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Write your name here

Surname	Other names

Centre Number | Candidate Number

Edexcel GCE

Biology

Advanced Subsidiary

Unit 1: Lifestyle, Transport, Genes and Health

Monday 1 June 2009 – Afternoon
Time: 1 hour 15 minutes

Paper Reference
6BI01/01

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.*

Information

- The total mark for this paper is 80.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- You will be assessed on your ability to organise and present information, ideas, descriptions and arguments clearly and logically, including your use of grammar, punctuation and spelling.
- Candidates may use a calculator.

Advice

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

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Answer ALL questions.

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

1 DNA and lipids are important molecules found in living organisms.

(a) A triglyceride is one type of lipid.

For each of the descriptions below, put a cross (☒) in the box that corresponds to the correct statement about lipids or triglycerides.

(i) Triglycerides are composed of:

(1)

- 3 glycerol molecules and 3 fatty acid molecules ☒
- 1 glycerol molecule and 3 fatty acid molecules ☒
- 1 glycerol molecule and 1 fatty acid molecule ☒
- 3 glycerol molecules and 1 fatty acid molecule ☒

(ii) The bond between a glycerol molecule and a fatty acid molecule is:

(1)

- A glycosidic bond ☒
- A peptide bond ☒
- A phosphodiester bond ☒
- An ester bond ☒

(iii) This bond is formed by:

(1)

- Hydrolysis ☒
- Condensation ☒
- A chain reaction ☒
- An automatic reaction ☒

(iv) Unsaturated lipids:

(1)

- Do not have any double bonds ☒
- Have double bonds only between carbon atoms ☒
- Have double bonds between carbon atoms and between carbon and oxygen atoms ☒
- Have double bonds only between carbon and oxygen atoms ☒

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(v) Saturated lipids have:

(1)

- More hydrogen atoms than unsaturated lipids ☒
- Fewer hydrogen atoms than unsaturated lipids ☒
- The same number of hydrogen atoms as unsaturated lipids ☒
- No hydrogen atoms ☒

(b) DNA is a double-stranded molecule composed of mononucleotides.

(i) In the space below, draw a diagram to show **two** mononucleotides joined together in a **single** strand of DNA (polynucleotide). Use the symbols shown below for each component in your diagram.

(3)

Phosphate group  Base 

Deoxyribose sugar  Bond —

(ii) Name an enzyme involved in DNA replication.

(1)

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(Total for Question 1 = 9 marks)

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2 Cystic fibrosis is a genetic disorder caused by one of a number of possible gene mutations. Prenatal testing can be used to determine whether or not a fetus has cystic fibrosis.

(a) Name **one** method of prenatal testing and explain how it can be used to detect cystic fibrosis.

(3)

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(b) Describe **one** benefit and **one** risk, to a pregnant woman, of prenatal testing.

(4)

Benefit .....

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Risk .....

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(c) Discuss either **one** ethical issue or **one** social issue relating to the use of prenatal testing.

(2)

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(Total for Question 2 = 9 marks)

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3 The cardiac cycle involves the contraction and relaxation of heart muscle. This brings about changes in blood pressure within the heart.

(a) The table below refers to the three phases of the cardiac cycle. Complete the table by stating whether the atria and ventricles are **contracted** or **relaxed** in each of these three phases.

(3)

Phase of cardiac cycle	Atria	Ventricles
Atrial systole		
Ventricular systole		
Diastole		

