Write your name here

Surname	Other names

Pearson Edexcel
International
Advanced Level

Centre Number

Candidate Number

Biology
Advanced Subsidiary
Unit 1: Lifestyle, Transport, Genes and Health

Wednesday 13 January 2016 – Morning
Time: 1 hour 30 minutes

Paper Reference
WBI01/01

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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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   Water is an important solvent in biological systems.

   (a) Put a cross ☒ in the box that completes each of the following statements.

   (i)   The drawing that represents a molecule of water is

(1)

☒ **A** $\delta^- O \overset{H^{\delta+}}{\diagup \diagdown} O^{\delta-}$

☒ **B** $\delta^+ O \overset{H^{\delta-}}{\diagup \diagdown} O^{\delta+}$

☒ **C** $\delta^- H \overset{O^{\delta+}}{\diagdown \diagup} H^{\delta-}$

☒ **D** $\delta^+ H \overset{O^{\delta-}}{\diagdown \diagup} H^{\delta+}$
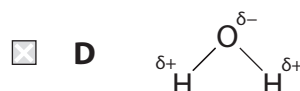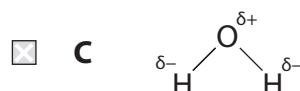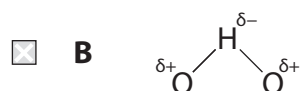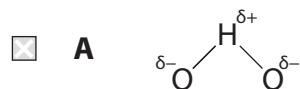
   (ii) The intermolecular force that explains many of the important properties of water is

(1)

☒ **A**   covalent bonding

☒ **B**   hydrogen bonding

☒ **C**   ionic bonding

☒ **D**   oxygen bonding

(b) The solubility of substances affects how they are transported in the blood.

(i) The diagram below shows the structure of a molecule of glucose.
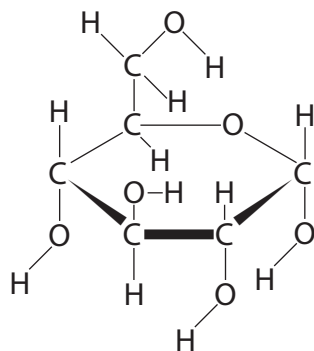
Suggest why glucose is soluble in water.

(1)

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(ii) Suggest how triglycerides are transported in the blood.

(2)

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(Total for Question 1 = 5 marks)

2 Pulmonary thrombosis is a condition in which blood clots form in the lungs.

(a) Put a cross ⊠ in the box that completes each of the following statements.

(i) The role of thrombin in blood clotting is to

(1)

☒ **A** stimulate the release of prothrombin from platelets

☒ **B** catalyse the conversion of fibrinogen to fibrin

☒ **C** stimulate the release of thromboplastin from platelets

☒ **D** catalyse the conversion of fibrin to fibrinogen

(ii) The ion required in the conversion of prothrombin to thrombin is

(1)

☒ **A** calcium

☒ **B** chloride

☒ **C** potassium

☒ **D** sodium

(iii) Blood clots form only when required because the clotting factors used are

(1)

☒ **A** pre-synthesised in an active form in the blood

☒ **B** present in an inactive form in the blood

☒ **C** synthesised in an active form when required

☒ **D** synthesised in an inactive form when required

*(b) Describe how the human lung is adapted for rapid gas exchange.

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(c) Suggest why blood clots, formed in pulmonary thrombosis, reduce gas exchange
     in the lungs.

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(Total for Question 2 = 10 marks)

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

(a) The table below shows male death rates from CVD in several developed countries.

Death rate from CVD per 100 000 males	Countries
Less than 200	Italy, Portugal and Spain
200 to 300	Finland, Germany, Sweden and United Kingdom
300 to 500	Poland
Greater than 500	Romania, Russian Federation and Ukraine

(i) Suggest why the data are presented as deaths per 100 000.

(1)

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(ii) In France, 48 000 men died from CVD in 2011. The male population of France was 31 000 000.

Calculate the death rate from CVD per 100 000 males in France.
Show your working.

(2)

............................deaths per 100 000

P 4 6 9 3 1 A 0 6 2 4

(iii) Suggest reasons for the different death rates from CVD in Italy and Romania.

