Write your name here

Surname	Other names

Pearson Edexcel Level 3 GCE

Centre Number	Candidate Number

Biology A (Salters Nuffield)

Advanced Subsidiary
Paper 1: Lifestyle, Transport, Genes and Health

Specimen Paper for first teaching September 2015
Time: 1 hour 30 minutes

Paper Reference
8BN0/01

You may need a ruler, a pencil and a calculator.

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.
- Show your working in any calculation questions and include units in your answer where appropriate.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- You may use a scientific calculator.
- In questions marked with an **asterisk (*)**, marks will be awarded for your ability to structure your answer logically, showing how the points that you make are related or follow on from each other where appropriate.

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.*

Advice

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

Turn over ▶

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Draft

Answer ALL questions.

Write your answers in the spaces provided.

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 Blood clotting is associated with cardiovascular disease.

(a) Anticoagulants are a commonly prescribed drug.

(i) An anticoagulant

(1)

☒ **A** decreases blood cholesterol concentrations

☒ **B** decreases the time taken for a blood clot to form

☒ **C** increases blood cholesterol concentrations

☒ **D** increases the time taken for a blood clot to form

(ii) A major risk associated with the use of anticoagulants is

(1)

☒ **A** cardiovascular disease

☒ **B** high blood pressure

☒ **C** internal bleeding

☒ **D** obesity

(b) Explain the role of blood clots in heart disease.

(3)

Rearplan

(Total for Question 1 = 5 marks)

2 During cell division, DNA undergoes semiconservative replication.

(a) Which type of sugar is found in a nucleotide?

(1)

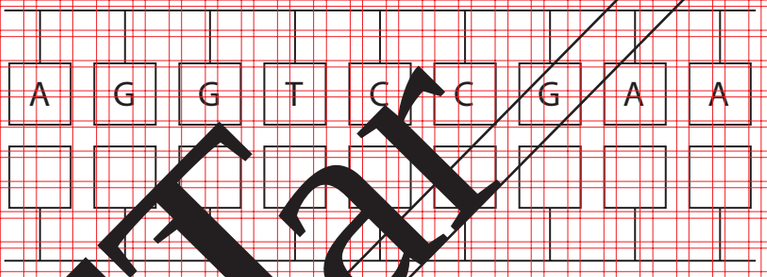
- ☒ **A** triose
- ☒ **B** pentose
- ☒ **C** hexose
- ☒ **D** heptose

(b) A DNA double helix is formed from two strands of DNA.

(i) The diagram shows a short sequence of DNA. The bases in one strand have been given.

Complete the diagram by filling in the missing bases.

(1)



(ii) Name the type of bond that holds the two strands of DNA together.

(1)

Exemplar

(c) Describe the experiment carried out by Meselson and Stahl that demonstrates the semiconservative replication of DNA.

Include an outline of the method used and a description of the results obtained.

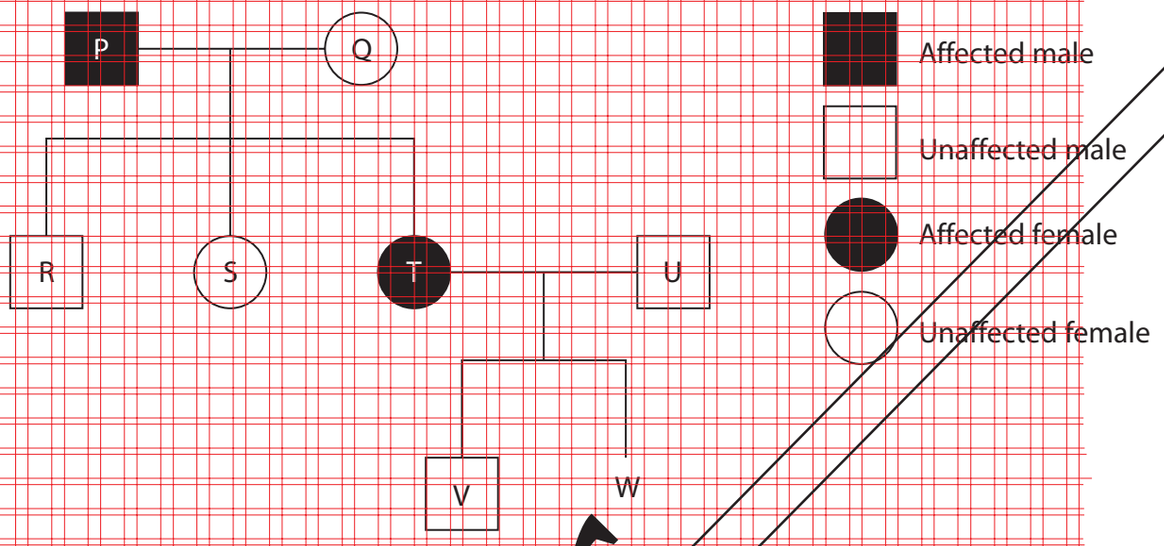
(5)

