Candidate forename		Candidate surname	

Centre number						Candidate number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

AS GCE

F222/TEST

HUMAN BIOLOGY

Growth, Development and Disease

WEDNESDAY 18 JANUARY 2012: Afternoon
DURATION: 1 hour 45 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

Candidates answer on the Question Paper.

OCR SUPPLIED MATERIALS:

Advance Notice (inserted)

OTHER MATERIALS REQUIRED:

Electronic calculator
Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

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INSTRUCTIONS TO CANDIDATES

- **The Advance Notice will be found in the centre of this document.**
- **Write your name, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.**
- **Use black ink. HB pencil may be used for graphs and diagrams only.**
- **Answer ALL the questions.**
- **Read each question carefully. Make sure you know what you have to do before starting your answer.**
- **Write your answer to each question in the space provided. If additional space is required, you should use the lined pages at the end of this booklet. The question number(s) must be clearly shown.**

INFORMATION FOR CANDIDATES

- **The number of marks is given in brackets [ ] at the end of each question or part question.**
- **The total number of marks for this paper is 100.**
- **You are advised to show all the steps in any calculations.**
- **You may use an electronic calculator.**
-  **Where you see this icon you will be awarded marks for the quality of written communication in your answer.**

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Answer ALL the questions.

1 This question is based on the Case Study 'NEW WAYS OF TREATING HEART DISEASE' (Case Study 1).

(a) In the Case Study you were told about the estimated cost of coronary heart disease (CHD) in the United Kingdom (UK).

(i) State TWO examples of the DIRECT healthcare provided by the NHS that contribute to the estimated cost of CHD.

1 _____

_____

2 _____

_____ **[2]**

(ii) Suggest what is meant by the term 'productivity loss' as used in the Case Study.

_____

_____

_____

_____

_____

_____

_____ **[2]**

(b) Table 1.1 shows a breakdown of the estimated cost of CHD in the UK, in 1999.

Table 1.1

	cost of CHD in UK (£ million per year)
direct healthcare	1 730
informal care	2 416
productivity loss	2 909
TOTAL	7 055

Using the information in Table 1.1, calculate what percentage of the total cost of CHD is due to productivity loss.

Show your working. Give your answer TO THE NEAREST WHOLE NUMBER.

Answer = _____ % [2]

(c) If left untreated, CHD may lead to a heart attack.

Describe the First Aid treatment you would give to a person suspected of having a heart attack who is still conscious.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[4]**

(d) You are told in Case Study 1 that a protein called thymosin-beta4 can cause progenitor cells to move into heart muscle and form new blood vessels.

(i) Name TWO tissues that the progenitor cells must develop into to form NEW BLOOD VESSELS.

1 _____

2 _____ **[2]**

(ii) Outline the processes by which progenitor cells, which are similar to stem cells, develop into tissues.

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[3]**

(iii) A damaged heart may be repaired by using either progenitor cells or donated stem cells.

Suggest TWO advantages of using progenitor cells rather than donated stem cells to repair a damaged heart.

_____

_____

_____

_____

_____

_____ **[2]**

(e) You are told in the Case Study that scientists have used nanotechnology to develop nanoburrs that can target and treat damaged arteries in patients with CHD.

Nanoburrs target specific tissues in the walls of the damaged arteries and release drugs in a controlled manner.

Fig. 1.1 is a diagram of a nanoburr.

