

Class	Register Number	Name
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# BARTLEY SECONDARY SCHOOL

## O LEVEL PRELIMINARY EXAMINATION

**SCIENCE (BIOLOGY)**

**5078/04**

**Sec 4 Express / 5 Normal (Academic)**

Paper 4

18 Sept 2019

**1 hour 15 minutes**

Candidates answer on the Question Paper.  
No Additional Materials are required.

**READ THESE INSTRUCTIONS FIRST**

Write your name, register number and class on all the work you hand in.  
You may use an HB pencil for any diagrams, graphs, tables or rough working.  
Write in dark blue or black pen.  
Do not use staples, paper clips, glue or correction fluid.

The use of an approved scientific calculator is expected, where appropriate.  
You may lose marks if you do not show your working or if you do not use appropriate units.

**Section A (45 marks)**

Answer **all** questions.  
Write your answers in the spaces provided on the question paper.

**Section B (20 marks)**

Answer any **two** questions.  
Write your answers in the spaces provided on the question paper.

At the end of the examination, fasten all your work securely together.  
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
<b>Section A</b>	
<b>Section B</b>	/
_____	
_____	
<b>Total</b>	

This document consists of **16** printed pages.

[Turn over

**Sec 4E5NA Science (Biology) Prelim Exams 2019**  
**PAPER 1 (20 marks)**

21	D
22	B
23	C
24	C

25	D
26	D
27	C
28	C

29	B
30	C
31	B
32	C

33	B
34	C
35	B
36	C

37	B
38	D
39	B
40	C

The end

2

## Section A

Answer **all** questions in the spaces provided.

- 1 Fig. 1.1 shows part of a food web in a fresh water pond.

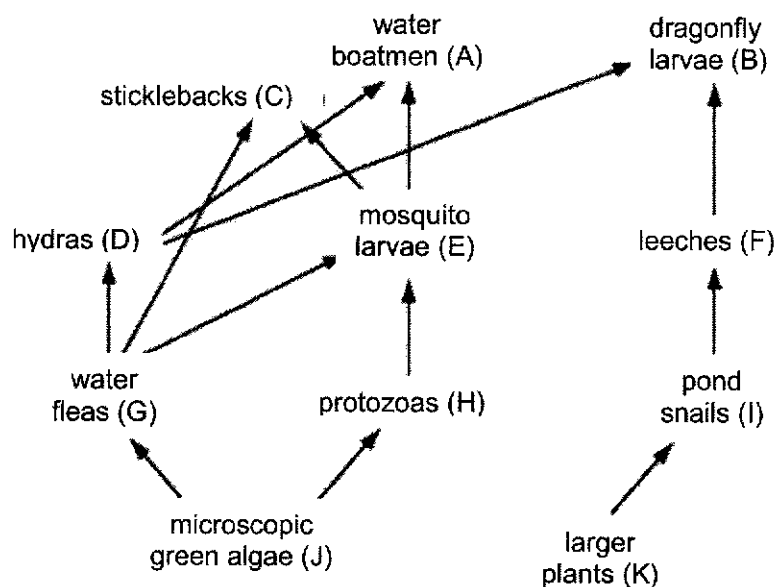


Fig. 1.1

- (a) Using leeches as an example, explain the term **consumer**.

.....

.....

..... [1]

- (b) Tadpoles are herbivores and are preyed upon by dragonfly larvae and turtles.

Add this information to the food web.

[2]



- 2 Fig. 2.1 shows the main blood vessels that carry blood to or away from the liver. The arrows show the direction of blood flow.

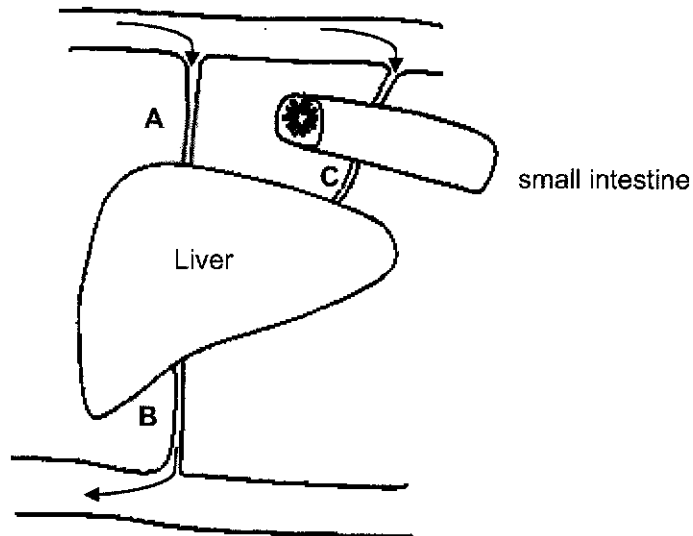


Fig. 2.1

- (a) Identify the blood vessels **A**, **B** and **C**.

