Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4791/01

ADDITIONAL APPLIED SCIENCE

UNIT 1: Science at Work in Applied Contexts
FOUNDATION TIER

P.M. MONDAY, 20 May 2013

1 hour

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**8**	
2.	**6**	
3.	**5**	
4.	**9**	
5.	**5**	
6.	**5**	
7.	**8**	
8.	**7**	
9.	**7**	
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 **9**(i).

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

Examiner only

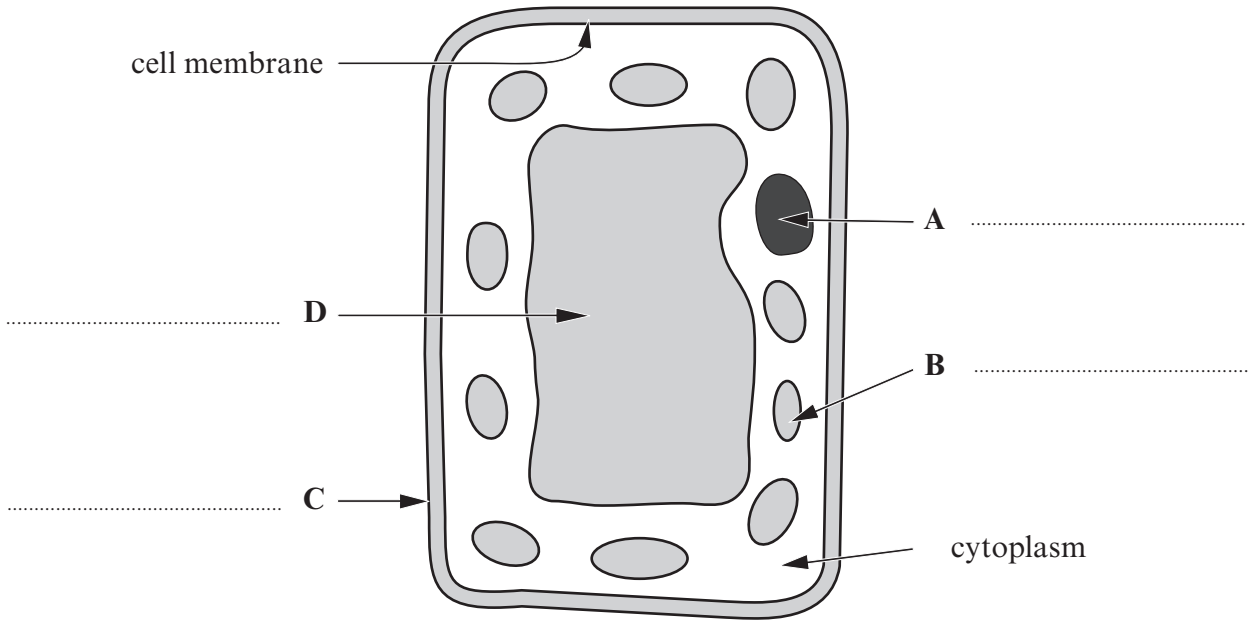
Answer **all** *the questions in the spaces provided.*

1. Plant biologists have examined some plants that had not grown very well.

(a) They looked at cells from the leaves of a plant under a microscope.

Choose from the following words to label the parts **A**, **B**, **C** and **D** on the diagram. [4]

cell wall chromosome vacuole nucleus chloroplast



(b) The biologists found that the plants were deficient in phosphate and magnesium.