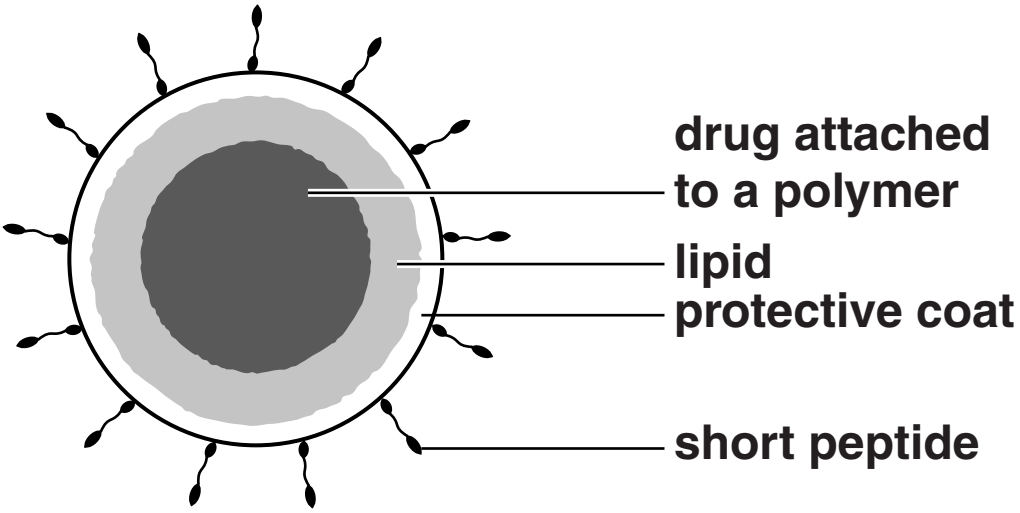

Fig. 1.1

Use the information in Fig. 1.1 to suggest how the nanoburr BINDS to the damaged wall of an artery.

_____

_____

_____

_____

_____

_____ **[2]**

(f) Currently, damaged tissues in the walls of arteries can be treated by inserting drug-releasing stents.

Suggest TWO advantages of using nanoburrs, instead of stents, to release drugs slowly in damaged arteries.

_____

_____

_____

_____

_____

_____ **[2]**

[Total: 21]

BLANK PAGE

QUESTION 2 STARTS ON PAGE 12

2 This question is based on the Case Study 'EFFECTIVE PRACTICE IN BLOOD TRANSFUSION' (Case Study 2).

(a) Suggest TWO reasons why a person may need a blood transfusion, other than during and after an operation.

1 _____

_____

2 _____

_____ **[2]**

(b) Fig. 2.1 shows a diagram of the structure of an artery and a vein.

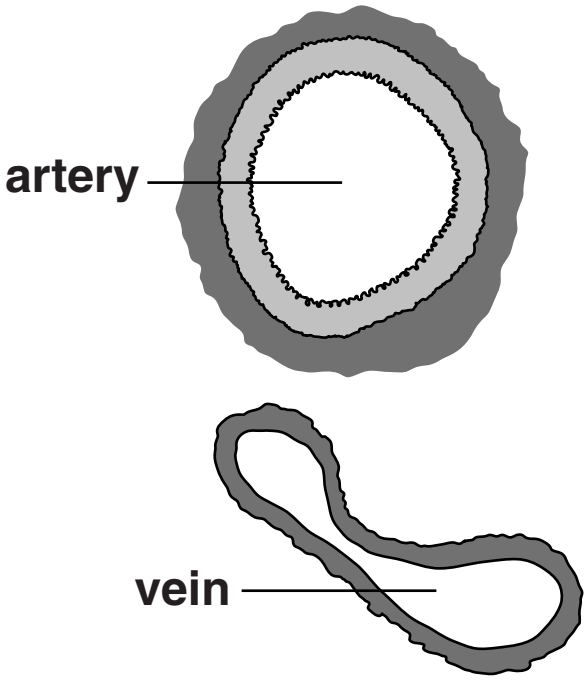

Fig. 2.1

Suggest TWO reasons why blood is transfused into a vein and not into an artery.

1 _____

_____

2 _____

_____ **[2]**

(c) For a blood transfusion to be successful, ABO blood groups must be compatible between the donor's blood and the patient's blood.

If a patient needs a blood transfusion, blood typing followed by cross-matching is carried out. This identifies a donor blood group that is compatible with the patient's blood group.

