Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel Level 3 GCE

Centre Number	Candidate Number

Friday 24 May 2019

Morning (Time: 1 hour 30 minutes) | Paper Reference **8BI0/02**

Biology B

Advanced Subsidiary
Paper 2: Core Physiology and Ecology

You must have:
Calculator, HB pencil, ruler

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.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- You may use a scientific calculator.
- In question(s) 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 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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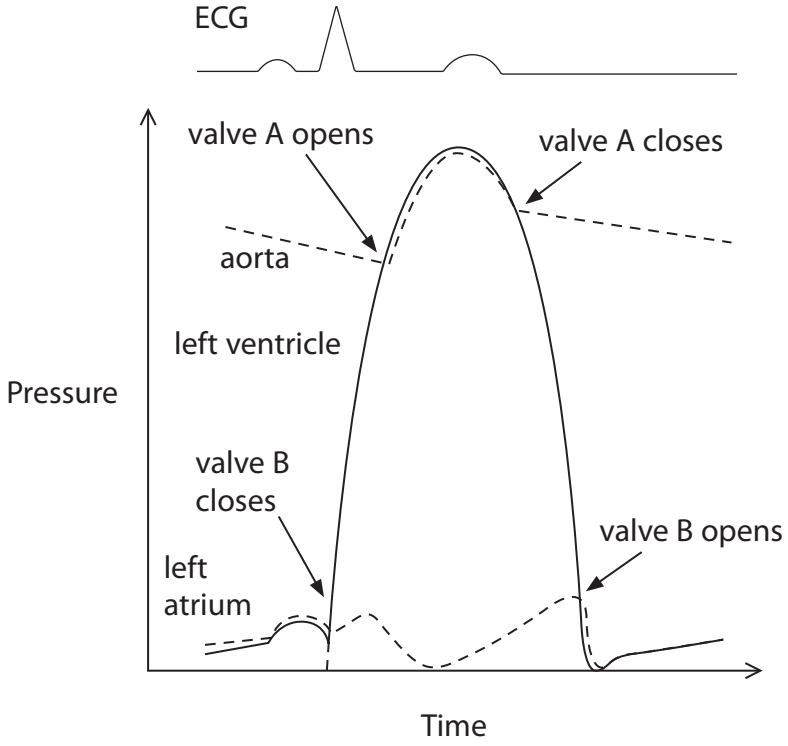
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Answer ALL questions.

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 The diagram shows an ECG trace and pressure changes in the aorta and in the left side of the heart.



(a) Valve A is the

(1)

☒ **A** atrioventricular

☒ **B** mitral

☒ **C** semi-lunar

☒ **D** bicuspid

(b) Which wave on the ECG trace occurs when the pressure in the left ventricle is highest?

(1)

☒ **A** P

☒ **B** Q

☒ **C** R

☒ **D** T

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(c) Which of these structures functions as the heart's pacemaker?

(1)

☒ **A** the atrioventricular node (AVN)

☒ **B** the bundle of His

☒ **C** the septum

☒ **D** the sinoatrial node (SAN)

(d) The heart muscle is described as myogenic.

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

(1)

(ii) An artificial pacemaker may be fitted to a patient's heart to control the cardiac cycle.

Early pacemaker models did not change the heart rate.

Newer pacemaker models can change the heart rate depending on circumstances.

Comment on the advantages of these newer pacemaker models.

(4)