(i) Complete the table to show the symptoms of these deficiencies. [2]

Mineral	Deficiency symptoms
nitrate	poor growth
phosphate	..... roots
potassium	poor flower growth
magnesium	..... leaves

(ii) Explain the function of chlorophyll. [2]

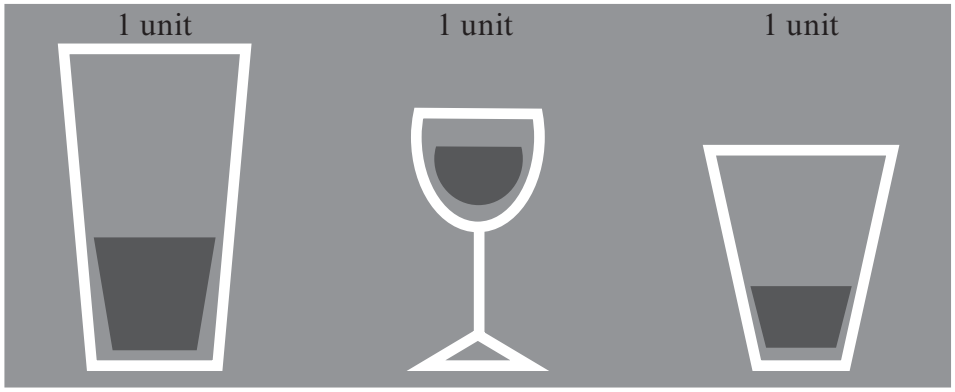
.....

.....

Examiner only

2. Lifestyle can affect health and fitness.

(a) The diagram below shows the units of alcohol in each drink.



½ pint of ordinary strength beer, lager or cider

1 small glass of wine

1 single measure of spirits

lothianhealthandlife.scot.nhs.uk

The government advises that people should not regularly drink more than the daily unit guidelines of 3 units of alcohol for men and 2 units of alcohol for women.

Complete the following sentences.

(i) To stay in the limit, women should drink no more than ..... small glasses of wine a day. [1]

(ii) To stay in the limit, men should drink no more than..... half pints of beer a day. [1]

(b) Too much alcohol can affect the body in many ways.
Use ticks (✓) to **complete** the table below to show whether each effect is short term or long term. [4]

Effect on body	Short term	Long term
slurred speech		
liver damage		
becomes addicted		
vomiting		

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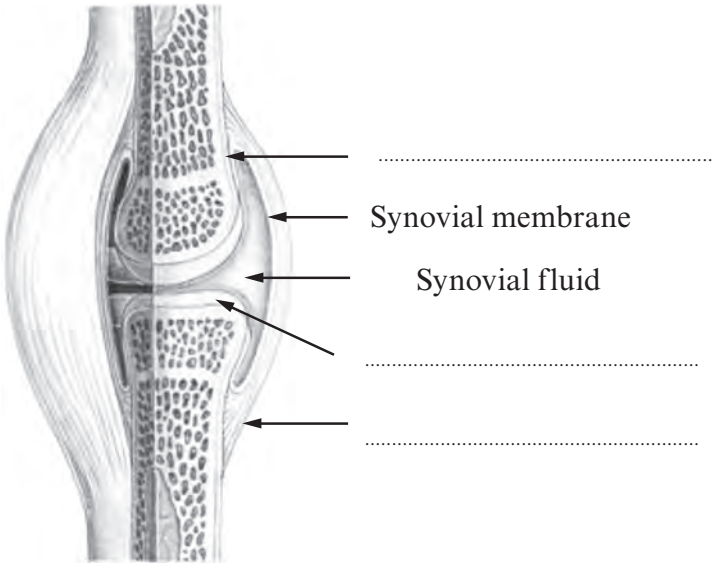
6

Turn over.

Examiner only

3. Researchers into arthritis study synovial joints.

(i) Label the **cartilage**, **bone** and **ligament** on the diagram of a synovial joint shown below. [2]



(ii) **Join** each part of the joint below to its function with a line. [3]

synovial fluid	**pads the ends of bones**
cartilage	**lubrication**
ligament	**support**
bone	**joins bones together**

5

Examiner only

4. Aeroplane wings are made out of sheets of metal.

(a) Underline **three** properties of metals in the list below that make them suitable for this use. [3]

shiny when polished **strong** **malleable** **ductile** **good conductors**

(b) The table shows properties of different metals.