(i) Suggest what is meant by blood typing and cross-matching.

blood typing _____

_____

_____

cross-matching _____

_____

_____ **[2]**

(ii) Table 2.1 below shows the blood groups of donors and recipients.

Complete each row of the table by adding a tick (✓) if the donor's blood group is compatible with the recipient's blood group or a cross (✗) if the donor's blood group is not compatible.

Table 2.1

donor's blood group	recipient's blood group			
	A	B	AB	O
A				
B				
AB				
O				

[4]

(iii) You were told in Case Study 2 that if the wrong type of blood is given accidentally it can cause serious complications.

Describe what happens in the bloodstream of a patient who is given the wrong blood group by mistake.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[6]**

(d) In the Case Study you were told about some new research where scientists have developed a way of converting group A, group B and group AB red blood cells (erythrocytes) into group O red blood cells. The process uses newly discovered bacterial enzymes.

(i) Suggest how the bacterial enzymes convert GROUP A red blood cells into GROUP O red blood cells.

_____

_____

_____

_____

_____

_____

_____ **[2]**

(ii) State TWO factors, other than enzyme concentration, that would need to be controlled when using bacterial enzymes to convert group A red blood cells into group O red blood cells.

_____

_____ **[2]**

(e) One important role of a Transfusion Practitioner is to make sure that all blood transfusions are safe.

(i) Suggest why patients are asked to stop taking aspirin before and after surgery.

_____

_____

_____

_____

_____ **[2]**

(ii) Suggest why using CELL SALVAGE, as an alternative to using donated blood, reduces the risks associated with blood transfusion.

_____

_____

_____

_____ **[1]**

[Total: 23]

3 Meiosis is the type of cell division by which haploid gametes (egg and sperm cells) are produced.

Fig. 3.1 shows the stages of meiosis. Three of the stages are labelled A, B and C.

