

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										



General Certificate of Secondary Education
Foundation Tier
January 2013

Additional Science 1

AS1FP

Unit 5

Tuesday 22 January 2013 9.00 am to 10.30 am

F

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

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 11(a) 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.

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



J A N 1 3 A S 1 F P O 1

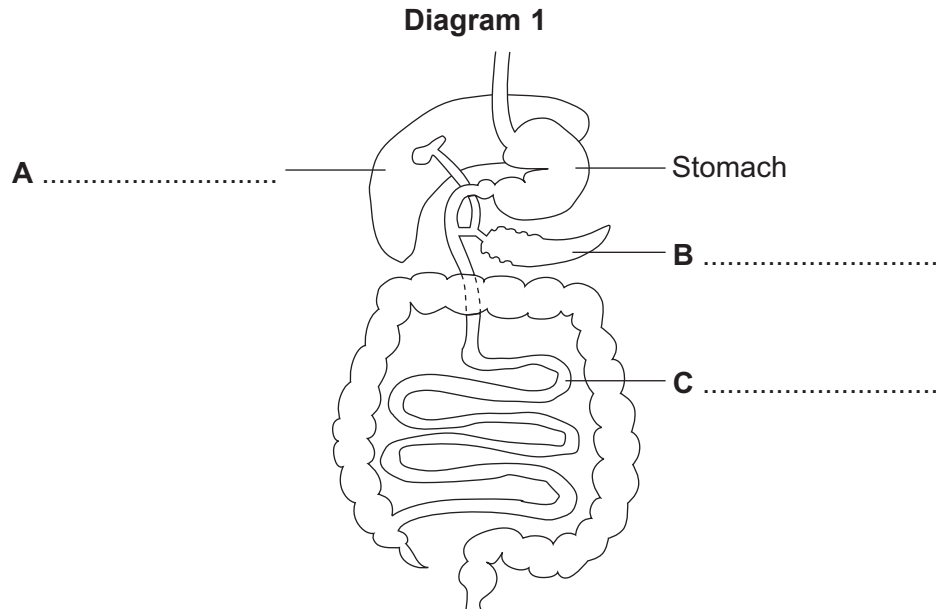
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AS1FP

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

Biology Questions

- 1 **Diagram 1** shows part of the digestive system.



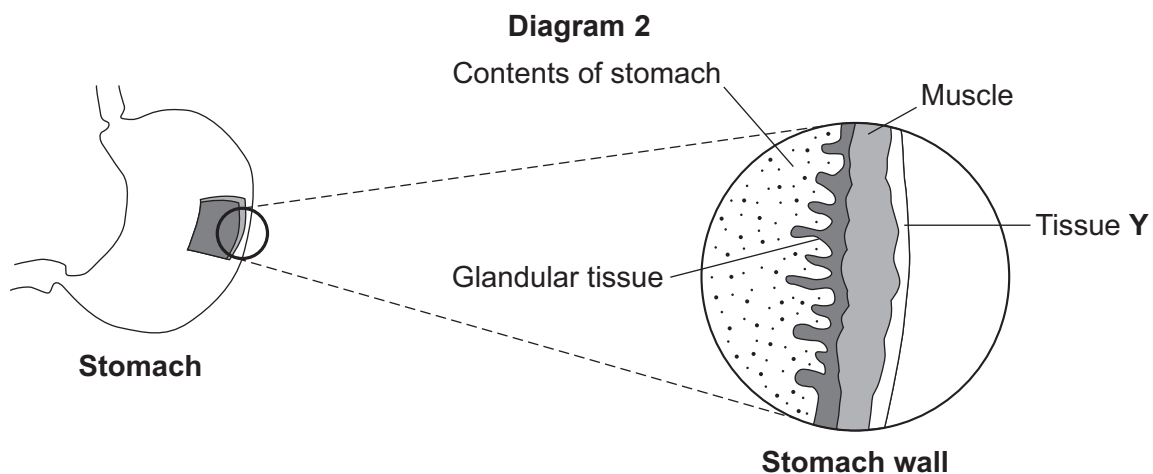
- 1 (a) Use words from the box to label **A**, **B** and **C** on the diagram.

large intestine	liver	pancreas
salivary gland	small intestine	

(3 marks)

- 1 (b) **Diagram 2** shows the stomach.

