

Write your name here

Surname

Other names

Pearson
Edexcel GCSE

Centre Number

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Candidate Number

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Computer Science

Paper 1: Principles of Computer Science

Wednesday 7 June 2017 – Morning
Time: 2 hours

Paper Reference

1CP0/01

You do not need any other materials.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- Use of a calculator is **prohibited**.

Information

- The total mark for this paper is 90.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
– *you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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Answer ALL questions. Write your answers in the spaces provided.

Some questions must be answered with a cross . If you change your mind about an answer, put a line through the box and then mark your new answer with a cross .

1 Computers are made of components that hold and manipulate data.
Some computers run programs that control physical devices in the real world.

(a) Binary is used to represent numbers inside computing devices.

(i) Convert the denary number 12 to binary.

(1)

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(ii) Convert the binary number 0000 0101 to denary.

(1)

(b) Memory is referred to by capacity.

Complete the table to show capacities in order from smallest (at the top) to largest (at the bottom).

(4)

Term	Capacity in bytes
Kilobyte	
Gigabyte	

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(c) A database table holds related data in an organised structure.

(i) Here is a table from a database about greetings cards.

Draw around a field in the table.

(1)

1	birthday	f	2.99
2	anniversary	m	3.00
3	thank you	b	2.88
4	anniversary	f	2.54
5	birthday	m	2.55
6	birthday	m	2.50
7	thank you	b	2.50
8	birthday	f	2.50

(ii) Here is a table from a database about greetings cards.

Draw around a record in the table.

(1)

1	birthday	f	2.99
2	anniversary	m	3.00
3	thank you	b	2.88
4	anniversary	f	2.54
5	birthday	m	2.55
6	birthday	m	2.50
7	thank you	b	2.50
8	birthday	f	2.50



(iii) Here is a table from a database about carpets.

carpets				
id	fibre	name	description	price
115	polyester	strip151	Spots and More Spots	76.00
225	polyester	strip749	Stripes and Spots	98.00
392	wool	spo874	Green Spots	19.00
567	wool	spo259	Blue Stripes	79.00
646	wool	261spot	Red Spots and Stripes	56.00
734	wool	823spot	Spots Multi	34.00
787	polyester	spo954	Spots and Stripes	55.00
887	polyester	476spo	Multi Spots	38.00

Here is a query that is run against this database table.

```
SELECT id  
FROM carpets  
WHERE description LIKE '%Spots'
```

% is a substitute for zero or more characters.

State how many records are returned from running this query.

(1)

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(iv) Here is a table from a database about carpets.

carpets				
id	fibre	name	description	price
115	polyester	strip151	Spots and More Spots	76.00
225	polyester	strip749	Stripes and Spots	98.00
392	wool	spo874	Green Spots	19.00
567	wool	spo259	Blue Stripes	79.00
646	wool	261spot	Red Spots and Stripes	56.00
734	wool	823spot	Spots Multi	34.00
787	polyester	spo954	Spots and Stripes	55.00
887	polyester	476spo	Multi Spots	38.00

Complete the WHERE clause in this query to find records for all the carpets that are made from wool.

(1)

SELECT *

FROM carpets

WHERE



(d) A Caesar cipher can be used to encrypt and decrypt text.

(i) Complete the table using a Caesar cipher algorithm.

(2)

Plain text	Shift	Cipher text
jump	-2	
wmtcq		zpwft

(ii) The word 'box' is encrypted using a Caesar cipher with a shift of +4. The resulting cipher text is 'fsz'. It has an error. The cipher text should be 'fsb'.

Give the reason why this error occurred.

(1)

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(e) One lane of a two-lane road is closed because of roadworks. An automated traffic light system allows cars to take turns using the single open lane.

(i) Give **two** reasons why an automated system has been chosen for this task.

(2)

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(ii) Explain how a microcontroller and sensors could be used to make this system work.

(2)

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(Total for Question 1 = 17 marks)



2 Many fields of science use models and simulations. Scientists often write specialised programs and store data on secondary storage devices.

