Surname	Centre Number	Candidate Number
Other Names		0

New GCSE

4791/01

ADDITIONAL APPLIED SCIENCE

UNIT 1: Science at Work in Applied Contexts
FOUNDATION TIER

A.M. TUESDAY, 22 January 2013

1 hour

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**10**	
2.	**9**	
3.	**7**	
4.	**10**	
5.	**7**	
6.	**9**	
7.	**8**	
Total	**60**	

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ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication used in your answer to question **7***(b)*.

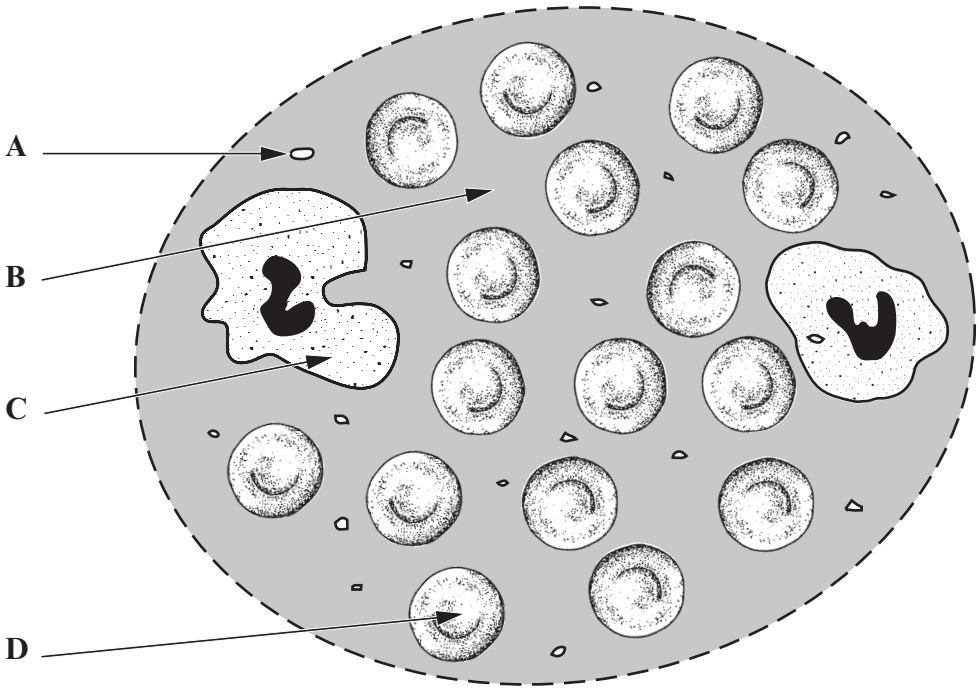
You are reminded to show all your working. Credit is given for correct working even when the final answer given is incorrect.

Examiner only

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

1. Amy visits the doctor because she always feels tired. The doctor takes a blood sample for analysis.

Some of the blood sample is put onto a microscope slide and looked at with a microscope. The blood sample contains red blood cells, white blood cells, platelets and plasma.



(a) Which letter **A**, **B**, **C** or **D** shows the red blood cell? ..... [1]

(b) Here is a table about the components of blood and their functions. The first row has been completed for you. Complete the table. [2]

Component	Function
red blood cell	to carry oxygen
white blood cell	.....
.....	to help form blood clots

(c) Amy is found to be anaemic and is given iron tablets.

Give the chemical symbol for iron. ..... [1]

Examiner only

(d) The iron tablets are checked by the manufacturer by carrying out a titration.

The following table shows the titration results.

	Titration **A**	Titration **B**	Titration **C**
Final burette reading (cm^3)	27.7	27.8	25.6
Initial burette reading (cm^3)	5.0	5.0	5.0
Titre (difference) (cm^3)	22.7	.....	20.6

(i) Complete the table. [1]

(ii) Give **one** reason why the manufacturer repeats the titration. [1]

.....

.....

(iii) The manufacturer calculates the average titre from the titrations. Suggest which one of the titrations is not included in this calculation and give **one** reason why. [2]

Titration .....

Reason .....

.....