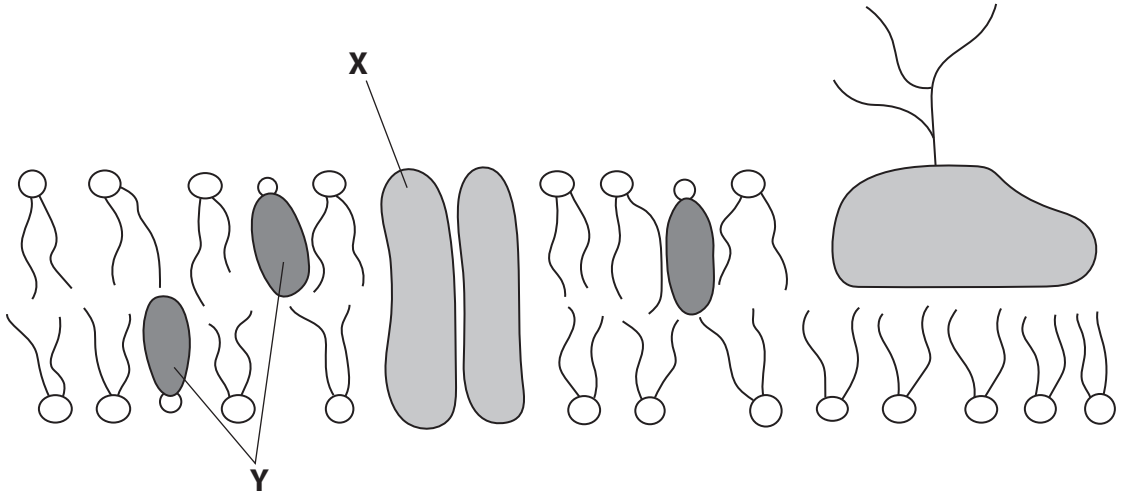
(Total for Question 1 = 8 marks)

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2 The diagram shows a model of the structure of the cell membrane.



(a) The part labelled X

(1)

☒ **A** allows facilitated diffusion to take place

☒ **B** is absent in animal cells

☒ **C** is made of phospholipid

☒ **D** prevents lipid soluble molecules from entering the cell

(b) The part labelled Y

(1)

☒ **A** allows active transport to take place

☒ **B** allows polar molecules to pass into the cell

☒ **C** makes the membrane more fluid

☒ **D** makes the membrane permeable to water-soluble molecules

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(c) Explain how the properties of molecules affect their transport through the cell membrane.

(3)

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(d) The properties of cell membranes were investigated using samples of tissue from a beetroot.

The following procedure was used:

- equal sized discs of beetroot were cut and placed in boiling tubes containing 5 cm^3 of different concentrations of ethanol solution
- these boiling tubes were placed in a water bath at 20 °C for 30 minutes
- the discs of beetroot were then removed from the solutions
- a colorimeter was then used to measure the absorbance of each solution.

The ethanol solutions contained pigment that had leaked out of the beetroot discs. The darker the red colour, the higher the absorbance.

Each concentration of ethanol solution was tested seven times.

The results of this investigation are shown in the table.

Ethanol concentration (%)	Absorbance / a.u.								
	1	2	3	4	5	6	7	Mean	Standard deviation
0	0.30	0.14	0.03	0.58	0.14	0.22	0.03	0.21	0.19
10	0.07	0.30	0.04	0.64	0.30	0.42	0.09	0.27	0.22
20	0.35	0.46	0.08	0.75	0.60	0.65	0.10	0.43	
30	0.39	0.52	0.27	0.82	0.65	0.67	0.45	0.54	0.19
40	0.28	0.60	0.70	0.88	0.72	0.82	0.63	0.66	0.20
50	0.34	0.72	0.73	0.92	0.85	0.89	0.74	0.74	0.19
60	0.25	0.86	0.73	0.93	0.86	0.90	0.78	0.76	0.23
70	0.43	0.93	0.92	0.95	0.88	0.96	0.93	0.86	0.19

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(i) Give a reason why the beetroot discs were placed in the same volume of ethanol solution.

(1)

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(ii) Explain why the boiling tubes were kept in a water bath.

(2)

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(iii) Calculate the standard deviation for absorption at the ethanol concentration of 20% using the formula

(2)

$$s = \sqrt{\frac{\sum(x - \bar{x})^2}{n - 1}}$$

Answer .....

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(iv) State why the standard deviation is a better measure of variation than the range.

