OCR
RECOGNISING ACHIEVEMENT

Tuesday 15 January 2013 – Afternoon

AS GCE HUMAN BIOLOGY

F222/01/TEST   Growth, Development and Disease

Duration: 1 hour 45 minutes

Candidate forename		Candidate surname	

Centre number						Candidate number					

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 pages 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.

Turn over

Answer **all** the questions.

1 This question is based on the case study '**STORING UP TROUBLE**' **(Case study 1)**.

(a) You were told in the case study that the BMI values for obesity vary with age in children.

Suggest why the BMI values for obesity vary with age in children.

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.... **[1]**

(b) The National Health Service Information Centre used the data from the National Child Measurement Programme (NCMP) to determine the percentage of obese children in reception classes and in year 6.

- In the first year of the programme (2005), the participation rate in the NCMP was 48%.
- By 2010 the participation rate was 91%.

(i) Suggest why the 48% participation rate in the first year of the programme means that any conclusions based on the data may not be considered to be valid.

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.... **[1]**

(ii) Suggest why the data collected in 2010 are likely to be an underestimate of the percentage of obese children.

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.... **[1]**

(c) The increase in childhood obesity is a concern because obesity is an important risk factor for the development of a range of chronic diseases in adulthood.

State two chronic diseases, **other than diabetes**, that a child has a higher risk of developing if they remain obese into adulthood.

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        [2]

(d) The information provided by the NCMP is used by the National Health Service (NHS) to plan and provide better health care for children.

Table 1.1 shows the number of children measured and the prevalence of obese children in year 6 in England in 2009 and 2010.

Sex	2009		2010	
	Number measured	Prevalence of obesity (%)	Number measured	Prevalence of obesity (%)
Boys	256 338	20.0	256 848	20.4
Girls	241 342	16.5	243 019	17.0

Table 1.1

(i) Using the information in Table 1.1, calculate the number of year 6 boys in England that were obese in 2010.

Show your working and give your answer **to the nearest whole number**.

Answer = ... **[2]**

(ii) The following conclusion can be drawn from the data in Table 1.1:

There has been a bigger increase in the prevalence of obesity in girls than boys.

State whether you agree or disagree with this conclusion.

Give evidence to support your decision.

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.... **[1]**

Turn over

4

Sex	2009		2010	
	Number measured	**Prevalence of obesity (%)**	**Number measured**	**Prevalence of obesity (%)**
Boys	256 338	20.0	256 848	20.4
Girls	241 342	16.5	243 019	17.0

Table 1.1

   (iii) State a second conclusion that can be drawn from the data in Table 1.1.

   Give evidence to support your conclusion.

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   .... **[2]**

(e) In the case study you were told that children with type 2 diabetes may be treated with the drug metformin because it does not pose a risk of hypoglycaemia.

   Suggest what is meant by hypoglycaemia.

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   .... **[1]**

(f) Children with diabetes need to have their blood glucose level monitored.

   Glucose biosensors can be used to measure the concentration of glucose in the blood.

   Fig. 1.1 shows a diagram of the essential components of a glucose biosensor.
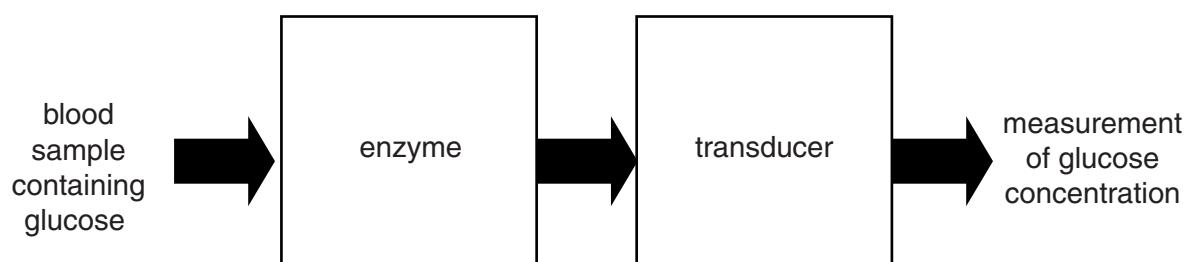
Fig. 1.1

Describe **and** explain how a glucose biosensor **detects** and **measures** the concentration of glucose in a blood sample.

