Please check the examination details below	before entering your candidate information			
Candidate surname	Other names			
Pearson Edexcel International Advanced Level	e Number Candidate Number			
Monday 10 June	2019			
Morning (Time: 1 hour 30 minutes) Paper Reference WBI04/01				
Biology Advanced Unit 4: The Natural Environ	ment and Species Survival			
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.
- Answer the questions in the spaces provided
 - there may be more space than you need.

Information

- The total mark for this paper is 90.
- 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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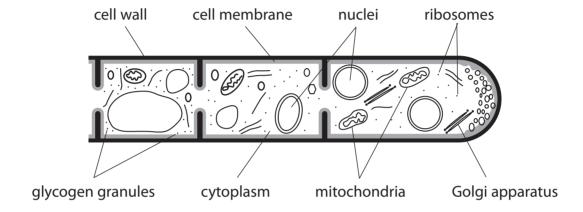
Answer ALL questions.

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

1 Bacteria and fungi are involved in the decomposition of organic matter and the recycling of carbon.

Fungi grow hyphae over the surface of organic matter.

The diagram below shows the structure of part of a hypha.



(a) Put a cross \boxtimes in the box next to the structure in the diagram that shows fungi belong to a different domain from bacteria.

(1)

- A cell membrane
- B cytoplasm
- **C** mitochondria
- **D** ribosomes



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(b) Put a cross ⊠ in the box next to the structure in the diagram that shows fungi not plants.	are (1)
☑ A cell membrane	
☑ B cell wall	
☑ C glycogen granules	
☑ D Golgi apparatus	
(c) Explain the role of the Golgi apparatus in the decomposition of organic matte	er. (3)



(d) Explain the role of these mitochondria in the recycling of carbon. (2)	DOA
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(Total for Question 1 = 7 marks)	DO NOT WRITE IN THIS AREA
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2	Sepsis is caused when bacteria get into the bloodstream.	
	As a result, an inflammatory response occurs that can destroy body organs and result in death.	
	(a) Explain how inflammation is a response of the body to infection.	
		(2)
	(b) Sepsis is treated with antibiotics. However, scientists are developing alternative treatments.	
	(i) Explain the meaning of the term antibiotic .	
		(2)
	(ii) Evalain why esigntists pood to dovelop alternative treatments for bootsviol infe	ations
	(ii) Explain why scientists need to develop alternative treatments for bacterial infe	(2)



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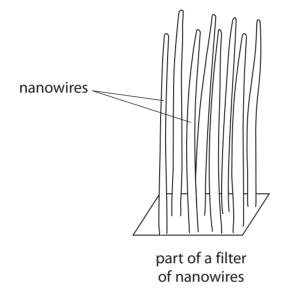
(c) One alternative treatment that is being developed uses nanowires.

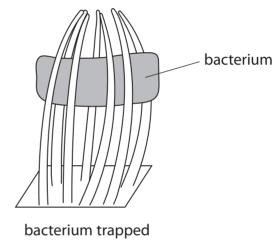
Nanowires are small lengths of wire with a very narrow diameter.

Blood is passed through a filter of nanowires.

Nanowires bend around the bacteria as they pass through the filter, trapping the bacteria.

The diagram below shows part of a filter of nanowires and a bacterium trapped by the nanowires.

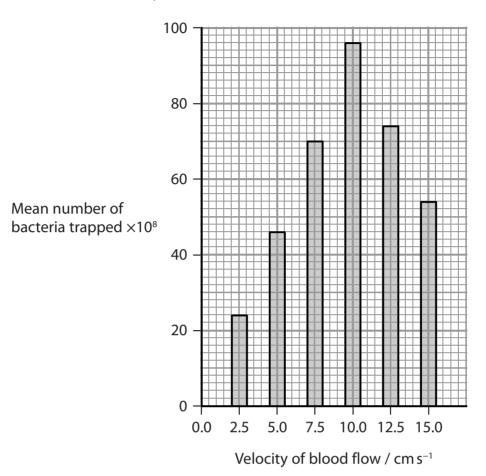




bacterium trapped by the nanowires



The graph below shows the mean number of bacteria trapped as blood is passed through the filter of nanowires, at different velocities.