(1)

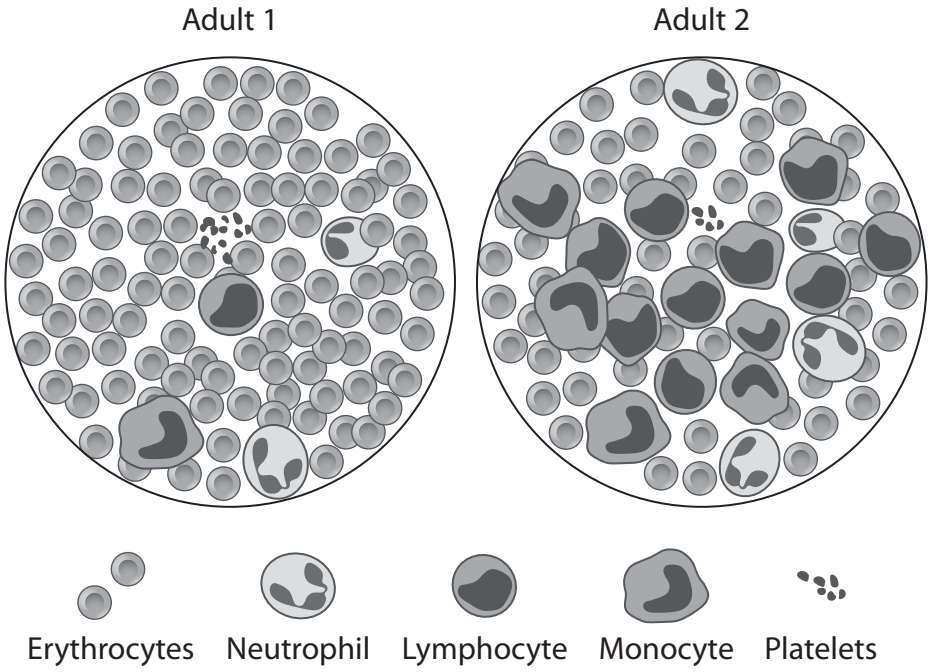
(v) Explain the effect of increasing ethanol concentration on membrane permeability.

(2)

(Total for Question 2 = 13 marks)

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3 The diagrams show blood samples from two adult patients as seen using a microscope.



(a) (i) The diameter of the monocyte in Adult 1 is 20 μm.

Calculate the magnification of the blood sample.

(2)

Answer .....

(ii) Compare and contrast the blood sample from Adult 1 with the blood sample from Adult 2.

(3)

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(iii) Explain the likely causes of the differences seen in the sample from Adult 2.

(2)

(iv) Give one assumption that is made to enable a valid comparison between these two samples.

(1)

(b) Explain why Adult 2 had symptoms of tiredness.

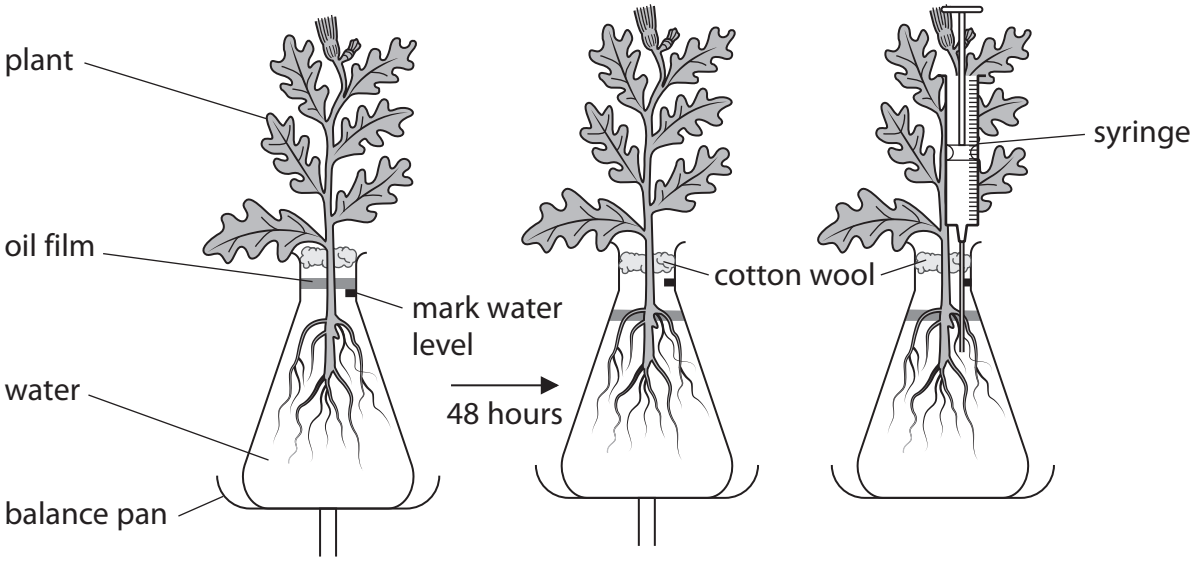
(3)

(Total for Question 3 = 11 marks)

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4 An experiment was carried out to measure the rate of uptake and loss of water in a plant, using a mass potometer.