Part of the stomach has been cut away to show the structure of the stomach wall.



1 (b) (i) Which word describes the stomach?

Draw a ring around the correct answer.

cell

organ

organism

(1 mark)

1 (b) (ii) The contents of the stomach are churned (mixed up).

Describe how.

.....

.....

.....

.....

(2 marks)

1 (b) (iii) Tissue **Y** covers the outside of the stomach.

What is the name of tissue **Y**?

Tick (✓) **one** box.

Epithelial tissue

☐

Mesophyll tissue

☐

Epidermal tissue

☐

(1 mark)

1 (b) (iv) The inner lining of the stomach has a layer of glandular tissue.

What does this glandular tissue do?

.....

.....

(1 mark)



2 (a) Complete the word equation for photosynthesis.

Use **one** word from the box.

nitrogen

starch

water

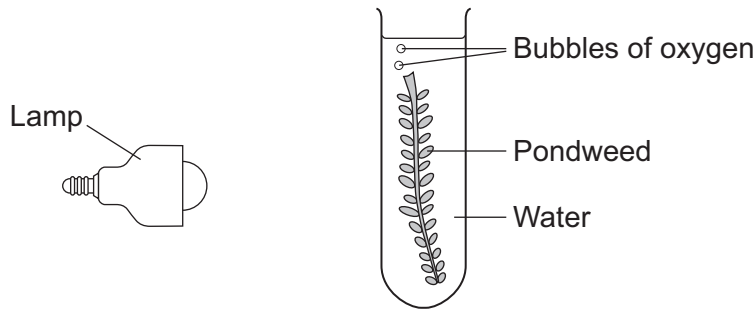
carbon dioxide + $\xrightarrow{\text{light energy}}$ glucose + oxygen

(1 mark)

2 (b) Students investigated the effect of light intensity on the rate of photosynthesis.

The students measured the rate of photosynthesis by counting the number of bubbles of oxygen produced by pondweed in one minute.

The diagram shows the apparatus.



2 (b) (i) The students changed the light intensity in the investigation.

Suggest how.

.....

(1 mark)

2 (b) (ii) To make their investigation fair the students should have controlled some variables.

Give **two** control variables the students should have used in their investigation.

1

2

(2 marks)



2 (c) The students' results are shown in the table.

Light intensity in lux	Number of bubbles of oxygen produced per minute
0	0
5000	14
10 000	29
15 000	43
20 000	43
25 000	43

2 (c) (i) Describe the effect of increasing the light intensity on the rate of photosynthesis.

Use information from the table in your answer.

.....

.....

.....

.....

(2 marks)

2 (c) (ii) A fish-breeder wants to grow pondweed in a fish tank.

The fish-breeder decides to light the fish tank using a light intensity of 25 000 lux.

This is **not** the best decision.

Why?

.....

.....

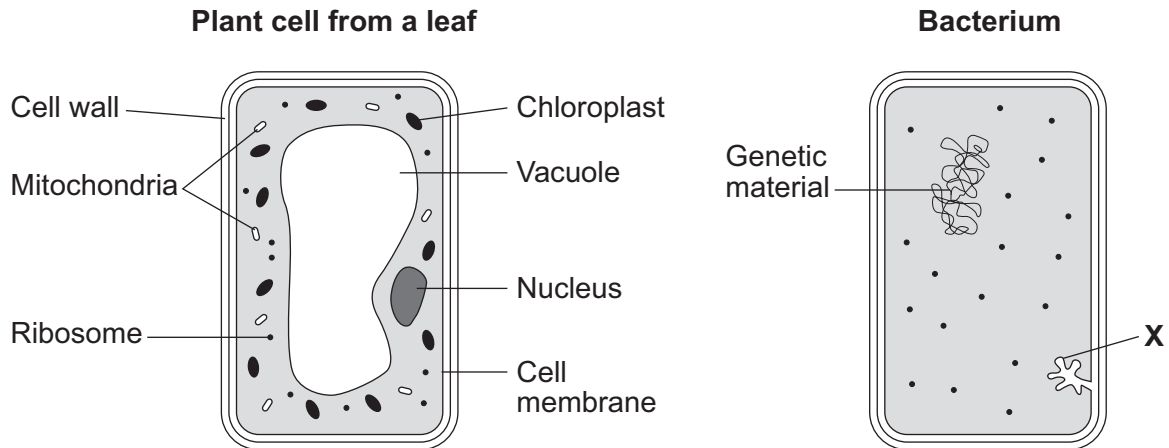
(1 mark)