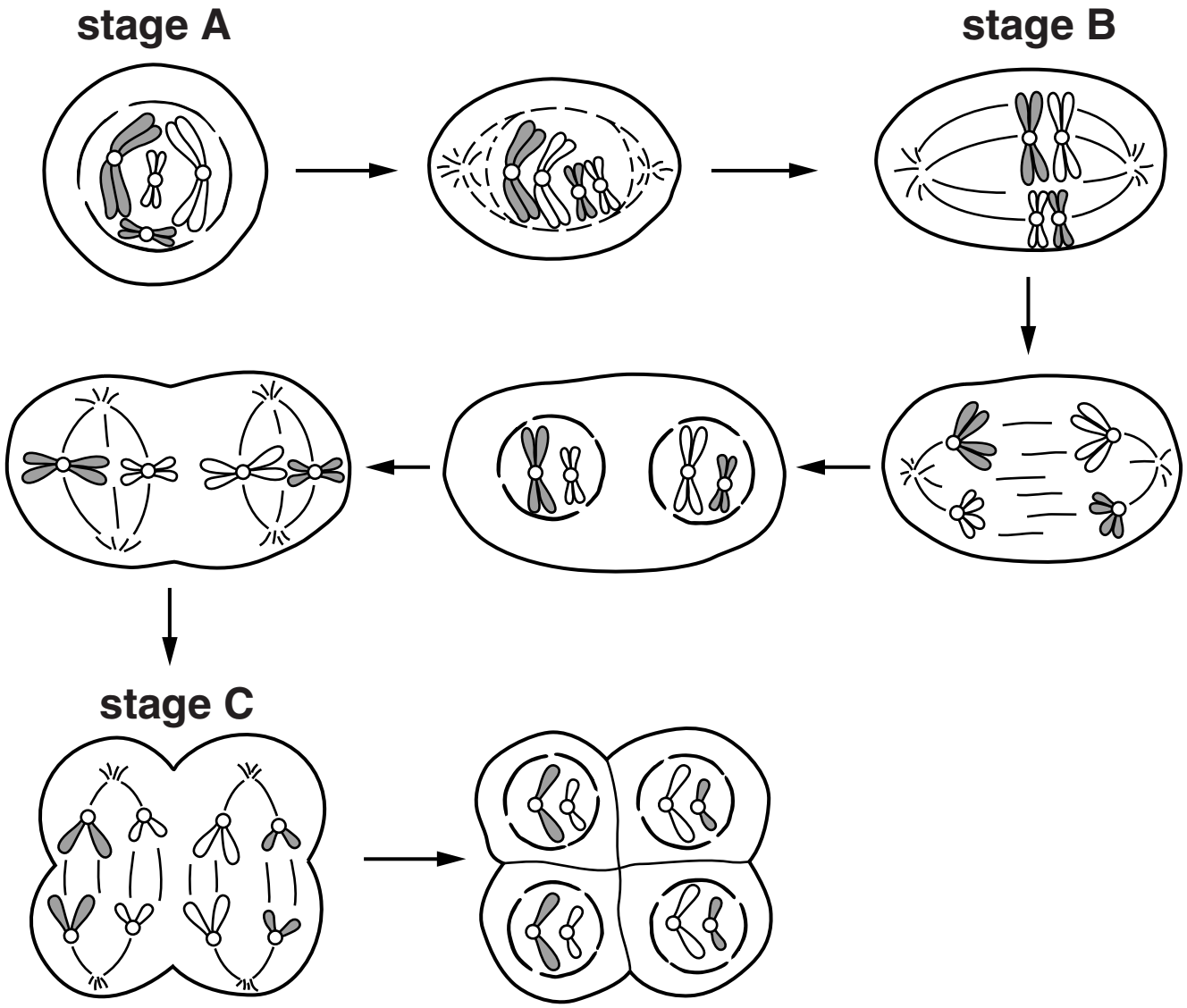

Fig. 3.1

(a) Name the stages A, B and C, shown in Fig. 3.1.

A _____

B _____

C _____ **[3]**

(b) (i) Using the information in Fig. 3.1, describe how the behaviour of chromosomes during meiosis leads to the production of haploid gametes.

In your answer you should make clear the order in which events occur.

_____

_____

_____

_____

_____

_____ **[9]**

(ii) State TWO DIFFERENT processes that occur during meiosis that result in genetic variation between gametes.

_____

_____ **[2]**

[Total: 14]

QUESTION 4 STARTS ON PAGE 22

4 Human Immunodeficiency Virus (HIV) and Mycobacterium tuberculosis are two pathogens that cause infections which contribute significantly to human disease.

Fig. 4.1 shows outline diagrams of HIV and Mycobacterium tuberculosis.

