Write your name here

Surname	Other names

Pearson Edexcel GCE
Level 3 GCE

Centre Number | Candidate Number

Biology A (Salters Nuffield)

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

Thursday 26 May 2016 – Afternoon
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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P 4 9 8 2 9 A 0 1 2 8

PEARSON

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 Tay-Sachs disease is a genetic disorder.

(a) A couple without Tay-Sachs disease are expecting their second child. Their first child died from the disease.

Use a genetic diagram to determine the probability of their second child having Tay-Sachs disease.

(2)

Answer .....

(b) Tay-Sachs disease can be detected during pregnancy.

Name the prenatal test that could be used to detect Tay-Sachs disease at 11 weeks of pregnancy.

(1)

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(c) Explain why this couple may choose not to have this test.

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(Total for Question 1 = 6 marks)

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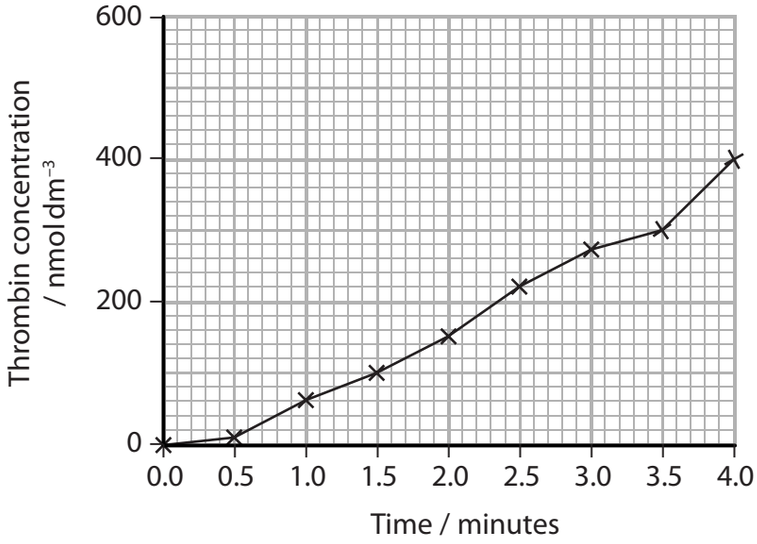
2 The photograph shows the tropical rattlesnake, *Crotalus durissus terrificus*.

This snake produces a toxin called convulxin (CVX), which activates platelets leading to blood clotting.

(a) The effect of CVX on the rate of thrombin production was investigated.

The graph shows the concentration of thrombin in a sample of blood treated with CVX.



(i) Calculate the rate of thrombin production during the last two minutes of this investigation.

(2)

Answer .....

(ii) State and justify a suitable control for this investigation.

(2)

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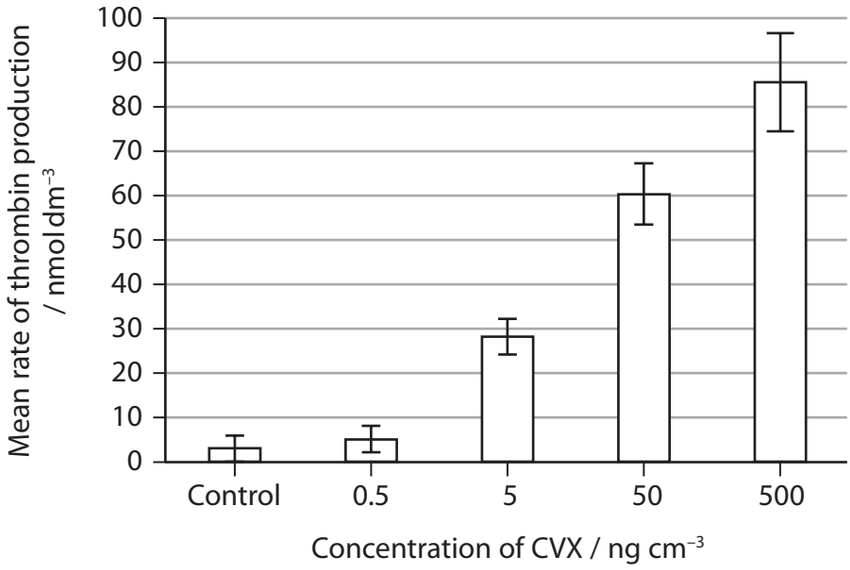
(b) The effect of four different concentrations of CVX on thrombin production was investigated.

The graph shows the results of this investigation, with bars showing the standard deviation.



Analyse the data to assess the effect of CVX on the rate of blood clotting.