(3)

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(b) Statins are prescribed to reduce the risk of CVD.

(i) Explain why statins reduce the risk of CVD.

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(ii) State **two** risks of using statins to treat CVD.

(2)

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(Total for Question 3 = 10 marks)

4 One function of the cell membrane is to control which molecules can enter or leave the cell.

The diagram below represents the structure of the cell membrane.
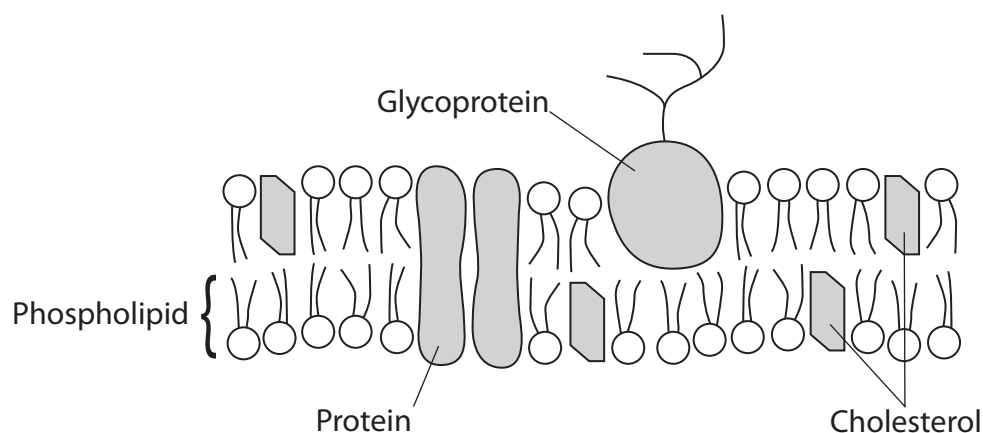
(a) Put a cross ☒ in the box that completes each of the following statements.

(i) In phospholipids, the fatty acid tails are

(1)

☒ **A** non-polar and hydrophilic

☒ **B** non-polar and hydrophobic

☒ **C** polar and hydrophilic

☒ **D** polar and hydrophobic

(ii) In phospholipids, the fatty acid tails are formed from

(1)

☒ **A** carbon and hydrogen only

☒ **B** carbon only

☒ **C** hydrogen only

☒ **D** carbon, hydrogen and oxygen

(iii) In phospholipids, each fatty acid is joined to glycerol by

(1)

☒ **A** an ester bond

☒ **B** a glycosidic bond

☒ **C** a peptide bond

☒ **D** a phosphodiester bond

(b) Cholesterol is a component of the cell membrane.

The graph below shows the effect of cholesterol to phospholipid ratio on membrane fluidity.
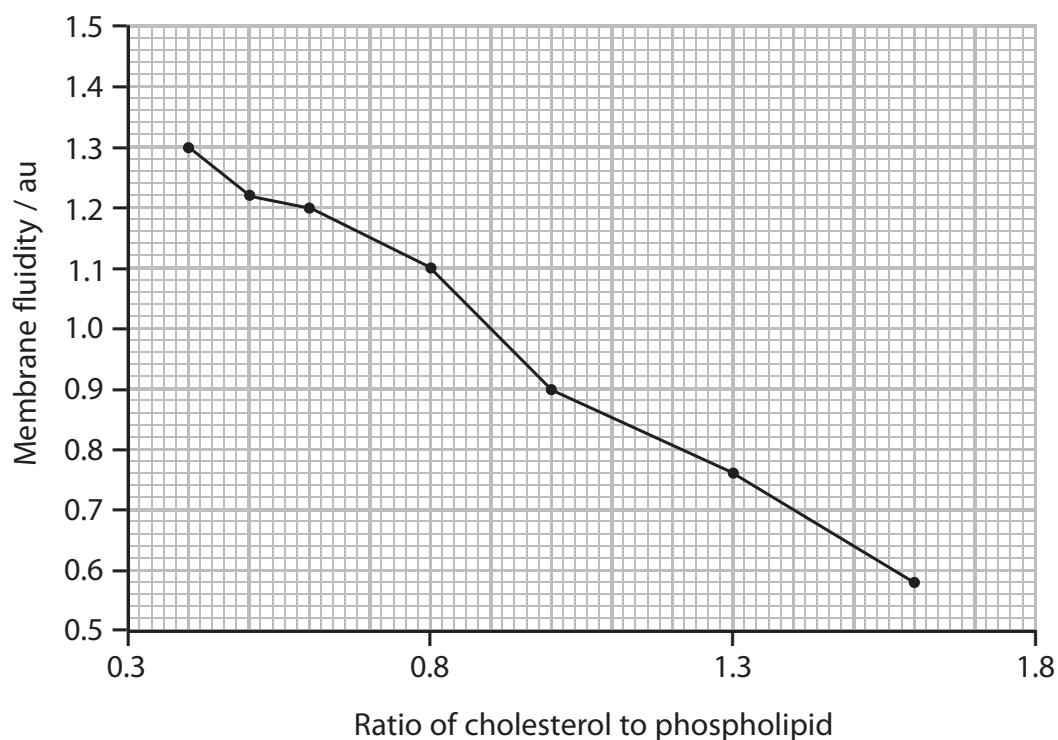
(i) Describe the relationship between the ratio of cholesterol to phospholipid and membrane fluidity.