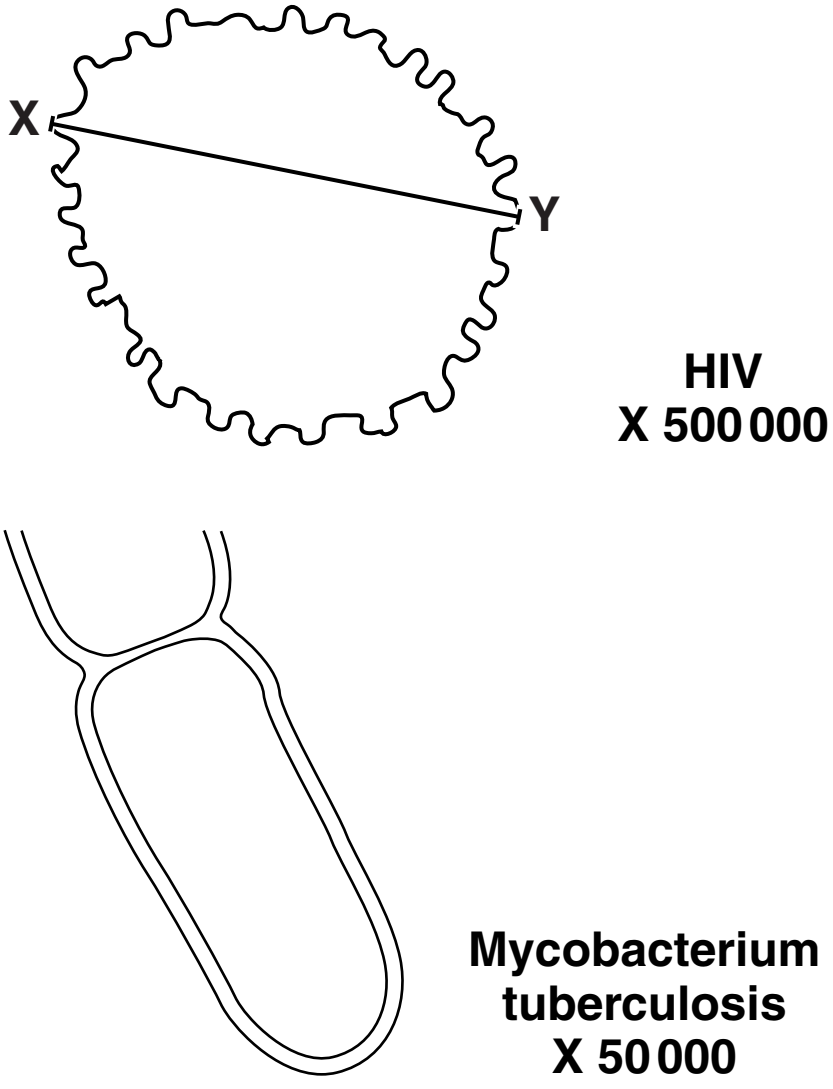

Fig. 4.1

(a) (i) Calculate the actual diameter of the HIV shown in Fig. 4.1 between points X and Y.

Show your working. Give your answer to two decimal places.

Answer = _____ μm [2]

QUESTION 4(a)(ii) STARTS ON PAGE 24

(ii) **Table 4.1 compares the structure of HIV and Mycobacterium tuberculosis.**

Complete the table by writing each structure listed below into the appropriate column of the table.

You should use each structure once only.

CAPSID DNA ENZYMES

OUTER MEMBRANE PEPTIDOGLYCAN CELL WALL

RIBOSOMES RNA

Table 4.1

structure found		
only in HIV	**only in Mycobacterium tuberculosis**	**in BOTH Mycobacterium tuberculosis and HIV**

[7]

(b) Since their discovery during the 20th Century, antibiotics have helped to bring many serious infectious diseases under control.

Suggest why antibiotics are used in the treatment of AIDS even though AIDS is caused by a virus.

_____

_____

_____

_____

_____ **[1]**

QUESTION 4(c) STARTS ON PAGE 26

(c) A new bacterial 'superbug' that is resistant to even the most powerful antibiotics has established itself in the UK.

Many factors have contributed to the emergence of these antibiotic-resistant bacteria.

Describe the actions of patients and GPs that have contributed to the EMERGENCE of antibiotic-resistant forms of bacteria.

In your answer, you should give a balanced account of the actions of patients and GPs.

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[5]**

QUESTION 4(d) STARTS ON PAGE 28

(d) A recent newspaper article stated:

> **Department of Health bans long sleeves and jewellery in a bid to stop the march of the 'super bugs.'**

Describe four further precautions that are used in HOSPITALS to reduce the SPREAD of resistant bacteria.

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[4]**

[Total: 19]

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QUESTION 5 STARTS ON PAGE 30

5 Type 2 diabetes accounts for between 85% and 95% of people with diabetes.

Type 2 diabetes usually appears in people over the age of 40.

Fig. 5.1 opposite shows the changes in blood glucose concentration over two days in an untreated type 2 diabetic person and in a non-diabetic person.

