

Wednesday 18 January 2012 – Afternoon

AS GCE HUMAN BIOLOGY

F222/TEST Growth, Development and Disease

Candidates answer on the Question Paper.

OCR supplied materials:

- Advance Notice (inserted)

Other materials required:

- Electronic calculator
- Ruler (cm/mm)

Duration: 1 hour 45 minutes




Candidate forename		Candidate surname	
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Centre number						Candidate number				
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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 above. 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 page at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the bar codes.

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.
- This document consists of **24** pages. Any blank pages are indicated.

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

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2

..... [2]

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

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..... [2]

(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.

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..... [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.

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..... [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.

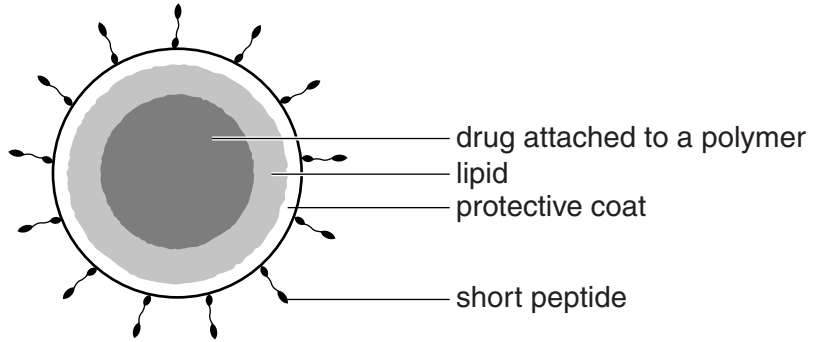


Fig. 1.1

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

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- (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.

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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

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2

..... [2]

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

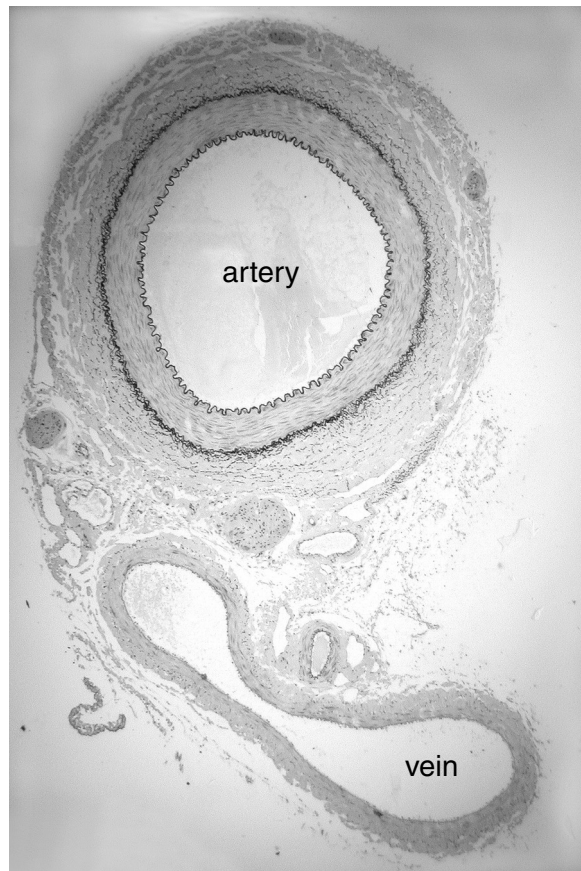


Fig. 2.1

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

- 1
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- 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
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-
- cross-matching
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- [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]

(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.

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..... [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.

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..... [2]

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

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[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**.