7

Turn over ►



- 3 The diagrams show a plant cell from a leaf and a bacterium.



- 3 (a) **List A** shows parts of a cell.
List B shows jobs of parts of a cell.

Draw **one** line from each part of the cell in **List A** to its correct job in **List B**.

List A
Parts of a cell

Vacuole

Cell wall

Cell membrane

List B
Jobs of parts of a cell

Contains cell sap

Protein synthesis

Controls the passage of
substances into the cell

Strengthens the cell

(3 marks)



3 (b) Genetic material controls the activities of a cell.

Where is the genetic material in the plant cell?

Tick (✓) **one** box.

In the mitochondria

☐

In the nucleus

☐

In the ribosomes

☐

(1 mark)

3 (c) There are differences between the plant cell and the bacterium.

3 (c) (i) In the plant cell photosynthesis makes food for the cell.

The bacterium is **not** able to photosynthesise.

Why?

Use information from the diagrams to help you.

.....

.....

(1 mark)

3 (c) (ii) The bacterium absorbs dissolved food from outside the cell.

Name the process by which dissolved food is absorbed into the bacterium.

.....

(1 mark)

3 (c) (iii) Structure **X** in the bacterium is where most energy is released in respiration.

Which part of the plant cell does the same job as structure **X**?

Draw a ring around the correct answer.

ribosome

mitochondria

chloroplast

(1 mark)



Chemistry Questions

- 4** Bronze was used to make coins.



- 4 (a)** Bronze is made out of copper and tin.

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

Bronze is	an alloy.
	a compound.
	a molecule.

(1 mark)

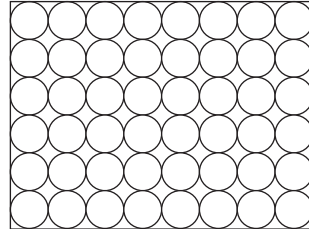


- 4 (b)** Draw **one** line from each substance to the diagram showing the arrangement of its atoms.

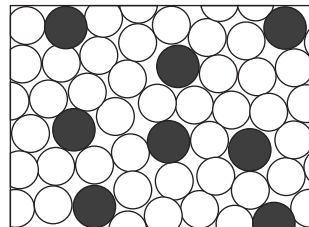
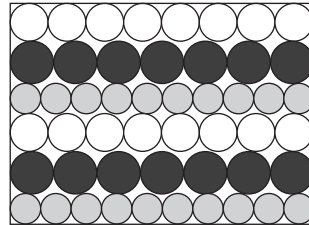
Substance

Arrangement of atoms

Bronze



Copper



(2 marks)

3

Turn over for the next question

Turn over ►



- 5 Rhubarb powder was used as a drug in the 1880s.



A bottle labelled 'Rhubarb Powder' was found in a museum. Scientists were asked to make sure that the substance in the bottle was rhubarb powder.

The scientists used an instrumental method called GC-MS. This identified compounds in the rhubarb powder.

- 5 (a) Draw a ring around the correct answer in the box to complete the sentence.

In this instrumental method the initials GC represent

gas
general
glass

chromatography.

(1 mark)

- 5 (b) Scientists often use instrumental methods instead of chemical tests to analyse substances.

Choose the **two** reasons why.

Tick (✓) **two** boxes.

Instrumental methods . . .	Tick (✓)
allow colour changes to be seen.	
are faster.	
are more accurate.	
use more of the substance.	

(2 marks)



5 (c) Rhubarb contains oxalic acid.