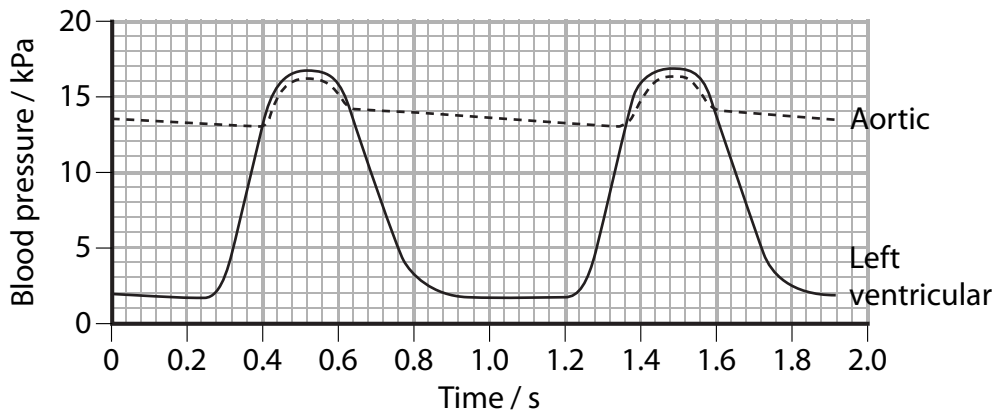
(b) Describe the roles of the atrioventricular (bicuspid and tricuspid) valves during the cardiac cycle.

(4)

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(c) The graph below shows changes in the blood pressure in the aorta and the left ventricle during two complete cardiac cycles.



(i) Use the information in the graph to calculate the heart rate. Show your working.

(3)

Answer .....

(ii) During the cardiac cycle, the pressure in the right ventricle rises to a maximum of about 3.3 kPa. Suggest reasons for the difference between this pressure and the maximum pressure in the left ventricle, as shown in the graph.

(3)

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(Total for Question 3 = 13 marks)

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4 Data on the cholesterol levels and blood pressure for different adult populations in America were collected.
The mean cholesterol level and the percentage of each population with high blood pressure were calculated. The results are shown in the table below.

Adult population (ethnic groups)	Mean cholesterol level / mg dm^{-3}	Percentage of population with high blood pressure (%)
Black and African American	204	40
White American	206	27
Mexican American	205	29
American Indian and Alaskan Native	Statistically unreliable data	Statistically unreliable data

(a) There could be a causal link or correlation between high blood pressure and the other variables shown in the table.

Distinguish between the terms **causation** and **correlation**.

(2)

(b) (i) Using the information in the table above, describe the relationship between ethnic group, cholesterol levels and the percentage of the population with high blood pressure.

(2)

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(ii) Suggest **one** reason why the data on the American Indian and Alaskan Native population are described as statistically unreliable.

(1)

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(c) A student concluded from the results for gender, shown in the table below, that higher cholesterol levels cause lower blood pressure.

Adult population (gender)	Mean cholesterol level / mg dm^{-3}	Percentage of population with high blood pressure (%)
Female	207	26
Male	204	30

Using the information in both tables, explain why this is not a valid conclusion.

(3)