Metal	Density (g/cm^3)	Stiffness (GPa)	Tensile strength (MPa)
aluminium	2.7	69	100
steel	7.8	210	400
titanium	4.5	110	550
vanadium	5.7	138	630

Wings for modern jet fighter aircraft are made from an alloy of titanium, aluminium and vanadium.

The alloy has a density of $4.4\,g/cm^3$, a stiffness of 110 GPa and tensile strength of 1 000 MPa.

Use the information in the table to answer the following questions.

(i) State **three** differences between the properties of this alloy compared with steel. [3]

1. .....

2. .....

3. .....

(ii) State the effect on **density** of adding aluminium to this alloy. [1]

.....

(iii) State the effect on **strength** of adding vanadium to this alloy. [1]

.....

(c) Which diagram below, **A**, **B** or **C**, best shows the structure of an alloy? [1]

.....

A

B

C

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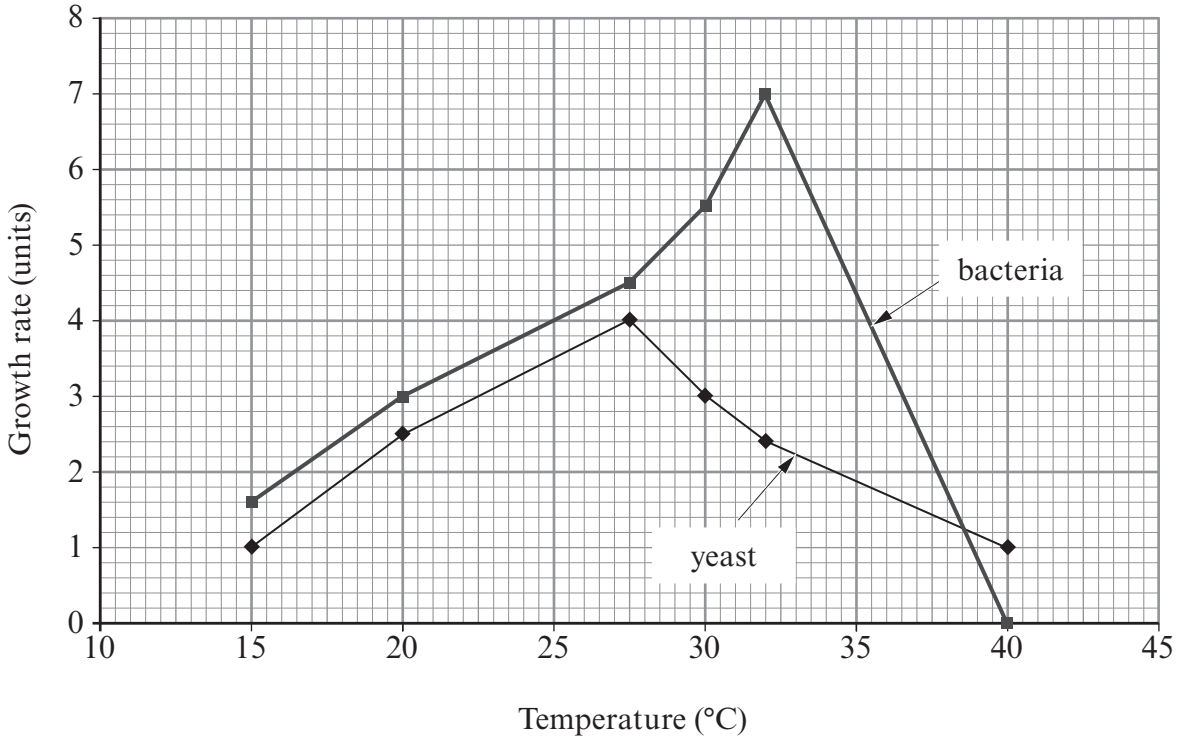
5. Sourdough bread is made using two types of microorganism – yeast and bacteria. The bacteria make lactic acid which makes the bread taste sour.

The graph below shows how the growth rates of the yeast and the bacteria change with temperature.