(1)

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(ii) Calculate the percentage change in membrane fluidity when the ratio of cholesterol to phospholipid increases from 0.4 to 0.8.

Show your working.

(2)

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(iii) Suggest how cholesterol affects membrane fluidity.

(2)

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(c) The concentration of potassium ions in red blood cells is higher than the concentration in blood plasma.

Explain how this difference in potassium ion concentration is maintained.

(2)

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(d) Red blood cells swell and burst if placed in water.

Explain why this happens.

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(Total for Question 4 = 13 marks)

5 Cystic fibrosis and glycogen storage disease type (II) are examples of recessive genetic disorders.

Glycogen storage disease type (II) is caused by mutations in the GAA gene. This results in a deficiency of an enzyme called acid alpha-glucosidase.

(a) Explain the meaning of each of the following terms.

(i) Recessive allele

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(ii) Gene mutation

(2)

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*(b) Explain how a mutation in the GAA gene could result in a change in the activity of the enzyme acid alpha-glucosidase.

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(c) The enzyme acid alpha-glucosidase breaks the glycosidic bonds in glycogen.

Suggest why a deficiency in acid alpha-glucosidase results in a lack of energy for muscle contraction.

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(d) The incidence of glycogen storage disease type (II) is about 1 in 40000 of the population.

(i) Name a test that could be used to find out if an unborn child has this disease.

(1)

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(ii) Suggest why testing for glycogen storage disease type (II) is not offered to all pregnant women.

(1)

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(iii) Give **one** disadvantage of carrying out genetic tests on unborn children.

(1)

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(Total for Question 5 = 13 marks)

6 Many animals have a heart and circulatory system.

(a) Explain why animals need a heart and circulatory system.

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P 4 6 9 3 1 A 0 1 4 2 4

(b) When the human heart contracts, blood from the left ventricle enters the aorta.

Describe how the structure of the aorta is related to its function.

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(Total for Question 6 = 8 marks)

7 The photograph below shows broccoli, a green vegetable.

Green vegetables are a source of vitamin C. Cooking can reduce the vitamin C content of vegetables.

© Flagstaffotos

Magnification ×1

(a) Describe how the vitamin C content of broccoli could be measured.

(4)

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P 4 6 9 3 1 A 0 1 6 2 4

(b) The vitamin C content of uncooked broccoli is 89.2 mg per 100 g.

A student investigated the effect of different cooking methods on the vitamin C content of broccoli.

The table below shows the effect of boiling or microwave cooking, for different times, on the vitamin C content of broccoli.

Method of cooking	Time of cooking / minutes	Vitamin C content of broccoli / mg per 100 g
Boiling	2	80.3
	4	71.4
	8	62.4
Microwave	2	86.5
	4	84.7
	8	66.9

(i) Using the information in the table, compare the effect of these two cooking methods on the vitamin C content of broccoli.