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(c) Haemophilia is a disease that affects blood clotting. People with haemophilia are sometimes given a protein called factor VIII. Factor VIII is an enzyme that is involved in the process of blood clotting.

Explain how a change in the primary structure of factor VIII could cause difficulties with blood clotting.

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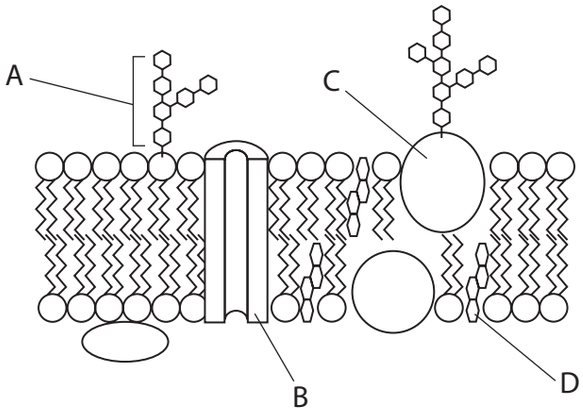
3 The diagram shows part of a cell surface membrane.



(a) (i) Which of the molecules labelled in the diagram is a glycoprotein?

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(ii) Describe the function of carrier proteins in a cell surface membrane.

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(b) Anthocyanins are purple pigments found in the cells of red cabbage leaves.

A student investigated the following hypothesis:

'The permeability of cell membranes in a red cabbage leaf is affected by the age of the plant.'

Devise an investigation the student could use to test this hypothesis and collect valid data.

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4 Cardiovascular disease (CVD) is a major cause of death in developed countries.

(a) A high body mass index (BMI) and diabetes are two risk factors for CVD.

(i) Which of the following is another risk factor for CVD?

(1)

☒ **A** high blood pressure

☒ **B** low blood cholesterol

☒ **C** low salt intake

☒ **D** using statins

(ii) A woman is 154 cm tall and has a mass of 61 kg. Her body mass index is calculated using the following formula.

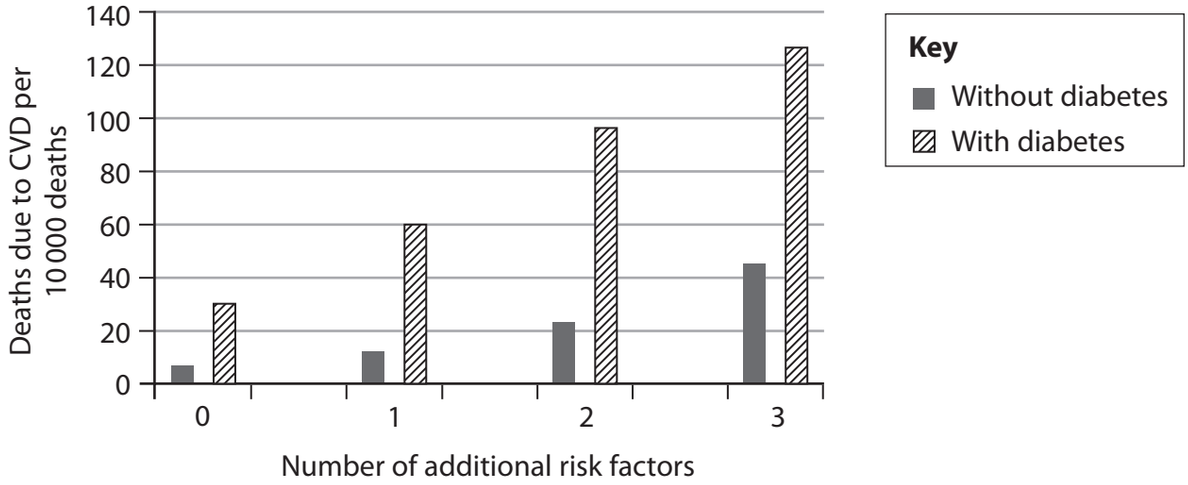
$$\text{BMI} = \frac{\text{mass in kilograms}}{(\text{height in metres})^2}$$

Calculate her BMI to one decimal place.

(2)

Answer .....

(iii) The graph shows the effect of additional risk factors on deaths due to CVD for people with and without diabetes.



Identify the effect of the number of additional risk factors on deaths due to CVD for people with and without diabetes.

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(b) It is possible to reduce the risk of CVD by taking medication or changing diet.

Explain the role of antihypertensive drugs in reducing the risk of atherosclerosis.

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5 Muscle cells contain globular and fibrous proteins.

