Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
TOTAL	

AQA

General Certificate of Secondary Education
Foundation Tier
June 2014

Additional Science
Unit 5

AS1FP

F

Tuesday 13 May 2014 9.00 am to 10.30 am

For this paper you must have:
- a ruler
- a calculator
- the Chemistry Data Sheet and Physics Equations Sheet Booklet (enclosed).

Time allowed
- 1 hour 30 minutes

A

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 90.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 13 should be answered in continuous prose. In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

Advice
- In all calculations, show clearly how you work out your answer.

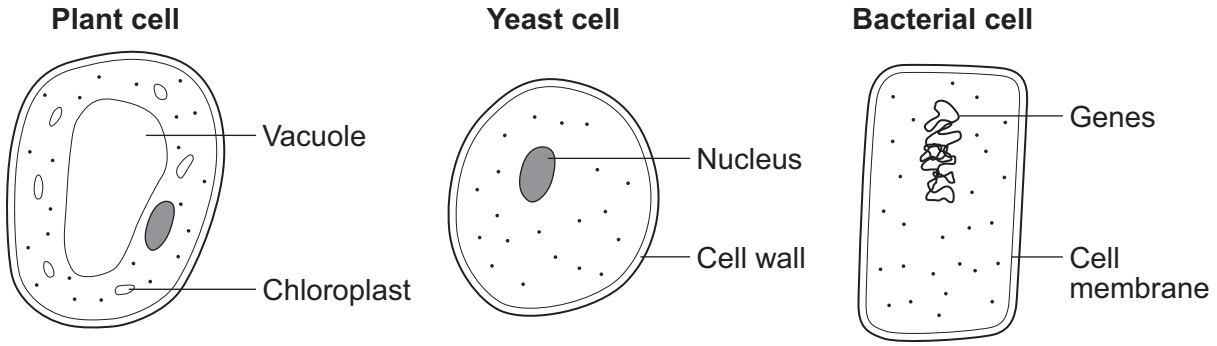
Answer **all** questions in the spaces provided.

Biology Questions

1 This question is about cells.

1 (a) **Figure 1** shows a plant cell, a yeast cell and a bacterial cell.

Figure 1



1 (a) (i) Give **two** ways in which a plant cell is similar to a yeast cell.

[2 marks]

1 .....

.....

2 .....

.....

1 (a) (ii) How is a yeast cell different from a bacterial cell?

Tick (✓) **one** box.

[1 mark]

Difference	**Tick (✓)**
A yeast cell has a cell wall.	
A yeast cell has chloroplasts.	
A yeast cell has a nucleus.	

1 (b) Large living things have many cells. The cells are organised into different levels of organisation.

Draw **one** line from each level of organisation to the correct example.

[3 marks]

Level of organisation	Example
Organ	Human
Organism	Digestive system
Tissue	Stomach
	Muscle

Question 1 continues on the next page

1 (c) There are many different types of cell in an animal.
All these cells are formed from one original type of cell.

Draw a ring around the correct answer to complete each sentence.

[2 marks]

Many types of cell can be produced from one type of cell by

a process called

- diffusion.
- differentiation.
- synthesis.

The advantage of this process is that different types of cell

can have different

- functions.
- chromosomes.
- genes.

8

2 This question is about photosynthesis.

2 (a) Complete the following sentences about photosynthesis.

2 (a) (i) The green substance in leaves absorbs ..... energy.

[1 mark]

2 (a) (ii) During photosynthesis plants use energy, carbon dioxide and ..... .

