Write your name here

Surname	Other names

Centre Number | Candidate Number

Edexcel GCE

Biology

Advanced Subsidiary

Unit 1: Lifestyle, Transport, Genes and Health

Wednesday 9 January 2013 – Morning
Time: 1 hour 30 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.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*
- 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.

Turn over ▶

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1/1/1/1/

P 3 9 8 7 8 A 0 1 2 4

PEARSON

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 Read through the following passage on the cardiac cycle, then write on the dotted lines the most appropriate word or words to complete the passage.

The cardiac cycle consists of three stages: atrial systole, ventricular systole and

..... .

During atrial systole, the ..... contract and the

..... are relaxed. The ..... valves are open.

During ventricular systole, the ..... open as oxygenated blood is

forced out of the heart through the aorta to the body and through the pulmonary

..... to the lungs.

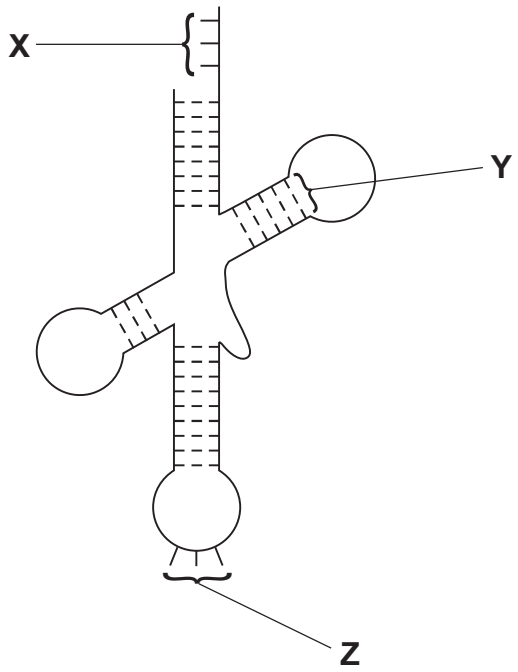
(Total for Question 1 = 6 marks)

2 Messenger RNA (mRNA) and transfer RNA (tRNA) are important nucleic acids involved in the process of protein synthesis.

(a) Describe how a molecule of mRNA is made during transcription.

(4)

(b) The diagram below represents a tRNA molecule.



For each of the statements below, put a cross (☒) in the box that corresponds to the correct statement.

(i) Part **X** binds to

(1)

☒ **A** an amino acid for transcription

☒ **B** an amino acid for translation

☒ **C** mRNA for transcription

☒ **D** mRNA for translation

(ii) Part **Y** is a

(1)

☒ **A** glycosidic bond

☒ **B** hydrogen bond

☒ **C** peptide bond

☒ **D** phosphodiester bond

(iii) Part **Z** binds to

(1)

- ☒ **A** an amino acid during transcription
- ☒ **B** an amino acid during translation
- ☒ **C** mRNA during transcription
- ☒ **D** mRNA during translation

(c) Using the information shown in the diagram, describe **two** ways in which the structure of a tRNA molecule differs from the structure of a mRNA molecule.

(2)

1 .....

.....

.....

.....

2 .....

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.....

(Total for Question 2 = 9 marks)

3 Molecules are transported across the cell membrane in a number of different ways.

(a) Describe the structure of a cell membrane.

(3)

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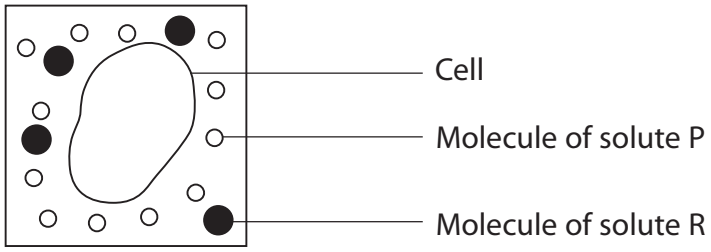
Question 3 continues on page 8

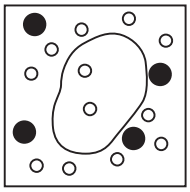
(b) Cells were placed in a solution containing two different solutes, solute P and solute R.

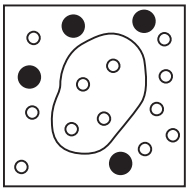
The diagram below represents the concentration of the two solutes outside one of the cells, when this cell was placed in the solution.