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(ii) Describe **one** way in which the student could ensure that the results were valid.

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(iii) Vitamin C is not destroyed by the cooking methods used in this investigation.

Suggest why the vitamin C content of broccoli changes when broccoli is boiled.

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(Total for Question 7 = 10 marks)

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8 Diabetes is a condition that causes a person's blood glucose level to become too high.

Type 2 diabetes occurs when not enough insulin is produced or when cells do not react to insulin.

Obesity, measured using body mass index (BMI), and amount of exercise are associated with the relative risk of developing type 2 diabetes.

In one study, scientists used online questionnaires to collect information from 84 000 female nurses.

The results of this study are shown in the graph below.

Key

▨ BMI < 25.0

■ BMI 25.0 – 29.9

□ BMI ≥ 30.0
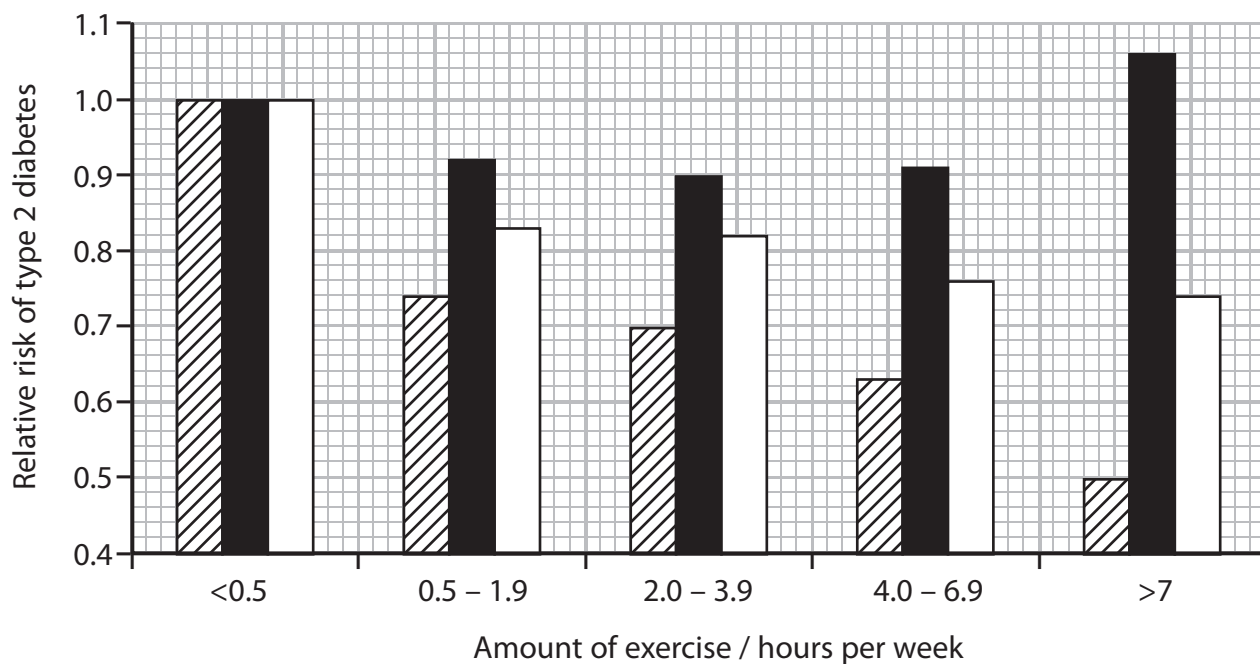
(a) Suggest what is meant by the term **relative risk**.

(2)

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(b) Using the information in the graph, describe the effect of exercise on the relative risk of developing type 2 diabetes for the three BMI groups.

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(c) Suggest the health advice that could be given to a person with a BMI greater than 30.0, to reduce the risk of type 2 diabetes.

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(d) Suggest why questionnaires were used to collect the data in this study.

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(e) Suggest **two** reasons why these results cannot be applied to all people at risk of type 2 diabetes.

(2)

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(Total for Question 8 = 11 marks)

TOTAL FOR PAPER = 80 MARKS

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