(a) Weather scientists use models and simulations.

(i) Give **one** reason for weather scientists to use simulations.

(1)

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(ii) Identify **one** piece of data that weather scientists might use in the simulations.

(1)

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(iii) Give **two** reasons why the algorithms used in weather simulations require powerful computers.

(2)

1

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2

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(b) A weather scientist uses Boolean logic in programs.

(i) Complete the table to show the results of each operation.

(2)

S	W	NOT S	(NOT S) OR W
0	0		
0	1		
1	0		
1	1		

(ii) Let R = rain. Let L = lightning. Let W = wind.

Construct a Boolean expression to show a storm (Q) that has all three features.

(1)

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(c) A magnetic hard disc contains metal platters that spin at a high speed. Platters are divided into cylinders and sectors.

Describe how data is physically stored on a magnetic hard disc.

(2)

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(d) Here is some pseudocode.

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16 INTEGER i
17 INTEGER j
18 FOR i FROM 1 TO n - 1 DO
19   FOR j FROM 1 to n - 1 DO
20     IF (a[j] > a[j+1]) THEN
21       SET t TO a[j]
22       SET a[j] TO a[j+1]
23       SET a[j+1] TO temp
24     END IF
25   END FOR
26 END FOR

```

(i) Give **two** techniques that could be used to make this pseudocode more readable.

(2)

1

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2

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(ii) Identify a line number of a declaration statement.

(1)

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(iii) Identify the range of line numbers of a conditional statement.

(1)