The formula of oxalic acid is $\text{H}_2\text{C}_2\text{O}_4$

Relative atomic masses (A_r): H=1, C=12, O=16

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

5 (c) (i) The relative formula mass (M_r) of oxalic acid is

29

90

192

(1 mark)

5 (c) (ii) The relative formula mass of oxalic acid in grams is called one

ion.

mole.

particle.

(1 mark)

5

Turn over for the next question

Turn over ►



- 6 Sodium fluoride is used in toothpaste.



- 6 (a) Sodium fluoride is an ionic compound.

Which **two** properties would you expect ionic compounds to have?

Tick (✓) **two** boxes.

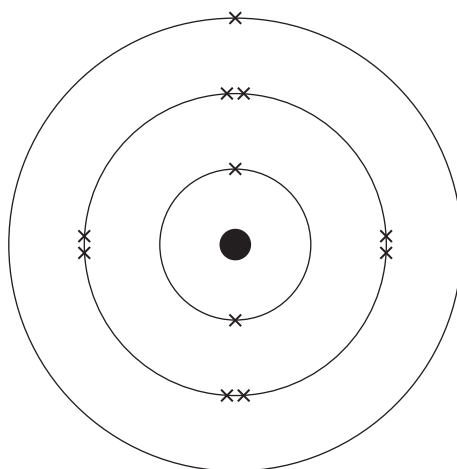
Ionic compounds . . .	Tick (✓)
conduct electricity when dissolved in water.	
conduct electricity when solid.	
are gases at room temperature.	
have a high melting point.	

(2 marks)

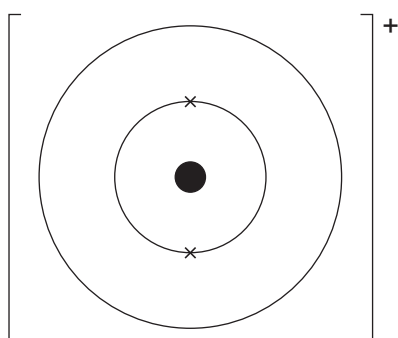


6 (b) Sodium fluoride contains sodium ions and fluoride ions.

The diagram shows the electronic structure of a sodium atom.



Complete the diagram below to show the electronic structure of a sodium ion (Na^+).



(1 mark)

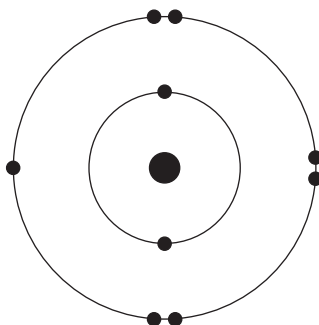
Question 6 continues on the next page

Turn over ►



6 (c) When sodium reacts with fluorine, the fluorine atoms change into fluoride ions.

The diagram below represents a fluorine atom.



Use the diagram to help you answer this question.

6 (c) (i) Draw a ring around the correct answer in each box to complete the sentence.

A fluorine atom	gains	1	electron(s) to form a fluoride ion.
	loses	2	
	shares	7	

(2 marks)

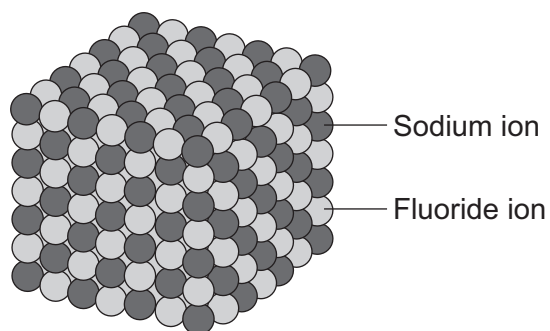
6 (c) (ii) What is the charge on the fluoride ion?

.....

(1 mark)



- 6 (d)** The structure of solid sodium fluoride is shown below.



The sodium ions and fluoride ions are held together in solid sodium fluoride.

Describe how.

.....

.....

.....

.....

(2 marks)

- 6 (e)** Fluorine is in Group 7 of the periodic table.

Complete the sentence.

The elements in Group 7 are called the

(1 mark)

9

Turn over for the next question

Turn over ►



- 7 A cricketer uses zinc oxide sunblock on his face.



- 7 (a) The formula of zinc oxide is ZnO .