Partial

(Total for Question 2 = 8 marks)

3 Marfan syndrome is a disorder that affects elastic tissue. Mutations in the FBN1 gene can cause Marfan syndrome. The FBN1 gene codes for a protein called fibrillin-1.

(a) Marfan syndrome is caused by a dominant allele M. The diagram shows the inheritance of Marfan syndrome in a family.



(i) Which of the following are the genotypes of individuals S and T?

(1)

- ☒ **A** S – MM and T – Mm
- ☒ **B** S – Mm and T – MM
- ☒ **C** S – mm and T – Mm
- ☒ **D** S – MM and T – mm

(ii) The probability of child W inheriting Marfan syndrome is

(1)

- ☒ **A** 0
- ☒ **B** 0.25
- ☒ **C** 0.5
- ☒ **D** 1.0

Exemplar

(b) Explain how a mutation in the FBN1 gene can affect the production of fibrillin protein.

(4)

(c) Fibrillin-1 is involved in the formation of elastic fibres in the walls of blood vessels.

Explain how Marfan syndrome affects the structure and function of an artery.

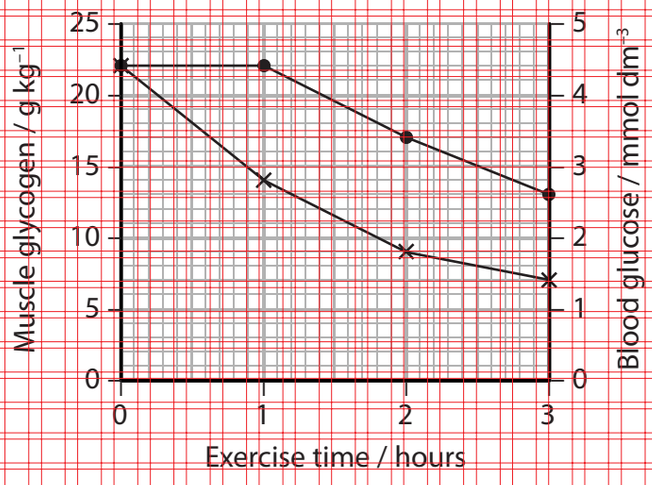
(2)

(Total for Question 3 = 8 marks)

Reprint

4 Carbohydrates are the body's main energy source.

The graph shows the change in concentration of blood glucose and muscle glycogen during exercise.



(a) Calculate the percentage change in muscle glycogen during the three hours of exercise.

(2)

Answer ..... %

Exemplar

(b) Analyse the data to explain the role of blood glucose and muscle glycogen during exercise.

(3)

(c) Endurance athletes, such as marathon runners, often 'carb load' before an event. This involves eating food containing large quantities of starch.

(i) Describe the structure of starch.

(4)

Rapidar

(ii) Explain why it is useful for marathon runners to 'carb load'.

(4)

(Total for Question 4 = 13 marks)

Exemplar

SAMPLE

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5 Fick's Law of Diffusion can be used to calculate the rate of diffusion across gas exchange surfaces.

(a) Use Fick's Law of Diffusion to explain the adaptations of mammalian gas exchange surfaces.

(5)

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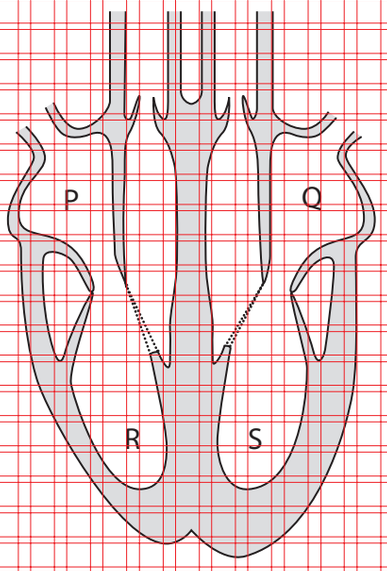
(b) Explain how gas exchange is affected in individuals with cystic fibrosis.