e the relationship shown in the	chown in th	rolationchir	loccribo tha	(i)
e the relationshin shown in the	snown in tr	reiationsnir	lescrine the	(1)

(2)

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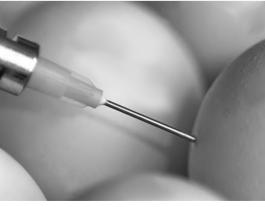
(ii) Suggest why the velocity of blood flow through the filter affects the mean number of bacteria trapped.	(2)
(Total for Question 2 = 10 n	narks)

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3 Cultures of bacteria and viruses can both be grown in a laboratory.	
(a) Describe one way in which bacteria can be grown in a laboratory.	(3)
(b) One way to culture viruses in a laboratory is to inject them into chicken e	embryos in eggs.
The photograph below shows an egg being injected with viruses.	



www.alamy.com

 $\text{Magnification} \times 2$



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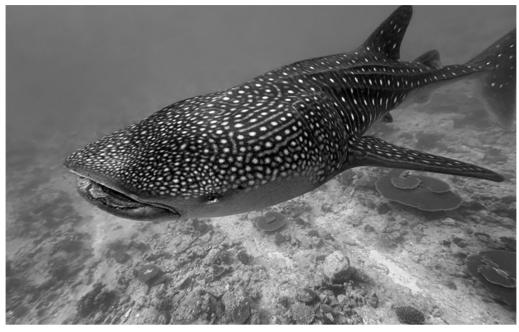
(i)	Na	me two structures found in all viruses.	(2)
(ii)	Ex	plain why viruses have to be cultured in living cells.	(2)
(iii) Pu	t a cross 🛮 in the box that names the host cell of Human Immunodeficiency	Virus (HIV). (1)
X	A	B memory cell	
\boxtimes	В	plasma cell	
×	C	T helper cell	
	D	T killer cell	

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the chicken embryo.	(2)
	(Total for Question 3 = 10 marks)



4 The photograph below shows a whale shark.



© crisod/Getty Images

(2)

Magnification $\times 0.01$

Whale sharks are an endangered species.

The number of individuals of this species and their distribution are not known.

(a)	Give two	reasons	why this	species	is difficult	to study.
-----	-----------------	---------	----------	---------	--------------	-----------

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(b) Environmental DNA (eDNA) is present in seawater at very low concentrations. This DNA is used to study whale sharks.

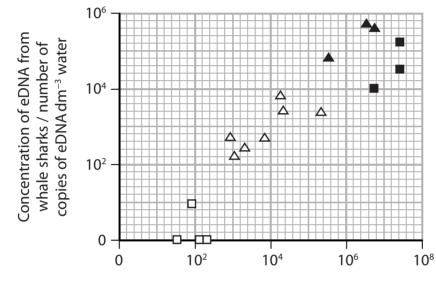
In one study in 2013, scientists determined the concentration of eDNA from whale sharks in the Arabian Gulf.

They also determined the concentration of eDNA from mackerel tuna, a species of fish, in the same area.

The scientists also recorded when they saw the whale shark.

The scientists repeated this study in 2014.

The graph below shows the results of both studies.



Concentration of eDNA from mackerel tuna / number of copies of eDNA dm⁻³ water

Key

- △ 2013 no whale sharks seen
- ▲ 2013 whale sharks seen
- □ 2014 no whale sharks seen
- 2014 whale sharks seen

(i) Suggest **one** source of eDNA from whale sharks in the water.

(1)





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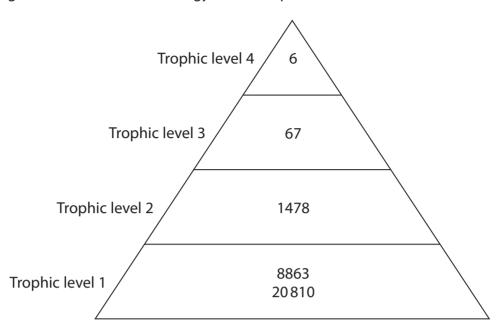
(ii) Using the information in the graph, describe conclusions that can be drawn from this study (3)
*(iii) Describe how the data shown in the graph could have been collected and analysed. (6)
(Total for Question 4 = 12 marks)



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5 (a) The diagram below shows the energy in four trophic levels in a food chain.