The relative formula mass (M_r) of zinc oxide is 81

Relative atomic masses (A_r): O = 16, Zn = 65

Calculate the percentage of zinc in zinc oxide.

Use the equation to help you answer this.

$\text{percentage (\%)} \text{ of element} = \frac{\text{relative atomic mass of element}}{\text{relative formula mass of compound}} \times 100$
--

Show clearly how you work out your answer.

.....

.....

.....

Percentage of zinc =%
(2 marks)

- 7 (b) Modern sun creams contain nanoparticles.

- 7 (b) (i) How are nanoparticles different in size from normal sized particles?

.....

.....

(1 mark)



7 (b) (ii) A nanoparticle has a high surface area to volume ratio.

Suggest why nanoparticles are useful in sun creams.

.....

.....

(1 mark)

4

Turn over for the next question

Turn over ►



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Physics Questions

- 8 (a)** **List A** shows the names of two electrical components.
List B shows the current-potential difference graphs for some electrical components.

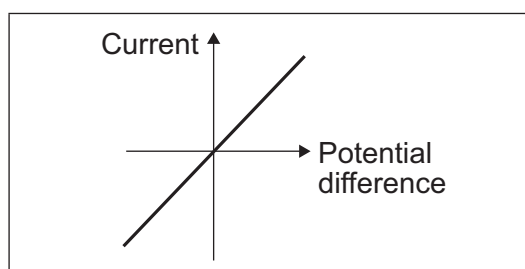
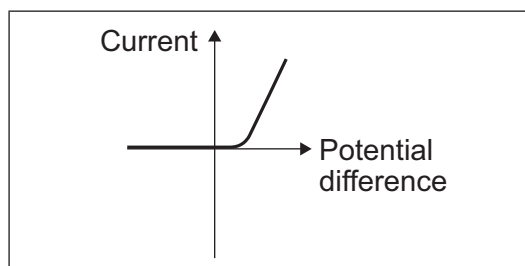
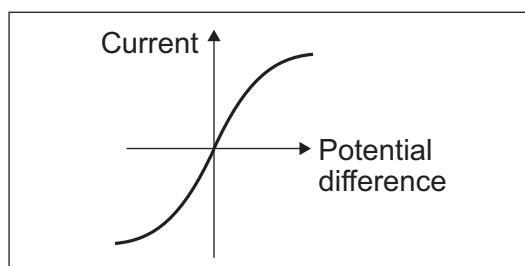
Draw **one** line from each component to the correct current-potential difference graph.

List A
Electrical components

Resistor
(at a constant
temperature)

Filament bulb

List B
Current-potential difference graphs



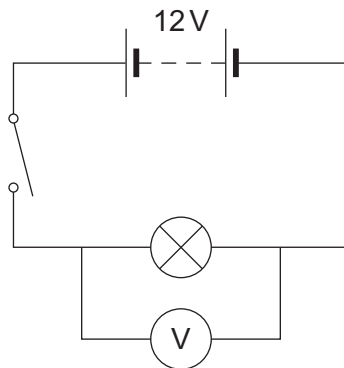
(2 marks)

Question 8 continues on the next page

Turn over ►



- 8 (b)** A student investigates how car headlights work.
The student starts with one lamp and connects **Circuit 1**.

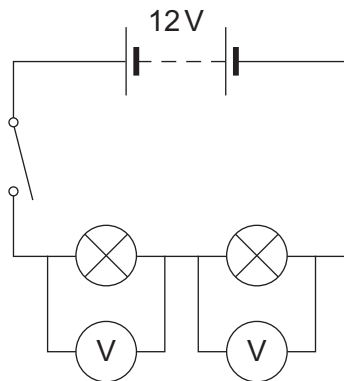
Circuit 1

- 8 (b) (i)** The student closes the switch.

What is the reading on the voltmeter?

..... V
(1 mark)

- 8 (b) (ii)** The student connects two identical lamps in series in **Circuit 2**.

Circuit 2

The student sees that each lamp in **Circuit 2** is not as bright as the one lamp in **Circuit 1**.

The potential difference across each lamp in **Circuit 2** is the same.

What is the reading on each voltmeter?

