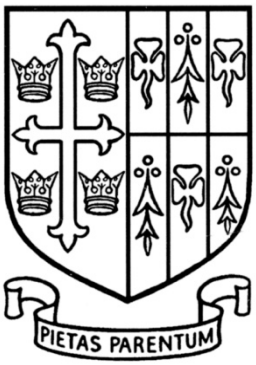
ST EDWARD'S
OXFORD



13+ SCHOLARSHIP EXAMINATION
2016

SCIENCE: 1 Hour

Candidate Name

First name……..

Surname……....

INSTRUCTIONS TO CANDIDATES

Write your name in the box above.
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

The number of marks available is given in brackets ( ) at the end of each question or part question.
A calculator may be used.

E

Biology	Chemistry	Physics

Total /60

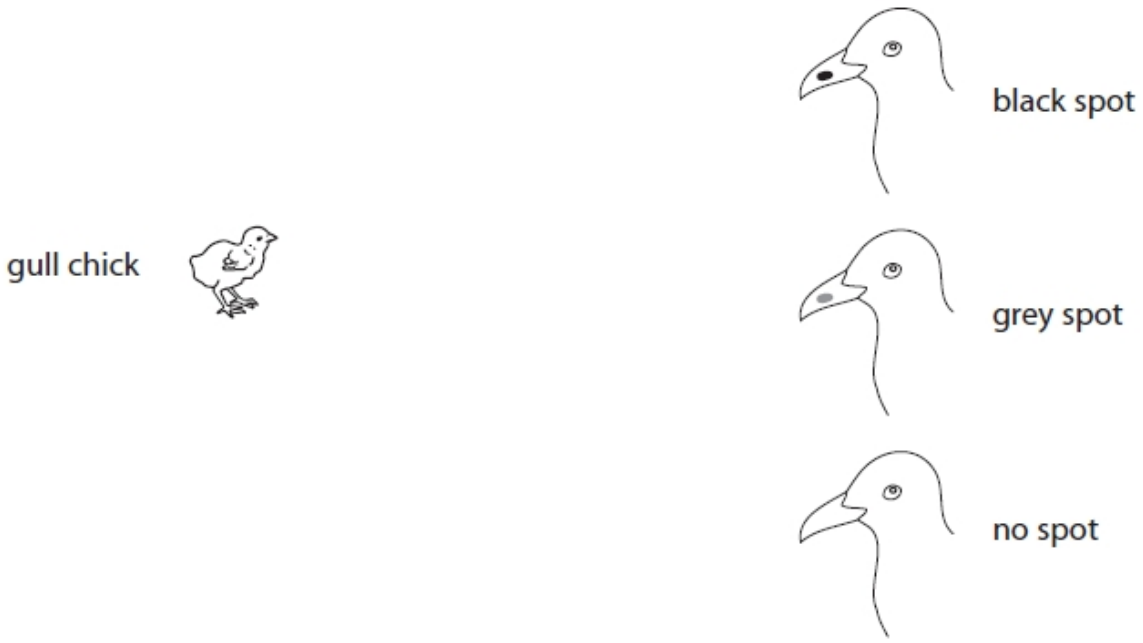
%

Grade

Q1.

A scientist investigated the behaviour of a newly-hatched gull chick.

She painted a coloured spot on the beaks of plastic adult gulls, as shown in the diagram.



She observed how many times the chick pecked at the spot on each beak.

The results were recorded in a tally chart.

	number of pecks	
spot colour	**tally**	**total**
black	𝍸 𝍸 ||||	14
grey	𝍸 ||	
no spot	|||	3

(a) State the number of pecks at the grey spot.

(1)

..... pecks

(b) Describe the effect of spot colour on the behaviour of the gull chick.

(2)

.....

.....

.....

.....

(c) Live adult gulls have a red spot on their beaks.

The investigation was repeated but an additional plastic gull was included. This gull had a red spot painted on its beak.

Suggest how this might affect the results of the investigation.

(1)

.....

.....