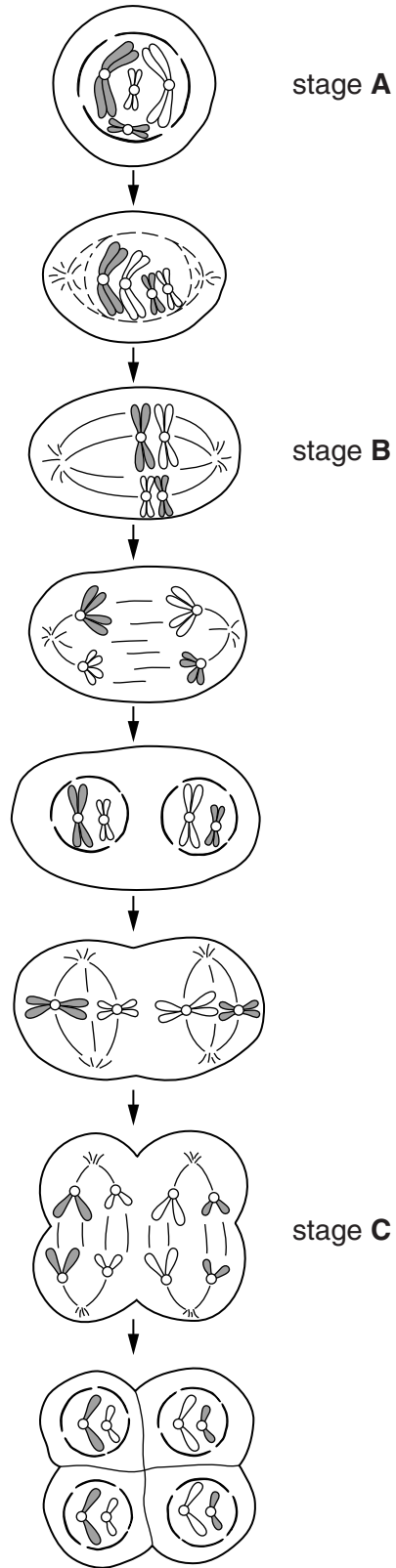


Fig. 3.1

- (ii) State **two different** processes that occur during meiosis that result in genetic variation between gametes.

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..... [2]

[Total: 14]

PLEASE DO NOT WRITE ON THIS PAGE

QUESTION 4 STARTS ON PAGE 14

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

Fig. 4.1 shows electron micrographs of HIV and *Mycobacterium tuberculosis*.

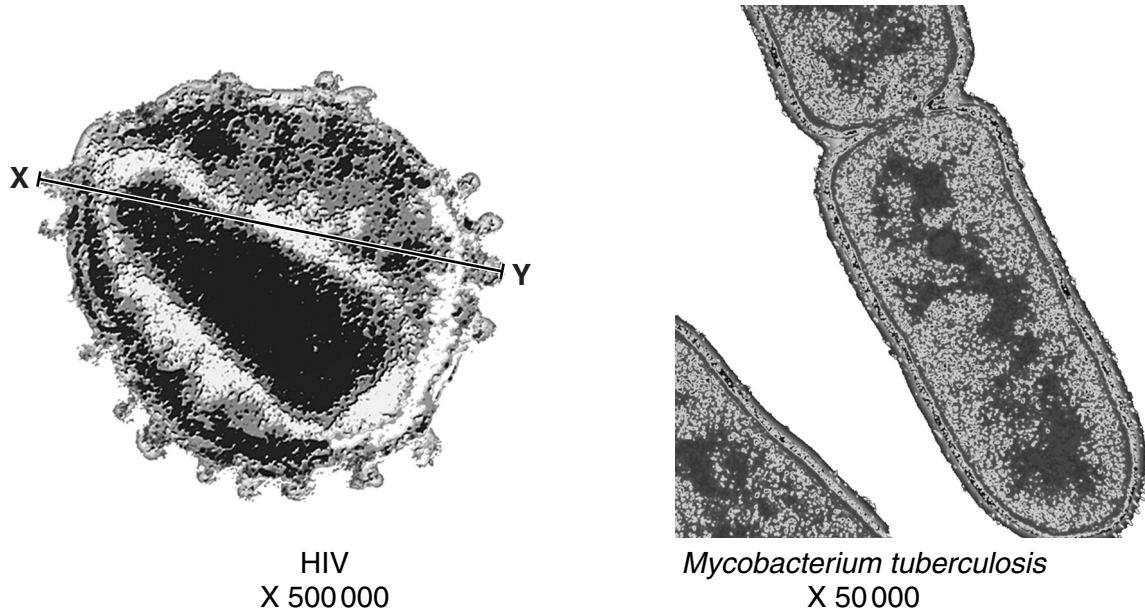


Fig. 4.1

- (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]

(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.

- outer membrane**
 - peptidoglycan cell wall**
 - capsid**
-
- ribosomes**
 - enzymes**
 - DNA**
 - RNA**

Table 4.1

structure found		
only in HIV	only in <i>Mycobacterium tuberculosis</i>	in both <i>Mycobacterium tuberculosis</i> 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.