[1 mark]

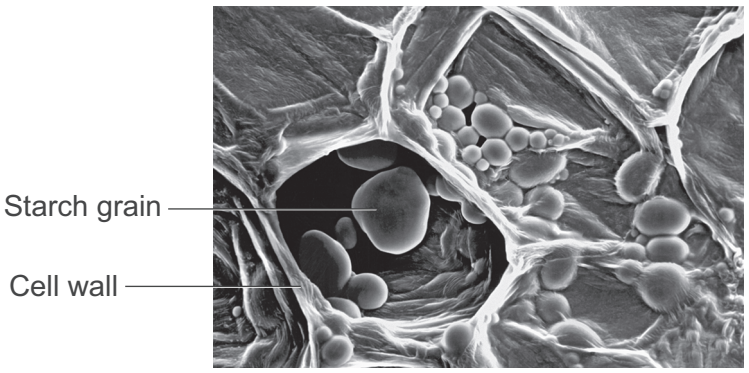
2 (a) (iii) The products of photosynthesis are glucose and the gas ..... .

[1 mark]

2 (b) Some of the glucose made by photosynthesis is changed into starch.
The starch forms grains inside cells.

Figure 2 shows starch grains inside plant cells.

Figure 2



2 (b) (i) The magnification of the photograph is x 500.

In **Figure 2**, the labelled starch grain is 1 cm across.

Calculate the actual size of this starch grain.
Use the formula:

[2 marks]

$$\text{actual size} = \frac{\text{size of image}}{\text{magnification}}$$

.....

.....

Actual size = ... cm

Question 2 continues on the next page

2 (b) (ii) Why do plant cells change glucose into starch?

Tick (✓) **one** box.

[1 mark]

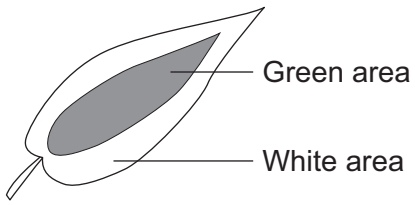
	Tick (✓)
For storage.	☐
For photosynthesis.	☐
For growth.	☐

2 (c) Some plants have variegated leaves.

Variegated leaves have some white areas and some green areas.

Figure 3 shows a variegated leaf.

Figure 3



A plant with variegated leaves was kept in bright light for five days.

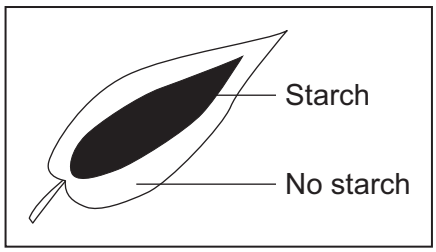
After the five days, one leaf was taken from the plant and tested for starch.

2 (c) (i) Which diagram shows the correct result?

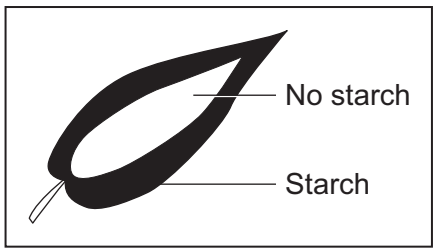
Tick (✓) **one** box.

[1 mark]

Result



☐



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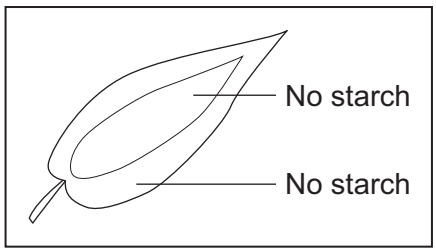


☐

2 (c) (ii) Plants with variegated leaves grow more slowly than plants with completely green leaves.

Suggest why.

[1 mark]

.....

.....

8

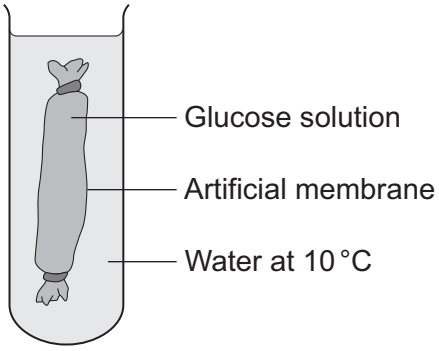
3 Students investigated the effect of temperature on the diffusion of glucose through an artificial membrane.