**A** .....

**B** .....

**C** .....

[3]

- (b) State the function of blood vessel **C**.

.....  
..... [1]

- (c) Describe a structural difference between arteries and veins and relate it to their functions.

.....  
.....  
.....  
..... [2]

(d) State the role of the liver in protein metabolism after a protein-rich meal.

.....  
..... [1]

3 (a) To run very fast, the cheetah releases energy by both **aerobic** and **anaerobic** respiration.

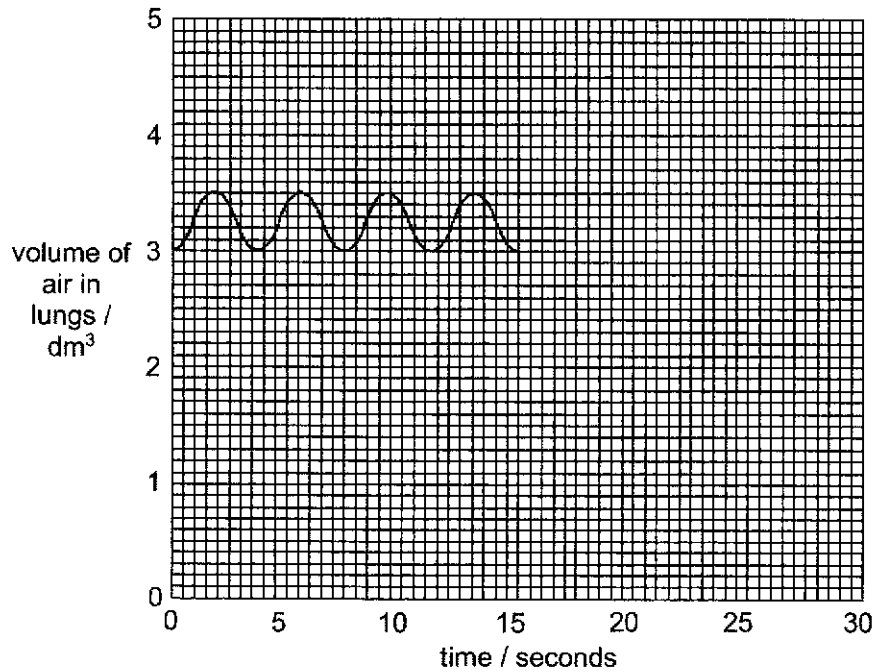
(i) Write the **word** equation for anaerobic respiration.

..... [1]

(ii) Compare aerobic and anaerobic respiration.

.....  
 .....  
 .....  
 .....  
 .....  
 ..... [3]

(b) The graph shows the volume of air flowing into and out of the lungs of a human while breathing at rest.



(i) State how many breaths are inhaled in 15 seconds.

..... [1]

(ii) State the volume of air breathed in during each breath.

..... [1]

(iii) At 15 seconds, the person began to exercise. Sketch on the graph **five** more breaths taken during this exercise.

[2]

4 (a) Define **transpiration**.

.....

.....

.....

..... [2]

(b) Fig. 4.1 shows two set-ups for an investigation. The two set-ups are kept at the same temperature and humidity.

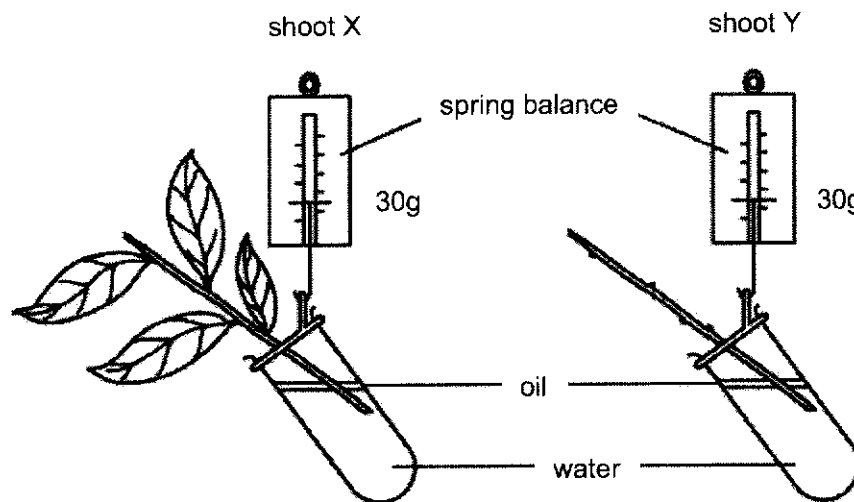


Fig. 4.1

(i) Suggest an aim for the investigation.

.....