(i) Put a cross ⊠ in the box next to the row in the table that shows the GPP, NPP and R of trophic level 1.

(1)

		GPP	NPP	R
X	Α	8863	11947	20810
X	В	8 8 6 3	20810	11947
X	C	20810	8863	11947
×	D	20810	11947	8 8 6 3

(ii) Put a cross ⊠ in the box next to the units for GPP.

(1)

- \square **B** kJ m⁻¹ yr⁻²
- \square **C** kJ m⁻² yr⁻¹
- \square **D** kJ m⁻² yr⁻²

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	_	4.00	
X		4.02	
X		8.95	
X		8.96	
X	D	11.17	
(iv)	Pu	t a cross ⊠ in the box to complete the following statement.	
	Th	e energy content decreases from one trophic level to the next because	(1)
X		energy is made by respiration	
X		energy is lost to the environment	
_			
X	C	the organisms are larger at each trophic level	
X	D	the organisms are larger at each trophic level there are fewer organisms in each trophic level ggest why there are only four trophic levels in this food chain.	(2)
(v)	D	there are fewer organisms in each trophic level	(2)
X	D	there are fewer organisms in each trophic level	(2)
X	Su	there are fewer organisms in each trophic level	
X	Su	there are fewer organisms in each trophic level ggest why there are only four trophic levels in this food chain.	
X	Su	there are fewer organisms in each trophic level ggest why there are only four trophic levels in this food chain.	
X	Su	there are fewer organisms in each trophic level ggest why there are only four trophic levels in this food chain.	
X	Su	there are fewer organisms in each trophic level ggest why there are only four trophic levels in this food chain.	



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	Give two similarities and two differences between the structure of starch and the structure of a cellulose molecule.	(4)
		(4)
(ii)	Explain why seeds contain starch and cell walls contain cellulose.	(2)
(ii)	Explain why seeds contain starch and cell walls contain cellulose.	(3)
(ii)	Explain why seeds contain starch and cell walls contain cellulose.	(3)
(ii)	Explain why seeds contain starch and cell walls contain cellulose.	(3)
(ii)	Explain why seeds contain starch and cell walls contain cellulose.	(3)
(ii)	Explain why seeds contain starch and cell walls contain cellulose.	(3)
(ii)	Explain why seeds contain starch and cell walls contain cellulose.	(3)
(ii)	Explain why seeds contain starch and cell walls contain cellulose.	(3)
(ii)	Explain why seeds contain starch and cell walls contain cellulose.	(3)
(ii)	Explain why seeds contain starch and cell walls contain cellulose.	(3)
(ii)	Explain why seeds contain starch and cell walls contain cellulose.	(3)
(ii)	Explain why seeds contain starch and cell walls contain cellulose.	(3)



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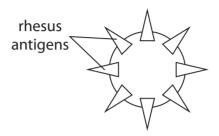
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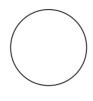
6 The membranes of red blood cells contain a number of different antigens. One of these antigens is the rhesus antigen.

People whose red blood cells have the rhesus antigen are rhesus positive (Rh positive). People whose red blood cells do not have the rhesus antigen are rhesus negative (Rh negative).

The diagram below shows a red blood cell from a Rh positive person and one from a Rh negative person.



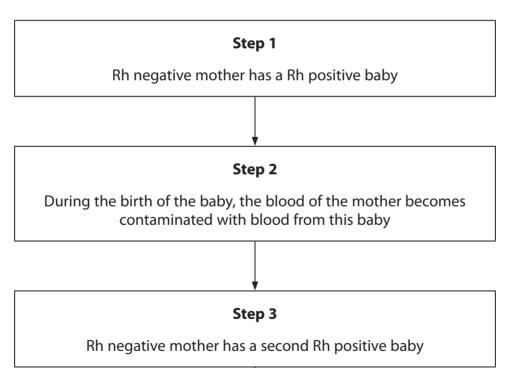
red blood cell from a Rh positive person



red blood cell from a Rh negative person

Rhesus disease is a condition where antibodies in the blood of a pregnant woman destroy the red blood cells of her developing baby.

The diagram below shows the sequence of events that lead to rhesus disease.