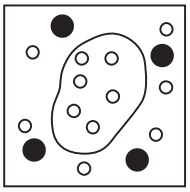


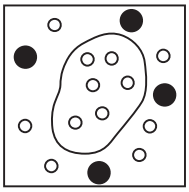
The cells were left in the solution for 50 minutes.

The diagrams below represent the concentrations of the two solutes, inside and outside the cell after 10, 20, 30 and 40 minutes in the solution.


After 10 minutes


After 20 minutes


After 30 minutes


After 40 minutes

(i) Using the information in the diagrams, describe the changes that have taken place in the concentrations of solute P and solute R, in the 40 minute period.

Suggest an explanation for these changes.

(5)

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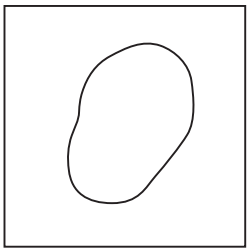
(ii) Complete the diagram below, to show the concentration of solute P and solute R inside and outside the cell, after 50 minutes.

(1)



(Total for Question 3 = 9 marks)

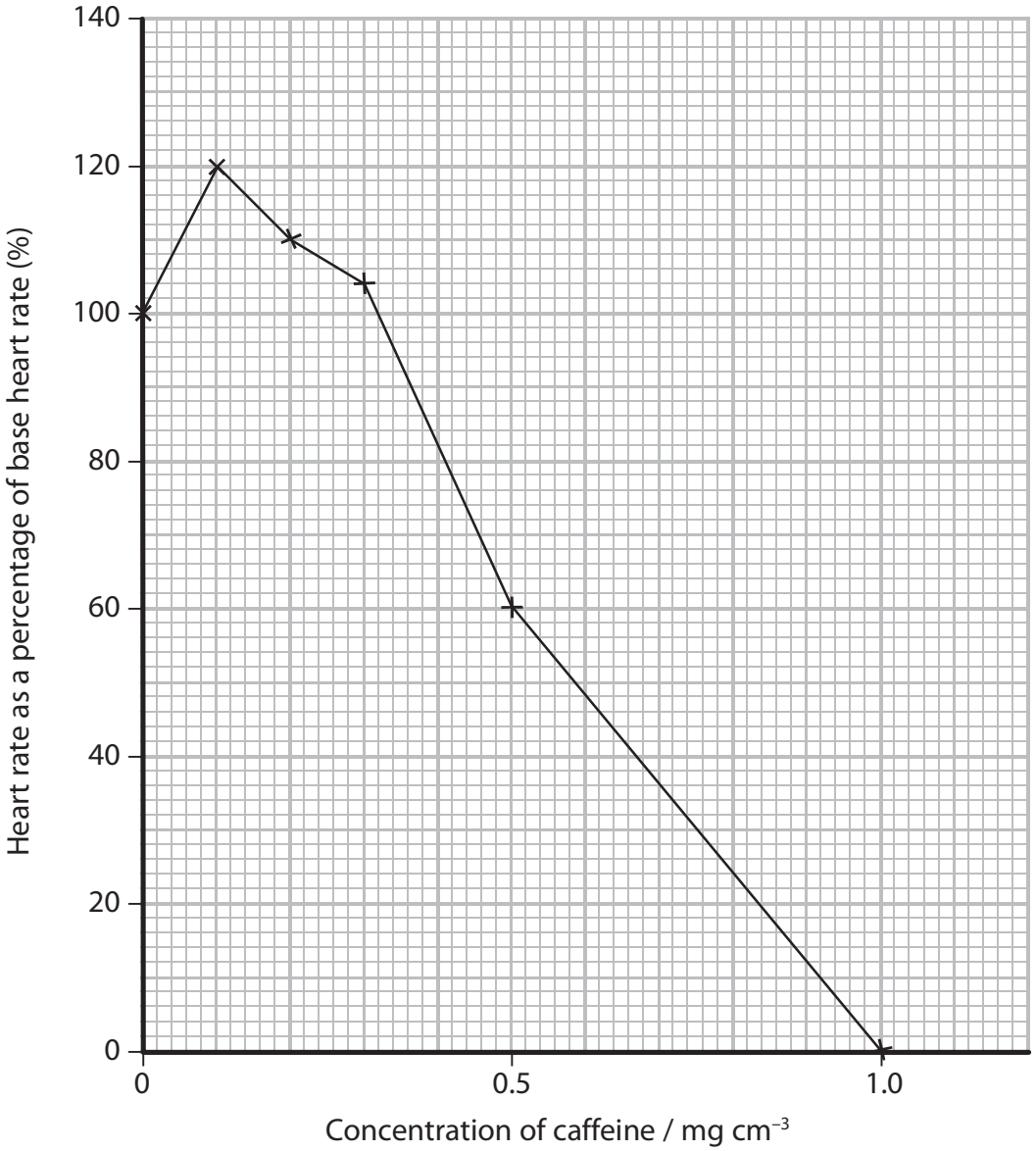
4 An investigation was carried out to study the effect of caffeine on the heart rate of a chicken embryo.

