Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
International Advanced Level

Centre Number | | | | | |

Candidate Number | | | | |

Tuesday 21 May 2019

Afternoon (Time: 1 hour 30 minutes) | Paper Reference **WBI11/01**

Biology

International Advanced Subsidiary / Advanced Level
Unit 1: Molecules, Diet, Transport and Health

You must have:
Scientific calculator, ruler, HB pencil

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.*
- Calculators may be used.
- **Show all your working in calculations and include units 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.*
- 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.

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 ▶

P61469A

1/1/1/1/1/

P 6 1 4 6 9 A 0 1 2 8

Pearson

Answer ALL questions.

Write your answers in the spaces provided.

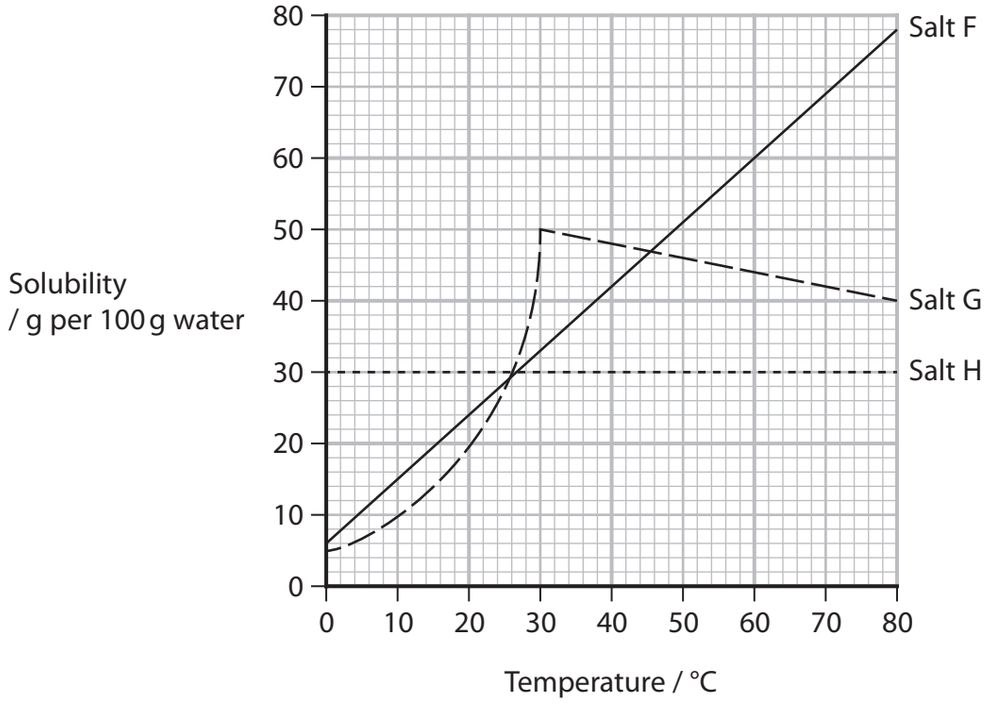
Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 Water is important as a solvent for transport in living organisms.

(a) Draw a diagram of a water molecule to show its dipole nature.

(2)

(b) The graph shows the effect of temperature on the solubility in water of three salts, F, G and H, in the human diet.



(i) Describe the effect of temperature on the solubility of these three salts.

(3)

(ii) How many times more soluble is salt G than salt H at 30 °C?

(1)

☒ **A** 15.00

☒ **B** 1.67

☒ **C** 1.50

☒ **D** 0.60

(Total for Question 1 = 6 marks)

2 The risk of developing cardiovascular disease (CVD) can be increased by a number of factors including diet and a history of thrombosis.

Thrombosis is the development of a blood clot in a blood vessel. Blood clots can develop in veins and then move through the circulatory system into the coronary artery.

(a) A diet high in saturated triglycerides raises the levels of cholesterol in the blood.