Give a reason for your answer.

Voltmeter readingV

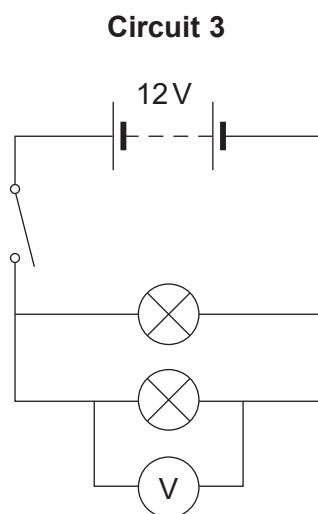
Reason

.....

(2 marks)



8 (b) (iii) The student connects the two lamps in parallel in **Circuit 3**.



What is the reading on the voltmeter in **Circuit 3**?

..... V
(1 mark)

8 (b) (iv) The student decides that **Circuit 3** is the best circuit for car headlights.

Why is **Circuit 3** the best?

Tick (✓) **one** box.

Circuit 3 is the best because...	Tick (✓)
the lamps can be controlled separately.	
if one lamp breaks the other will stay on.	
if one lamp breaks the other will increase in brightness.	

(1 mark)

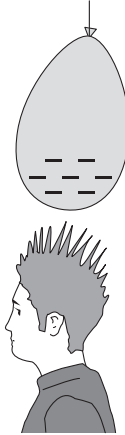
7

Turn over for the next question

Turn over ►



- 9** The diagram shows a student after rubbing a balloon on his hair. The balloon and hair have become charged.



- 9 (a)** Draw a ring around the correct answer in each box to complete each sentence.

- 9 (a) (i)** After rubbing, the charge on his hair is

positive.
negative.
neutral.

(1 mark)

- 9 (a) (ii)** When the balloon is rubbed on his hair the balloon gains

neutrons.
protons.
electrons.

(1 mark)

- 9 (b)** After the student rubs the balloon on his hair, his hair stands on end.

Explain why.

.....

.....

.....

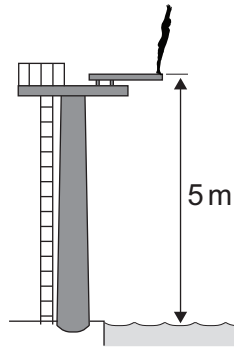
.....

(2 marks)



10

The diagram shows a high diving platform at a swimming pool.
The height of the board from the water is 5 metres.



- 10 (a) (i)** The mass of the diver is 50 kg.
The gravitational field strength is 10 N/kg.

Calculate the weight of the diver.

Use the correct equation from the Physics Equations Sheet.

Show clearly how you work out your answer.

.....

.....

.....

Weight = N
(2 marks)

- 10 (a) (ii)** A different diver weighs 600 N.

Calculate the work done when this diver climbs the steps to the top of the diving platform.

Use the correct equation from the Physics Equations Sheet.

Show clearly how you work out your answer.

.....

.....

.....

Work done = J
(2 marks)

Question 10 continues on the next page

Turn over ►



- 10 (b)** The diagram shows a diver as she enters the water.



When the diver enters the water she slows down.

Why?