The heart from a chicken embryo was removed and placed in a glucose solution. The heart rate was determined and recorded as the base heart rate.

The experiment was repeated using glucose solutions containing five different concentrations of caffeine.

The heart rate was determined and recorded as a percentage of the base heart rate for each solution.

The graph below shows the results of this investigation.



(a) (i) Suggest why glucose was included in the solutions.

(2)

(ii) Suggest how the caffeine solutions were prepared to obtain valid results.

(1)

(iii) State how these results could be made more reliable.

(1)

(iv) Using the information in the graph, describe the effect of caffeine on the heart rate of the chicken embryo.

(3)

(b) (i) Describe how this investigation could be carried out using *Daphnia* instead of chicken embryos.

(4)

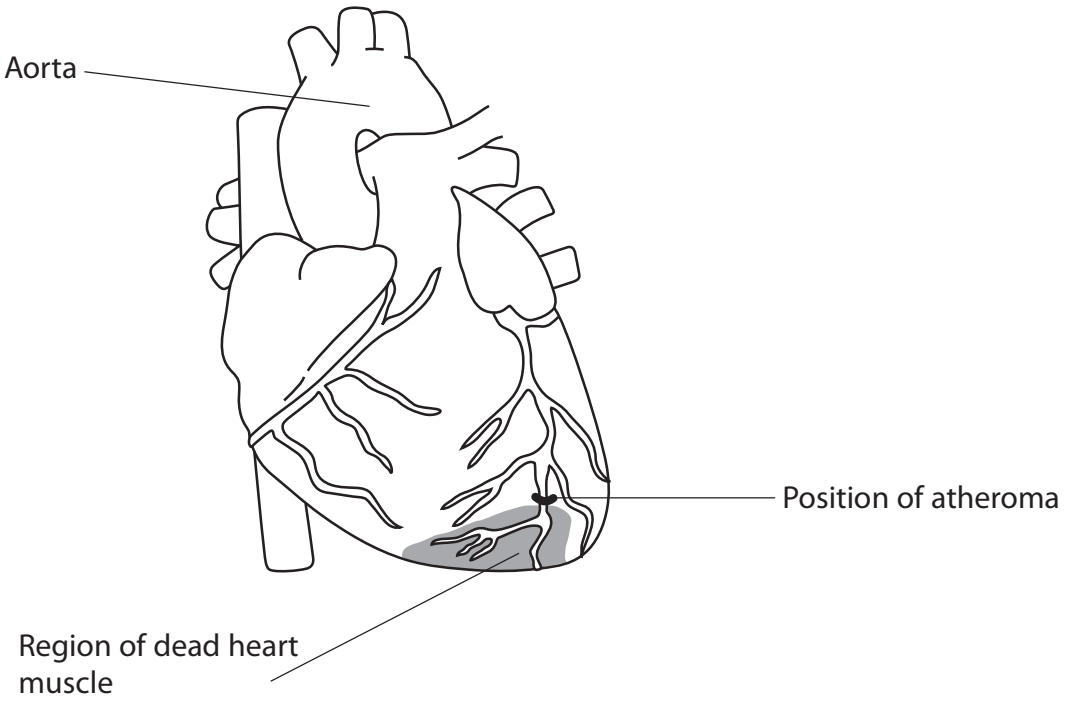
(ii) Suggest **one** ethical issue in the use of chicken embryos in this investigation.

(1)

(Total for Question 4 = 12 marks)

5 Atherosclerosis is responsible for many deaths that result from cardiovascular disease (CVD).

The diagram below shows an external view of a human heart.
The position of an atheroma (plaque) is shown and a region of dead heart muscle is shaded.



(a) (i) Explain how the structure of the aorta relates to its function.