The students:

- put 20 cm^3 of glucose solution into a bag made from an artificial membrane
- put the bag into a tube of water kept at 10 °C
- measured the concentration of glucose in the water after 30 minutes.

Figure 4 shows how the investigation was set up.

Figure 4



3 (a) The students repeated their investigation at different temperatures.

To make their investigation fair, the students kept some variables the same.

Give **two** control variables the students kept the same in their investigation.

[2 marks]

1 .....

2 .....

3 (b) **Table 1** shows the students' results.

Table 1

Temperature in °C	Percentage concentration of glucose in the water after 30 minutes
10	2
20	4
30	8
40	16

Glucose diffuses from the bag into the water.

What conclusion could the students make about the effect of increasing temperature on the concentration of glucose in the water?

To gain full marks in this question you must refer to the data in **Table 1** in your answer.

[2 marks]

.....

.....

.....

.....

4

Turn over for the next question

Chemistry Questions

4 This question is about alloys.

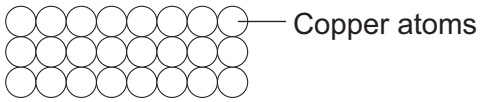
4 (a) Some coins are made from cupronickel.

Cupronickel is an alloy made from copper and nickel.

Copper is a metal. Copper is easy to bend.

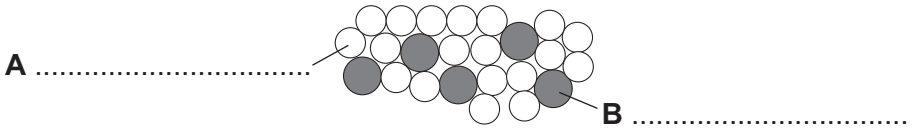
Figure 5 shows how the atoms are arranged in copper.

Figure 5 – Copper



4 (a) (i) **Figure 6** shows how the atoms are arranged in cupronickel.

Figure 6 – Cupronickel



Write the names of the atoms labelled **A** and **B** on **Figure 6**.

[1 mark]

4 (a) (ii) Draw a ring around the correct answer to complete the sentence.

[1 mark]

Cupronickel is | harder / more flexible / softer | than copper.

4 (b) Nitinol is a mixture of nickel and titanium.

Nitinol wire is used in dental braces. The brace can be bent to fit around teeth.

When it is warmed, the dental brace goes back to its original design.

Draw a ring around the correct answer to complete the sentence.

[1 mark]

Nitinol is a

- nanoparticle.
- shape memory alloy.
- smart polymer.

3

Turn over for the next question

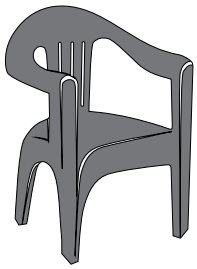
5 There are two different types of poly(ethene) called LD poly(ethene) and HD poly(ethene).

These different types of poly(ethene) are used to make different products.

LD poly(ethene)

Supermarket plastic bag

HD poly(ethene)



Garden chair

5 (a) (i) **Table 2** shows the properties of LD poly(ethene) and HD poly(ethene).

Table 2

	LD poly(ethene)	**HD poly(ethene)**
Density in g/cm^3	0.92	0.95
Flexibility	Very flexible	Rigid
Relative strength	1	2.7

Use information from **Table 2** to compare the properties of LD poly(ethene) and HD poly(ethene).

[3 marks]

.....

.....

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.....

.....

5 (a) (ii) HD poly(ethene) is used to make garden chairs.

Give **two** reasons why.

[2 marks]

1 .....

.....

2 .....

.....

5 (b) The properties of LD poly(ethene) and HD poly(ethene) are **not** the same.

Tick (✓) **two** boxes which would correctly complete the sentence.