(a) (i) State the range over which the blood glucose concentration varies in the untreated type 2 diabetic and the non-diabetic person over the two days.

blood glucose range in untreated type 2 diabetic

_____

blood glucose range in the non-diabetic

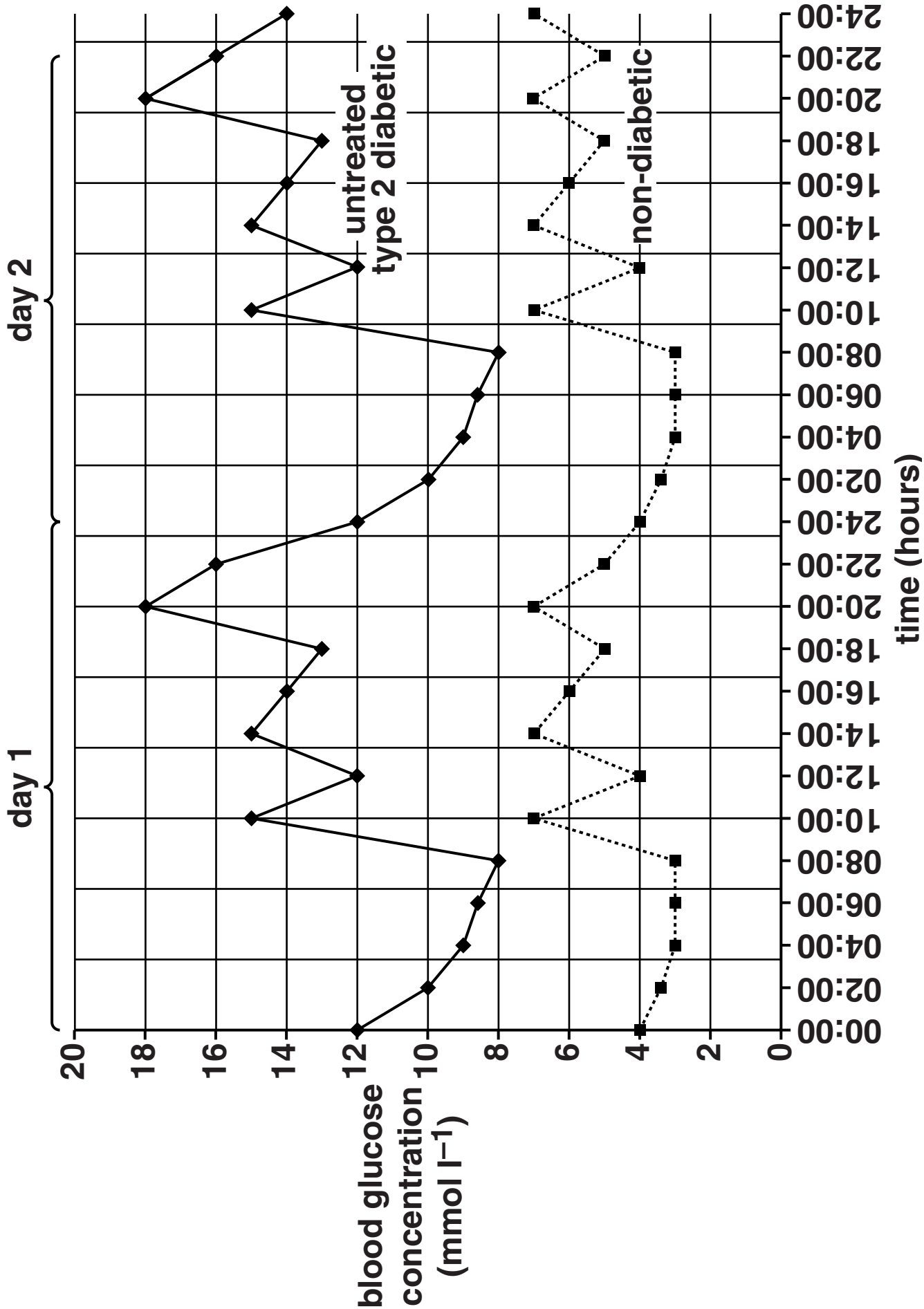
_____ **[2]**

(ii) One test used to diagnose diabetes is the fasting blood glucose test.