(e) (i) The manufacturer analyses another sample of tablets. They obtain an average titre of 22.6 cm^3. Calculate the iron content of the tablets using the equation: [1]

$$\text{iron content (mg)} = \frac{\text{average titre}}{1.61}$$

Amount of iron = ... mg

(ii) Tablets are rejected if the amount of iron is outside the range 13.90 - 14.10 mg. Give **one** reason whether or not this sample of tablets should be rejected. [1]

.....

.....

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10

Turn over.

Examiner only

2. A school group visits a farm to see how food is produced. The produce from the farm is sold in the onsite shop.

(a) In the shop they have various products that have been preserved. Complete the following sentences using words from the box below. [2]

three	seven	ten	slows	speeds up	does not change

Onions can be preserved by pickling with vinegar. Vinegar has a pH of .....

which ..... the growth of bacteria.

(b) When serving in the shop, the assistants have to wash their hands as they move from the raw meat counter to the cooked meat counter.

(i) Give **one** reason why they need to wash their hands. [1]

.....

.....

(ii) Give **one** *other* precaution that the shop assistants take when working with raw and cooked meat. [1]

.....

.....

(c) Yoghurt is one of the foods produced on the farm and sold in the shop.

(i) The production sequence is shown incorrectly in the steps below. Using the letters below, put the steps in the correct sequence. [2]

A. Incubate for 3-6 hours

B. Cool the milk to 30°C

C. Heat the milk to 85°C to kill contaminant organisms

D. Add the yoghurt culture and stir

One has been done for you.

(ii) What is meant by 'incubate'? [1]

.....

Examiner only

(d) Piglets are also reared on the farm. The farm is trialling feeding the piglets yoghurt.

Litter	Litter **1**	Litter **2**
Average starting mass of piglet (kg)	7.9	7.8
Average mass gain each week (kg)	1.2	1.5

(i) How can you tell from the data in the table that litter **2** must have been fed yoghurt as well as milk from the mother? [1]

.....

.....

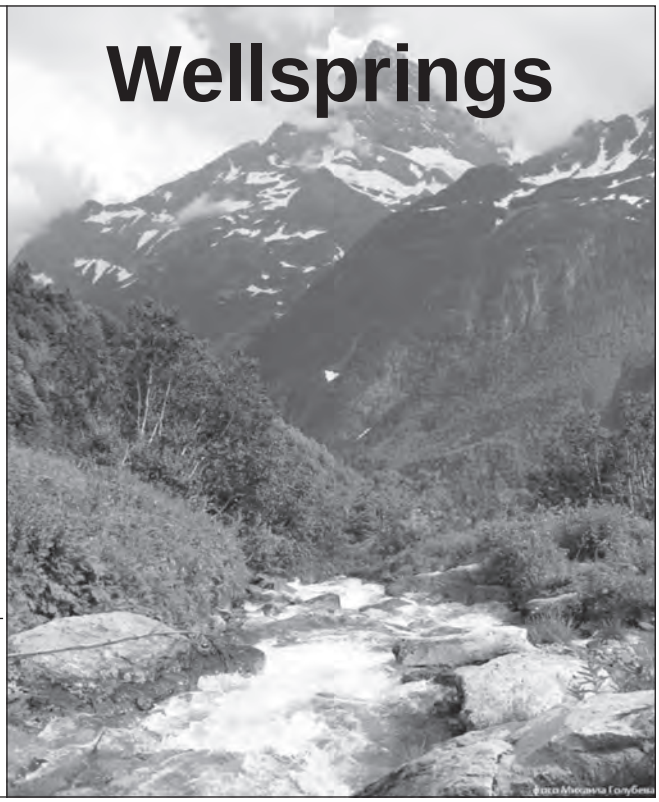
(ii) Calculate the average mass gain of a piglet from litter **2** in 4 weeks. [1]

