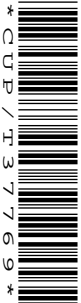


Candidates answer on the question paper
Additional materials (enclosed): None

Additional materials (required):
 Electronic calculator
 Ruler (cm/mm)



Candidate
 Forename

Candidate
 Surname

Centre
 Number

--	--	--	--	--

Candidate
 Number

--	--	--	--

INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided.

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is 60.
- You will be awarded marks for the quality of written communication where this is indicated in the question.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.

FOR EXAMINER'S USE

Qu.	Max.	Mark
1	8	
2	15	
3	10	
4	17	
5	10	
TOTAL	60	

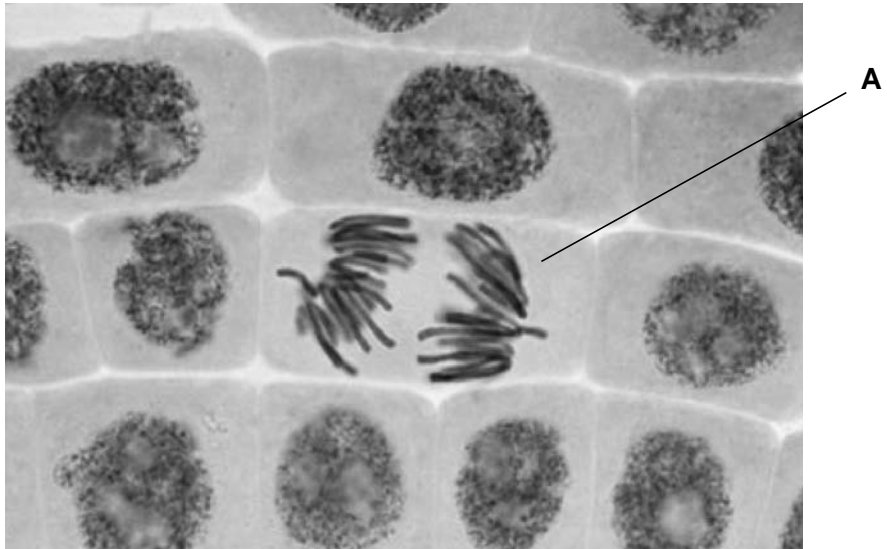
This document consists of **13** printed pages and **3** blank pages.

Answer **all** the questions.

1 Humans start life as a single fertilised ovum.

This cell has the potential to divide by mitosis to make all the cells of a new individual.

Fig. 1.1 shows cells that are undergoing mitosis.



© Sinclair Stammers

Fig. 1.1

(a) (i) Name the stage of mitosis shown by cell A.

..... [1]

(ii) Describe the behaviour of chromosomes during this stage of mitosis.

.....
.....
.....
.....
..... [2]

(b) (i) Explain how the cell cycle produces genetically identical daughter cells.

.....
.....
.....
.....
.....
.....
..... [3]

(ii) State **two** roles of mitosis in a living organism.

1
.....
2
..... [2]

[Total: 8]

- 2 Sickle cell anaemia is an inherited genetic condition that results in an abnormality in haemoglobin molecules.

Fig. 2.1 shows erythrocytes from an individual with sickle cell anaemia.



© Eye of Science / Science Photo Library

Fig. 2.1

- (a) Complete the following description of the cause of sickle cell anaemia by using the **most** appropriate words from the list to fill in the gaps.

fatty acidic base soluble high
amino low mutation protein polypeptide

In the disease sickle cell anaemia, there is a in the gene that codes for one of the chains in haemoglobin.

The adenine replaces thymine in the sixth codon of the gene coding for the beta chains of haemoglobin. As a result one acid is replaced by another.

This small change has a devastating effect on the functioning of haemoglobin.

The haemoglobin molecules are less and when oxygen levels are, the molecules form long fibres that stick together inside the erythrocyte, making the cell sickle shaped.

[6]

- (b) Changes in the DNA of the gene coding for the beta chains of haemoglobin do not always affect the function of haemoglobin.

Explain why.

.....
.....
.....
.....
.....
.....
..... [3]

- (c) Prenatal diagnosis is a widely used approach for the detection of sickle cell anaemia.