[2 marks]

The properties of LD poly(ethene) and HD poly(ethene) are not the same because they . . .	**Tick (✓)**
are made at different pressures.	
are made using different catalysts.	
are made from a different raw material.	
are different types of thermosetting polymers.	

7

Turn over for the next question

6 Magnesium is used in fireworks.

Magnesium burns in oxygen to produce magnesium oxide.

6 (a) Draw a ring around the correct answer to complete the sentence.

[1 mark]

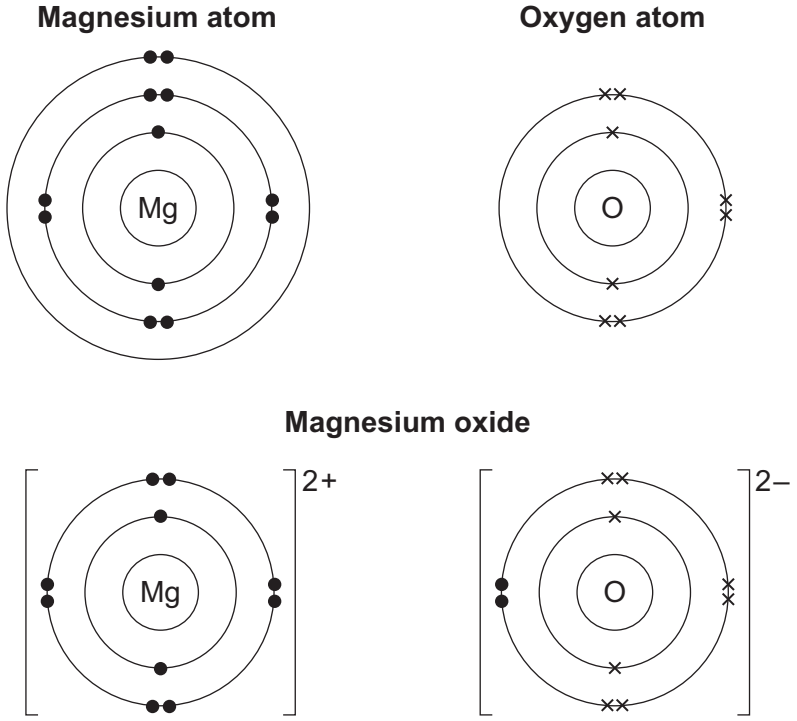
Magnesium oxide is

- an alloy.
- a compound.
- a polymer.

6 (b) The diagrams in **Figure 7** show the electronic structures of a magnesium atom, an oxygen atom and the ions in magnesium oxide.

The symbols ● and x are used to represent electrons.

Figure 7



Use the diagrams in **Figure 7** to help you answer this question.

6 (b) (i) Describe, as fully as you can, what happens to the electrons when magnesium reacts with oxygen to produce magnesium oxide.

[4 marks]

.....

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Question 6 continues on the next page

6 (b) (ii) Draw a ring around the correct answer to complete the sentence.

[1 mark]

Magnesium oxide has a high melting point because

- it has a low boiling point.
- it has strong bonds.
- it is insoluble in water.

6

7 Two different types of lithium atom can be represented as $^{6}_{3}\text{Li}$ and $^{7}_{3}\text{Li}$

7 (a) **Table 3** shows information about the two different types of lithium atom.

Complete **Table 3**.

[3 marks]

Table 3

	$^{6}_{3}$**Li**	$^{7}_{3}$**Li**
Mass number	6	
Number of protons		3
Number of neutrons		4

7 (b) Draw a ring around the correct answer to complete the sentence.

[1 mark]

The different types of lithium atom are called

isotopes.

macromolecules.

nanoparticles.