Average mass gain in 4 weeks = ... kg

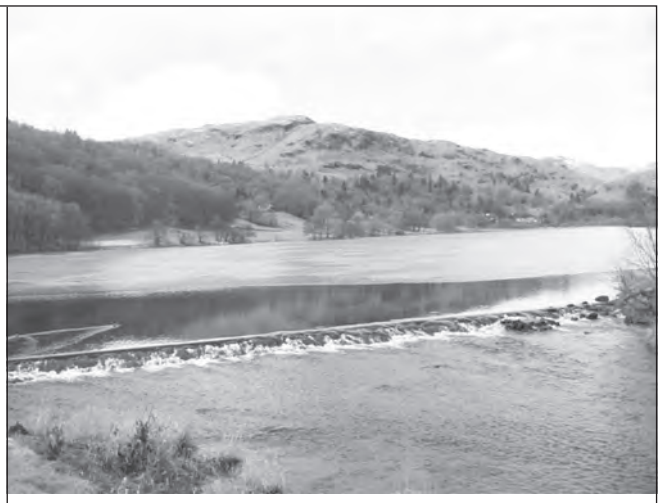
9

3. "Wellsprings" and "Vital H_2O" are companies producing bottled water. The data from the labels on their bottles is shown below.

	mg/cm^3
Calcium	1.0
Magnesium	0.2
Sodium	0.8
Potassium	0.1
Bicarbonate	2.4
Chloride	1.2
Sulfate	1.0
Nitrate	1.1
Total dry residue at 180°C	7.9 mg
pH at source	6.1



	mg/cm^3
Calcium	0.9
Magnesium	1.1
Sodium	0.1
Potassium	0.1
Bicarbonate	1.9
Chloride	0.9
Sulfate	0.0
Nitrate	0.1
Total dry residue at 180°C	5.4 mg
pH at source	7.3



Vital H_2O

Examiner only

(a) (i) Using the data from the labels, state which water is acidic giving **one** reason for your answer. [1]

.....

.....

(ii) Give **one** difference, other than pH, between the two bottles of water. [1]

.....

(b) The table below shows analytical techniques that the companies could use to test their water.

Technique	Observation	Ions present
Flame test	yellow flame	sodium
	brick red flame	calcium
	lilac flame	potassium
Test with sodium hydroxide	white precipitate forms	calcium
	brown precipitate forms	iron(III)
Test with barium chloride	white precipitate forms	sulfate

(i) Which of these three techniques could **not** be used to test for the presence of the metal ions in the water? [1]

.....

(ii) What observations would you expect to make when a sample of each water is tested with barium chloride? [2]

Wellsprings .....

Vital H_2O .....

(iii) Give **one** reason why the results of the flame test for 'Wellsprings' water might be difficult to interpret. [1]

.....

.....

(c) The mass of the dry residue is measured with a balance. Suggest **one** reason why the companies should regularly check the balance. [1]

.....

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7

Turn over.

Examiner only

4. The Jones family make a New Year resolution to get fit. They join a gym.

(a) Each person is given an initial fitness assessment.

(i) Susan Jones, their 10 year old daughter, has a BMI of 17. Give **one** reason why this information **may not** be useful to the fitness instructors. [1]

.....

.....

(ii) Give **one** example, apart from BMI, of the basic information taken as part of the fitness assessment. [1]

.....

(iii) State why this information is kept confidential. [1]

.....

.....

(b) Mrs Jones has an active job and is 'on her feet' for most of the day. Her training programme includes using the following pieces of equipment.

A running machine

A multigym

An exercise ball

(i) Which piece of equipment should Mrs Jones use for **aerobic exercise**? Give **one** reason for your choice. [2]

Equipment .....

Reason .....

.....

Examiner only

(ii) Which piece of equipment should Mrs Jones use for **building muscle mass**? Give **one** reason for your choice. [2]

Equipment .....

Reason .....

.....

(c) (i) Mr Jones is a taxi driver and does little exercise. Give **one** reason why his lifestyle could affect his health. [1]

.....

(ii) Give **one** short term effect on Mr Jones' body when he begins an exercise programme for the first time. [1]

.....

(iii) Give **one** long term effect on Mr Jones' heart when he exercises regularly. [1]

.....