..... [1]

(ii) A control set-up has everything kept the same, but without a shoot.

Why is this set-up a suitable control?

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.....

..... [1]



(iii) Predict and explain the results of this investigation.

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..... [3]

(iv) Explain why the two set-ups are kept at the same temperature and humidity.

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.....  
..... [1]

9

- 5 Fig. 5.1 shows the chromosomes of a human.

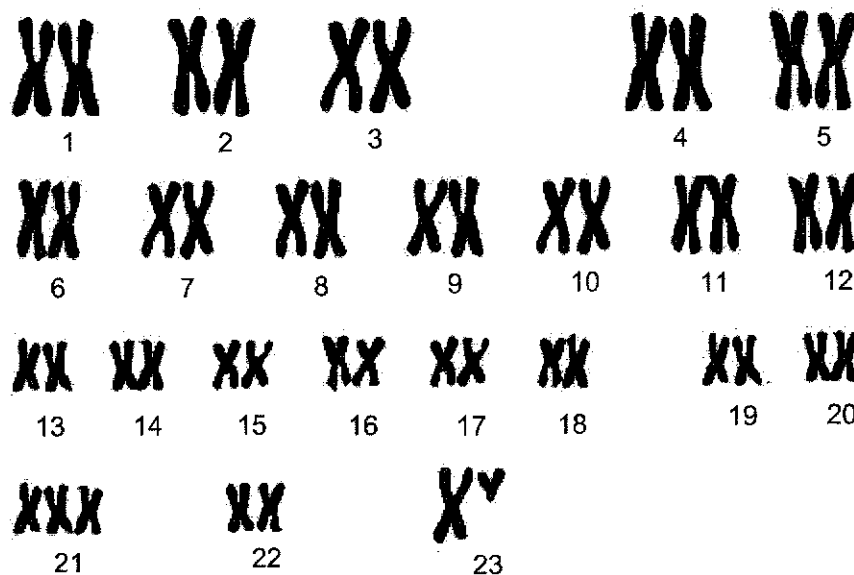


Fig. 5.1

- (a) State the gender of this person. Give a reason for your choice.

.....  
 .....  
 ..... [2]

- (b) The person suffers from a disease due to chromosomal mutation.

What is unusual about the chromosomes?

..... [1]

- (c) The rate of mutation is very low.

State **two** factors that may increase the chances of such a mutation.

.....  
 .....  
 .....  
 ..... [2]

6 Fig. 6.1 shows the DNA of a person.

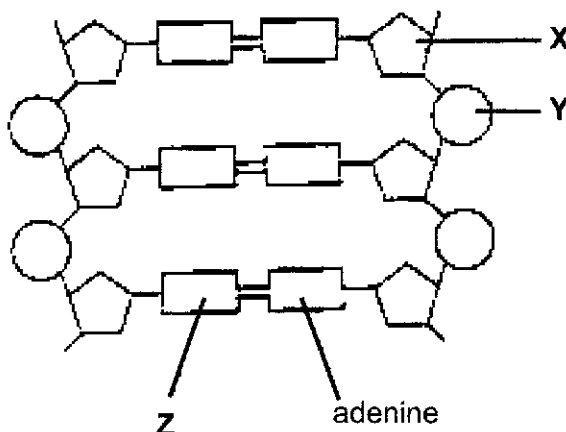


Fig. 6.1

(a) Name the parts represented by X, Y and Z.

X .....

Y .....

Z .....

[3]

(b) Describe the structure of the DNA shown in Fig. 6.1.

.....  
 .....  
 .....  
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 .....  
 ..... [3]

(c) What is the relationship between a **gene** and **DNA**?

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 .....  
 .....  
 .....  
 ..... [2]





8 (a) Describe the process of photosynthesis.

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.....  
..... [3]

(b) Explain how the leaf is fully adapted for its function.

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..... [3]











Answers  
 Sec 4E5N Science (Bio) Paper 4 Prelim 2019  
 Section A

1	a	Consumers (leeches) are organisms which feeds on another organism (pond snail).	[1]
	b	<p>At least 3 arrows correct          Tadpole and turtle added.          Allow mistakes for one arrow.</p>	[2]
	c	level 4 – A, B, C; level 2 – G, H, I;	[2]
	d	<p>(all responses in the context of fewer mosquito larvae)          1 fewer water fleas eaten;          more food for hydra so hydra population rises;          2 less food for water boatmen (as their food, mosquito larvae population decreased)          which eat more hydra so hydra population falls;          3 less food for sticklebacks (as their food mosquito larvae population decreased) so they eat more water fleas instead          less food / water fleas for hydra so hydra population falls;          4 fewer protozoa eaten by mosquito larvae so more green algae eaten by protozoan          thus less food for water fleas so hydra population falls;</p> <p>any two pairs – 2 marks each          A – less food for water boatmen so population falls;          which eat less hydra so hydra population rises;          (this is an alternative approach to 2.          Both cannot be awarded in one candidate's responses)</p>	[4]
2	a	A – hepatic artery B – hepatic vein C – hepatic portal vein	[3]
	b	Transports glucose and amino acids from the small intestine to the liver;	[1]
	c	<u>structural difference</u> (1) has thick elastic muscular wall while (2) has thin wall with fewer muscles and elastic fibres/ (1) has no valves, (2) has valves. <u>function</u>	[2]