(3)

(ii) Describe **two** differences between the structure of a capillary and the structure of a vein.

(2)

1 .....

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2 .....

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(b) (i) Suggest how the location of the atheroma results in the position and size of this region of dead heart muscle.

(3)

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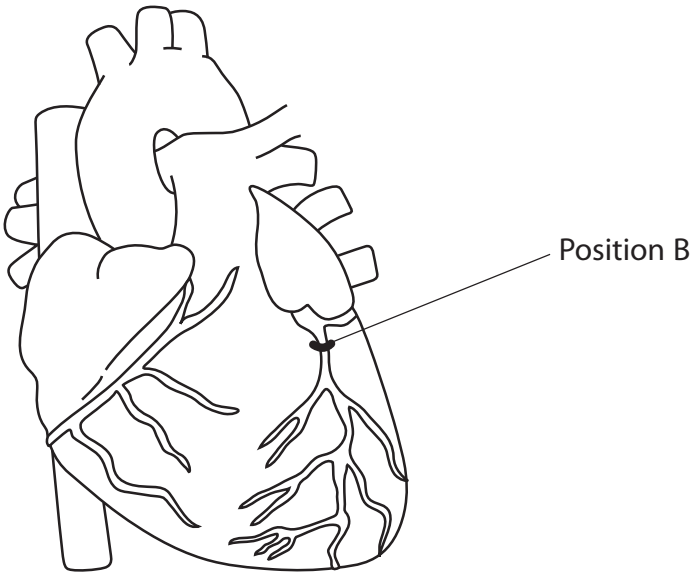
(ii) On the diagram below, shade an area to show the position and size of dead heart muscle, if the atheroma occurred at position B.

(2)



(Total for Question 5 = 10 marks)

6 Enzymes act as biological catalysts.

Amylase is an enzyme present in saliva that catalyses the hydrolysis of starch into maltose.

*(a) Describe the structure of starch.

(5)

(b) Explain the meaning of the following terms.

(i) Catalyst

(2)

(ii) Hydrolysis

(2)

(c) Bread contains a high proportion of starch. If bread is chewed for a long period of time it begins to taste sweet.

Suggest why bread tastes sweet after chewing for a long period of time.

(1)

(Total for Question 6 = 10 marks)

7 There is evidence for a causal relationship between blood cholesterol levels and cardiovascular disease (CVD).

(a) Explain the meaning of the term **causal relationship**.

(1)

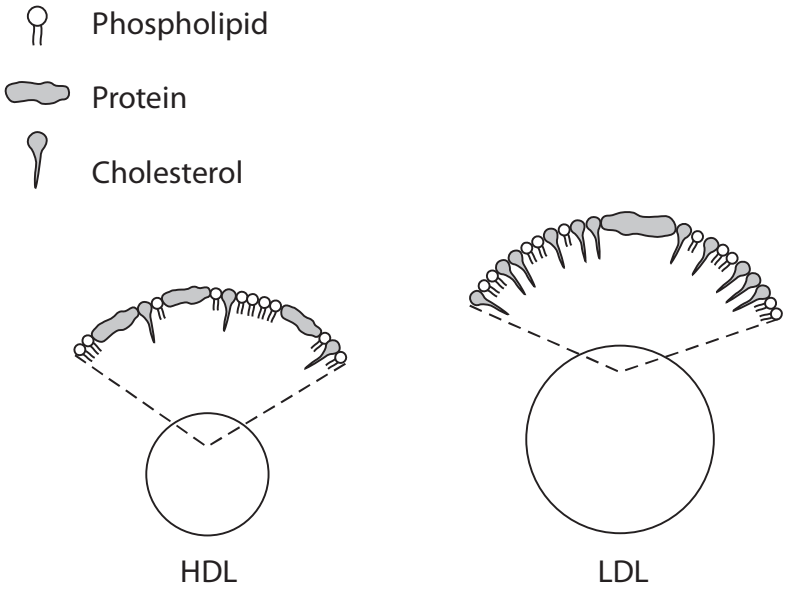
(b) Lipoproteins are composed of phospholipids, cholesterol and proteins.

(i) Proteins are made up of amino acids.

Describe how amino acids join together to form the three-dimensional structure of a protein.

(4)

(ii) The diagrams below show part of the structure of the surface of high-density lipoprotein (HDL) and low-density lipoprotein (LDL).



