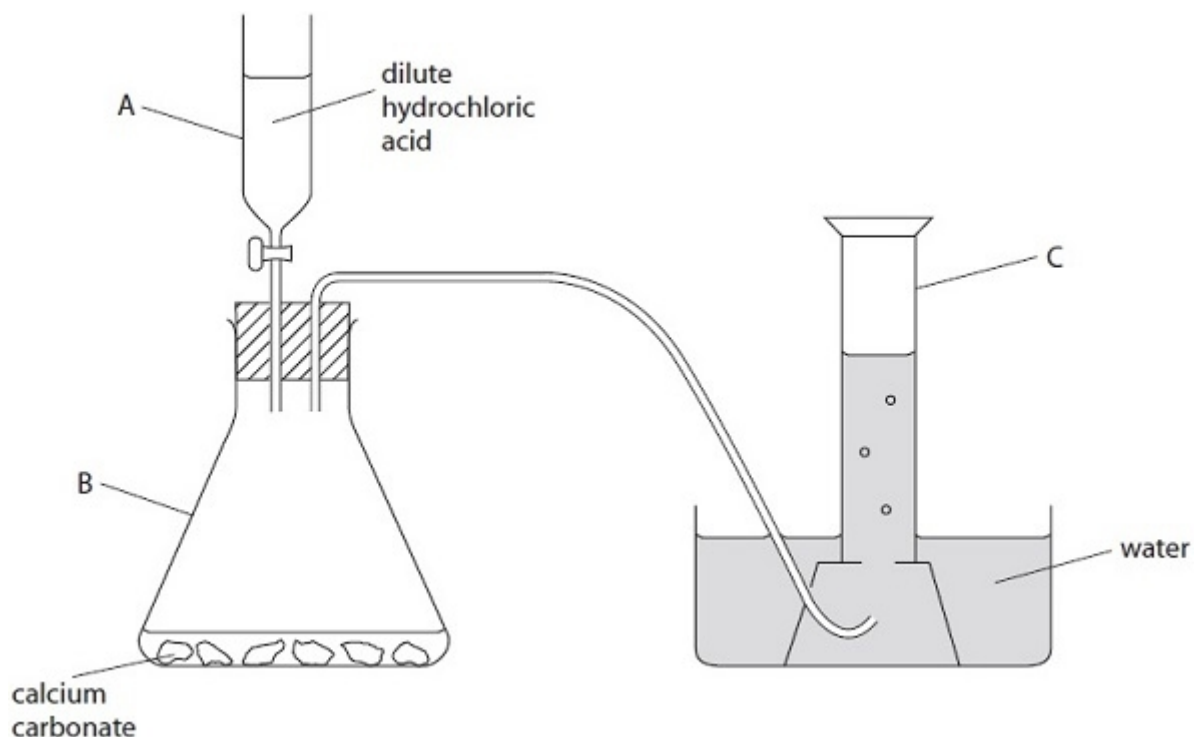
.....

(Total for question = 4 marks)

Q3.

This apparatus can be used to make and collect carbon dioxide.

This is done by adding dilute hydrochloric acid to calcium carbonate.



(a) Give the names of the pieces of apparatus labelled A, B and C.

(3)

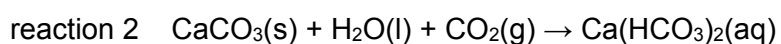
A

B

C

(b) When an excess of carbon dioxide is bubbled through limewater, reaction 1 occurs, followed by reaction 2.

The equations for these reactions are



Suggest two observations that would be made when excess carbon dioxide is bubbled through limewater.

(2)

1

2

(c) Carbon dioxide is used in some fire extinguishers because it does not support combustion.

State another property of carbon dioxide that makes it suitable for use in fire extinguishers.

(1)

.....

(d) Carbon dioxide is slightly soluble in water. The solution formed has a pH of 5.6

Which is the best description of a solution of carbon dioxide in water?

(1)

- A strongly acidic
- B strongly alkaline
- C weakly acidic
- D weakly alkaline

(Total for Question = 7 marks)

Q4.

Casper is a horse training for the Grand National. Casper's diet contains an increased amount of carbohydrate. Casper runs several miles each day.

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

(2)

fat oxygen protein carbon dioxide nitrogen
--

During training, Casper's heart rate increases to supply his muscles with more
.

Casper's breathing rate increases to remove excess from his blood.

(ii) Explain why Casper needs a diet containing an increased amount of carbohydrate.

(3)

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(Total for question = 5 marks)

Q5.

The photograph shows the close relationship between an oxpecker and an antelope.