4

Turn over for the next question

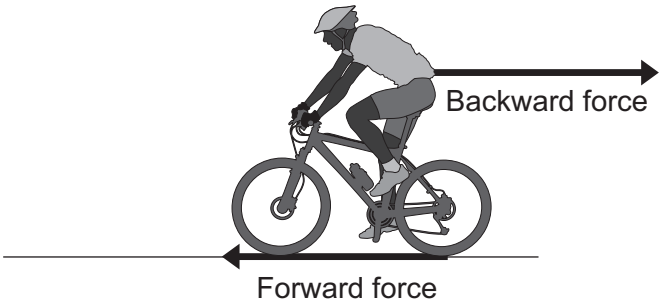
Physics Questions

8 The velocity of a cyclist is affected by

- the cyclist's body position
- the force the cyclist applies to the pedals.

8 (a) **Figure 8** shows the forces acting on a cyclist moving at a constant velocity on level ground.

Figure 8



Draw a ring around the correct answer to complete each sentence.

[2 marks]

The resultant force is zero. The forward force and the backward force are

different.

equal.

zero.

The main part of the backward force is air resistance. If the cyclist stops pedalling, the air resistance will

decrease.

increase.

stay the same.

8 (b) The cyclist changes to the body position shown in **Figure 9.** He continues to pedal with the same force as in **Figure 8**.

Figure 9

This new position creates less air resistance.

Draw a ring around the correct answer to complete the sentence.

[1 mark]

The velocity of the cyclist will

- decrease.
- increase.
- stay the same.

8 (c) Later, the cyclist's velocity increases from 0 m/s to 18 m/s in 6 seconds. His acceleration is constant.

8 (c) (i) Calculate the acceleration of the cyclist.

Use the correct equation from the Physics Equations Sheet.

[3 marks]

.....

.....

.....

Acceleration = ...

Draw a ring around the correct unit.

m **m/s** **m/s^2**

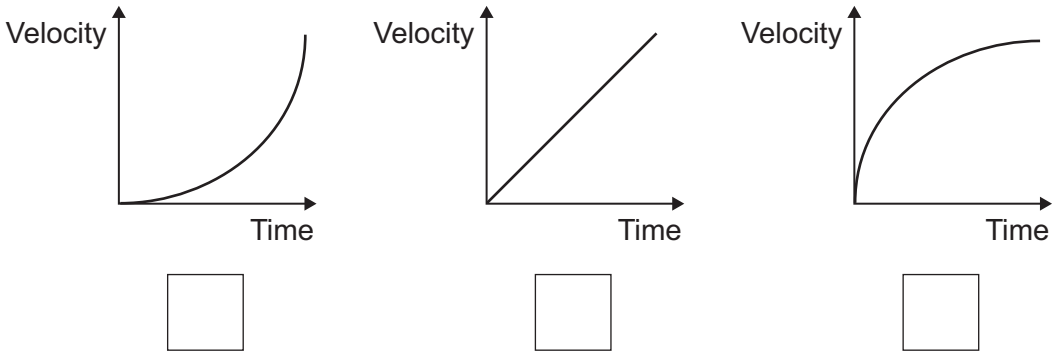
Question 8 continues on the next page

8 (c) (ii) Which velocity-time graph in **Figure 10** shows the motion of the cyclist during the 6 seconds?

Tick (✓) **one** box under the correct graph in **Figure 10**.

[1 mark]

Figure 10



8 (d) Some cyclists take drugs to help them win races.

Suggest **two** reasons why competition rules do **not** allow cyclists to take these drugs.

[2 marks]

1 .....

.....

2 .....

.....

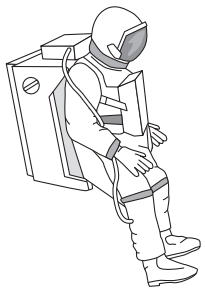
9

Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

9 **Figure 11** shows an astronaut floating in space. She is stationary.