Chorionic villus sampling (CVS) allows prenatal diagnosis as early as eight weeks.

- (i) Describe how CVS is carried out.

.....
.....
.....
.....
..... [3]

- (ii) State **one disadvantage** of using CVS for the prenatal diagnosis of conditions such as sickle cell anaemia.

.....
..... [1]

- (iii) Describe **two** ethical issues related to the prenatal diagnosis of sickle cell anaemia.

1
.....
2
..... [2]

[Total: 15]

- 3 Growth patterns of children are used by health specialists to help diagnose problems of development at an early stage.

Fig. 3.1 shows the mean rate of growth of humans from birth to 20 years.

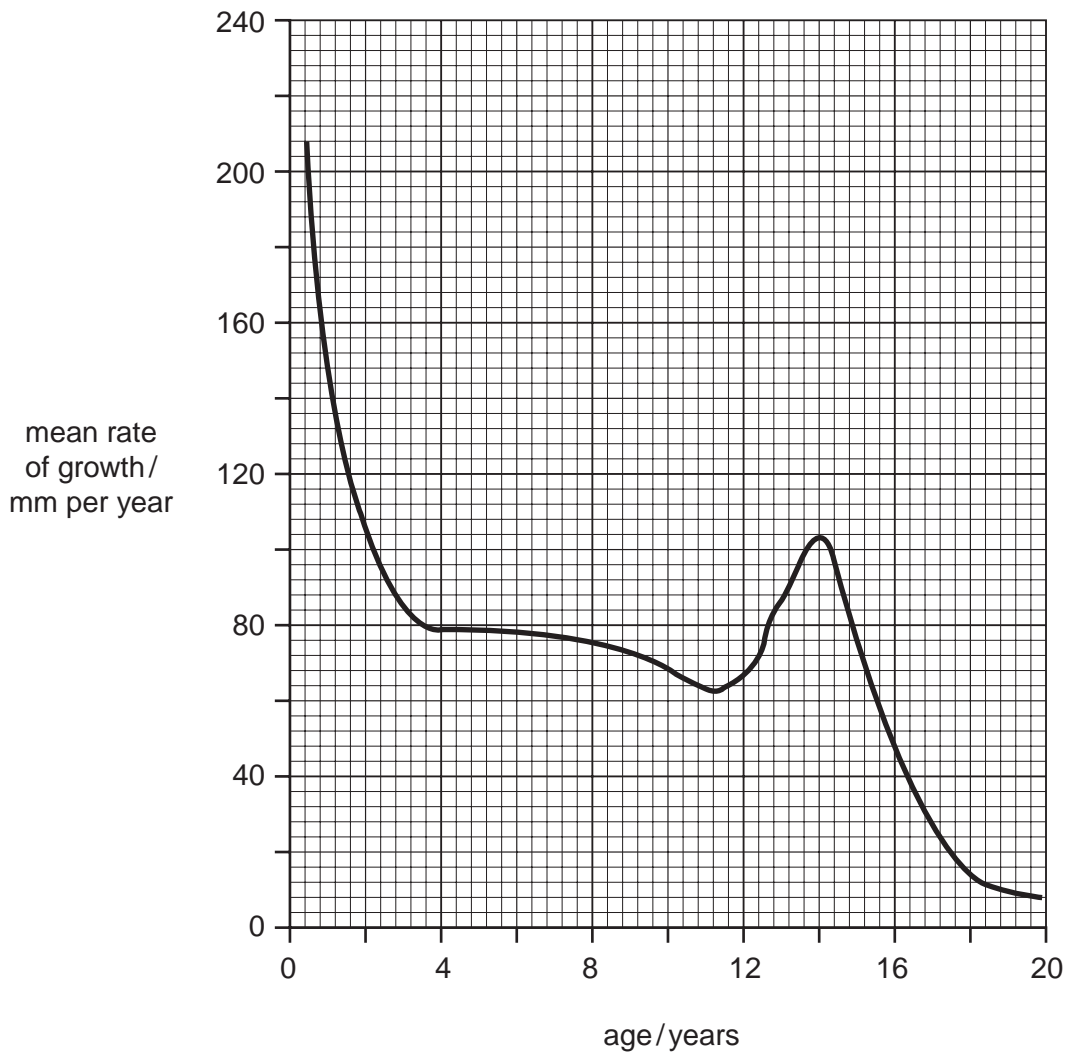


Fig. 3.1

(a) Describe **and** suggest reasons for the trends shown by the data in Fig. 3.1.