A plant with roots was set up in a flask on a balance and the mass of the plant and apparatus was recorded as shown in the diagram.



a Record original mass of plant plus container

b Record change in mass

c Add water until the water level is restored; record volume to be added

The plant was left for 48 hours and the change in mass and volume of water that the plant had absorbed were measured.

The results showed that the plant had lost 3.1 g in 48 hours.

A volume of 3.2 cm^3 of water was added to restore the original water level in the flask.

(a) The correct conclusion from these results is

(1)

☒ **A** the plant absorbed more water than it lost

☒ **B** the plant lost more water than it absorbed

☒ **C** the rate of respiration and photosynthesis are the same

☒ **D** the rate of transpiration and absorption are the same

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(b) In which of these conditions would water uptake be slowest?

(1)

☒ **A** cold, dry and bright conditions

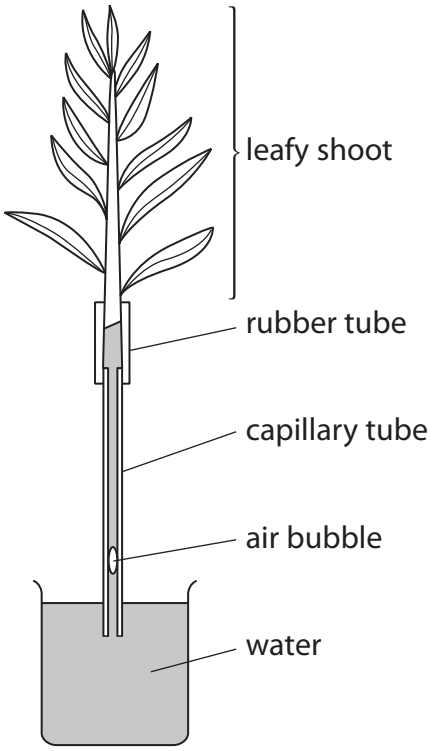
☒ **B** cold, humid and dark conditions

☒ **C** warm, dry and bright conditions

☒ **D** warm, humid and bright conditions

(c) Water uptake in plants can also be investigated using a bubble potometer.

The diagram shows a bubble potometer.



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(i) Compare and contrast the mass potometer with the bubble potometer as methods of measuring the rate of transpiration.

(4)

(ii) Describe how the bubble potometer can be used to investigate the effect of wind speed on the rate of water uptake.

(4)

(Total for Question 4 = 10 marks)

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5 Taxonomy defines and names groups of organisms.

(a) The correct hierarchy of classification categories is

(1)

☒ **A** domain, kingdom, phylum, class, order, family, genus, species

☒ **B** domain, kingdom, phylum, order, class, family, genus, species

☒ **C** kingdom, domain, order, phylum, class, genus, family, species

☒ **D** kingdom, phylum, domain, order, class, family, genus, species

(b) (i) Describe the information scientists can use to classify an organism as a new species.

(4)

(ii) Explain why it may be difficult to classify a newly discovered organism as a separate species.

(2)

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(c) The hawthorn fly is found in a part of North America.

The hawthorn fly has separated into two species.

One species is called the apple maggot fly and feeds on apples. The other species is called the hawthorn fly and feeds on hawthorn fruit.

The photographs show these two species.

Apple maggot fly



Hawthorn fly



Explain how these two species have evolved.

(3)

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(d) Changes in the number of chromosomes of lizards can occur, resulting in speciation.

Some lizards are tetraploid (4n) rather than diploid (2n).

Explain how this speciation has arisen.