Figure 11



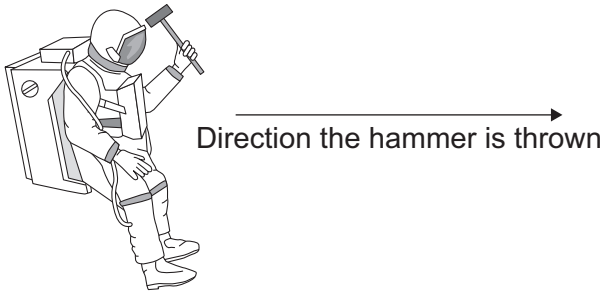
9 (a) Draw a ring around the correct answer to complete the sentence.

[1 mark]

The | mass / momentum / density | of the astronaut is zero.

9 (b) The astronaut throws a hammer in the direction shown in **Figure 12**.

Figure 12



9 (b) (i) As she throws the hammer, the astronaut will move.

Draw an arrow **on Figure 12** to show the direction the astronaut will move as she throws the hammer.

[1 mark]

9 (b) (ii) The momentum of the hammer is 5 kgm/s.

What is the momentum of the astronaut?

Draw a ring around the correct answer.

[1 mark]

0 kgm/s **– 5 kgm/s** **10 kgm/s**

9 (b) (iii) In space there is no air.

What will happen to the astronaut after she has thrown the hammer?

Tick (✓) **one** box.

[1 mark]

	Tick (✓)
She will slow down and stop.	☐
She will continue moving at a steady speed.	☐
She will accelerate.	☐

4

Turn over for the next question

10 A light meter is used to check the light levels during a cricket match.

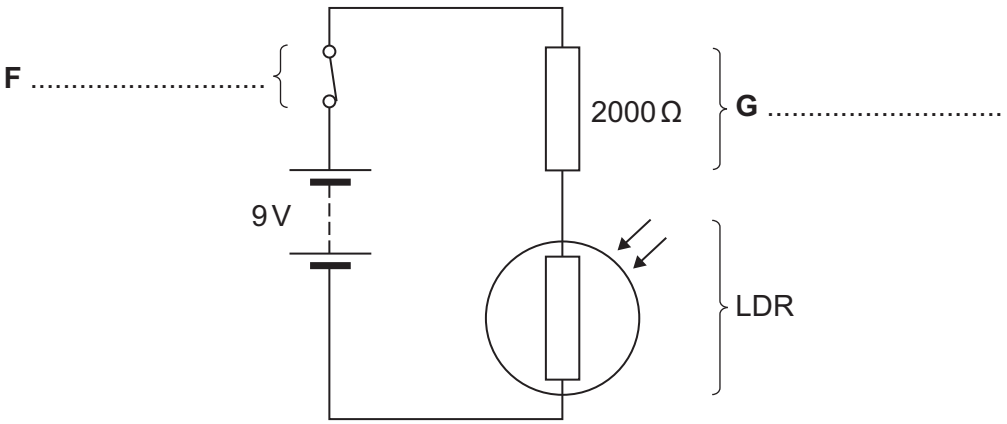
Figure 13 shows a cricket umpire using a light meter.

Figure 13

10 (a) Some light meters use a light-dependent resistor (LDR).

10 (a) (i) **Figure 14** shows a circuit in a light meter. The components in the circuit are connected in series. The LDR has been labelled.

Figure 14



Label the components **F** and **G**, on **Figure 14**.

[2 marks]

10 (a) (ii) Draw a ring around the correct answer to complete each sentence.

[3 marks]

The current in the circuit is

- shared between each component.
- the same through each component.
- greatest through the LDR.

The potential difference across the LDR is

- less than 9 V.
- 9 V.
- greater than 9 V.

The total resistance in the circuit is calculated by

- adding
- multiplying
- subtracting

the resistance of each component.

10 (b) What happens to the resistance of the LDR as the light level increases?

[1 mark]

.....

10 (c) A cricket umpire may want to check if the light level is too low to see the cricket ball clearly.