Using the information in the diagram, describe the differences between the structure of HDL and the structure of LDL.

(2)

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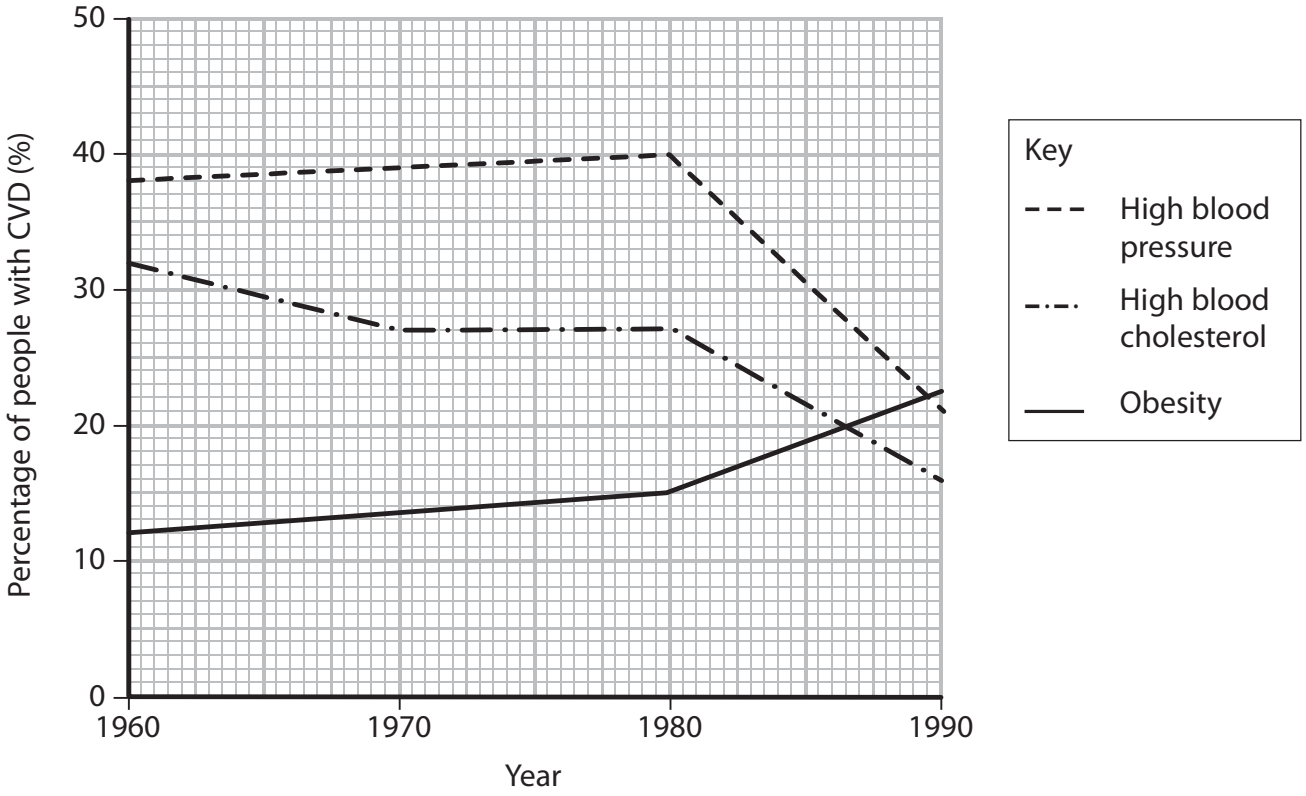
(c) Obesity and high blood pressure are also factors that increase the risk of CVD.

The graph below shows the percentage of people with CVD who have high blood pressure or have high blood cholesterol or are obese for the period 1960 to 1990.



(i) Using the information in the graph, describe the overall changes that have occurred in these risk factors during this period.

(3)

(ii) Suggest **two** reasons for the overall change in high blood cholesterol as a risk factor.

(2)

1 .....

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2 .....

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.....

(iii) State **two** factors, other than obesity, high blood pressure and high blood cholesterol, that increase the risk of CVD.

(1)

1 .....

2 .....

(Total for Question 7 = 13 marks)

8 Cystic fibrosis and albinism are examples of recessive genetic disorders.

Tay-Sachs disease is another example of a recessive genetic disorder.

(a) Explain the meaning of the term **recessive genetic disorder**.