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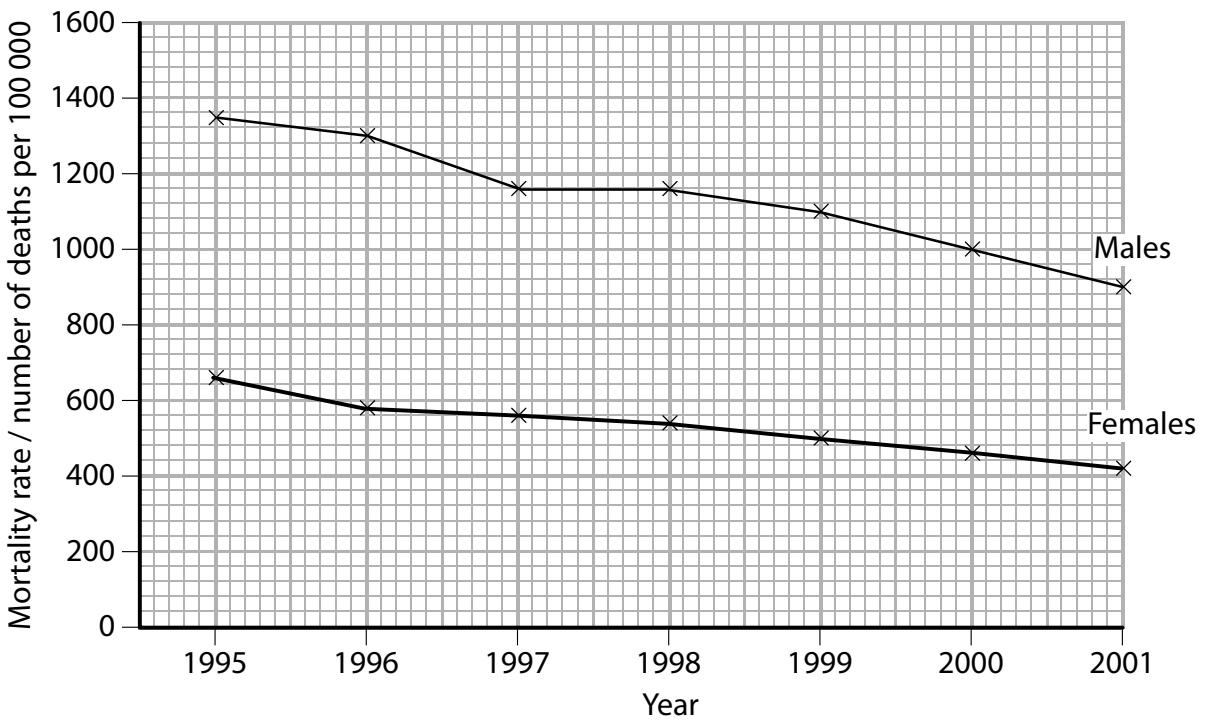
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(Total for Question 4 = 8 marks)

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5 The graph below shows the mortality rate (number of deaths per 100 000) from coronary heart disease in people aged between 65 and 74 in Scotland between 1995 and 2001.



(a) Compare the mortality rate from coronary heart disease in males with that of females, between 1995 and 2001.

(3)

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(b) The graph shows a change in the number of deaths from coronary heart disease between 1995 and 2001. Suggest **three** reasons for this change.

(3)

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(c) One cause of coronary heart disease is atherosclerosis. Describe how atherosclerosis develops.