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(g) Suggest **three** strategies that families could use to prevent children becoming obese.

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.... **[3]**

[Total: 19]

2 This question is based on the case study '**PERSONALISED MEDICINE**' **(Case study 2)**.

In this case study you were told how personalised medicine allows specific treatment to be selected for cancers that have the same genetic defect.

(a) Suggest **two** advantages of using personalised medicine to treat cancer.

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.... **[2]**

(b) Cancer cells have tumour specific proteins that are not found in normal cells.
The immune system normally detects these tumour specific proteins and recognises them as foreign.

(i) Describe how the immune system normally **detects** these tumour specific proteins.

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.... **[3]**

(ii) Name the type of cell that destroys the cancer cells.

.... **[1]**

(c) Personalised cell therapies are used to treat disease by regenerating healthy tissues or organs.

(i) Suggest an advantage of using the patient's own cells to regenerate tissues or organs.

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.... **[1]**

   (ii) Suggest an advantage of using embryonic stem cells instead of adult stem cells to regenerate tissues or organs.

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   .... **[1]**

(d) Patients with severe cirrhosis of the liver have been treated by being injected with blood stem cells cultured from their own bone marrow.

   During the culturing process, the cells undergo many cell cycles to increase the number of genetically identical cells.

   (i) Identify the stage of the cell cycle where DNA replication occurs **and** describe the sequence of events in the **semi-conservative replication** of DNA.

   In your answer you should identify the stage and make clear the sequence of events.

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Turn over

   (ii) Suggest how the injected blood stem cells help to repair the damaged liver.

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   .... **[2]**

 (e) Herceptin® is available for use in the UK to treat cancers such as breast cancer.

   However, not all patients diagnosed with breast cancer will be prescribed Herceptin®.

   (i) Suggest **two** reasons why not all patients diagnosed with breast cancer are prescribed Herceptin®.

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   .... **[2]**

   (ii) As Herceptin® is an antibody, this drug treatment is a form of immunotherapy. State **two** methods, other than immunotherapy, which may be used to treat breast cancer.

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   2 ....

   [2]

   [Total: 22]

3 In 2009, approximately 1.7 million people worldwide died from tuberculosis (TB). This figure includes 380 000 people with HIV infection.

   (a) Describe how TB is transmitted from one person to another.

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   .... **[2]**

   (b) One of the symptoms of TB is fatigue. State **two** other symptoms of TB.