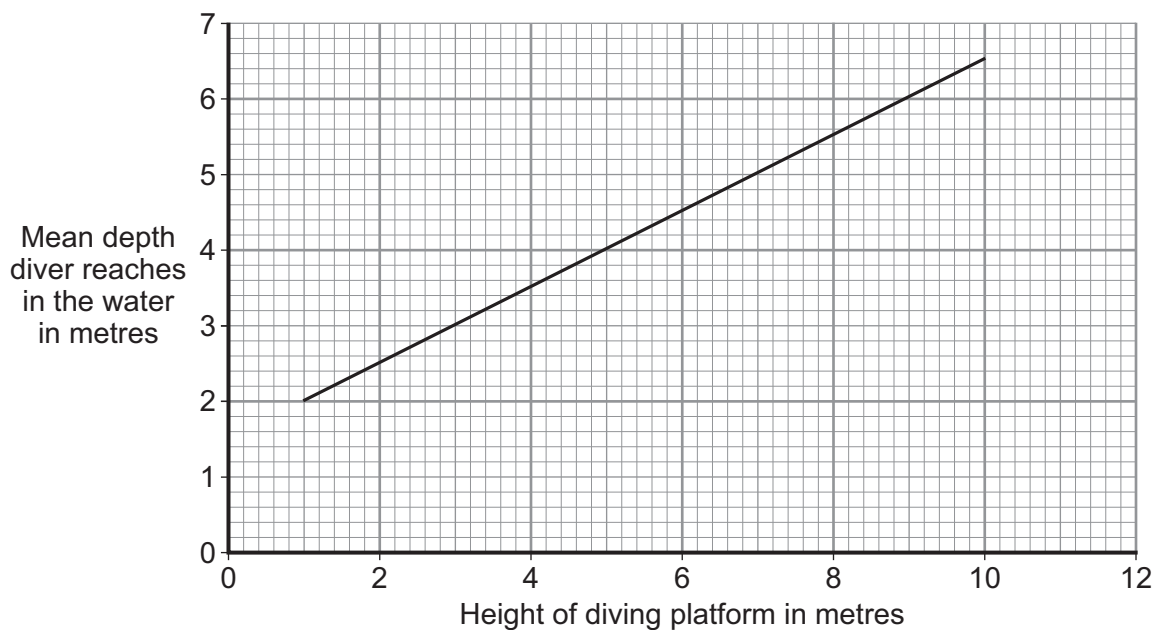
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(1 mark)

- 10 (c)** Some swimming pools have diving platforms at different heights above the water.

The graph below shows the mean depth a diver reaches in the water after diving from platforms of different heights.



- 10 (c) (i)** What happens to the mean depth the diver reaches as the height of the diving platform increases?

.....

.....

(1 mark)



- 10 (c) (ii)** A family is going to build a swimming pool. They are thinking about putting in a 5 metre high diving platform.

Suggest the minimum depth their swimming pool needs to be.

Explain your answer.

Minimum depth metres

Reason

.....

.....

.....

.....

(3 marks)

9

Turn over for the next question

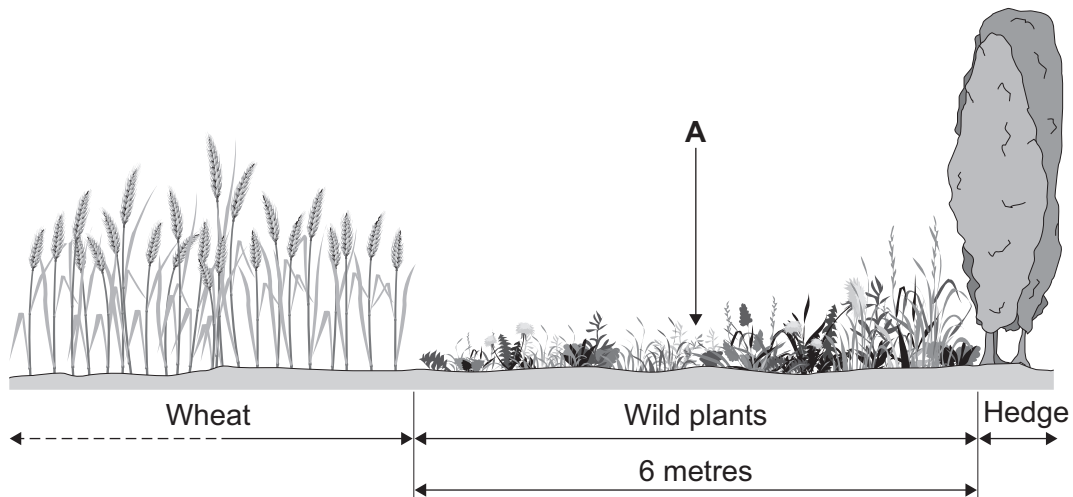
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Biology Questions

11 Farmers grow crops of wheat.

Wild plants grow, in a border 6 metres wide, between the edge of the crop and the hedge around a field.