.....
.....
.....
.....
.....
.....
.....
..... [4]

(b) Explain how you could determine the mean growth rate of a group of children over a twelve month period.

.....
.....
.....
..... [2]

(c) Name **two** nutrients needed by infants and state their role in maintaining healthy growth.

nutrient 1
role
.....
nutrient 2
role
..... [4]

[Total: 10]

- 4 A person can become immune to a specific infectious disease in several different ways.

Table 4.1 shows information about different types of immunity.

- (a) Complete Table 4.1 by filling in the information for each type of immunity.

The first one has been done for you.

Table 4.1

type of immunity	gives immediate protection	gives long lasting protection
passive natural	yes	no
active natural		
passive artificial		
active artificial		

[3]

- (b) During an immune response, antibodies are produced.

- (i) Name the specific type of cell that produces antibodies.

..... [1]

Fig. 4.1 shows the structure of an antibody molecule.

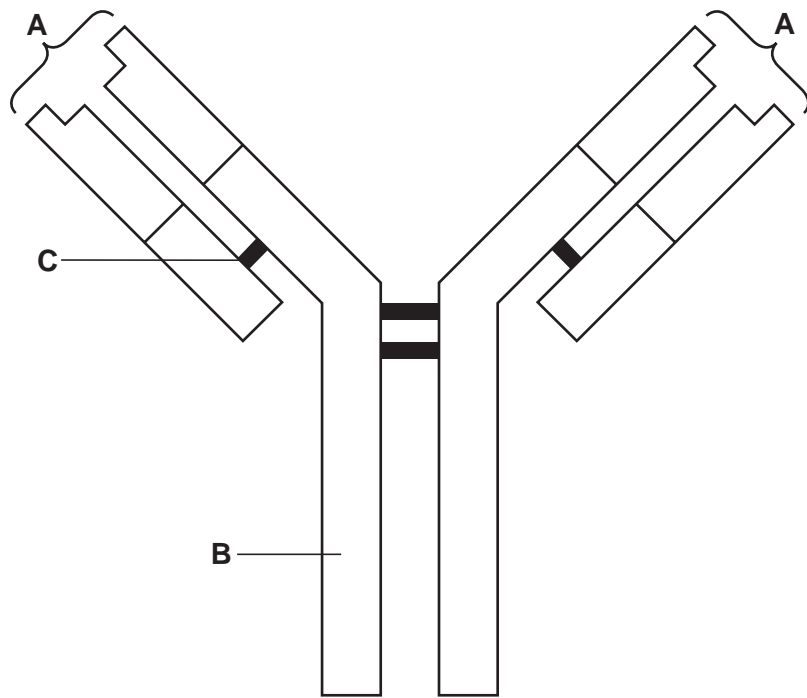


Fig. 4.1

(ii) Name **A**, **B** and **C**.

A

B

C [3]

(iii) Explain why one type of antibody will only bind to one antigen.

.....

.....

..... [2]

11
BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

- 5 In the future, therapeutic cloning may produce new tissues and organs for people who are seriously ill.

Fig. 5.1 shows stages in producing tissues and organs by therapeutic cloning.