(3)

Exemplar

(Total for Question 5 = 8 marks)

6 The diagram shows a section of a human heart and blood vessels.



(a) (i) The blood vessel transporting blood with the highest pressure is

(1)

- ☒ **A** aorta
- ☒ **B** pulmonary artery
- ☒ **C** pulmonary vein
- ☒ **D** vena cava

(ii) The order in which blood flows through the chambers of the heart is

(1)

- ☒ **A** P → R → Q → S
- ☒ **B** P → Q → R → S
- ☒ **C** R → S → P → Q
- ☒ **D** R → S → Q → R

(iii) Which structures will fill with blood as a result of atrial systole?

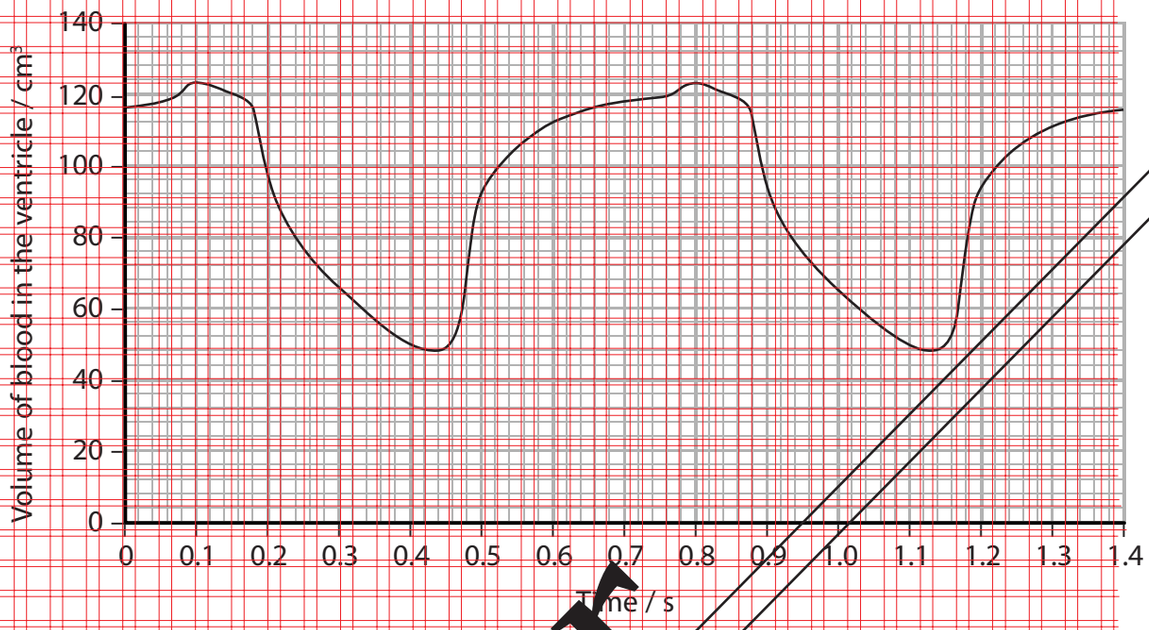
(1)

- ☒ **A** P and R
- ☒ **B** P and Q
- ☒ **C** Q and R
- ☒ **D** R and S

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(b) A scientist investigated the volume of blood pumped by the heart of a healthy individual.

The graph shows the volume of blood measured in the left ventricle.



(i) Calculate the heart rate.

(2)

Answer ..... beats min^{-1}

(ii) Calculate the volume of blood, in dm^3, pumped by the left ventricle each minute.

(3)

Answer ..... dm^3

(Total for Question 6 = 8 marks)