(i) What is the ratio of glycerol to fatty acid in a triglyceride molecule?

(1)

☒ **A** 1:1

☒ **B** 1:3

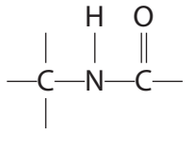
☒ **C** 3:1

☒ **D** 3:3

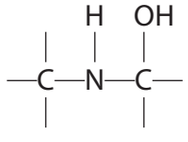
(ii) Which diagram shows the bond that joins a glycerol molecule to a fatty acid in a triglyceride?

(1)

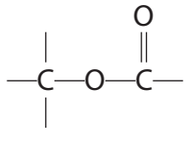
☒ **A**



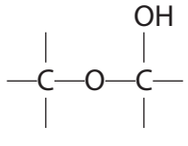
☒ **B**



☒ **C**



☒ **D**



(iii) The table gives some information about four fatty acids.

Fatty acid	Number of double bonds between carbon atoms	Number of carbon atoms
butyric	0	4
stearic	0	18
palmitoleic	1	16
linoleic	2	18

Explain which of these fatty acids would have the lowest risk of causing CVD, if included in a diet in equal masses.

(2)

.....

.....

.....

.....

.....

.....

(b) Anticoagulants, antiplatelets and thrombolytics are drugs used to treat blood clots.

(i) One anticoagulant binds to the active site of thrombin.

Explain how this drug reduces blood clotting.

(2)

(ii) Molecules on the surface of platelets enable them to bind to other molecules.

One of the antiplatelet drugs affects molecules on the surface of platelets.

Explain how this drug reduces blood clotting.

(2)

(iii) One thrombolytic drug converts plasminogen into the active enzyme, plasmin. Plasmin breaks down fibrin.

Explain how this drug reduces the formation of blood clots.

(2)

(Total for Question 2 = 10 marks)

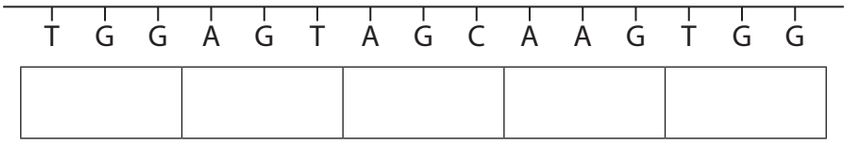
BLANK PAGE

3 The sequence of bases in DNA determines the sequence of amino acids in a polypeptide.

The table shows four amino acids and their genetic codes.

Amino acid	Genetic code
alanine (Ala)	GCT or GCC or GCA or GCG
lysine (Lys)	AAA or AAG
serine (Ser)	AGT or AGC or TCT or TCC or TCA or TCG
tryptophan (Trp)	TGG

(a) The diagram shows a DNA base sequence.



(i) Complete the diagram to show the sequence of amino acids coded by this DNA base sequence.

(1)

(ii) Explain why only five amino acids are coded by this sequence of bases.

(2)

(b) Explain why some amino acids, such as alanine, have more than one genetic code.

(3)

(c) Of the 64 possible genetic codes, 61 code for amino acids.

(i) Calculate the percentage of genetic codes that code for amino acids.

Give your answer to four significant figures.

(1)

Answer ..... %

(ii) Explain the role of the other three genetic codes.

(2)

(d) Messenger RNA (mRNA) and transfer RNA (tRNA) are involved in the synthesis of a polypeptide chain from DNA.

Which row of the table shows the codon on mRNA and the anticodon on tRNA that correspond to tryptophan?

(1)

	Codon on mRNA	Anticodon on tRNA
☒ **A**	ACC	TGG
☒ **B**	ACC	UGG
☒ **C**	UCC	AGG
☒ **D**	UCC	TGG

(Total for Question 3 = 10 marks)

4 Meselson and Stahl performed experiments that demonstrated semi-conservative replication of DNA.

(a) (i) State what is meant by the term semi-conservative replication.