(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

(1)

The oxpecker and the antelope both benefit from this relationship. This type of relationship is called

- A geotropism
- B mutualism
- C oviparous
- D viviparous

(ii) Describe how both the oxpecker and the antelope benefit from this close relationship.

(2)

.....

.....

.....

.....

(Total for question = 3 marks)

Q6.

Complete the sentence by putting a cross (☒) in the box next to your answer.

Human body temperature is controlled by the

(1)

- A brain
- B heart
- C lungs
- D stomach

(Total for question = 1 mark)

Q7.

A farmer grows wheat in a field and wants to know how many individual plants he has.



Describe a time-efficient method to estimate the total number of wheat plants in his field.

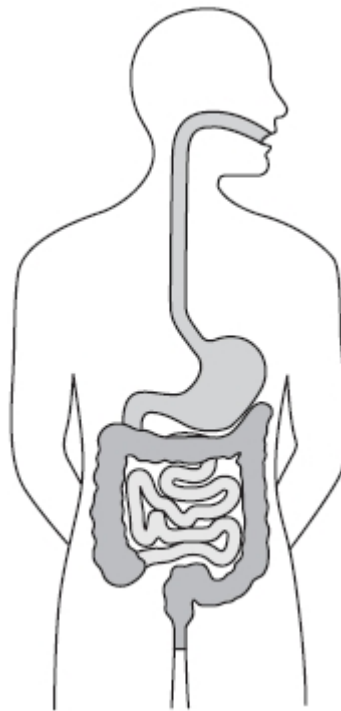
(5)

.....

.....(PTO)

Q8.

The diagram shows the human digestive system.



Use words from the box to complete the sentences.

(2)

active	amino	DNA	lactic	soluble
--------	-------	-----	--------	---------

During digestion, large molecules are broken down into small

..... molecules.

Proteins are large molecules that are broken down into

acids.

(Total for question = 2 marks)

Q9.

Blood from the left side of the heart travels to different organs of the body.

The table shows the percentage of blood travelling to different organs at rest and during exercise.

organ	percentage of blood (%)	
	at rest	during exercise
brain	19	3
muscles	15	60
skin	9	18
liver	28	7
rest of body	29	12

(i) During exercise the percentage of blood travelling to the skin doubles.

Calculate how many times the percentage of blood travelling to the muscles increases during exercise.

(2)

.....

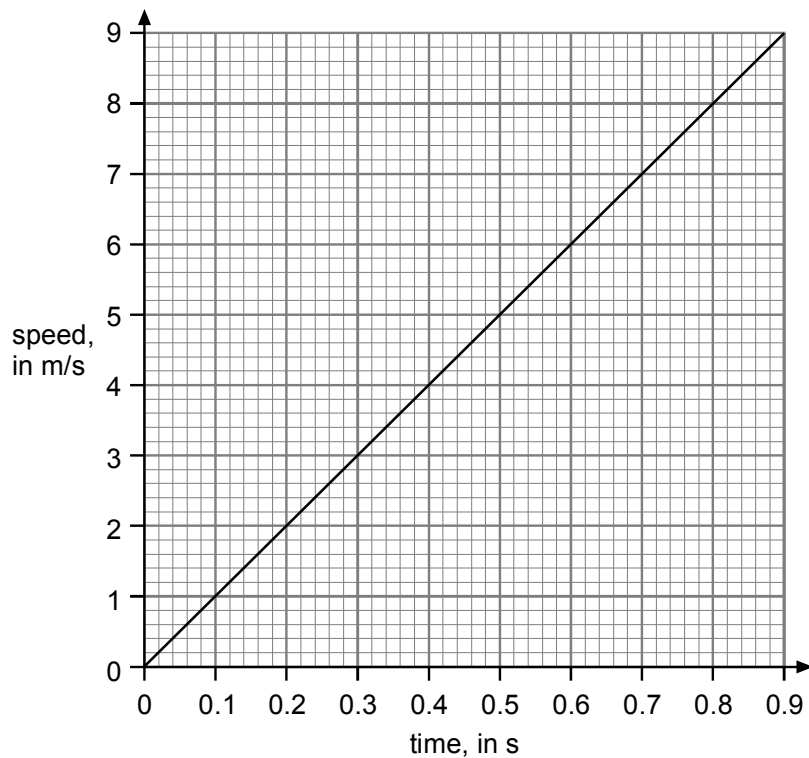
(ii) Explain why the percentage of blood travelling to the muscles increases during exercise.

(2)

.....
.....
.....
.....
.....

.....(Total for question = 4 marks)

Q10. The graph shows how the speed of a 0.1 kg mass changes as it falls.



