



**GCSE**

**4791/01**

**ADDITIONAL APPLIED SCIENCE**

**UNIT 1: Science at Work in Applied Contexts**

**FOUNDATION TIER**

**P.M. TUESDAY, 17 May 2016**

**1 hour plus your additional time allowance**

**Surname** \_\_\_\_\_

**Other Names** \_\_\_\_\_

**Centre Number** \_\_\_\_\_

**Candidate Number** 0 \_\_\_\_\_

<b>For Examiner's use only</b>		
<b>Question</b>	<b>Maximum Mark</b>	<b>Mark Awarded</b>
<b>1.</b>	<b>9</b>	
<b>2.</b>	<b>7</b>	
<b>3.</b>	<b>9</b>	
<b>4.</b>	<b>5</b>	
<b>5.</b>	<b>6</b>	
<b>6.</b>	<b>10</b>	
<b>7.</b>	<b>14</b>	
<b>Total</b>	<b>60</b>	

## **ADDITIONAL MATERIALS**

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

## **INSTRUCTIONS TO CANDIDATES**

Use black ink, black ball-point pen or your usual method.

Write your name, centre number and candidate number in the spaces provided on the front cover.

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 (QWC) used in your answer to question 7(b)(ii).

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

Answer ALL the questions in the spaces provided.

1(a) Laboratory technicians use the following techniques to analyse samples:

titrations      flame tests      chromatography  
 genetic profiling      microscopy      using dataloggers

(i) Select the correct technique from the box to complete the table below.  
 One row has been completed for you. [3]

Test	Technique used
comparing fibres	microscopy
identifying dyes in lipstick	_____
monitoring oxygen content in a water sample over a few days	_____
testing for inherited diseases	_____

**1(a) (ii) A titration is used for quantitative analysis and flame tests are used for qualitative analysis. Give ONE difference between quantitative and qualitative analysis. [1]**

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1(b) Paper chromatography is used to identify the different colours used in food dyes.

(i) Describe how you would carry out this technique. [3]

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(ii) Complete the following sentence by **UNDERLINING** the correct word in brackets. [2]

In chromatography, colours are separated by the movement of a (solid / solute / solvent) over a (primary / secondary / stationary) phase.

**2. Scientists have transferred a gene, which controls production of fish oil, from a fish into a rapeseed plant. Genetically modified (GM) rapeseed crops will now produce fish oil.**

**(a) The following statements are advantages and disadvantages of GM rapeseed crops.**

**Place a TICK (✓) next to the disadvantages. [3]**

<b>Statements about GM crops</b>	<b>Disadvantages</b>
<b>Easier to create large quantities of fish oil</b>	
<b>GM crops could cross breed and contaminate other plants</b>	
<b>GM rapeseed crops may be harmful</b>	
<b>The rapeseed GM crops will be more expensive</b>	
<b>Vegetarians can take fish oil from GM crops</b>	

- 2(b) An estimate of the worldwide production of three other non-GM and GM crops in 2010 and 2014 is shown in the table opposite.**

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

- (i) What area was used for growing all maize crops in 2010? [1]**

\_\_\_\_\_ millions of hectares

- (ii) What area was used for growing GM cotton crops in 2014? [1]**

\_\_\_\_\_ millions of hectares

- (iii) By how much has the area of land used for growing non-GM soya bean decreased between 2010 and 2014? [1]**