Total for question = 4 marks

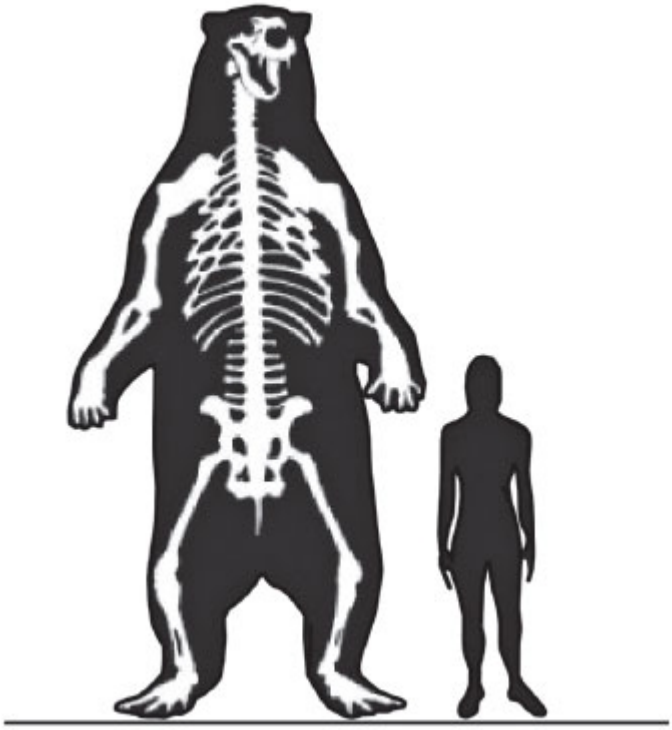
Q2.

A small number of fossil bones from a very large bear was found in South America in 1935.

The bones were estimated to be about one million years old.

Scientists used these bones to predict the shape and size of the bear.

The diagram shows the bear and a person who is 165 cm tall.



(a) Estimate the height of the bear. **(2)**

answer = ... cm

(b) Explain how fossils have helped scientists understand the process of evolution **(2)**

.....

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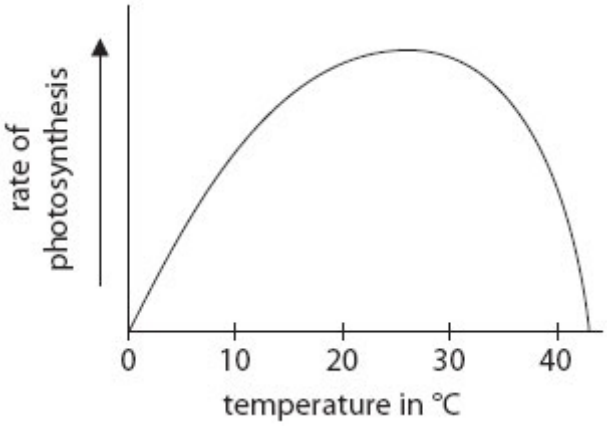
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Total for question = 4 marks

Q3.

The graph shows the effect of temperature on the rate of photosynthesis.



(a) Explain what you understand the word 'photosynthesis' to mean (2)

.....

.....

.....

(b) According to the graph above, state the optimum temperature for photosynthesis.

(1)

.....

(c) Temperature can be a limiting factor.

Name another factor that could limit the rate of photosynthesis.

(1)

.....

Total for question = 4 marks

Q4.

A pupil wanted to investigate how heart rate changes with the distance run.