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(e) State **two** reasons why programmers use subprograms when they write code.

(2)

1

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(f) Describe the difference between a global variable and a local variable.

(2)

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(Total for Question 2 = 17 marks)

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3 Algorithms are used to manipulate different kinds of data. Different kinds of data include letters, numbers and audio.

- (a) Character sets are used to map characters to binary. One character set uses 7 bits per character and the letter 'A' is assigned a decimal value of 65.

Name this character set.

(1)

- (b) A lossless, run length encoding algorithm (RLE) is used to compress images. Here is some of the image data.

b	b	b	r	r	y	y	y	r	r
---	---	---	---	---	---	---	---	---	---

Give the result of applying the RLE algorithm to this image data.

(2)

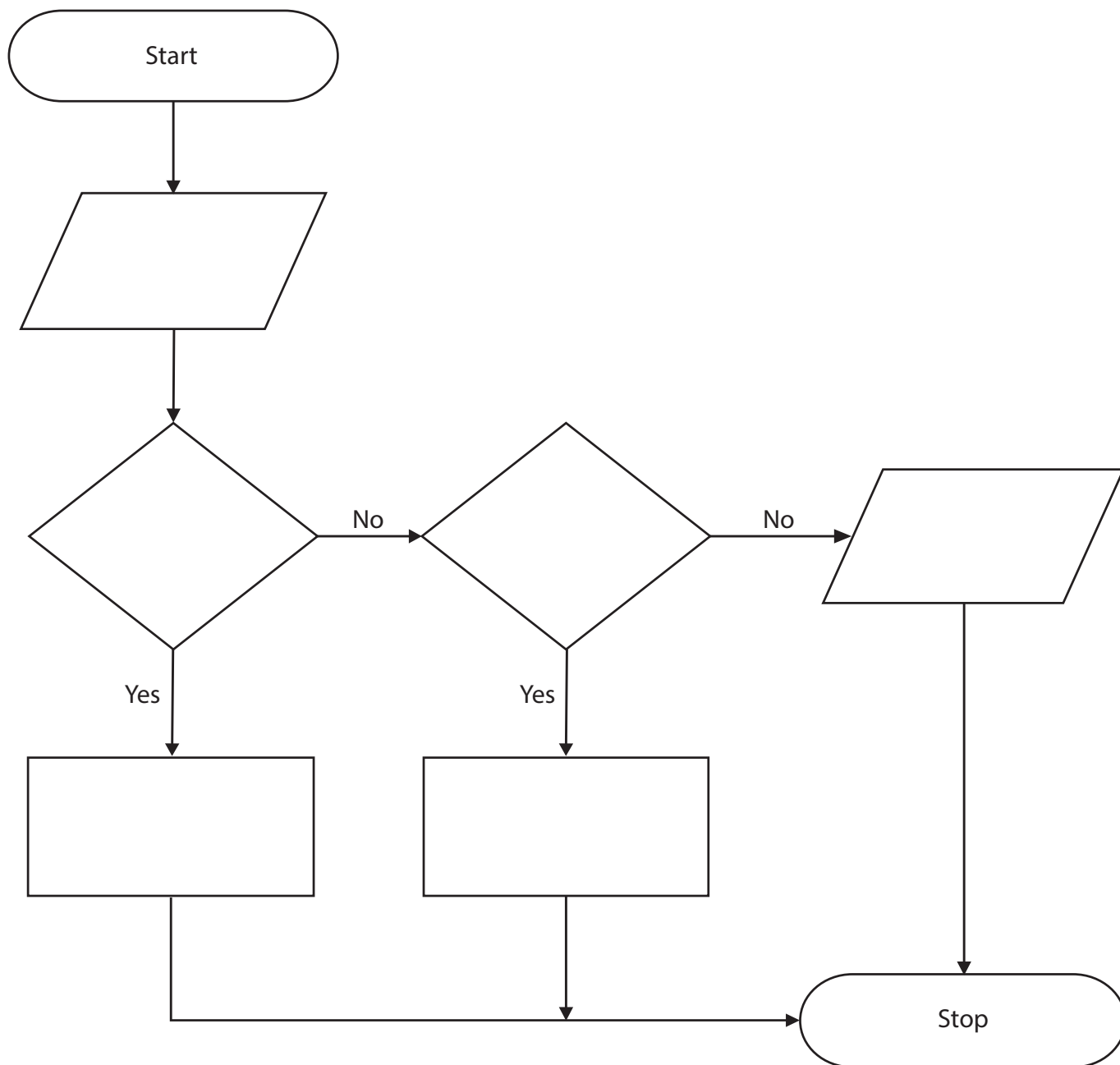


(c) School pupils are voting to change the colour of their uniform. They enter the letter B for blue or the letter R for red. A flowchart for counting the votes is shown. It is incomplete.

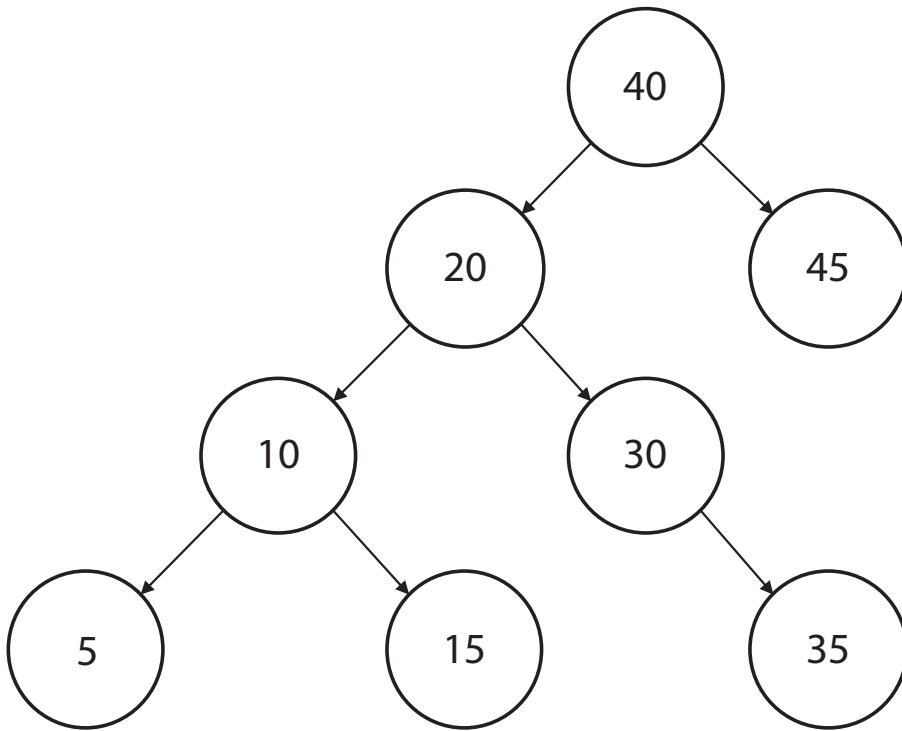
▱ This symbol is defined as input or output.

Complete this flowchart to show the algorithm used to count a single vote.

(4)



(d) Numbers are stored in a structure as shown.



A breadth-first search, with left node priority, begins at number 40 and searches for the number 30.

Give the number of each node in the order that it is visited.

(4)

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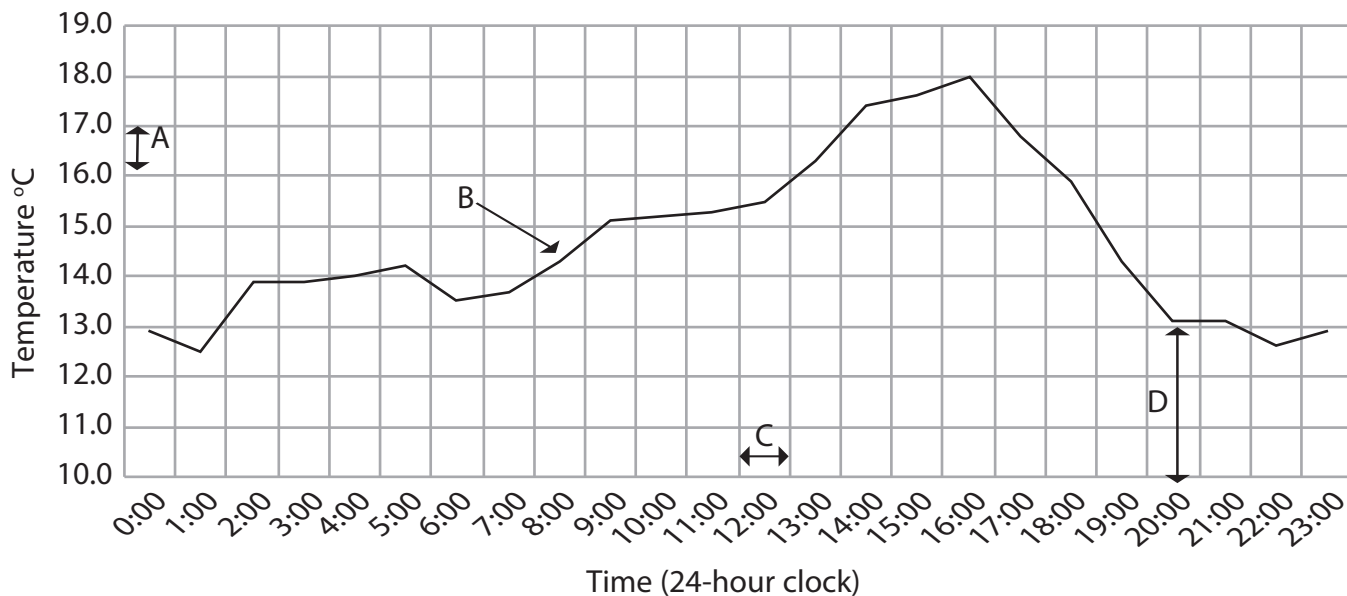
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(e) A graph representing temperature data from a city centre is shown.



(i) Identify which label represents 'amplitude'.

(1)

- A** Label A
- B** Label B
- C** Label C
- D** Label D