Suggest **one** reason why.

[1 mark]

.....

.....

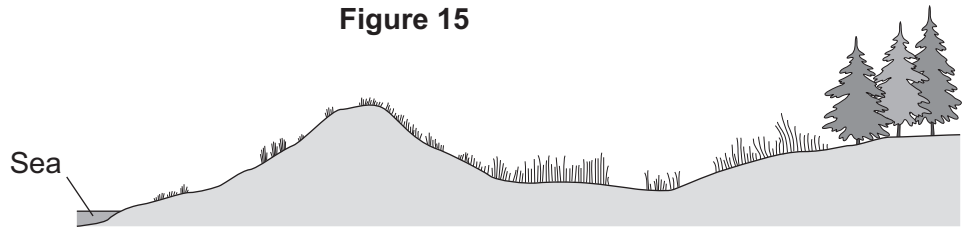
7

Biology Questions

11 A group of students investigated the distribution of plants living in a sand dune habitat next to a sea shore.
The students also collected information about some physical factors in the habitat.

Figure 15 shows a diagram of the sand dunes and the students' results.
The bars show where each plant species was found.

Figure 15



Plant species

Sea rocket										
Marram grass										
Red fescue										
Rush										
Creeping willow										
Buttercup										
Orchid										
Pine tree										

Physical factors

% light intensity at ground level	98	92	98	88	85	82	93	80	52	27
% of water in soil	10	8	2	5	10	45	56	23	26	22

11 (a) Describe how the students could have collected the data for the plant species.

[4 marks]

.....

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11 (b) Use **Figure 15** to answer these questions.

11 (b) (i) Which plant species has no competitors in any part of the habitat?

[1 mark]

.....

11 (b) (ii) Which plant species lives in the driest conditions in the habitat?

[1 mark]

.....

11 (b) (iii) The further away from the sea, the older the dune habitat becomes.

Different numbers of species of plants grow in different parts of the dune habitat.

Describe how the age of the dune habitat affects the **number** of different species sampled.

[2 marks]

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11 (c) Only a few other plants can grow in the area where the pine trees grow.

Explain why.

[2 marks]

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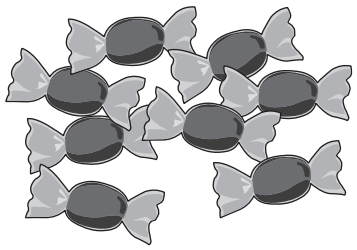
10

Chemistry Questions

12 Ammonium chloride is used to flavour sweets.



12 (a) Ammonium chloride is the product of the reaction between ammonia and hydrogen chloride.

The reaction is reversible.

Write a word equation for the reaction. Include the symbol for a reversible reaction.

[2 marks]

.....

12 (b) (i) A food scientist reacted 34 g of ammonia with 73 g of hydrogen chloride.

Calculate the maximum mass of ammonium chloride that the food scientist could produce.

[1 mark]

.....

Maximum mass ..... g

12 (b) (ii) At the end of the reaction, the food scientist obtained a lower yield of ammonium chloride than expected.

Give **one** reason why.

[1 mark]

.....

.....

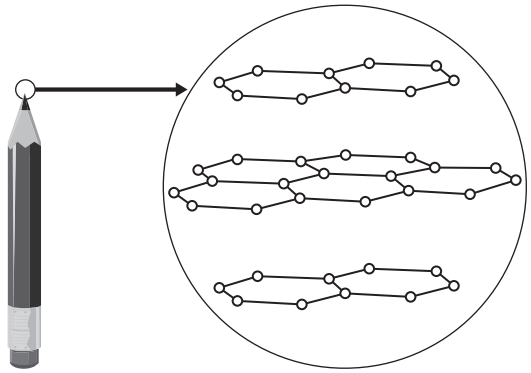
4

13 **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Graphite is used in pencils and as a lubricant to reduce friction in machines.