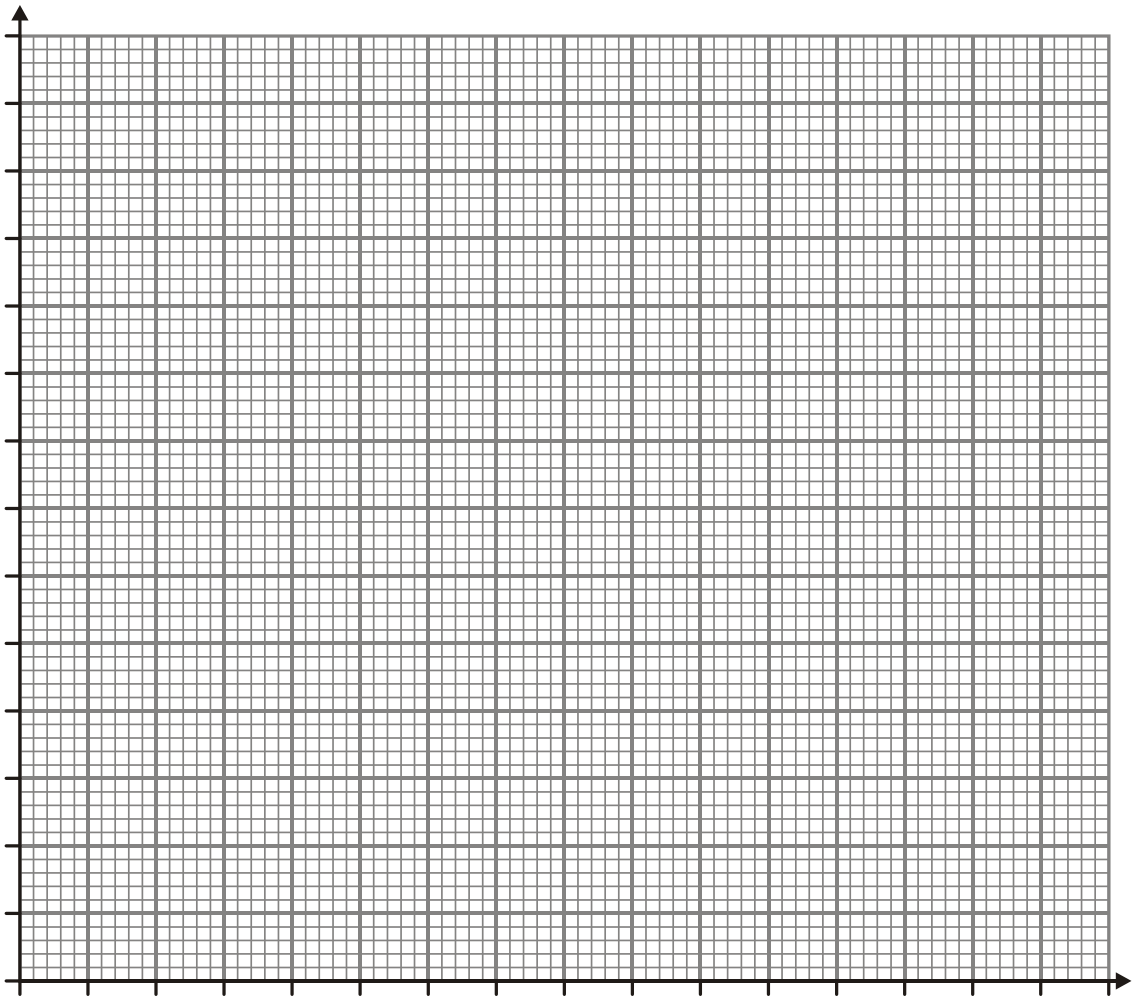
Distance jogged (m)	Heart Rate (bpm)			
	Trial 1	Trial 2	Trial 3	**Average**
10	70	71	73	**71**
20	75	74	77	**75**
30	80	82	81	
40	85	87	84	**85**
60	90	94	91	
80	105	101	107	**104**

(a) Complete the table above (to the nearest bpm) (1)

(b) Suggest what do you think 'bpm' stands for? (1)

.....

(c) Plot a graph of average heart rate against distance jogged, onto the graph paper below. (4)



(d) Explain the results (2)

.....

.....

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.....

Total for question = 8 marks

PHYSICS

Read the passage below and answer the questions that follow:

Five planets align: how to see this spectacular celestial show

Mercury, Venus, Mars, Jupiter and Saturn are visible together in the night sky for the first time since 2005

From: Daily Telegraph Newspaper
By: Sarah Knapton, Science Editor
9:52AM GMT 19 Feb 2016



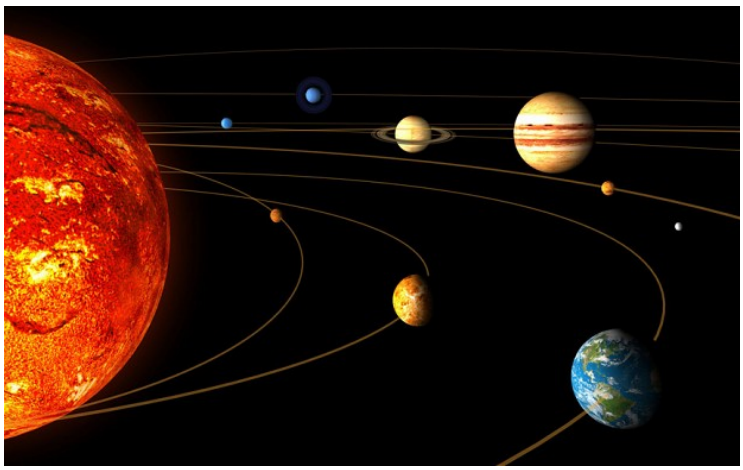
Keen astronomers still have time to see five planets in the night sky, in a rare alignment which has not happened for more than a decade.