Using the information in Fig. 5.1, state the most suitable TIME for a blood sample to be taken for the fasting blood glucose test.

_____ **[1]**

Fig. 5.1


day 1
day 2
untreated type 2 diabetic
non-diabetic
blood glucose concentration (mmol l−1)
time (hours)
20
18
16
14
12
10
8
6
4
2
0
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
24:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
24:00

(iii) As shown in Fig. 5.1, the blood glucose concentration of an untreated type 2 diabetic is always higher than that of a non-diabetic person.

Explain why.

_____

_____

_____

_____

_____

_____

_____ **[2]**

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QUESTION 5(b) STARTS ON PAGE 34

(b) Table 5.1 shows the prevalence of type 2 diabetes between 1994 and 2001 in England.

Table 5.1

gender	prevalence of type 2 diabetes (per 1 000)							
	1994	1995	1996	1997	1998	1999	2000	2001
female	16	17	17	18	19	20	21	23
male	18	19	20	21	22	23	25	27

(i) Define the term prevalence.

_____

_____ **[1]**

(ii) Using the information in Table 5.1, describe the trends in the prevalence of type 2 diabetes between 1994 and 2001.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[3]**

(iii) **Suggest THREE reasons for the trends described in (b)(ii).**

_____

_____

_____

_____

_____

_____

_____

_____ **[3]**

(c) **A research study suggested that increasing the daily intake of fruit and vegetables reduces the risk of developing type 2 diabetes.**

Suggest why increasing the daily intake of fruit and vegetables may reduce the risk of developing type 2 diabetes.

_____

_____

_____

_____ **[1]**

[Total: 13]

6 Immunity is the state of being protected against an infectious disease.

(a) Complete the following passage which describes ACTIVE immunity and PASSIVE immunity.

Active immunity occurs when

_____ enter the body as

a result of infection or vaccination. In active

immunity, an immune response occurs and

B lymphocytes differentiate into

_____ cells and

_____ cells.

Passive immunity occurs when

_____ enter the body by

injection, or are passed from mother to child

either through the placenta or by

_____ . [5]

QUESTION 6(b) STARTS ON PAGE 38

(b) All children in the United Kingdom (UK) are offered vaccinations against certain diseases, as part of the national childhood immunisation schedule.

Table 6.1 opposite shows the vaccinations offered routinely during the first 2 years of a child's life.

(i) State the name of the vaccine that is offered to children at 13 months old.

_____ **[1]**

(ii) Explain why children are given second doses of a vaccine.

_____

_____

_____

_____

_____

_____ **[2]**

QUESTION 6(iii) STARTS ON PAGE 41

Table 6.1

age (months)	disease	stage of vaccine course
2	diphtheria tetanus acellular pertussis (whooping cough) polio influenza type B	first dose
3	diphtheria tetanus whooping cough polio	second dose
	meningitis C	first dose
4	diphtheria tetanus whooping cough polio	third dose
	influenza type B	second dose
	meningitis C	second dose
12	influenza type B meningitis C	booster
13		first dose

(iii) Suggest TWO reasons why it is important that most children are vaccinated against the diseases in the UK immunisation programme.

_____

_____

_____

_____

_____

_____ **[2]**

[Total: 10]

END OF QUESTION PAPER

ADDITIONAL PAGE

If additional space is required, you should use the lined page(s) below. The question number(s) must be clearly shown.

ADDITIONAL PAGE

ADDITIONAL PAGE

ADDITIONAL PAGE

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