Partial

7 The cell vacuoles of beetroot, *Beta vulgaris*, contain the red pigment betalain.

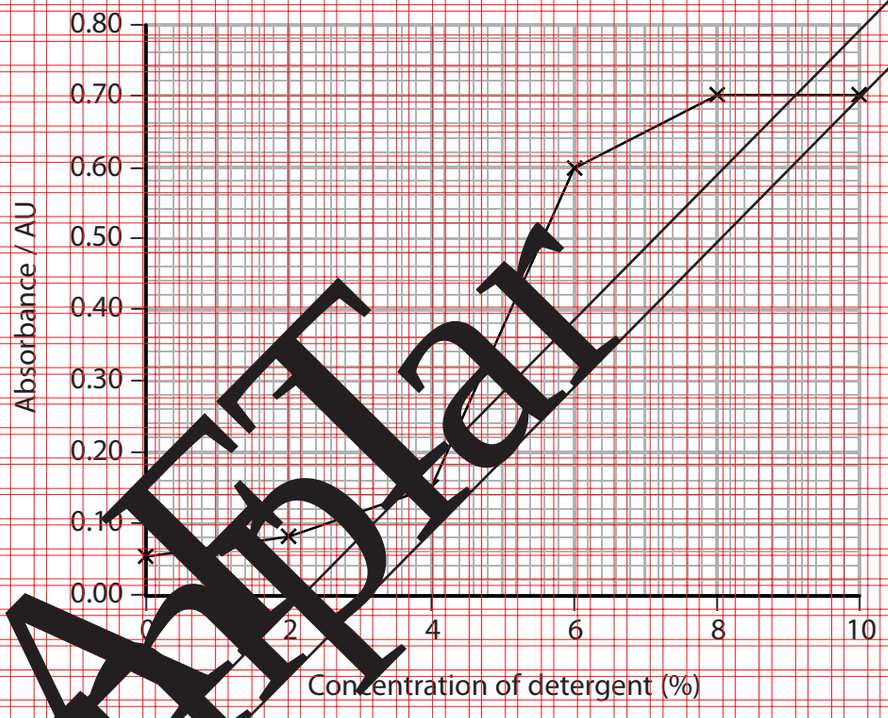
A student investigated the effect of detergent on the permeability of beetroot cell membranes.

A cube of beetroot was placed in water for 20 minutes.

After 20 minutes the beetroot cube was removed and the intensity of the colour of the water was measured using a colorimeter.

The same procedure was carried out for other cubes of beetroot using detergent concentrations of 2%, 4%, 6%, 8% and 10%.

The results are shown in the graph.



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(a) Analyse the data to explain the effect of detergent on beetroot cell membranes.

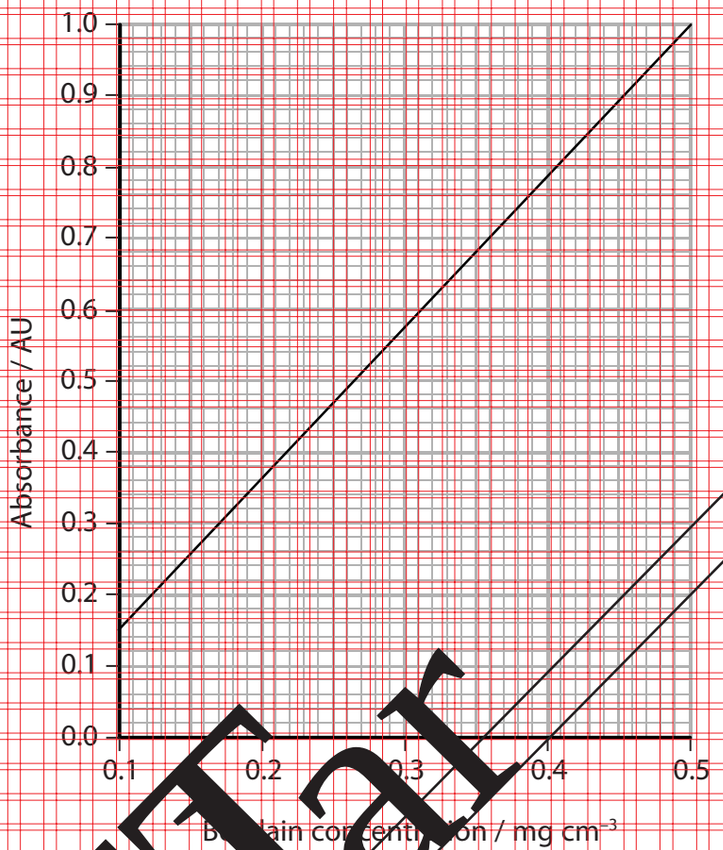
(4)

(b) Explain the steps that could be taken to improve the validity of the investigation.

(4)

Partial

(c) The student prepared a standard curve to convert absorbance units into concentrations.



Use the graph to predict the concentration of betalain if 5% detergent solution was used.