(ii) Identify a digitised value for 3:00, to one decimal place.

(1)

(iii) Explain the difference between analogue and digital signals.

(2)



(f) The bitrate of an audio signal and the amount of storage required to save it can be calculated.

- (i) An audio sound is sampled at 44.1 kHz. Sixteen bits are used to store each sample. The audio has two channels.

Construct an arithmetic expression to determine the bitrate for this audio in bits per second.

Do not carry out the calculation.

(2)

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- (ii) Another sound has a bitrate of 128000 bits per second. It is three minutes long.

Construct an arithmetic expression to determine the amount of storage needed for this audio file in megabytes (MB).

Do not carry out the calculation.

(2)

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(Total for Question 3 = 19 marks)



4 Networks connect computers all over the world.

- (a) Three very experienced programmers are going to write a computer program for charities that work with children. The programmers have chosen to use open source software.

Justify the programmers' decision to use open source software based on the user support available and the ability to customise the program solution.

(3)

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(b) An online company is creating a website using HTML and CSS.

(i) State the purpose of a cascading style sheet (CSS).

(1)

(ii) Here is some text shown in a web browser.

This site is under construction.

Please visit us again to follow our progress.

Identify which instruction would produce the effect shown in the first line.

(1)

- A { font-style:normal; text-align:center; }
- B { font-weight:bold; text-align:center; }
- C { font-style:italic; font-weight:bold; }
- D { text-align:center; font-weight:bold; font-style:italic; }

(iii) Here is some code from a web page.