(a) Read from the graph the speed of the mass at 0.4 s and 0.8 s. Use your results to work out the **average** speed of the mass between 0 and 0.4 s and then between 0 and 0.8 s. Give the units.

(i) final speed at 0.4 s =
 average speed between 0 and 0.4 s =

1 mark

(ii) final speed at 0.8 s =
 average speed between 0 and 0.8 s =

1 mark

(b) Using the average speeds calculated in (a), work out how far the mass falls in:

(i) 0.4 s

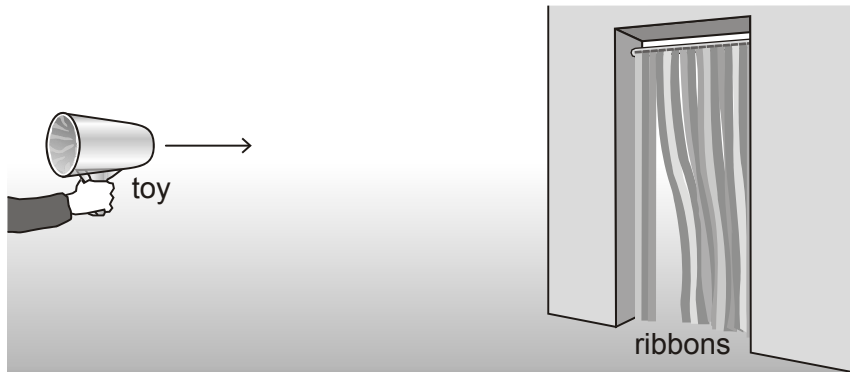
1 mark

(ii) 0.8 s

1 mark

(TOTAL: 4 marks)

11. John has a toy that fires a 'pulse of air'. He fires it at ribbons in a doorway. The ribbons move when the pulse of air hits them.



- (a) John's friend measured how long it took for a pulse of air to travel different distances to the ribbons.

He used a digital stopwatch to measure the time between firing the toy and the ribbons moving.

He took six measurements of time at each distance.

He recorded his results in a table.

distance from toy to ribbons (m)	time measured (s)						average time (s)
6	0.37	0.45	0.48	0.33	0.29	0.42	0.4
10	0.66	0.77	0.73	0.72	0.76	0.70	0.7
14	1.24	1.31	1.27	1.67	1.18	1.19	1.3
18	2.30	2.27	2.39	2.15	2.23	2.34	2.3

Give **one** cause of the differences in the measurements of the time for the same distance.

.....
..

1 mark

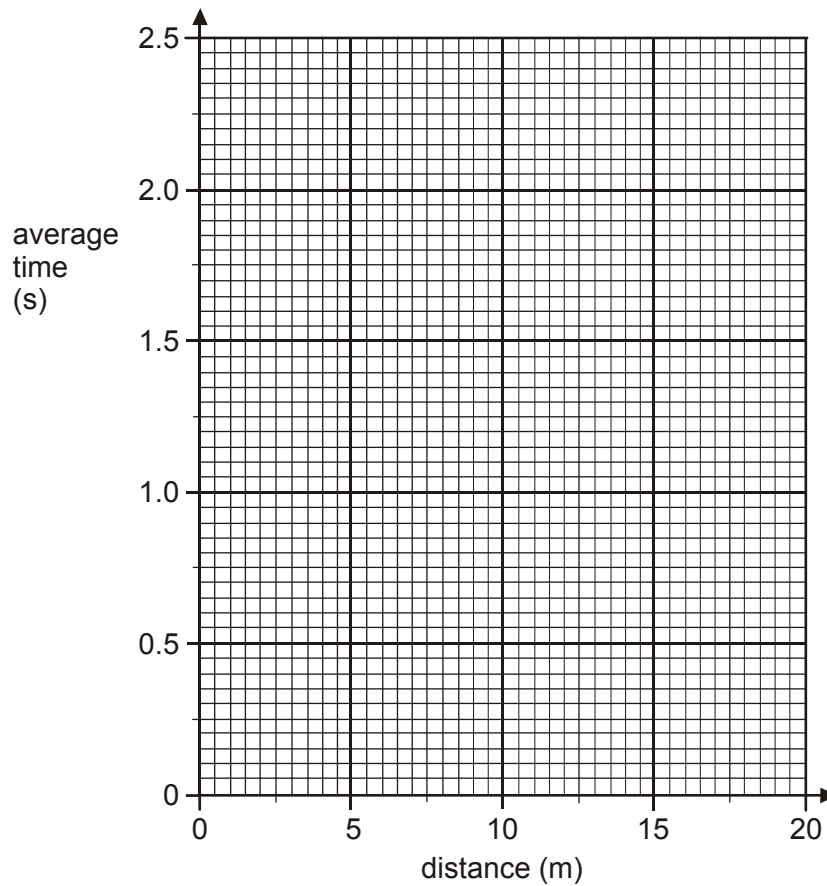
- (b) John's teacher said, 'In other investigations we have usually plotted time on the x-axis and distance on the y-axis of a graph. We should do the opposite with the data in the table.'