Figure 16 shows the structure of graphite.

Figure 16



- Describe the structure of graphite.
- State the properties of graphite.
- Explain why the structure of graphite gives graphite these properties.

[6 marks]

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6

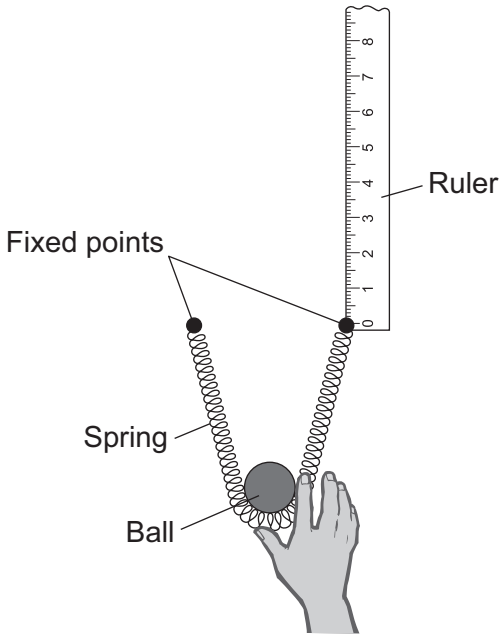
Physics Questions

14 Some students are investigating a catapult.

The catapult has a spring attached to two fixed points, as shown in **Figure 17**.

The spring is pulled down and stretched. It is then released so that the catapult fires a ball into the air.

Figure 17



14 (a) Suggest **one** safety precaution the students should take when using the catapult.

[1 mark]

.....

.....

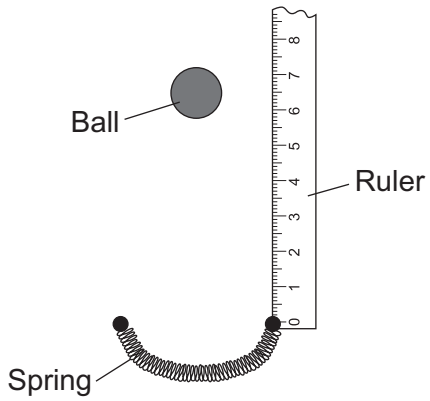
14 (b) What type of energy is stored in the stretched spring?

[1 mark]

.....

14 (c) The students stretch the spring by different amounts and measure the height the ball reaches each time. **Figure 18** shows the ball after it has been fired into the air.

Figure 18



14 (c) (i) Suggest **two** sources of error when measuring the height the ball reaches.

[2 marks]

1 .....

.....

2 .....

.....

14 (c) (ii) The ball is fired into the air and reaches a height of 1.8 metres.

The mass of the ball is 20 g.

The gravitational field strength is 10 N/kg.

Calculate the gravitational potential energy gained by the ball and give the unit.

Use the correct equation from the Physics Equations Sheet.

[3 marks]

.....

.....

.....

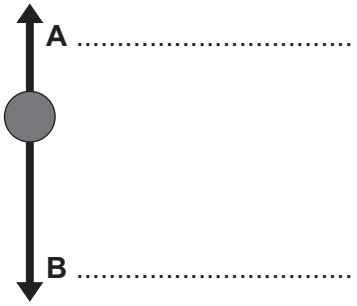
Energy = ... Unit .....

Question 14 continues on the next page

14 (d) After reaching a maximum height, the ball accelerates towards the ground.

Figure 19 shows the two forces acting on the ball as it accelerates.

Figure 19



14 (d) (i) Label the forces **A** and **B**, on **Figure 19**.

[2 marks]

14 (d) (ii) Draw a ring around the correct answer to complete the sentence.

[1 mark]

As the ball accelerates, its gravitational potential energy decreases

and its kinetic energy | increases. | stays the same. | decreases.

10

END OF QUESTIONS

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Dental Brace © Thinkstock
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