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   .... **[2]**

Turn over

(c) Fig. 3.1 shows the estimated mean percentage change in the incidence of TB for different groups of countries, from 1997 to 2006.
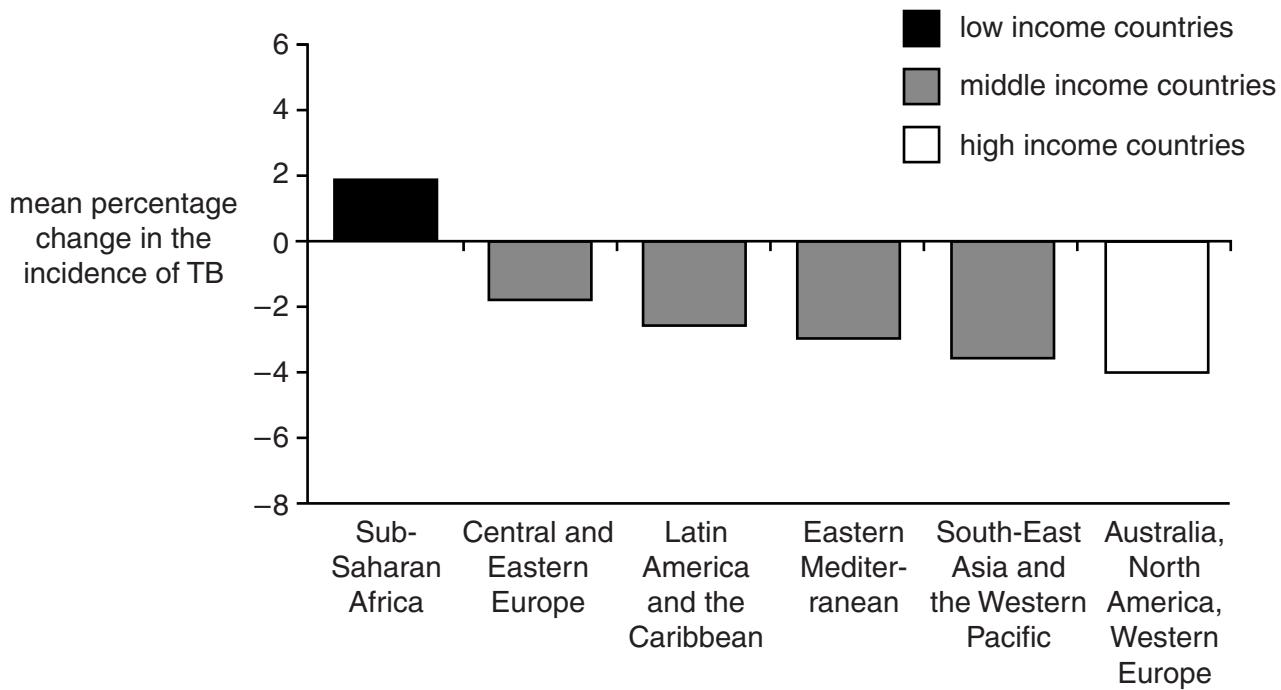
Fig. 3.1

(i) Suggest why the mean percentage change in the incidence of TB is given as an estimate and not as a direct measurement.

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(ii) What conclusions can be drawn about the changes in incidence of TB from the information in Fig. 3.1?

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(iii) The World Health Organisation (WHO) is recommending strategies for reducing the global burden of TB.

Discuss why it is proving difficult to prevent and control TB in the world's least developed countries such as those in Sub-Saharan Africa.

*In your answer you should only refer to **social**, **economic** and **ethical** factors.*

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[Total: 17]

Turn over

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4 Pregnant women are advised not to smoke or drink alcohol as these activities can cause serious harm to the developing fetus.

(a) Complete the following passage, which describes how smoking may affect the developing fetus, by inserting the most suitable term.

When a pregnant woman smokes, the diameter of the .... carrying

blood to the fetus is reduced due to the presence of .... in the

cigarette smoke.

Cigarette smoke also contains .... that combines with

.... in the red blood cells.

Smoking during pregnancy reduces the supply of ....

to the developing fetus. This makes it more likely that the baby will be born with a

low birth .... **[6]**

(b) A pregnant woman who drinks more than six units of alcohol a day is at risk of having a baby with fetal alcohol syndrome (FAS).

(i) Using FAS as an example, explain what is meant by the term **syndrome**.

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.... **[3]**

(ii) Explain how alcohol consumed by the mother reaches the fetal tissues.

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.... **[2]**

Turn over

(c) Suggest how changes in fetal development, due to smoking and alcohol, could be identified during routine antenatal checks.

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(d) Several different processes are necessary for the fetus to complete its growth and development.