(a) State the temperature at which yeast grows fastest. ..... [1]

(b) (i) State the temperature at which sourdough bread rises fastest. ..... [1]

(ii) Give **one** reason for your answer. [1]

.....

.....

(c) (i) State the temperature at which bacteria grow fastest. ..... [1]

(ii) Give **one** reason why bread will taste most sour at this temperature. [1]

.....

.....

5

Examiner only

6. (i) Use the table below to calculate the relative formula mass of the fertiliser ammonium nitrate NH_4NO_3. [4]

Element	Relative atomic mass	Number of atoms in NH_4NO_3	Total mass
N	14	2	28
H	1	4	.....
O	16	.....	.....
Relative formula mass		.....	

(ii) Another fertiliser is potassium nitrate, KNO_3. The relative formula mass of potassium nitrate is 101.
What is the mass of **one** mole of potassium nitrate? [1]

Mass = ... g

5

Turn over.

7. An engineering firm makes springs for trampolines.

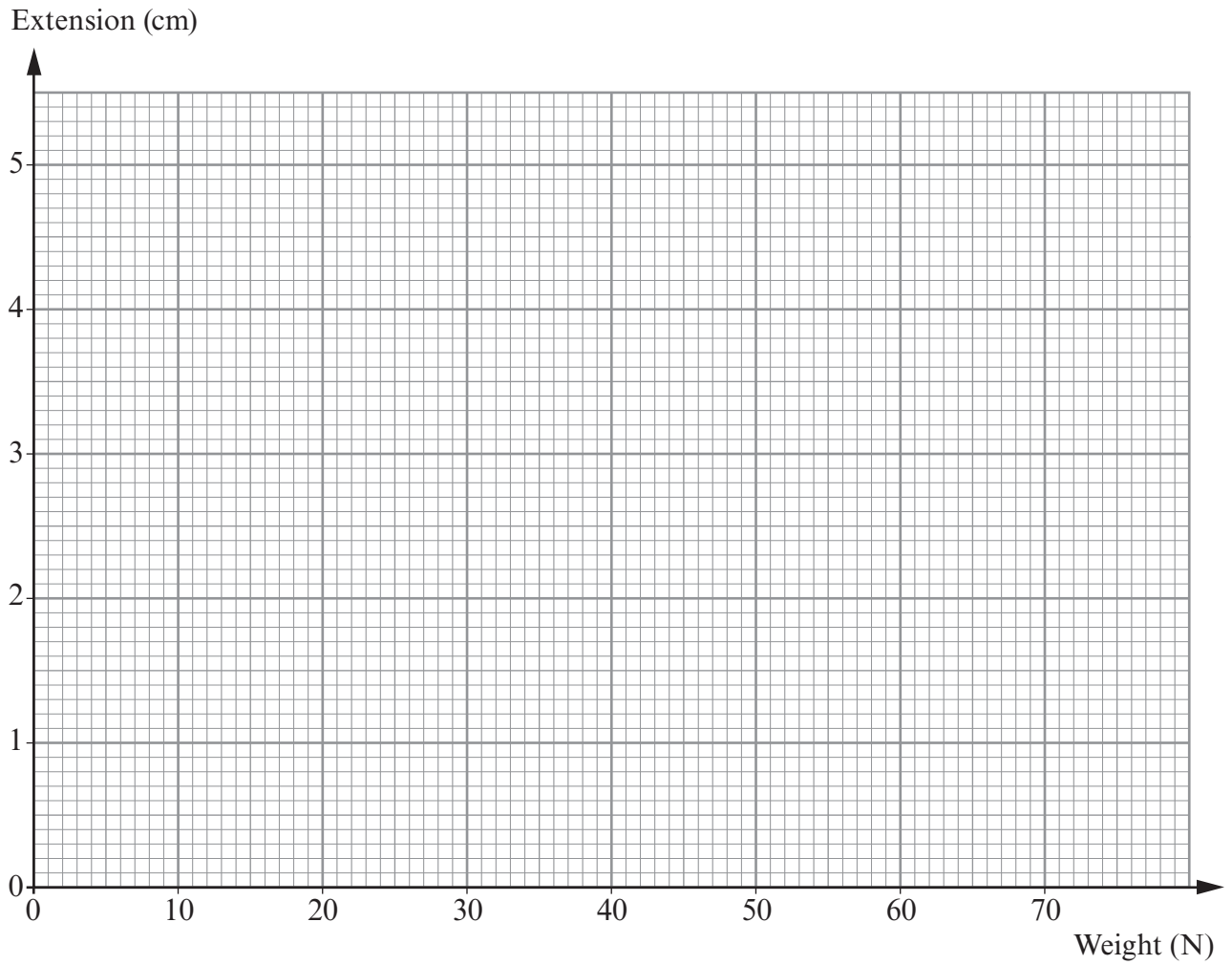
The springs are tested to see if they return to their normal length after being stretched.