(a) Compare and contrast the molecular structures of globular and fibrous proteins.

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(b) Describe the roles of transcription and translation in the synthesis of a globular protein by a muscle cell.

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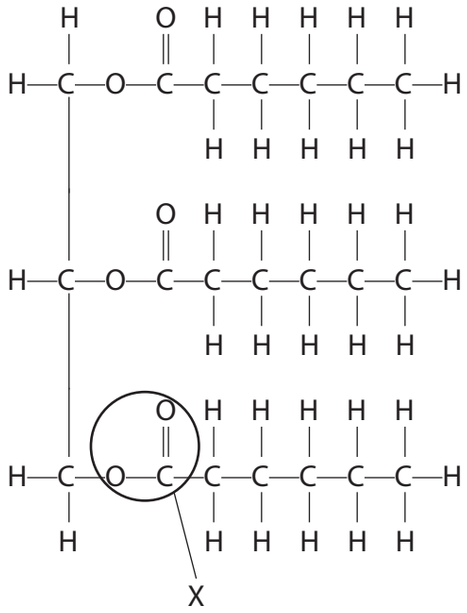
6 Hydrolytic enzymes are released by organs in the digestive system.

(a) Cells in the pancreas and small intestine synthesise lipase. Lipase hydrolyses lipids in food.

The diagram shows a triglyceride molecule.



(i) Which of the following is the name of the bond labelled X?

(1)

☒ **A** ester bond

☒ **B** glycosidic bond

☒ **C** hydrogen bond

☒ **D** phosphodiester bond

(ii) Name the process by which enzymes leave the cells of the pancreas and small intestine.

(1)

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(iii) Explain why the pH in the small intestine would change after lipase hydrolyses lipids.

(2)

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(b) The triglyceride in the diagram can combine with protein to form a lipoprotein.

Explain the effect that large quantities of this lipoprotein would have on blood cholesterol levels.

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(c) Glycogen and starch can be hydrolysed by enzymes.

Which row shows the correct features of the structure of glycogen?

(1)

☒ **A**	1,4-glycosidic bonds only	branched
☒ **B**	1,6-glycosidic bonds only	unbranched
☒ **C**	1,4-glycosidic bonds and 1,6-glycosidic bonds	branched
☒ **D**	1,4-glycosidic bonds and 1,6-glycosidic bonds	unbranched

(d) Starch contains two different molecules, amylose and amylopectin. The percentage of each molecule found in starch varies depending on its source.

The effect of amylose content on the hydrolysis of starch from different sources by enzymes was investigated.

Source of starch	**Amylose content (%)**	**Percentage of starch hydrolysed after 4 hours (%)**
Cassava	20.0	51.9
Peruvian carrot	18.7	54.2
Potato	28.9	39.6
Yellow maize	35.8	37.5

(i) Calculate the ratio of amylose to amylopectin in cassava. Give your answer in simplest form.

(1)

Answer .....

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(ii) Explain the relationship between the composition of the starch and the rate of hydrolysis by enzymes.

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7 DNA is a double-stranded molecule. During transcription, the antisense and sense strands are separated.

Part of the antisense strand, with base sequence TACGCTGAC, is transcribed.

(a) (i) State where transcription occurs in an animal cell.

(1)

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(ii) Which row shows the correct sequence for the complementary sense strand and the mRNA produced in transcription?

(1)

	Sense strand	mRNA
☒ **A**	ATGCGACTG	ATGCGACTG
☒ **B**	TACGCTGAC	AUGCGACUG
☒ **C**	TACGCTGAC	ATGCGACTG
☒ **D**	ATGCGACTG	AUGCGACUG

(b) A human gene is 27 000 base pairs long. In this section of double-stranded DNA there are 4050 nucleotides containing the base cytosine.

(i) State what is meant by the term gene.

(1)

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(ii) How many nucleotides in this gene contain the base adenine?

(1)

☒ **A** 9000

☒ **B** 18000

☒ **C** 22950

☒ **D** 45900

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(c) Mutations to DNA can affect the structure of proteins produced in the cell.

Removing one base from a DNA sequence will affect the primary structure of a protein.

Changing one base for another may not affect the primary structure of a protein.

Explain why these two types of mutation have different effects on protein structure.