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..... [1]

(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.

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[Total: 19]

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

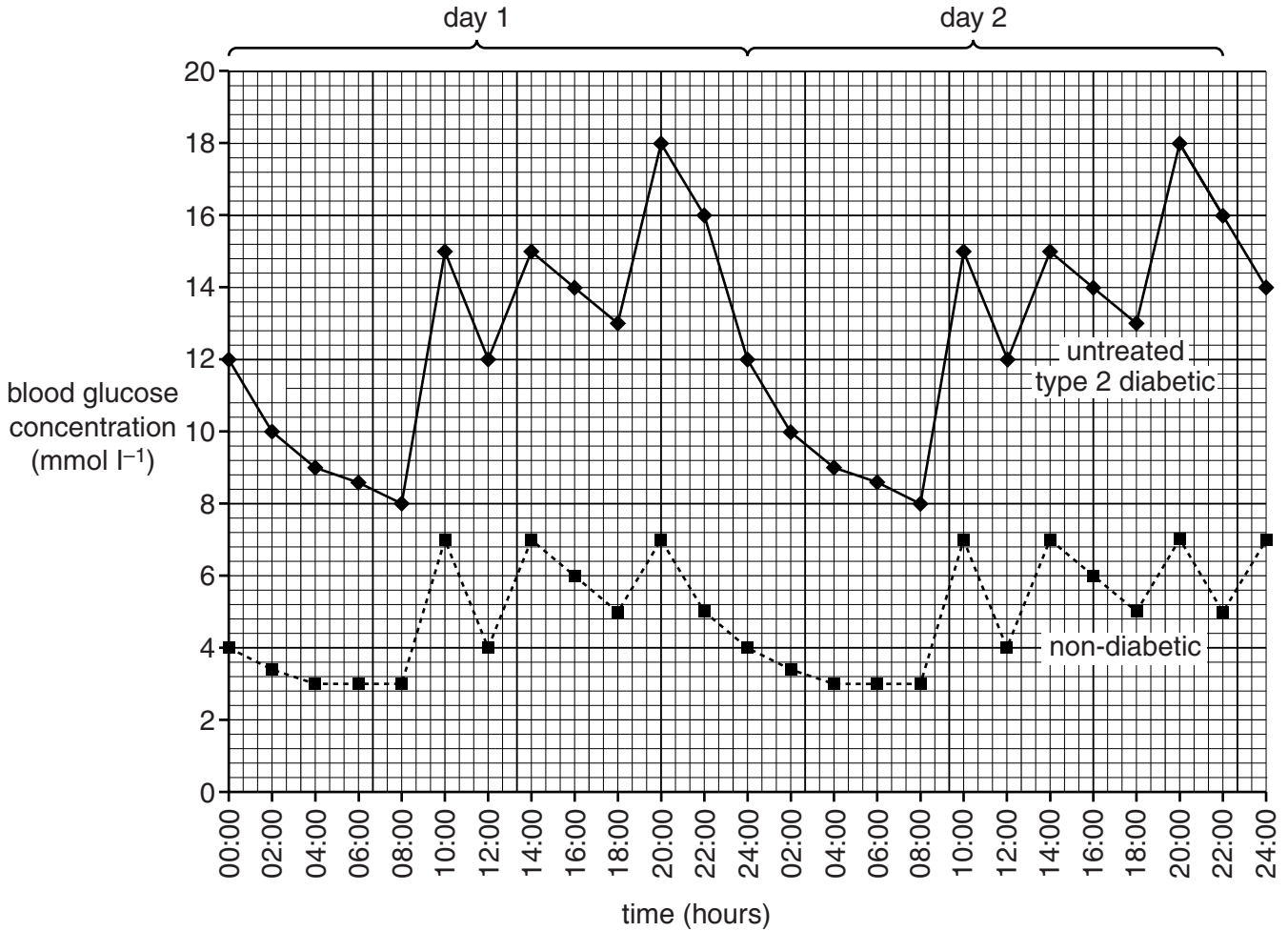


Fig. 5.1

(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]

- (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.

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..... [2]

QUESTION 5(b) STARTS ON PAGE 20

(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*.

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..... [1]

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

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

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(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.

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..... [1]

[Total: 13]

QUESTION 6 STARTS ON PAGE 22

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]

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

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

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

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

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

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[Total:10]

END OF QUESTION PAPER