(2)

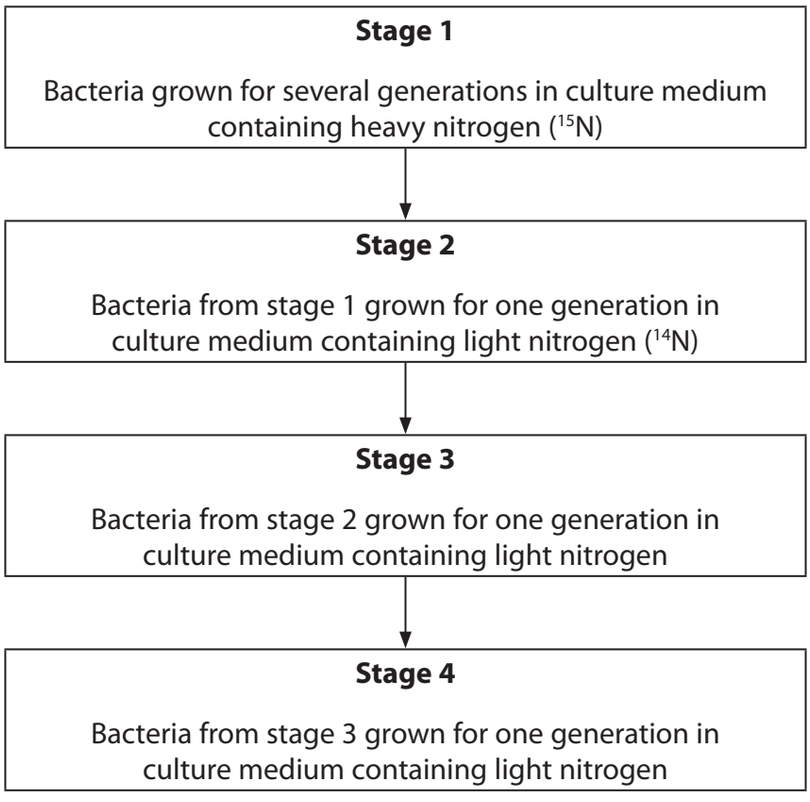
(ii) Name **one** enzyme involved in semi-conservative replication.

(1)

(iii) Explain the importance of semi-conservative replication in the production of new cells.

(2)

(b) The flow chart summarises part of one experiment performed by Meselson and Stahl.



Complete the table to show the percentage of the total number of DNA molecules containing heavy nitrogen only, light nitrogen only or both heavy and light nitrogen, at the end of each stage.

(3)

End of stage	Percentage of DNA molecules containing		
	heavy nitrogen only	light nitrogen only	both heavy and light nitrogen
1			
2			
3			

(Total for Question 4 = 8 marks)

BLANK PAGE

5 Pineapples contain the sugars fructose, glucose and sucrose.

(a) (i) Which row of the table shows which of these sugars are monosaccharides and which are disaccharides?

(1)

	Monosaccharides	Disaccharides
☒ **A**	fructose only	glucose and sucrose
☒ **B**	glucose only	fructose and sucrose
☒ **C**	fructose and glucose	sucrose only
☒ **D**	glucose and sucrose	fructose only

(ii) Which type of bond joins two monosaccharides together to form a disaccharide?

(1)

☒ **A** ester

☒ **B** glycosidic

☒ **C** peptide

☒ **D** phosphodiester

(b) The table shows the concentration of these sugars in three pineapples.

Sugar	Concentration of sugar / g cm^{-3}		
	Pineapple 1	Pineapple 2	Pineapple 3
fructose	1.71	1.44	1.41
glucose	1.22	1.02	1.00
sucrose	9.08	7.77	8.81

(i) Calculate the mean concentration of glucose in these three pineapples.