For the first time since 2005, Mercury, Venus, Mars, Jupiter and Saturn can be seen together.

The alignment was first visible in Britain just before dawn on Wednesday, January 20. The alignment will continue until the morning of February 20.

How can I see the planets align?

The planets form a diagonal line from the Moon to the horizon and with clear skies and good eyesight, should be visible with the naked eye.



People hoping to catch a glimpse of the alignment should choose an open spot, away from tall buildings and city lights to avoid light pollution.

Mercury will appear just three degrees above the horizon – the equivalent of three thumb widths with an outstretched arm – so will be the trickiest planet to spot.

The planets rarely come together because of their differing orbits. The best time to see the alignment is around 6.45am in the morning, just before dawn. It is best to try and see Venus, as it is the brightest, before looking for the rest of the planets.

Four of the five have already been visible in the early morning sky in recent weeks, but Mercury joined them for the first time on January 20. The stars Antares and Spica will also be visible in the same patch of sky. Uranus and Neptune are the only two planets that will not be on show.

Dr Robert Massey of the Royal Astronomical Society said spotting Mercury would be a challenge as it will be close to the horizon, but the other planets should be easy to see before dawn. “There will be a dance of the planets, and now is the time to get out and have a look,” said Dr Massey. “It will be well worth getting up for.

People will struggle to see Mercury, it will probably just look like a star but if we get good weather we should be able to see Venus, Saturn, Mars and Jupiter well. But people should have a shot at seeing them altogether. He added: “Venus will be very obvious in the south east and Saturn will be a little bit higher up to the right. Further over at due south, you’ll see Mars and way beyond in the south east will be Jupiter. "They won't be in an exact straight line, because you virtually never get that in astronomy. They will be more scattered."

Dr Massey added: “If you have binoculars you will be able to see Jupiter’s moons and the red tinge of Mars. You probably won’t be able to see Saturn’s rings but it will have a funny shape because of the rings which you should be able to pick out. “If you are using binoculars it’s important not to look towards the sun when it rises.”

Q1. Name the planets in the Solar System, starting from nearest to the Sun.

……..

……..

…….. (1)

Q2. Give 2 reasons why is it recommended to view this astronomical phenomenon in an open space, away from buildings?

……..

……..

……..

…….. (2)

Q3. Give two reasons will Mercury be difficult to spot, even in an open space?

……..

……..

……..

…….. (2)

Q4. Why is this particular alignment of planets not a permanent feature of our skies?

……..

……..

…….. (1)

Q5. Why is Venus, despite being a small planet, easy to spot?

……..

…….. (1)

Q6. Why do people only need to use a pair of binoculars and not a telescope to be able to see these 5 planets?

…….. (1)

……..

……..

……..

Q7. Why do you think Neptune and Uranus are not visible?

…….. (1)

Q8. How are Jupiter and Saturn different to Mars, Mercury and Venus?

……..

……..

…….. (2)

Q9 Looking at the Sun is dangerous. State why and the reason for which staring at the Sun through binoculars is even more dangerous. You may use a diagram to help explain your answer.

……..

……..

…….. (4)

Q10. If you looked up at the early morning sky, draw what you would expect to find according to this article. You must label each of your 5 planets; their relative scale, colour and other features are not important.

(5)

TOTAL MARKS = 20

CHEMISTRY

1. Some pupils predicted that water will evaporate faster if the surrounding air temperature is higher.

To investigate their prediction they placed some water in containers in two different rooms.

(a) Give **two** factors they should keep the same to make their investigation fair.

1. .....

(1)

2. .....

(1)

(b) They recorded the mass of the water and the container in room 1 and room 2 every day for 5 days.