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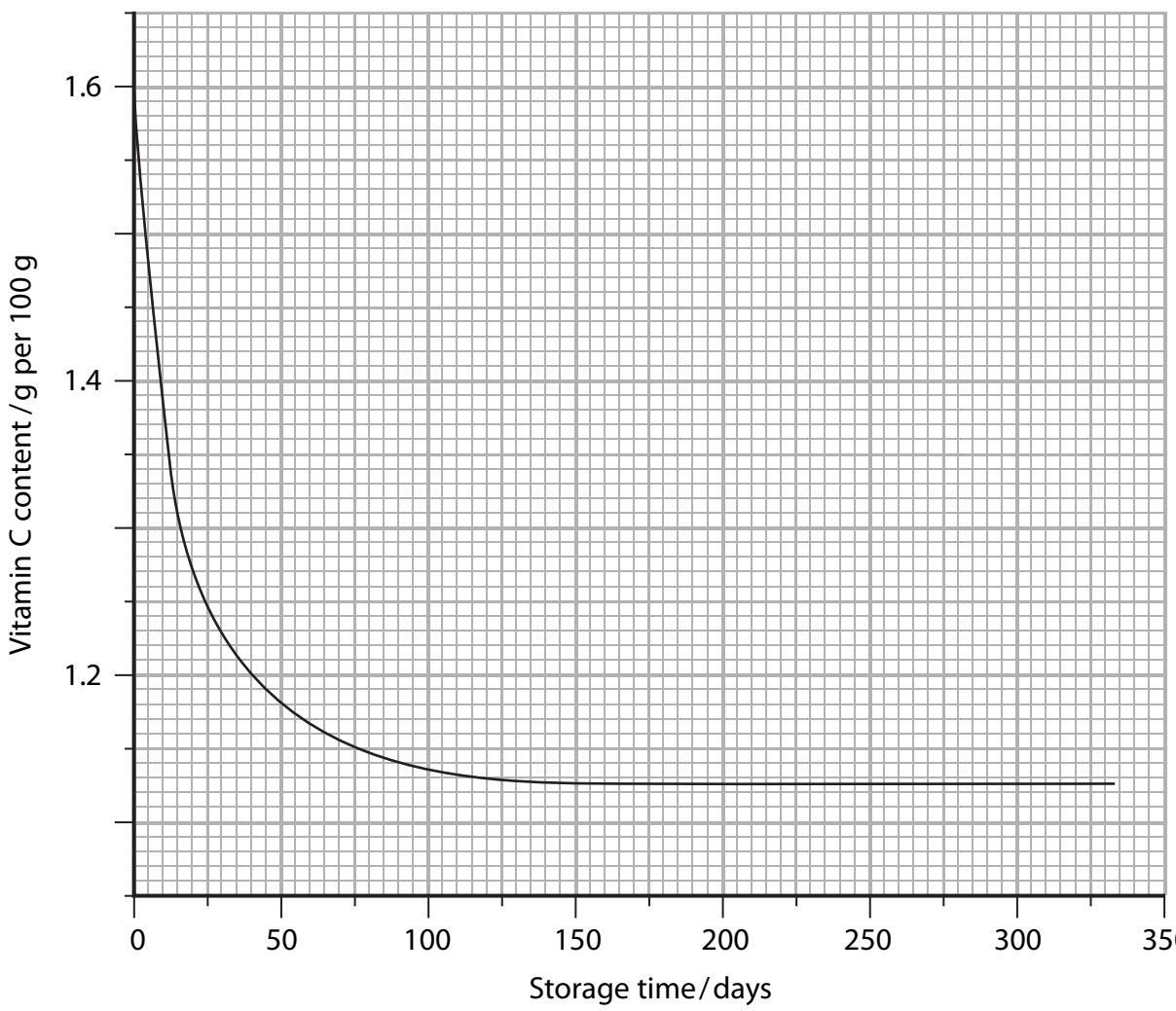
(Total for Question 5 = 10 marks)

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6 Camu-camu are fruit that grow in the Amazon region of South America and are shown in the photograph below. They have a very high vitamin C content.



(a) An investigation was carried out into the effect of storage time on the concentration of vitamin C in camu-camu fruit. The results of this investigation are shown in the graph below.



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Using the information in the graph, describe the effect of storage time on the vitamin C content of the camu-camu fruit.

(3)

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(b) Paraná state is another region in South America that produces camu-camu fruit. The camu-camu fruit from this region have a different vitamin C content from those grown in the Amazon region.

Describe how an investigation could be carried out to compare the effect of storage time on the vitamin C content of the Paraná state camu-camu fruit with those from the Amazon region.

(5)

(Total for Question 6 = 8 marks)

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7 Albinism is a genetic trait resulting from the inheritance of recessive alleles.

(a) (i) Distinguish between the terms **allele** and **gene**.