(2)

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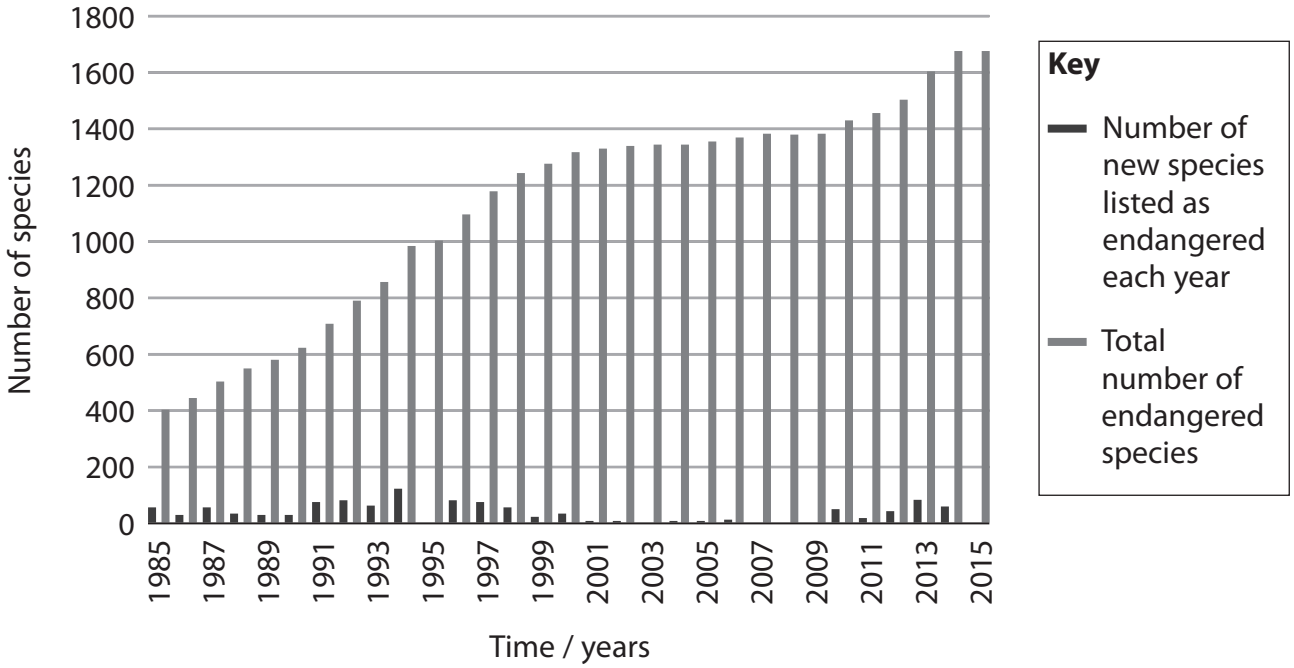
(Total for Question 5 = 12 marks)

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6 The graph shows the total number of endangered species and the number of new species listed as endangered from 1985 to 2015.



(a) (i) Calculate the rate of change in the total number of endangered species between 1985 and 2015.

(2)

Answer .....

(ii) Explain how the total number of endangered species and the total number of new species listed as endangered each year have both changed.

(4)

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*(b) A student stated that 'zoos are successful at protecting endangered species from extinction'.

Evaluate the validity of this statement.

(6)

(Total for Question 6 = 12 marks)

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7 A model can be used to show the effect of surface area on the efficiency of diffusion in the lungs.

The lungs are modelled as two spheres, each with a diameter of 180 mm.

(a) (i) Calculate the surface area in m^2 of a sphere with a diameter of 180 mm, using the formula

$$\text{Surface area} = 4\pi r^2$$

(2)

Answer ..... m^2

(ii) The volume of this sphere is 3.054 dm^3.

Calculate the surface area to volume ratio for this sphere.

(1)

Answer .....

(b) The lungs do not consist of two large spheres. They contain 6000 million small, spherical alveoli.

(i) Explain how having many alveoli increases the efficiency of the diffusion in the lungs.

(2)

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(ii) Explain how other features of alveoli enable efficient diffusion in the lungs.

(3)

(Total for Question 7 = 8 marks)

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8 The photograph shows a locust.



Locusts ventilate their tracheal systems by muscular contractions of their abdomen.

Devise an investigation to determine the effect of carbon dioxide concentration on the rate of ventilation in locusts.

(6)

(Total for Question 8 = 6 marks)

TOTAL FOR PAPER = 80 MARKS

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