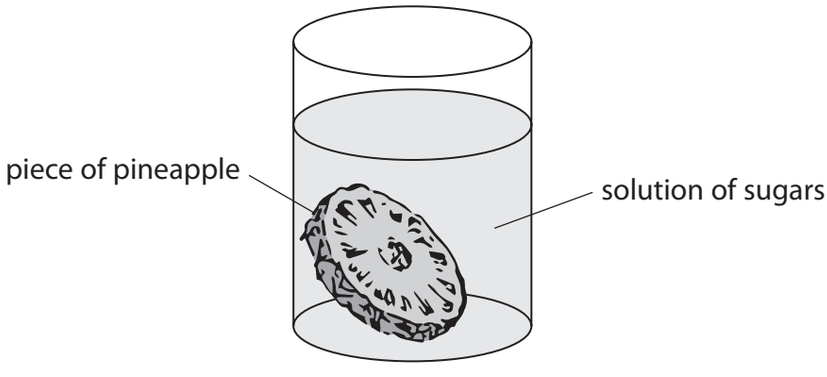
Give your answer in **g dm^{-3}**.

(2)

Answer ..... g dm^{-3}

*(ii) Pineapples can be preserved by a process called osmotic dehydration in which pieces of pineapple are submerged in a solution of sugars.

The diagram shows how this process can be carried out.



Osmotic dehydration helps to preserve the pineapple by reducing the water content.

Osmotic dehydration also ensures that the concentration of each sugar in the pineapple does not change. This preserves the sweet taste of the pineapple.

Explain what the solution of sugars should contain to preserve pineapples.
Use the information in the table to support your answer.

(6)

(Total for Question 5 = 10 marks)

BLANK PAGE

6 Dietary antioxidants may reduce the risk of cardiovascular disease (CVD).

(a) Explain how dietary antioxidants reduce the risk of CVD.

(3)

(b) Chocolate contains high concentrations of a group of antioxidants called flavonoids. It has been suggested that eating chocolate could reduce the risk of CVD.

The table shows some information about two types of chocolate.

Type of chocolate	Mass of flavonoids / mg per 100 g of chocolate	Energy content / kJ per 100 g of chocolate
milk chocolate	70	2345
dark chocolate	170	1800

(i) Explain whether eating dark chocolate is likely to reduce the risk of CVD more than eating milk chocolate. Use the information in the table to support your answer.

(4)

(ii) The table gives some information about ingredients in three different brands of milk chocolate and dark chocolate.

Ingredient	Percentage of ingredient in milk chocolate (%)			Percentage of ingredient in dark chocolate (%)		
	brand 1	brand 2	brand 3	brand 1	brand 2	brand 3
cocoa mass	16	16	16	40	40	40
sugar	40	40	40	50	50	50
milk fat	0	3	0	0	3	1
whole milk powder	20	20	20	0	0	0

Use the information in both tables to identify which ingredient contains the most flavonoids.

(1)

☒ **A** cocoa mass

☒ **B** milk fat

☒ **C** sugar

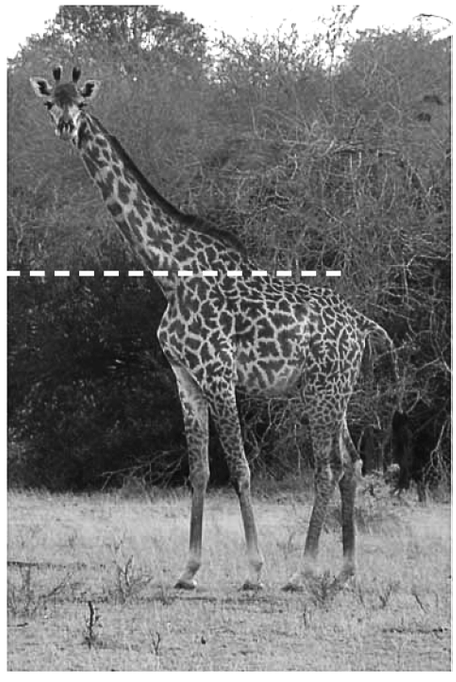
☒ **D** whole milk powder

(iii) Describe how a study could be designed to collect valid and reliable data on the effects of eating chocolate on the risk of CVD.