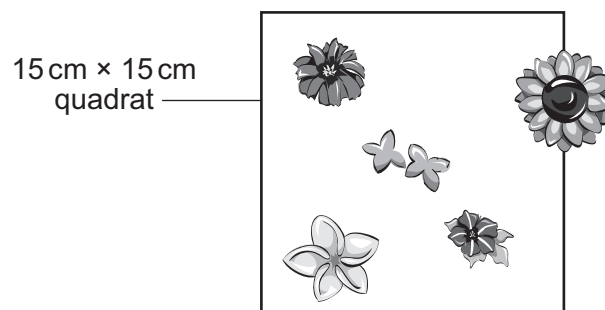
11 (a) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

A teacher asked a student to investigate the distribution of the different species of wild plants between the edge of the wheat crop and the hedge.

The student wrote a simple plan:

- use a 15 cm x 15 cm quadrat
- put the quadrat at **A**
- count the plants in the quadrat.

The student drew a diagram of the plants in the quadrat.



The student said,
'There are 6 plants between the edge of the wheat crop and the hedge'.



Suggest how the student could improve the plan to give valid results.

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Question 11 continues on the next page

- 11 (b)** Small mammals, such as mice, sometimes shelter among the wheat plants.
Mice feed on seeds.

The student improved the method.

The student found that the further away from the crop, the **more** wild plants there were.

Suggest why.

.....

.....

.....

.....

(2 marks)

8



Chemistry Questions

12 The age of an object can be found using carbon dating.

Carbon dating was used to estimate the age of an Egyptian boat thousands of years old.



Most carbon occurs as the isotope carbon-12 ($^{12}_6\text{C}$).

Another isotope, carbon-14 ($^{14}_6\text{C}$), is used in carbon dating.

What are isotopes?

In your answer you should refer to the numbers of protons, electrons and neutrons in the isotopes of carbon.

.....

.....

.....

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.....

.....

(3 marks)

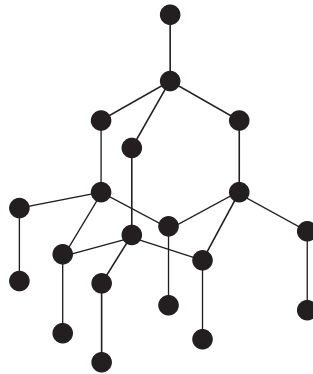
3

Turn over ►



13 Diamond-tipped drills can be used to cut through rock.

13 (a) The diagram shows how the atoms are joined in part of a diamond.



Describe the structure and bonding in diamond.

.....

.....

.....

.....

.....

.....

.....

.....

(4 marks)

13 (b) Diamonds are used in drills even though they are expensive.

Explain why.

.....

.....

.....

.....

(2 marks)



Physics Questions

14 The picture shows a very fast car.

The car was built to break the world land speed record.



14 (a) (i) The car accelerates from 0 m/s to a velocity of 470 m/s.
The car reaches this velocity in 40 seconds.

Calculate the acceleration of the car. Give the unit.

Use the correct equation from the Physics Equations Sheet.

Show clearly how you work out your answer.

.....

.....

.....

.....

.....

Acceleration =
(3 marks)

Question 14 continues on the next page

Turn over ►



- 14 (a) (ii)** During the 40 seconds it takes to accelerate to 470 m/s the car will have travelled about 10 km.

Only some places are suitable to attempt to break the world land speed record.

Suggest **three** factors that need to be considered when choosing an area in which to attempt to break the world land speed record.

Factor 1

.....

Factor 2

.....

Factor 3

.....

(3 marks)

- 14 (b)** The table shows some information about a world land speed record attempted in 1997.

Car name	Year	Maximum engine force in newtons	Top speed in m/s
Thrust SSC	1997	223 000	342

The top speed of a car occurs when terminal velocity is reached.

Explain why a car reaches terminal velocity.

.....

.....

.....

.....

.....

(3 marks)



14 (c) When trying to break the world land speed record there will be 55 practice runs.

During each practice run the car will give out 300 times more harmful gases than a normal family car over the same distance.

In terms of the environment do you think the world land speed record attempt is justified?

Draw a ring around your answer. **Yes** / **No**

Give **one** reason for your answer.

.....

.....

.....

(1 mark)

10

END OF QUESTIONS



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