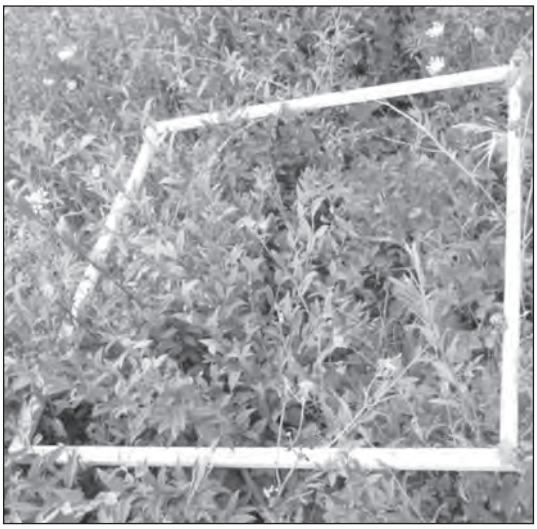
10

Turn over.

5. The Wildlife Trust manages a number of reserves where they maintain natural habitats.

A farm shares a boundary with a Wildlife Trust reserve. The plants are monitored to avoid the spread of species across the boundary (invasive species).

A quadrat can be used to sample the number of plants.

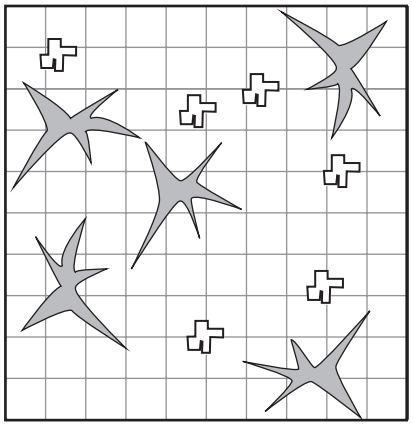


Sample **A** is from the boundary between the farmland and Wildlife Trust reserve.

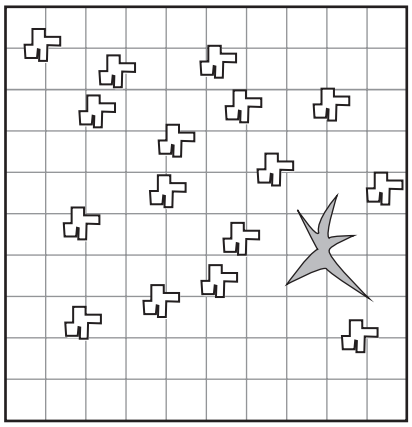
Sample **B** is taken 10 metres from the boundary on the farmland.

(a) Below are two quadrat samples.

Sample **A**



Sample **B**



Key

Teasel

Rapeseed

Examiner only

(i) Record the results from the quadrat samples in the table below. [2]

Sample	Number of teasel plants	Number of rapeseed plants
A	.....	.....
B	.....	.....

(ii) The farmer grows rapeseed as a crop. Teasel is a plant that grows in the Wildlife reserve. Explain why the farmer needs to monitor the teasel plants on his farmland. [3]

.....

.....

.....

.....

(iii) Give **one** reason why there is a greater variety of species on farms close to the reserve compared to farms further away. [1]

.....

.....

(b) Give **one** organic method of eliminating weeds that are growing within crops. [1]