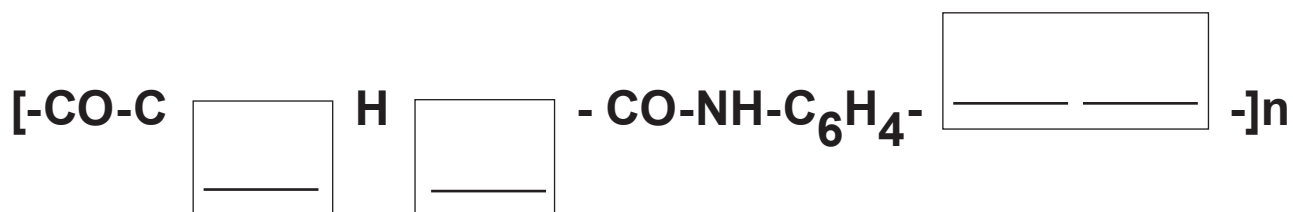
\_\_\_\_\_ millions of hectares

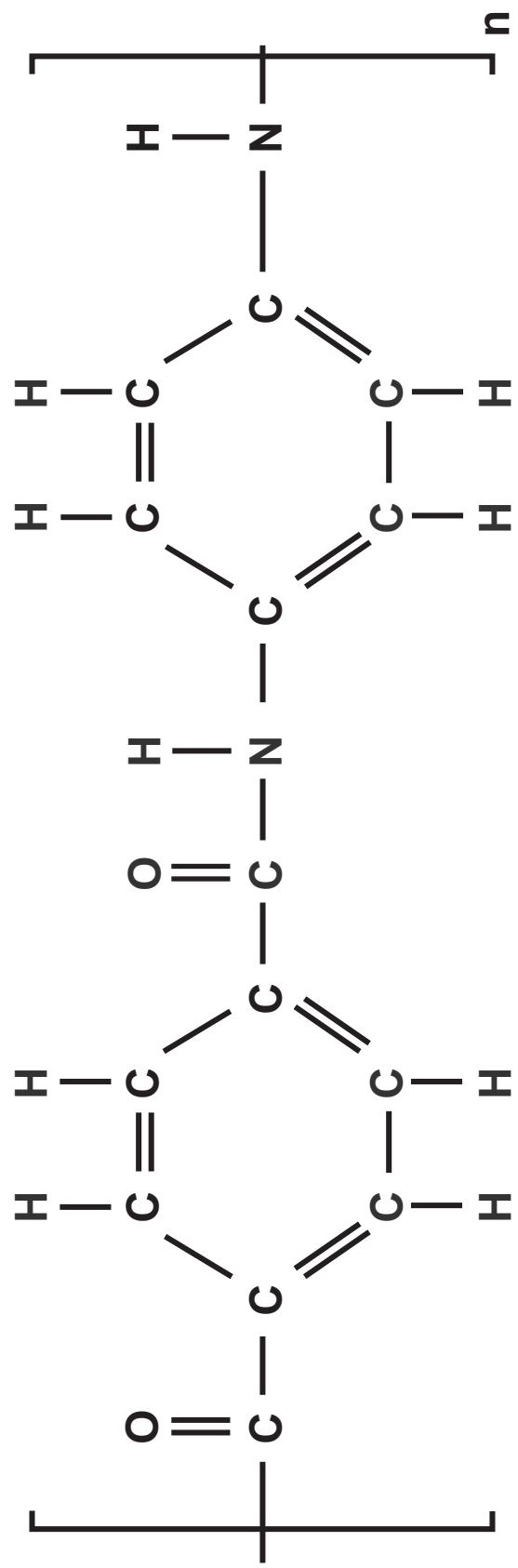
- (iv) State how the production of GM crops has changed between 2010 and 2014. [1]**



	<b>Area (millions of hectares)</b>			
	<b>2010</b>		<b>2014</b>	
<b>crop</b>	<b>non-GM</b>	<b>GM</b>	<b>non-GM</b>	<b>GM</b>
<b>soya bean</b>	<b>72</b>	<b>21</b>	<b>50</b>	<b>45</b>
<b>cotton</b>	<b>34</b>	<b>5</b>	<b>29</b>	<b>13</b>
<b>maize</b>	<b>140</b>	<b>12</b>	<b>116</b>	<b>46</b>

3. Modern cycle helmets contain a Kevlar® composite to protect the head in case of an accident.
- (a) The diagram opposite shows part of a molecule of Kevlar®.
- (i) Complete the boxes to show the molecular formula for Kevlar®. [3]





- (ii) Calculate the relative formula mass for a molecule of Kevlar® using the information below. [4]

Element	hydrogen	carbon	nitrogen	oxygen
Relative atomic mass	1	12	14	16
Number of atoms	10	14	2	_____
Total atomic mass	10	168	_____	_____

relative formula mass = \_\_\_\_\_

- 3(b) The density of Kevlar® is  $1.44 \text{ g/cm}^3$ . The volume of Kevlar® used in a cycle helmet is  $300 \text{ cm}^3$ . Calculate the mass of Kevlar® using the equation. [2]

mass = density  $\times$  volume

Mass = \_\_\_\_\_ g

9

4(a) Complete the following table showing examples of different types of material. [3]

Type of material	Example
Ceramic	porcelain
_____	silver
_____	fibre glass
_____	rubber

(b) (i) State ONE property of lead which is unusual for a metal. [1]

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(ii) State ONE property of mercury which is unusual for a metal. [1]

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5(a) Statements A-F below show the main stages of making beer. However the stages are not in the correct order.

**A** The drink is pasteurised, then stored in casks or bottles

**B** Fermentation is allowed to continue (the carbon dioxide helps to keep air out)

**C** Sugar is extracted from the plants

**D** The mixture is clarified by settling and filtration

**E** Air and other microorganisms are kept out of the fermentation container using an air lock

**F** Yeast is added to the solution and the mixture is kept warm

Use the letters B, D, E, F to arrange the stages in the correct order in the boxes below. [3]

<b>C</b>	_____	_____	_____	_____	<b>A</b>
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5(b) (i) Name the microorganism used in this process. [1]

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(ii) State ONE reason why the fermentation chamber should be sterilised before use. [1]

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(iii) State why the beer is pasteurised before it is bottled. [1]

