Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

1163799309

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/52**

Paper 5 (Core) **May/June 2015**

1 hour

Candidates answer on the Question Paper.

Additional Materials: Graphics Calculator

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
Do not use staples, paper clips, glue or correction fluid.
You may use an HB pencil for any diagrams or graphs.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** the questions.
You must show all relevant working to gain full marks for correct methods, including sketches.
In this paper you will also be assessed on your ability to provide full reasons and communicate your mathematics clearly and precisely.
At the end of the examination, fasten all your work securely together.
The total number of marks for this paper is 24.

This document consists of **7** printed pages and **1** blank page.

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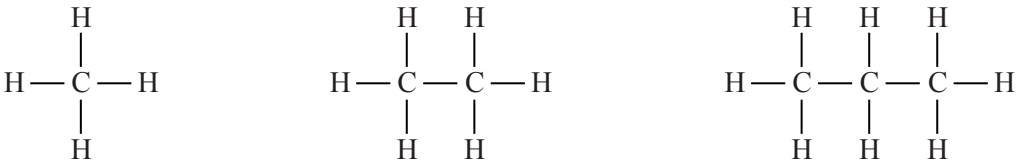
Answer **all** the questions.

INVESTIGATION **MOLECULES**

This investigation looks at the structure of models of molecules.

Molecules called alkanes contain carbon atoms (C) and hydrogen atoms (H) arranged in a pattern.

1 These diagrams show the first three alkanes.



(a) Draw a diagram to show the next alkane which contains four carbon atoms.

(b) **(i)** Complete this table to show the number of hydrogen atoms (h) for different numbers of carbon atoms (c).

c	h
1	4
2	6
3	
4	
5	
6	

(ii) What is the value of h when c is 12?

.....

(iii) Find a formula for h in terms of c.

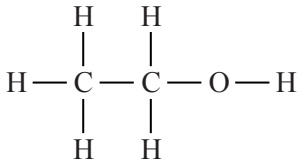
$h =$ .....

(iv) What is the value of c when h is 100?

.....

2 Alkanes can be made into alcohols by adding one oxygen atom (O).

For example



(a) Complete the table below for an alcohol with 3 carbon atoms.

Number of carbon atoms *c*	Number of hydrogen atoms *h*	Number of oxygen atoms *o*	Total number of atoms *t*
1	4	1	6
2	6	1	9
3			

(b) Find a formula for *t* in terms of *c*.

t = ...

3 Chemists use small spheres and rods to make models of molecules.

These diagrams show a sequence of molecules of height 1.

Molecule 1 Molecule 2 Molecule 3



(a) Draw the next two molecules in this sequence.

(b) Complete this table for molecules of height 1.

Molecule *m*	Number of spheres *s*	Number of rods *r*
1	1	0
2	2	1
3	3	2
4		
5		
6		

(c) Write down a formula for s in terms of m.

$s =$ .....

(d) A molecule of height 1 has 97 spheres.

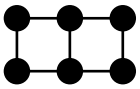
How many rods does this molecule have?

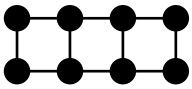
.....

4 These diagrams show a sequence of molecules of height 2.

Molecule 1 

Molecule 2 

Molecule 3 

Molecule 4 

(a) Complete this table for molecules of height 2.

Molecule *m*	Number of spheres *s*	Number of rods *r*
1	2	1
2	4	4
3	6	7
4		
5		
6		

(b) Find, in terms of m, a formula for

(i) s,

$s =$ .....

(ii) r.

$r =$ .....

(c) A molecule of height 2 has 100 spheres.

How many rods does this molecule have?

.....

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5 **(a)** Use your answers to **questions 3(c)** and **4(b)** to help you complete the table for molecules of height h.

Height (h)	Number of spheres (s) in terms of m	Number of rods (r) in terms of m
1		$m - 1$
2		
3	$3m$	$5m - 3$
4		
5	$5m$	$9m - 5$
6		

(b) Find, in terms of m and h, a formula for

(i) s,

$s =$ .....

(ii) r.

$r =$ .....

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