The table below shows their results.

time (days)	mass of water and container (g)	
	room 1	room 2
0	100	100
1	92	85
2	80	72
3	72	54
4	60	45
5	46	30

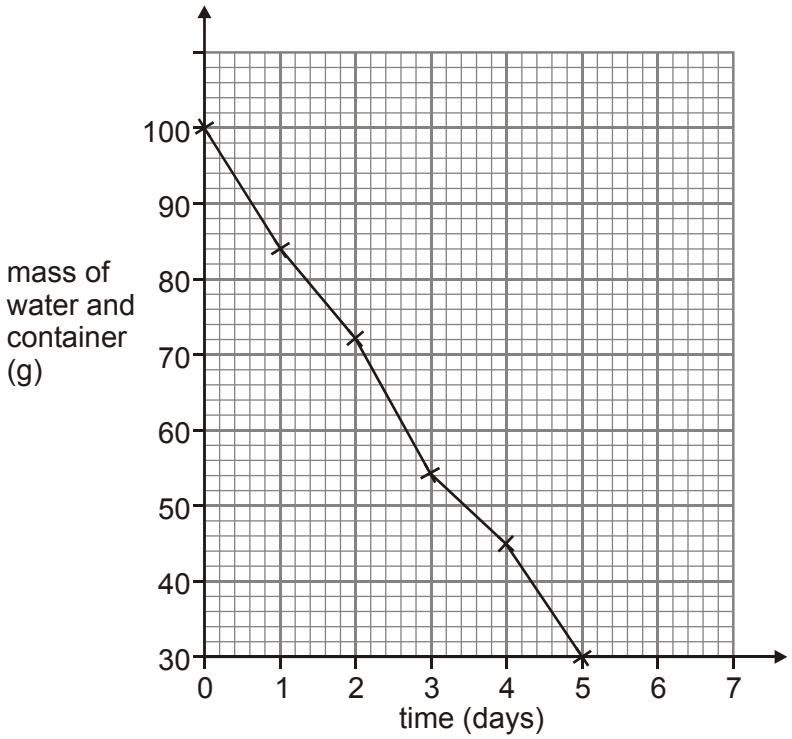
The data shown in their table is **not** sufficient to test their prediction.
Explain why.

.....

.....

(1)

They plotted their data for room 2 and attempted to draw a line of best fit.



(c) Describe the mistake they made in drawing the line of best fit.

.....

.....

(1)

(d) In which room did the water evaporate more quickly?
Tick **one** box.

room 1 ☐ room 2 ☐

Use their data to explain your answer.

.....

.....

(1)

(e)

The boiling point of water is 100° C. Explain why you think that water evaporates in the two rooms at temperatures that are much lower than this boiling point (the rooms are at roughly 20° C)

.....

.....

.....

.....

(4)

Maximum 9 marks

2. Air is a gas at room temperature. The chemical formulae below show some of the substances in the air.

Ar CO_2 H_2O N_2 Ne O_2

(a) Put these formulae in the correct columns in table A to show which substances are elements and which are compounds.

table A

element	compound

(1)

(b) Put the formulae in the correct columns in table B to show whether the formula of each substance represents an atom or a molecule.

table B

atom	molecule

(1)

(c) The coldest possible temperature is ‘absolute zero’, which is –273°C. As air is cooled towards absolute zero it liquefies. Table C gives the boiling points of the substances in air.

table C

formula	boiling point in ºC
Ar	–186
CO_2	–78
H_2O	100
N_2	–196
Ne	–246
O_2	–183

A sample of air at a temperature close to absolute zero is allowed to warm up.
Which substance boils first?

.....

(1)

(d) Each particle of neon can be represented by a circle.

Carefully complete the diagrams below to show the arrangement of particles in neon gas and liquid neon.

Use circles about ◯ in size.

neon gas, Ne

liquid neon, Ne

(4)

Maximum 7 marks

3. Sulfuric acid reacts with magnesium to produce magnesium sulfate and hydrogen

$$H_2SO_4 + Mg \rightarrow MgSO_4 + H_2$$

This is an example of a chemical reaction.

Describe:

- What you think a chemical reaction is
- How do we know a reaction has happened

.....

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.....

(4)

END OF QUESTIONS