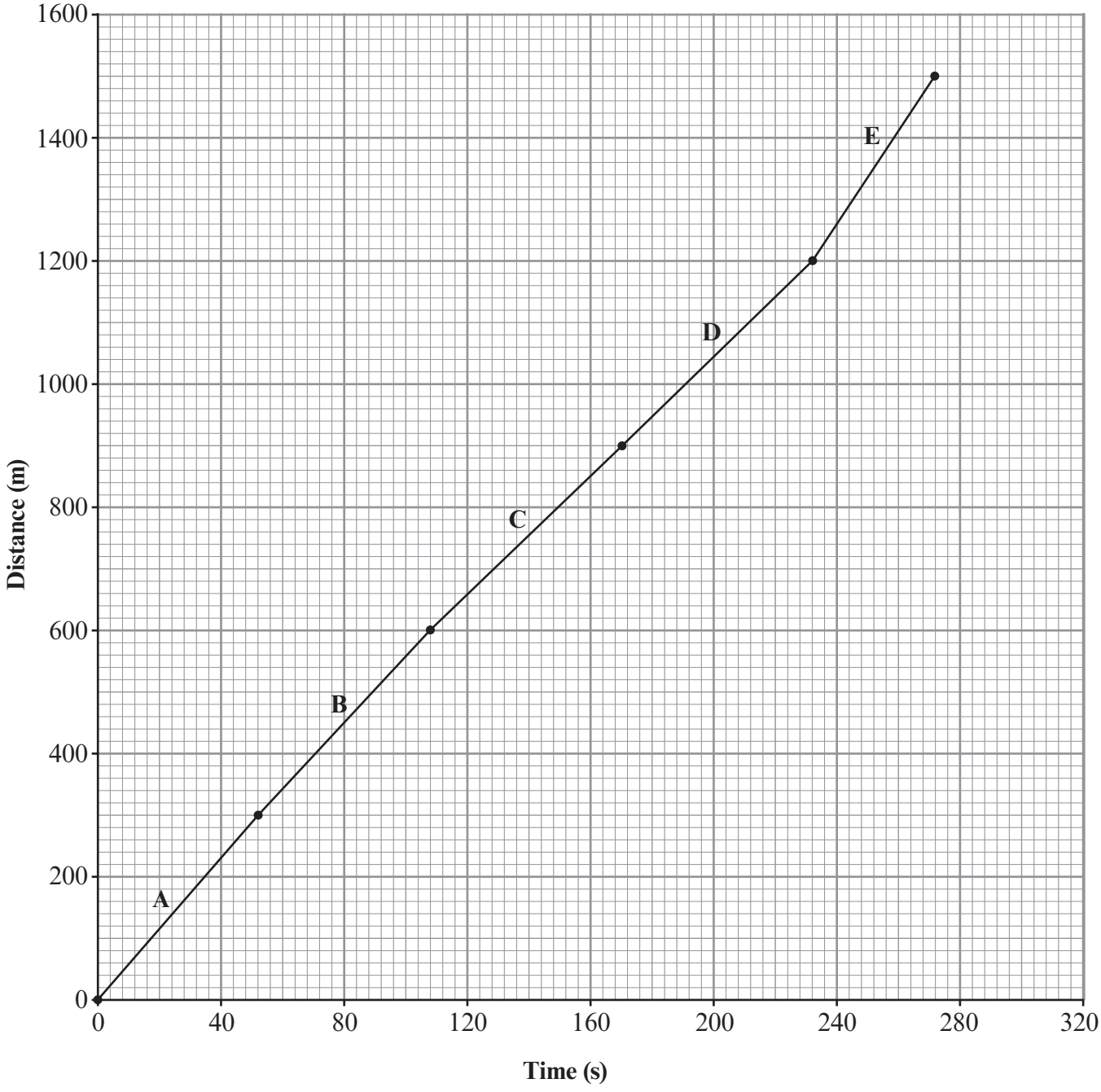
.....

7

Turn over.

6. Gareth and Kevin entered a 1500 m race. Their performance during the race was measured. The time they take to complete each 300 m stage of the race was measured.

A distance–time graph is plotted below for Kevin.



Examiner only

(a) Use the graph to find the:

(i) time taken by Kevin to complete the race. [1]

..... seconds

(ii) fastest 300 m section (**A**, **B**, **C**, **D** or **E**) ran by Kevin. [1]

.....

(b) Gareth's performance in the same race is recorded in the table below.

GARETH	
Time (seconds)	Distance (metres)
0	0
60	300
120	600
180	900
240	1200
320	1500

(i) On the same graph, **plot** the performance of Gareth using the values shown in the table above. [3]

(ii) Calculate the mean speed for **Gareth** during the first **900 m** using the equation: [2]

$$\text{Mean speed} = \frac{\text{distance}}{\text{time}}$$

Answer: ..... m/s

(c) Use the data to explain how the fitness of Gareth compares with Kevin. [2]

.....

.....

.....

9

Turn over.

Examiner only

7. Clothing worn by cyclists is made from a number of modern materials that include Lycra®, Gor-Tex® and Thinsulate®.

(a) Gor-Tex® is a material often used for the jackets worn by cyclists in the rain. Gor-Tex® is described as a 'breathable' material. What is meant by the term '*breathable*'? [2]

.....

.....

(b) Lycra® is used to make cyclist's shorts. Thinsulate® is used as the filling in their jackets. Explain why the structure and properties of Lycra® and Thinsulate® make them suitable for these uses. [6] *QWC*

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Examiner only

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END OF PAPER