(2)

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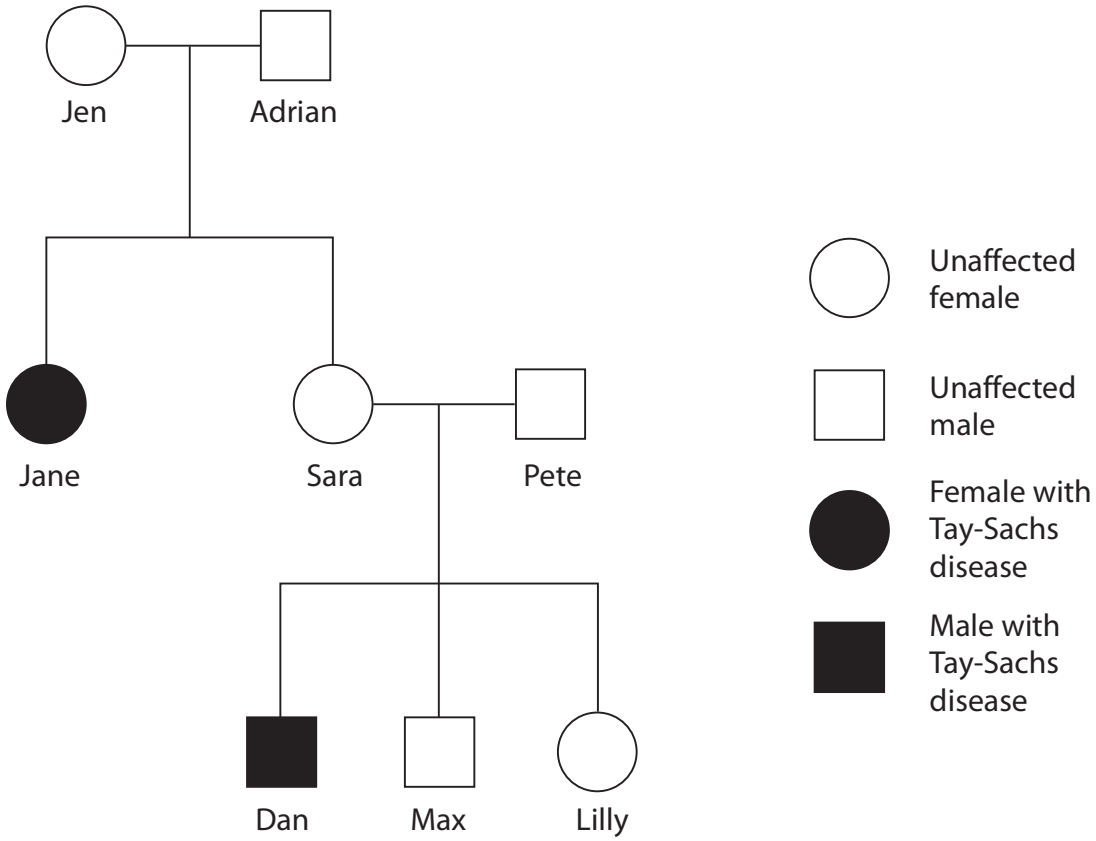
(b) The genetic pedigree diagram below shows the inheritance of Tay-Sachs disease in one family.



For each of the statements below, put a cross (☒) in the box that correctly completes the statement.

(i) The female who definitely has a homozygous genotype is

(1)

☒ **A** Jane

☒ **B** Jen

☒ **C** Lilly

☒ **D** Sara

(ii) The female whose genotype cannot be identified from the diagram is

(1)

☒ **A** Jane

☒ **B** Jen

☒ **C** Lilly

☒ **D** Sara

(iii) A male who definitely has a heterozygous genotype is

(1)

☒ **A** Adrian

☒ **B** Dan

☒ **C** Max

☒ **D** none of them

(iv) A male who definitely is homozygous dominant is

(1)

☒ **A** Adrian

☒ **B** Dan

☒ **C** Max

☒ **D** none of them

*(c) Tay-Sachs disease is caused by a gene mutation that results in the build up of lipid in the brain. It is hoped that gene therapy will be able to treat this disease in the future.

Sheep can also suffer from Tay-Sachs disease. Investigations have found that gene therapy increases the life span of these animals.

Suggest how these gene therapy investigations could have been carried out.

(5)

(Total for Question 8 = 11 marks)

TOTAL FOR PAPER = 80 MARKS