(3)

(Total for Question 6 = 11 marks)

7 The photograph shows an adult giraffe.



(a) Estimate the length of the neck of this giraffe from the shoulders, using the information in the photograph.

(1)

Answer ..... m

(b) The heart of an adult giraffe can be 60 cm long.

Explain why the heart of a giraffe needs to be so large.

(2)

.....

.....

.....

.....

.....

.....

(c) The arteries near the heart of a giraffe are highly elastic.

(i) Draw a labelled diagram of an artery, as seen in section.

(3)

(ii) Explain why the arteries near the heart of a giraffe are highly elastic.

(2)

(d) Damage to the legs of the giraffe could result in excessive bleeding.

To prevent excessive bleeding, the capillaries near the surface of the skin are very narrow.

(i) Explain why very narrow capillaries prevent excessive bleeding.

(2)

(ii) The red blood cells of the giraffe are about one third the size of human red blood cells, so that they can pass through the very narrow capillaries.

The small size of the red blood cells ensures that the legs of the giraffe have a good supply of oxygen.

Explain why smaller red blood cells increase the supply of oxygen to the legs.

(2)

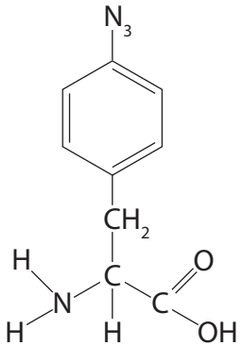
(Total for Question 7 = 12 marks)

8 Silkworms are caterpillars that produce silk. Silk is a fibrous protein that can be used in clothing and in medicine.

Silkworms have been selectively bred to produce a modified silk that could have even more medical uses.

The modified silk is made by these silkworms by inserting a synthetic amino acid, AzPhe, into the protein. This replaces the naturally-occurring amino acid phenylalanine.

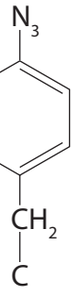
The diagram shows the structure of AzPhe.



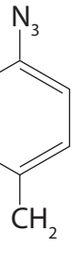
(a) Which of the following diagrams shows the R group only of AzPhe?

(1)

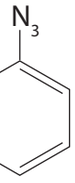
☒ **A**



☒ **B**



☒ **C**



☒ **D**

(b) Only the silkworms that have been selectively bred can use AzPhe in the synthesis of protein.

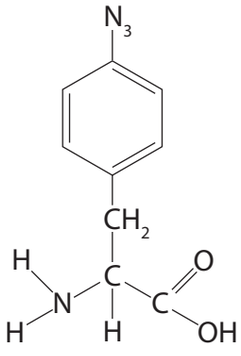
During translation, AzPhe joins to two other amino acids by condensation reactions.

(i) Name the covalent bond that joins two amino acids in a condensation reaction.

(1)

(ii) Draw two circles on the diagram of AzPhe to show which parts of the molecule are lost when AzPhe joins to two other amino acids by condensation reactions.

(2)



(iii) Transfer RNA (tRNA) is involved in translation. The amino acid AzPhe requires a special tRNA molecule during the synthesis of silk.

Suggest why AzPhe is **not** inserted into proteins in silkworms that have not been selectively bred.

(3)

(c) Part of a silk molecule contains 1100 amino acids. In natural silk, 1% of the amino acids are phenylalanine.

In modified silk, 16% of the phenylalanine molecules are replaced by AzPhe.

(i) Calculate the ratio of phenylalanine to AzPhe in this part of a modified silk molecule.

(2)

Answer .....

(ii) The R group of phenylalanine is smaller than the R group of AzPhe.

Suggest how inserting an amino acid with a larger R group could affect the properties of silk fibres.

(4)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for Question 8 = 13 marks)

TOTAL FOR PAPER = 80 MARKS

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

BLANK PAGE