Fig. 4.1 shows the hand of a developing fetus at 48 days and 51 days.
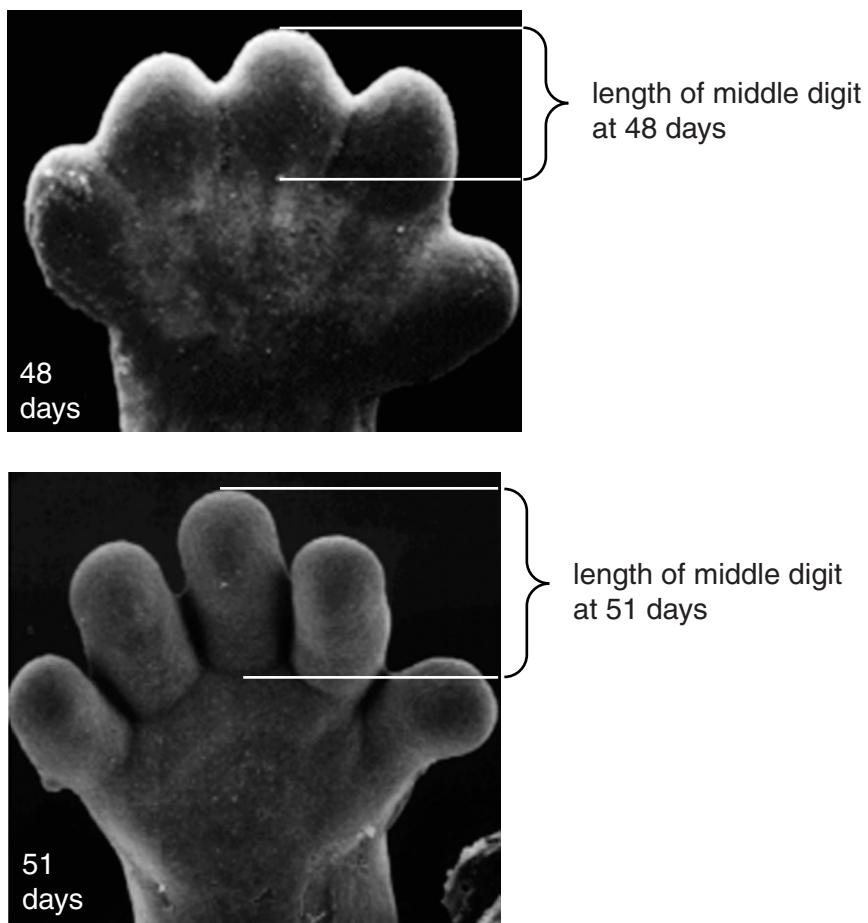
Fig. 4.1

(i) Using the information in Fig. 4.1 calculate the percentage increase in the size of the middle digit between 48 days and 51 days.

Show your working.

Answer = ... % **[2]**

(ii) Name **and** describe the processes that are taking place to increase the size of the digits **and** to separate the digits in the developing hand of the fetus.

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[Total: 19]

5 A study has been carried out to evaluate the association between the Human Papilloma Virus (HPV) and cervical cancer.

The study included 436 confirmed cases of invasive cervical cancer in three different countries and 387 randomly selected controls from the population of these countries.

Cervical swabs were taken from the confirmed cases and from the controls.

Cells from these swabs were then tested for the presence of Human Papilloma Virus DNA.