Explain why the y-axis should be labelled with time in this investigation.

.....
..

1 mark

(c) (i) Plot the average times against distance on the graph below.



1 mark

(ii) Draw a curve of best fit on the graph.

1 mark

(d) Which of the following statements is the most likely explanation of why the line on the graph is curved?

Tick one the box.

The pulse of air spreads out as it travels.

The pulse of air slows down as it travels.

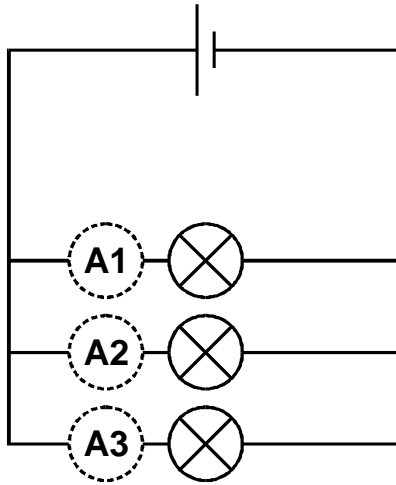
The pulse of air travels at constant speed.

The pulse of air does **not** travel in a straight line.

1 mark

(TOTAL: 5 marks)

12. Peter measured the current through each of three similar bulbs in a parallel circuit.



He had only one ammeter and he placed it first at A1, then A2, then A3, in order to measure the currents.

The table shows his results.

position of ammeter	current, in amps
A1	0.14
A2	0.16
A3	0.15

- (a) (i) He expected the current readings to be the **same** for each bulb but found they were **different**.

Suggest **two** reasons why the readings were different.

1.

2.

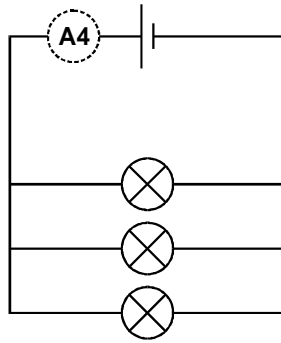
2 marks

- (ii) What is the value of the total current delivered by the cell?

.....

1 mark

(b) Peter then measured the current at **A4** and recorded it as 0.47 A.



(i) How does this value of 0.47A compare with your answer to (a) (ii)?

.....
..

1 mark

(ii) Give a reason for your answer to (b) (i)?

.....
..

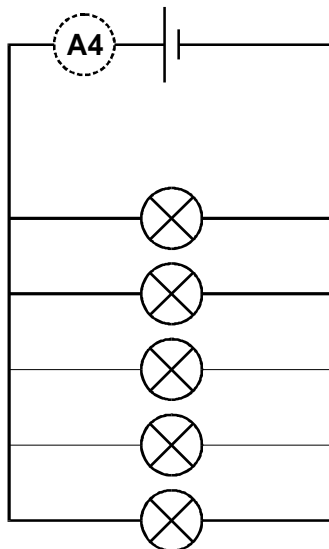
1 mark

He added two more similar bulbs to his circuit, in parallel. The current through each bulb was 0.15 A.

(iii) Estimate the total current now recorded at ammeter A5

..... A

1 mark



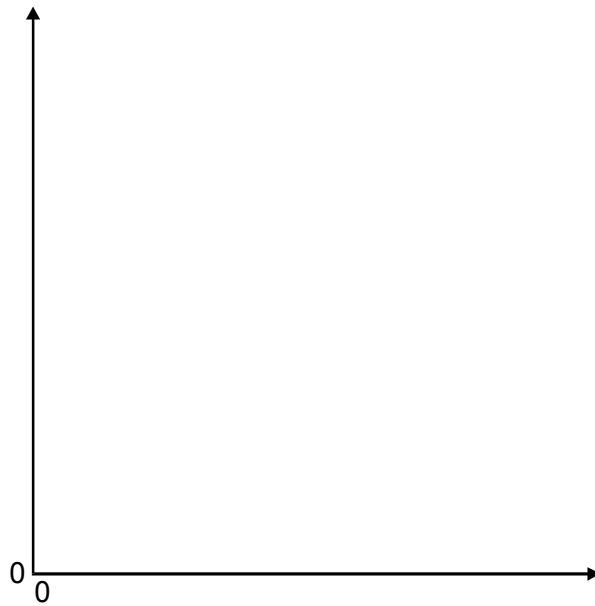
1 mark

- (c) Peter left the circuit connected overnight. He used a datalogger to measure the current at position **A4** at regular intervals of time. The next morning the bulbs were dim.