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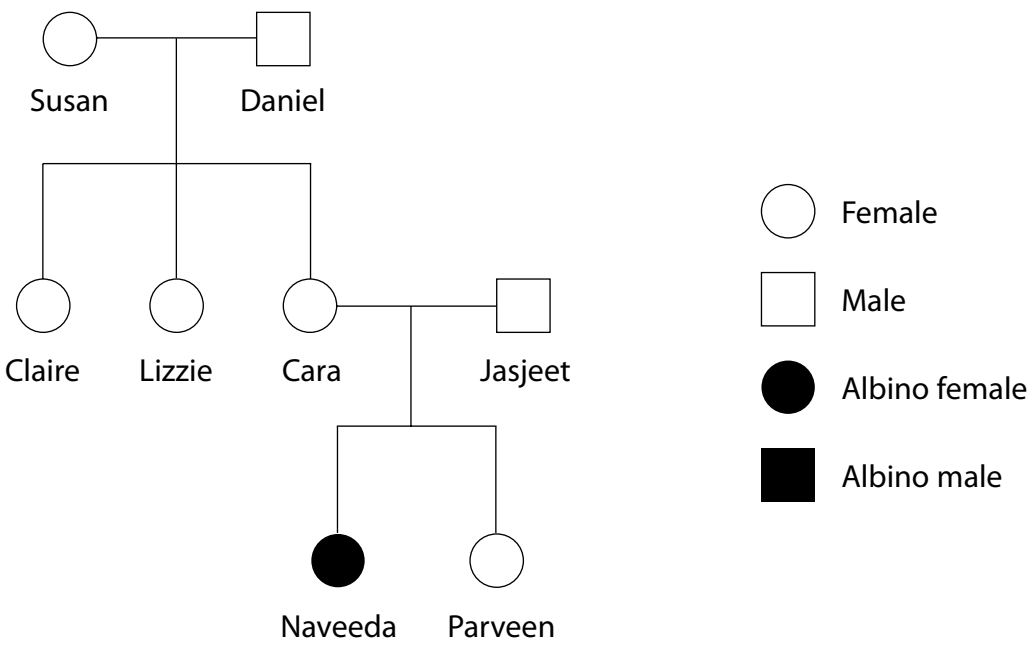
(ii) Explain the meaning of the term **recessive** allele.

(1)

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(b) The pedigree diagram below shows the inheritance of albinism in one family.



(i) Naveeda is homozygous. Explain the meaning of the term **homozygous**.

(1)

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(ii) Susan is also homozygous. Name the members of this family who are definitely carriers of albinism, giving reasons for your answer.

(4)

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(c) Albinism occurs in a number of different animals, including squirrels as shown in the photograph below.



The incidence of albinism in squirrels is 1 in 100 000 births, which is much lower than the incidence of albinism in humans. Suggest why the incidence of albinism in squirrels is lower than the incidence in humans, giving a reason for your answer.

(2)

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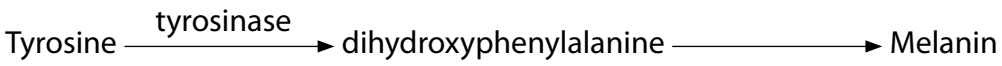
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(d) Individuals with albinism are unable to produce the pigment melanin. This can be due to the absence of the enzyme tyrosinase. The diagram below shows the role of tyrosinase in melanin production.



Explain why melanin cannot be produced in the absence of the enzyme tyrosinase.

(2)

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(Total for Question 7 = 12 marks)

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8 In an osmosis investigation, a student prepared five pieces of raw potato of equal mass and a range of sucrose solutions of different concentrations.

One piece of potato was placed in each sucrose solution. After two hours, the potato pieces were removed and blotted dry and the change in mass of each potato piece was calculated.

The results are shown in the table below.

Concentration of sucrose solution / mol dm^{-3}	Change in mass of potato piece / g
0.2	+1.34
0.4	+0.82
0.6	+0.31
0.8	–0.11
1.0	–0.65

(a) Explain the meaning of the term **osmosis**.

(2)

(b) (i) Explain why the piece of potato placed in 0.2 mol dm^{-3} sucrose solution had the largest change in mass.

(3)

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(ii) The student suggested that there would be no change in the mass of a piece of potato placed in a sucrose solution of 0.75 mol dm^{-3}. Give an explanation for this suggestion.

(2)

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(c) The student repeated this investigation using another potato and the results were different.

The student concluded that there was a difference in water content of the two potatoes. Suggest **two** reasons for this difference in water content.

(2)

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(d) A second student wanted to perform this investigation by measuring the change in length of the potato pieces. The student was advised that this method would not be as accurate as weighing the potato pieces.

Suggest **two** reasons why measuring the change in length would not be as accurate as weighing the potato pieces.

(2)

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(Total for Question 8 = 11 marks)

TOTAL FOR PAPER = 80 MARKS

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