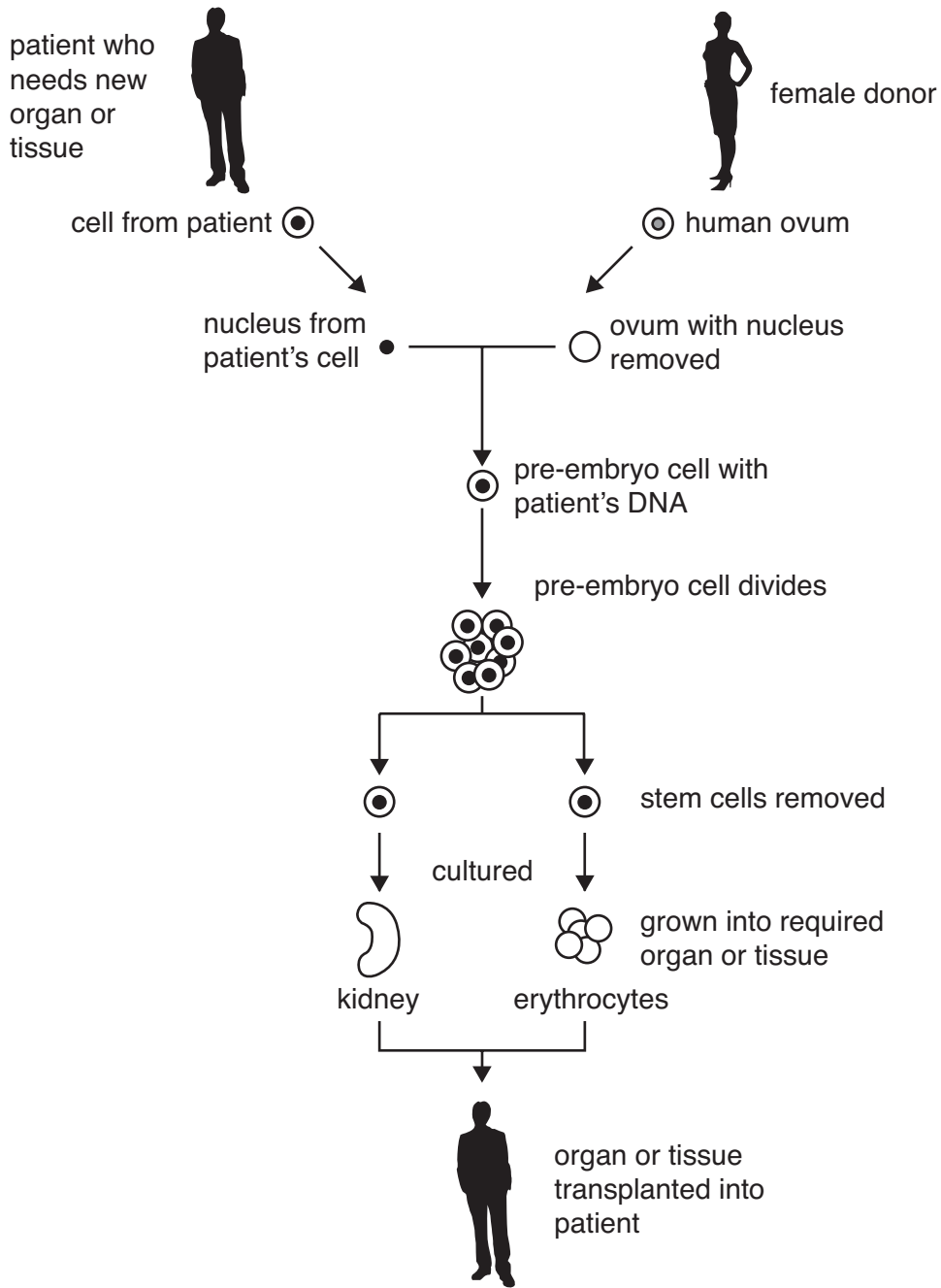


Fig. 5.1

(a) What is meant by *cloning*?

.....
..... [1]

(b) Using Fig. 5.1,

(i) explain why stem cells are used in cloning;

.....
.....
.....
..... [2]

(ii) outline how stem cells are cultured;

.....
.....
.....
..... [2]

(iii) describe how certain stem cells in the bone marrow develop into erythrocytes.

.....
.....
.....
..... [3]

(c) State **two** potential benefits of using therapeutic cloning to produce tissues and organs for transplantation.

1

.....

2

..... [2]

[Total: 10]

END OF QUESTION PAPER

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

15
BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

PLEASE DO NOT WRITE ON THIS PAGE

Copyright Acknowledgements:

Fig. 1.1 © Sinclair Stammers, www.micromacro.co.uk.

Fig. 2.1 © Eye of Science / Science Photo Library.

Fig. 3.1 Adapted from www.stat.washington.edu/wxs/images/growth-curve.gif by Werner Stuetzle. Reproduced by kind permission of Werner Stuetzle.

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (OCR) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

OCR is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.