```
23  
24 <p>The <a href="All_Info.asp">details</a> are public knowledge.</p>  
25
```

Identify the purpose of this code.

(1)

- A It takes the user to the same page on a different website.
- B It takes the user to a different section of this web page.
- C It takes the user to a different web page on this website.
- D It takes the user to a different web page on a different website.



(c) State **two** reasons why computers are connected by networks.

(2)

1

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2

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(d) State **three** distinct types of network transmission media.

(3)

1

2

3

(e) Describe how cookies are used in the context of web browsing.

(2)

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(f) Explain how a checksum is used to detect if there has been a transmission error.

(2)

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(g) Different types of addresses are used on networks.

- (i) A media access control (MAC) address is shown as six hexadecimal numbers, such as A0-B8-CD-81-88-FB.

Explain what is meant by the term 'MAC address'.

(2)

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- (ii) State the name for the system used to direct human-readable web addresses (e.g. www.pearson.com) to IP addresses (e.g. 92.122.122.161).

(1)

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(h) State what is meant by the term 'multi-agent computational model'.

(1)

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(Total for Question 4 = 19 marks)



5 Emerging technologies in computing may affect the way computers work and the ways in which we interact with and program them.

- (a) Explain why the addition of two negative numbers, represented in sign-magnitude format, does not give the correct answer.

You may use an example as part of your explanation.

(3)

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- (b) Complete the table to multiply the two binary numbers.

Show all your working.

(3)

0	1	0	
0	1	1	x



- (c) The components of a processor are the control unit (CU), the arithmetic/logic unit (ALU), the registers, the clock, the address bus and the data bus.

Describe the fetch-decode-execute cycle, in terms of individual components of the processor.

(4)

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- (d) Complete the table to identify the most appropriate programming language translator for each situation.

(2)

Situation	Compiler	Interpreter
The company does not require fast execution, so a single line-by-line translation and execution method is acceptable.	<input type="checkbox"/>	<input type="checkbox"/>
The company only wants to ship a single executable file to the client.	<input type="checkbox"/>	<input type="checkbox"/>
The company wants to make sure the client cannot read the source code to the program.	<input type="checkbox"/>	<input type="checkbox"/>
The company has asked the client to load a special run-time environment onto its computers before it can execute the new program.	<input type="checkbox"/>	<input type="checkbox"/>



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*(e) Although deoxyribonucleic acid (DNA) computers may not replace silicon-based computers, the technology has the potential to change our lives.

Discuss the potential advantages and disadvantages of DNA computers.

(6)

Area with horizontal dotted lines for writing the answer.

(Total for Question 5 = 18 marks)

TOTAL FOR PAPER = 90 MARKS



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