The table shows how far a spring extends when different weights are added.

Weight (N)	Extension (cm)
0	0
10	0.5
20	1.0
30	1.5
40	2.0
50	2.5
60	3.4
70	5.0

(i) Plot a graph of the data on the grid opposite. [3]

Examiner only



(ii) Beyond the elastic limit the spring will not return to its original length. The elastic limit is where the extension is no longer proportional to the weight.

In a trampoline, this spring will experience a maximum force of 65 Newtons. Explain whether the spring is suitable for this use. [2]

.....

.....

(iii) Calculate the constant for this spring using the equation: [2]

$$\text{spring constant (N/cm)} = \frac{\text{force (N)}}{\text{extension (cm)}}$$

Constant = ... N/cm

(iv) Suggest a constant for a spring that will not extend as much when weights are added.

..... [1]

8

Examiner only

8. A Scene of Crime Officer (SoCO) collects some powder from a crime scene. She carries out flame tests and precipitation reactions on solutions of the powder. When performing the tests, the SoCO refers to the following information sheet.

Type of salt	Test	Results
carbonate	add hydrochloric acid	carbon dioxide gas is given off
chloride	add nitric acid then silver nitrate	thick white precipitate
nitrate	add iron(II) sulfate solution followed by sulfuric acid	brown ring forms
sulfate	add a solution of barium chloride	white precipitate

Metal	Flame test colour
calcium	brick red
copper	green
lead	blue
sodium	orange/yellow

(a) To check her equipment, the SoCO tests some copper sulfate.

(i) What colour is produced in the flame test? [1]

.....

(ii) State what happens, if anything, when hydrochloric acid is added to copper sulfate solution. [1]

.....

(iii) Describe what happens when barium chloride solution is added to the solution of copper sulfate. [1]

.....

.....

(iv) **Write down** the correct chemical formula for copper sulfate. [1]

.....

Examiner only

(b) The SoCO then carries out the following tests on solutions of the powder found at the crime scene.
Complete the table below to show the conclusions reached by the SoCO. [2]

Test	Observation	Conclusions
flame test	orange/yellow	The metal is .....
add nitric acid then silver nitrate	thick white precipitate	The type of salt is .....

(c) These tests are examples of qualitative analysis. How would the results of quantitative analysis tests be different? [1]

.....

7

TURN OVER FOR QUESTION 9

Examiner only

9. (i) A nurse takes blood samples from patients. The samples are examined under a microscope by a technician who records the results in the table below. These are compared with the normal range for a healthy person.

Patient	Red blood cells (units)	White blood cells (units)	Platelets (units)
Tom	6.5	56	250
John	5.1	8.1	260
Julie	2.2	5.0	50
Normal range	*4.5-6.5*	*4-11*	*150-440*

Explain what the results show about the health of each patient. [6] *QWC*

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(ii) The blood plasma carries blood cells around the body. State **one** other function of blood plasma. [1]

.....

7

END OF PAPER