(2)

Answer ..... mg cm^{-3}

(Total for Question 7 = 10 marks)

Exemplar

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Partial

8 Enzymes are biological catalysts.

Lipase is an enzyme involved in the digestion of triglycerides.

(a) Lipase enzymes hydrolyse

(1)

☒ **A** ester bonds to produce fatty acids

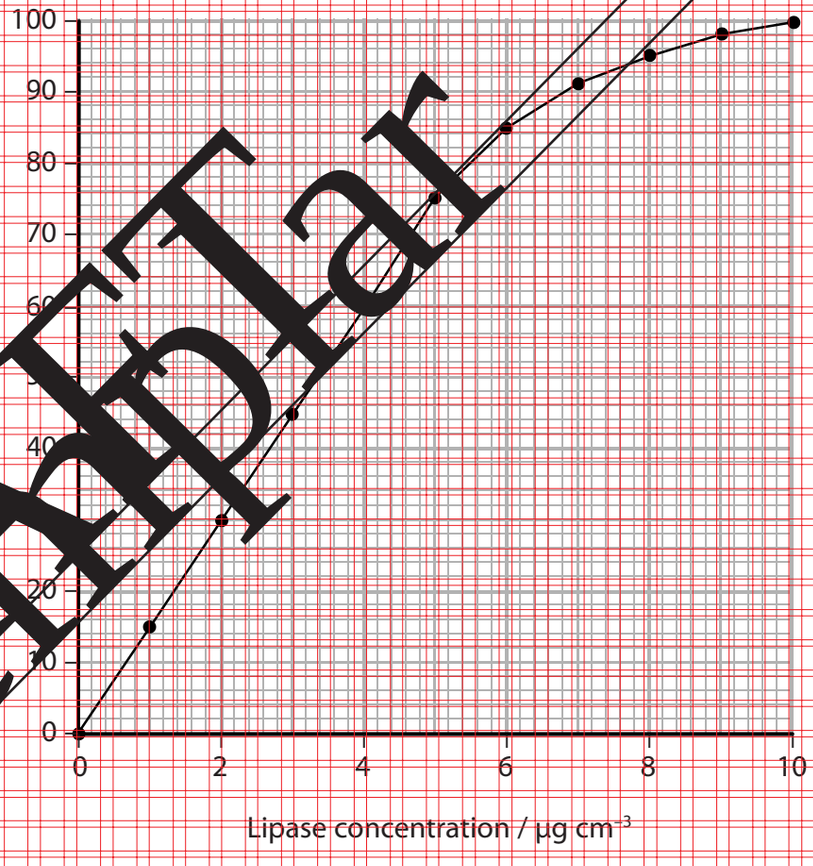
☒ **B** ester bonds to produce amino acids

☒ **C** peptide bonds to produce fatty acids

☒ **D** peptide bonds to produce amino acids

(b) An experiment was carried out to investigate the activity of lipase.

The mass of triglyceride hydrolysed per minute was determined for different concentrations of lipase.



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(i) Calculate the change in initial rate of reaction between a lipase concentration of 4 and 8 µg cm^{-3}.

(1)

Answer ..... µg min^{-1}

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(ii) Explain the effect of changing the lipase concentration on the initial rate of the enzyme activity.

(3)

(iii) Orlistat is a drug that inhibits lipase activity.

Using information from the graph, explain how the inhibitory properties of orlistat could be investigated.

(3)

Rearplan

(iv) The mass of triglyceride hydrolysed was used to measure the activity of lipase.

Identify an alternative way to measure lipase activity.

(1)

(c) Lipase is synthesised in cells.

Describe the role of RNA in the synthesis of lipase.

(5)

Exemplar

(Total for Question 8 = 14 marks)

***9** It has been suggested that statins should be given to all those aged over 50 years old.

There have been many studies of the risks and benefits associated with the use of statins.

In one study, two different groups of individuals over the age of 50 were given statins.

The results obtained are recorded in the table.

	Groups studied	
	Individuals with a major diabetic risk factor	**Individuals with no major diabetic risk factor**
Decrease in mortality associated with CVD	17%	22%
Increase in new cases of diabetes	28%	0%

Major risk factors for diabetes are:

- being overweight
- a low HDL cholesterol blood concentration
- a high blood pressure.

Analyse the information to evaluate whether statins should be prescribed for all those aged over 50.

(6)

Reject

(Total for Question 9 = 6 marks)

TOTAL FOR PAPER = 80 MARKS

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