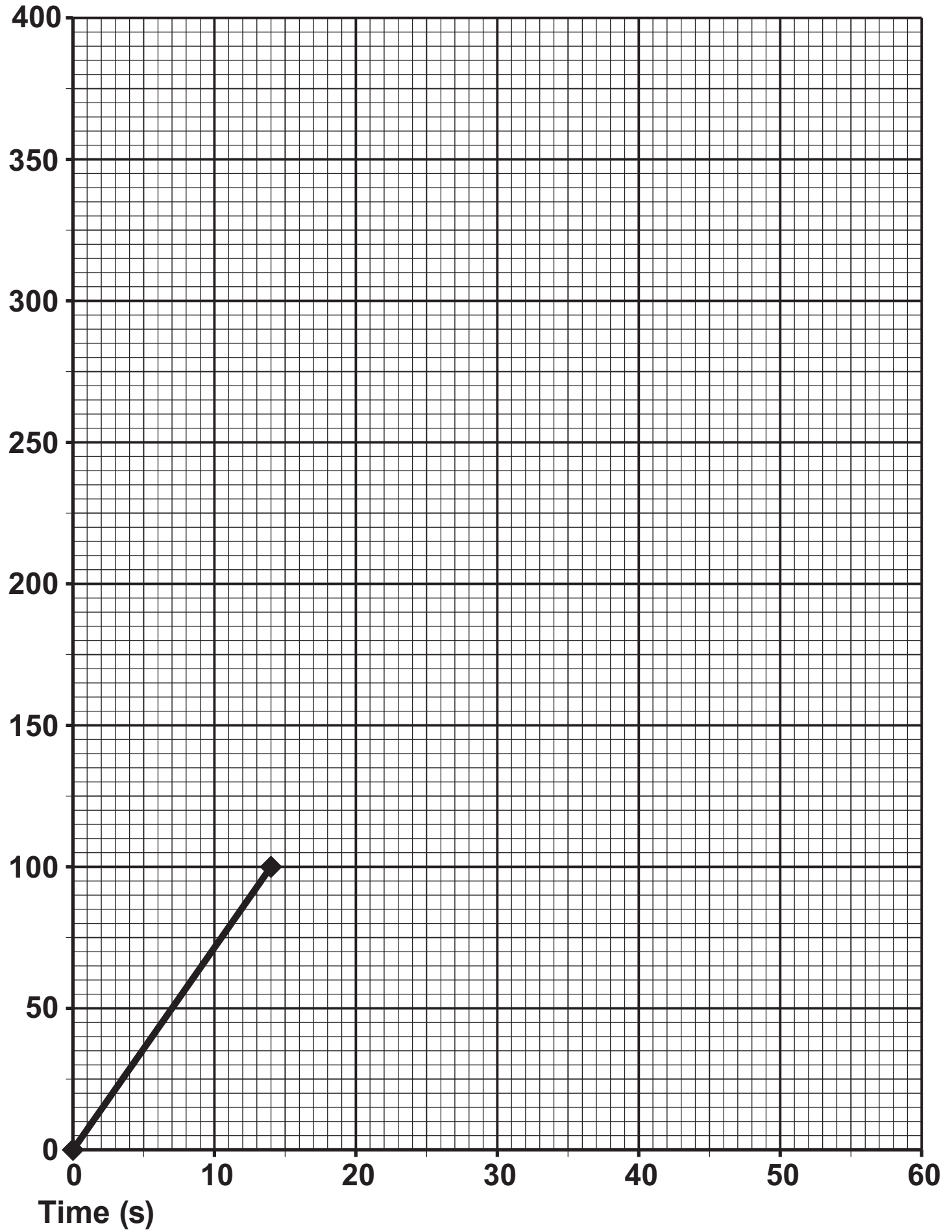
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Distance (m)



6. Four children are competing in a 4 x 100 m relay race in which each child runs 100 m.

(a) (i) How long did it take the FIRST CHILD to run 100 m? [1]

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(ii) The second child ran their 100 m in 16 s. The third child ran their 100 m in 13 s. The total time to complete the 400 m race was 55 s. Use this information to complete the graph opposite. [3]

(iii) State which child, FIRST, SECOND, THIRD or FOURTH, ran their 100 m at the fastest speed. Give ONE reason for your answer. [2]

Child: \_\_\_\_\_

Reason: \_\_\_\_\_

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6(b) Calculate the mean speed for the relay race using the equation. [2]

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

Mean speed = \_\_\_\_\_ m/s

(c) After a period of training, the children are all able to run faster.

Explain how this will affect the graph. [2]

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**7(a) (i) Describe how to measure pulse rate. [2]**

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**(ii) Brian's resting pulse rate was measured five times. The results were 65, 72, 74, 68 and 66 beats per minute. Calculate his mean resting pulse rate. [2]**

**Mean resting pulse rate = \_\_\_\_\_ beats per minute**

**(iii) Use the data in the table opposite to describe the long-term effects of exercise on the body. [3]**

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<b>Body measurement</b>	<b>Before exercise programme</b>	<b>After exercise programme</b>
<b>pulse rate (beats/minute)</b>	<b>82</b>	<b>65</b>
<b>breathing rate (breaths/minute)</b>	<b>17</b>	<b>14</b>
<b>volume of blood pumped out of the heart at each beat (cm<sup>3</sup>)</b>	<b>55</b>	<b>65</b>

**7(b) The diagram opposite shows the risks of an early death due to different factors. The bigger the circle the bigger the risk of early death.**

- (i) State which lifestyle choice presents the lowest risk. [1]**
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