Step 4

The second baby may be born with rhesus disease

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(i)	Explain how a Rh negative mother can have a Rh positive baby, in Step 1 .	
ζ-/	,	(2)
(ii)	Explain the probabilities of this mother having another Rh positive baby.	(2)
o) (i)	Put a cross ⊠ in the box next to the diagram of an antibody for the rhesus ant	
×	A	(1)
\boxtimes	В	
\boxtimes	c	
×	D \rightarrow	

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*(ii) Explain why the mother will produce antibodies to the rhe	esus antigen, in Step 2 .
(c) Suggest why a baby born with rhesus disease can be treated blood with blood from a healthy person.	
	(2)
(Total for	Question 6 = 13 marks)

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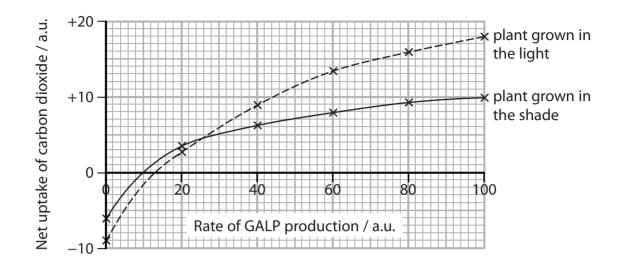
	ain how the light-dependent reactions enable hydrogen to be incorporated GALP.	
		(4)
		•••••
b) Expl	ain why an increase in temperature increases the rate of production of GALP.	
•		(3)



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(c) The graph below shows how the rate of GALP production affects the net uptake of carbon dioxide by two plants, one grown in the light and one grown in the shade.



(i) Explain why the plant grown in the light had a greater net uptake of carbon dioxide than the plant grown in the shade, when the rate of GALP production was above 26 a.u.

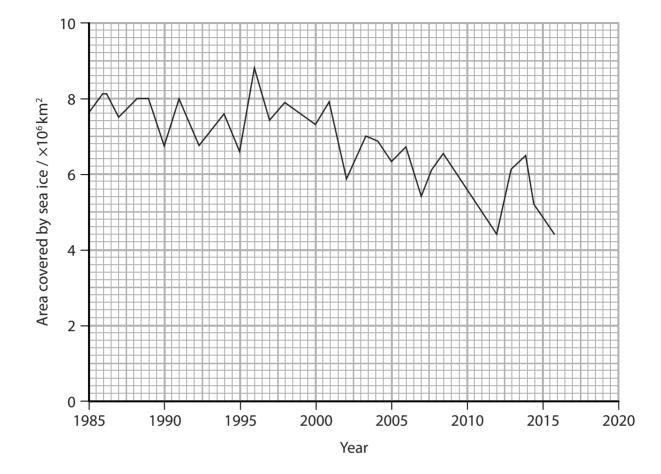
	(3)

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GALP production was very low.		(2)
	(Total for Question 7	7 = 12 marks)
	(**************************************	



- 8 Global warming is thought to be responsible for the decrease in area covered by sea ice.
 - (a) The graph below shows the changes in the area covered by sea ice in the Arctic between 1985 and 2016.



(i) Explain why global warming is thought to be responsible for this decrease.

(3)

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(ii) Describe how this graph could be used to estimate the area covered by sea in	ce in 2020. (2)
(iii) Explain why a prediction of the area covered by sea ice in 2020, using the dat	
in this graph, could be wrong.	(3)



(b) The reduction in area covered by sea ice is affecting the behaviour of polar bears. Some polar bears are staying on the ice-free areas, feeding on goose eggs, berries and, occasionally, caribou. Previously, these polar bears fed on seal blubber.

The table below gives some information about these food sources.

Food source	Mean mass / kg	Fat content / g kg ⁻¹	Energy content / J kg ⁻¹
one seal	160.000	862	32 424
one goose egg	0.144	139	5397
one berry	0.003	3	1344
one caribou	140.000	34	5334

(i) Calculate how many berries have the same mass as one seal.

(1)

Answer

(ii) Using the information in the table, explain why scientists are concerned that this change in behaviour could result in a decrease in the number of polar bears.

(4)

(Total for Question 8 = 13 marks)

TOTAL FOR PAPER = 90 MARKS

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