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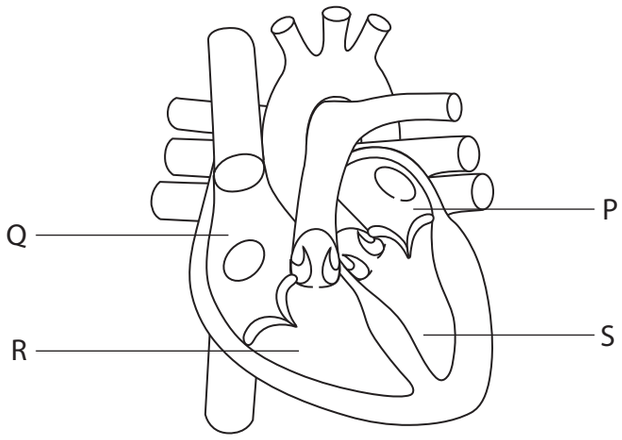
8 This diagram shows the structure of a normal human heart.



(a) (i) Which chamber of the heart generates the highest blood pressure?

(1)

☒ **A** P

☒ **B** Q

☒ **C** R

☒ **D** S

(ii) Which stage of the cardiac cycle is shown in the diagram of the heart?

(1)

☒ **A** atrial diastole

☒ **B** atrial systole

☒ **C** ventricular diastole

☒ **D** ventricular systole

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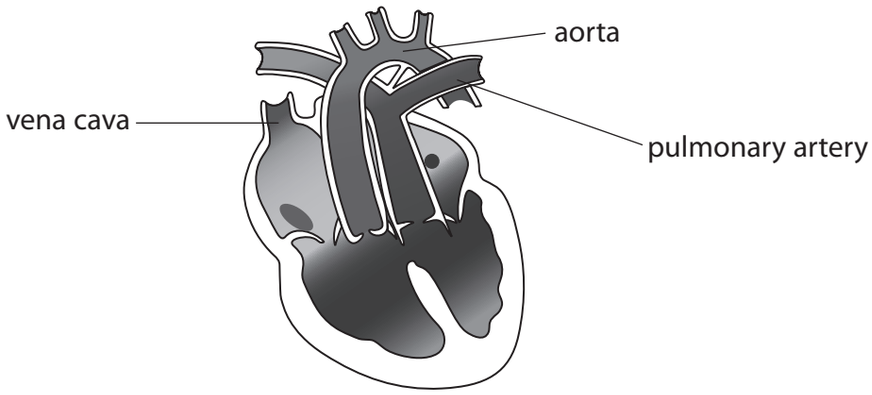
(b) A baby was born with an abnormal heart. The diagram shows the heart of this baby. There is a hole in the septum between the two ventricles.



(i) Identify the problem with the blood vessels of this heart.

(1)

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(ii) The baby survived because of the hole in the septum of the heart.

Explain how the hole in the septum allowed this baby to survive.

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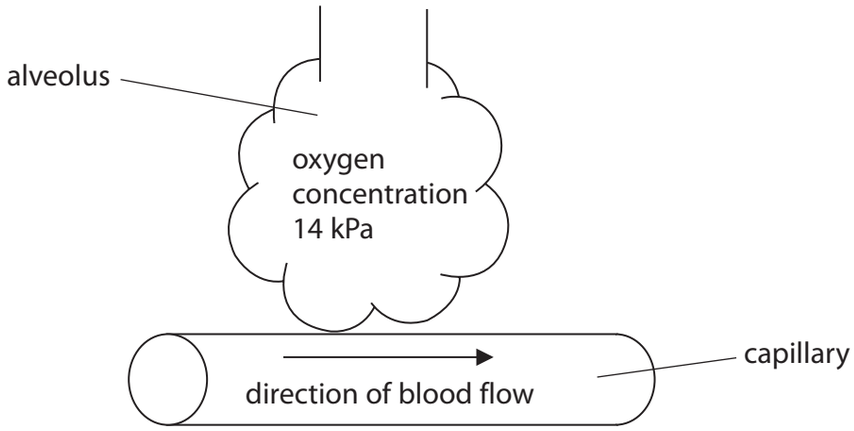
(iii) Oxygen diffuses between the alveoli of the lungs and the blood.

Fick's Law shows how three factors affect the rate of diffusion:

$$\text{Rate of diffusion} = \frac{\text{surface area} \times \text{concentration difference}}{\text{diffusion distance}}$$

The diagram and the table give information about the oxygen concentration in the alveoli and in the blood.



Heart	Oxygen concentration / kPa	
	Blood entering the lungs	**Blood leaving the lungs**
Normal	5	13
With hole in the septum between the ventricles	8	10

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*Assess the effect of this heart defect on the rate of oxygen diffusion between the alveoli and the blood.

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TOTAL FOR PAPER = 80 MARKS

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