(a) Fig. 5.1 shows the prevalence of Human Papilloma Virus DNA in the confirmed cases and in the controls.
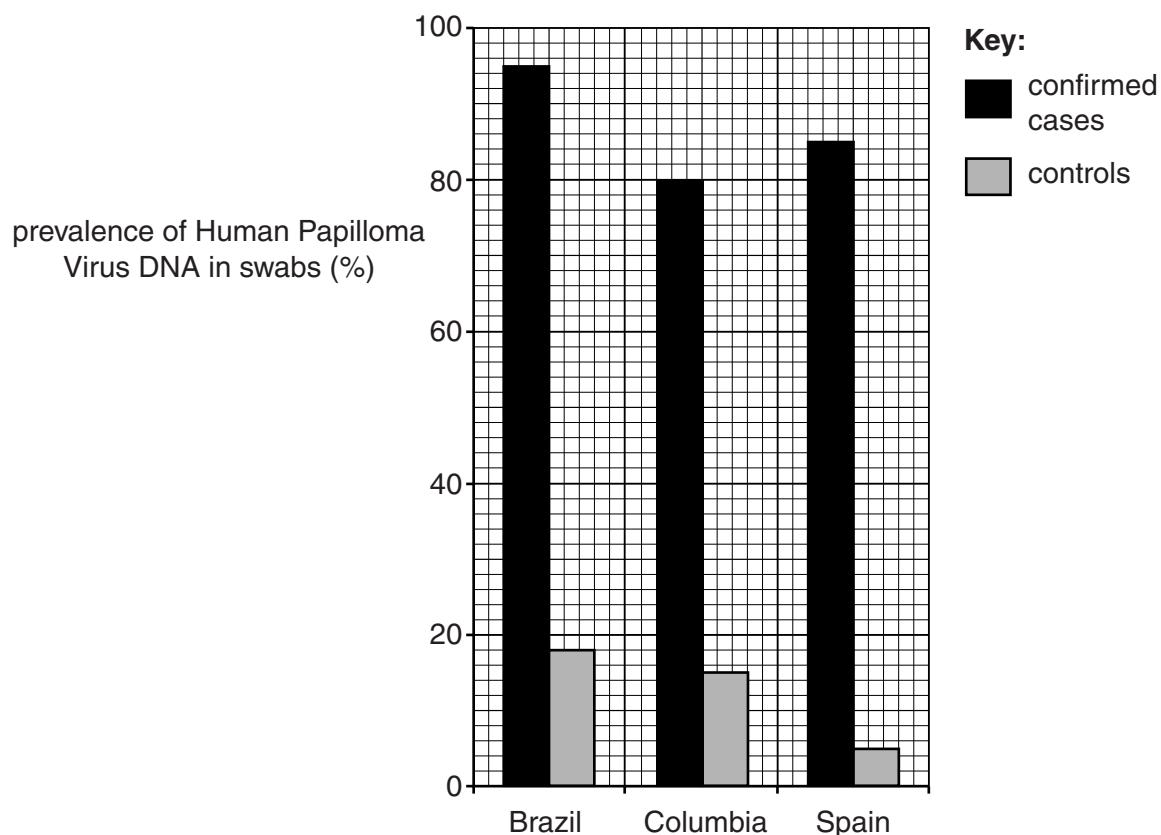
Fig. 5.1

(i) Suggest how suspected cases of cervical cancer can be confirmed in a hospital laboratory.

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.... **[2]**

(ii) Using information from Fig. 5.1, describe the evidence that supports a link between HPV infection and invasive cervical cancer.

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(iii) Suggest how HPV causes the cells of the cervix to become cancerous cells.

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.... **[2]**

(b) Suggest **one** major risk factor for the **transmission** of HPV to an individual.

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(c) Most women **infected with** HPV do not develop cervical cancer so other risk factors must be involved.

Suggest **two** other risk factors that increase the chances of a woman infected with HPV developing cervical cancer.

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.... **[2]**

Turn over

(d) Vaccines licensed in the United Kingdom (UK) are highly effective in preventing infection by HPV.

To be most effective, the vaccine should be given to girls before they become sexually active.

The vaccine is not offered to boys.

Discuss the ethical concerns associated with this vaccination programme.

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(e) Many newly evolved infectious diseases such as Swine Flu are caused by viruses.

Suggest why new viral diseases occur and why their spread is difficult to control.

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[Total: 13]

6 Coronary heart disease (CHD) is a leading cause of death for people of most ethnicities in the United States of America (USA).

(a) Table 6.1 shows the mortality due to CHD in males and females of different ethnic groups in the USA in 2003.

Ethnic group	Mortality from CHD (per 100 000)	
	Male	**Female**
White, non-Hispanic	287	187
Black	364	254
Hispanic	207	146
Asian / Pacific islander	158	104

Table 6.1

(i) Using information in Table 6.1, describe the effect of ethnic group **and** gender on mortality from CHD.

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Turn over

(ii) List **four** risk factors, other than gender and ethnicity, associated with a high mortality from CHD.

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(b) The following passage describes what is meant by coronary heart disease.

Read the passage carefully and then give the correct scientific or medical term for the words in bold.

Coronary heart disease is what happens when the walls of the coronary arteries become furred up with **fatty deposits**.

If the coronary arteries become narrow due to a build-up of fatty deposits, the blood supply to the heart will be restricted. This can cause **chest pains**.

If a coronary artery becomes completely blocked, it can cause a **heart attack**.

State the correct scientific or medical term for the following words:

fatty deposits..

chest pains...

heart attack...

[3]

[Total: 10]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional answer space is required, you should use the following lined pages. The question number(s) must be clearly shown in the margins.