Using the axes below, sketch (do **not** plot) how the current at position **A4** might change with time.

Indicate on the graph:

- (i) The correct labels for each axis, including the correct units.
- (ii) The shape of the graph you would expect to obtain.



2 marks

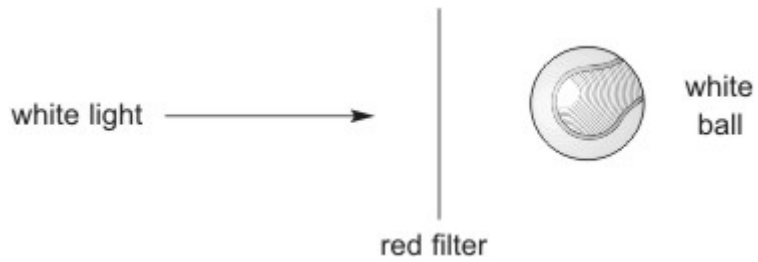
(TOTAL: 9 marks)

Q13. (a) Peter had two different coloured tennis balls as shown below.



He shone white light through a red filter onto each ball.

(i) **Experiment 1**



The white ball appeared red.
Explain why this ball appeared red.

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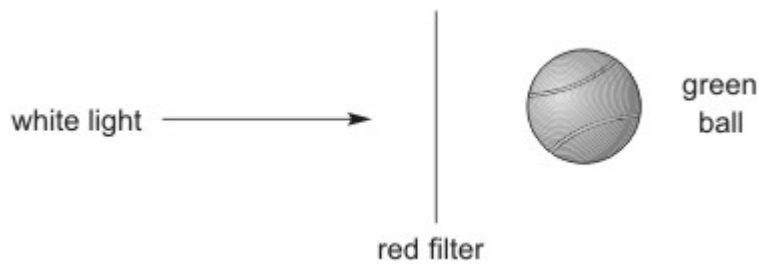
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2 marks

(ii) **Experiment 2**



What colour did this ball appear?

.....

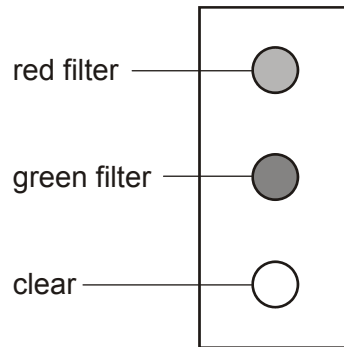
Explain your answer.

.....

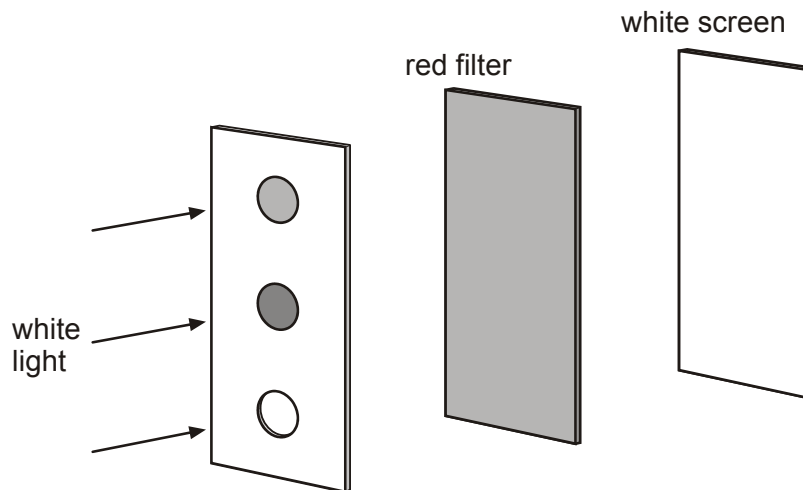
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2 marks

- (b) Peter set up a different experiment.
He cut three holes in a piece of card.
Two of the holes were covered by coloured filters as shown below.



Peter placed a red filter between the piece of card and a white screen.
He shone white light at the piece of card with three holes in it.



What would Peter see on the screen?

.....
..
.....
..

1 mark
(TOTAL: 5 marks)