18

		(1) has blood flowing at high pressure / very fast flow while , to withstand the high pressure and force (2) has blood flow which is slow, smooth and under low pressure, so no backflow	
	<b>d</b>	Liver deaminates excess amino acids to form urea; urea is removed in urine.	[1]

<b>3</b>	<b>ai</b>	glucose → lactic acid + small amount of energy	[1]
	<b>aii</b>	<u>Aerobic:</u> More energy released; No Lactic acid is produced; Occurs when there is sufficient oxygen; <u>Anaerobic:</u> Little energy released; Lactic acid accumulates in the muscles; Occurs when there is insufficient oxygen.	[3]
	<b>bi</b>	4 inhalations in 15 seconds	[1]
	<b>bii</b>	0.5dm <sup>3</sup> or 500cm <sup>3</sup>	[1]
	<b>biii</b>	single breaths occupy a shorter time; breaths have greater amplitude;	[2]

<b>4</b>	<b>a</b>	Transpiration is the loss of water vapour; from the aerial parts of the plant via the stomata;	[2]
	<b>bi</b>	The aim of the experiment is to find out if transpiration occurs mainly through the leaves or shoot;	[1]
	<b>bii</b>	This is to prove that any loss in mass is due to water lost from the shoot;	[1]
	<b>biii</b>	Shoot <b>X</b> will lose more mass or weight than shoot <b>Y</b> ; Water vapour is lost mainly through the stomata located on the underside of the leaves; With no leaves in shoot <b>Y</b> , little or no water vapour will be lost thus no water will be used for replacement;	[3]
	<b>biv</b>	To keep these factors affecting transpiration the same for both set-ups, so that changes in mass due to transpiration loss is only affected by the presence/absence of leaves	[1]

<b>5</b>	<b>a</b>	Male; presence of XY chromosome at the 23rd pair;	[2]
	<b>b</b>	21st pair has 3 chromosomes instead of a pair	[1]
	<b>c</b>	Exposure to radiation or UV rays or pollutions in the environment and carcinogens in food	[2]

<b>6</b>	<b>a</b>	X: deoxyribose sugar Y: phosphate Z: thymine/ Base	[3]
	<b>b</b>	It has a double helix structure; It is made up of nucleotides; Nucleotide is made up of a phosphate, a ribose sugar and a base; The base follow the rule of complementary base pairing when forming the DNA; Adenine pairs with thymine;	[3]

		Guanine pairs with cytosine;	
	<b>c</b>	A section of DNA forms the gene; Gene contains genetic materials that codes for production of one polypeptide;	[2]

## Section B

<b>7</b>	<b>a</b>	When light falls on the retina; Impulse is produced. It travels along the optic nerve to the brain; Brain send impulse to the ciliary muscle and the suspensory ligament; Ciliary muscle then contracts or relaxes its pull on the suspensory ligament , Lens becomes rounder and more convex or less convex to focus clearly.	[5]
	<b>bi</b>	<u>At Position 1</u> , the ciliary muscle is more relaxed; Suspensory ligaments are thus pulled a little taut; Lens is pulled but not too long or flat. This showed that the humming bird must be at a distance but not too far away; <u>At Position 2 and 3</u> , ciliary muscles becomes more fully relaxed; Suspensory ligament is more taut; Thus humming bird is moving further and further away; <u>At Position 4</u> , ciliary muscle suddenly becomes fully contracted; Suspensory ligament becomes more slackened; Lens thus is rounder and more convex; as the humming bird is suddenly flying towards him; <u>At Position 5</u> , position of humming bird is maintained;	[5]

<b>8</b>	<b>a</b>	Photosynthesis is the process in which <u>light energy</u> absorbed by <u>chlorophyll</u> is transformed into chemical energy; <u>glucose</u> . The chemical energy is used to synthesise <u>carbohydrates</u> from <u>water and carbon dioxide</u> ; <u>Chlorophyll in chloroplasts</u> are found in leaves <u>Water and carbon dioxide</u> are the <u>raw materials</u> for photosynthesis. <u>Oxygen is released in the process as waste product.</u>	3
	<b>b</b>	-- <u>Petiole or leaf stalk</u> – <u>holds the leaf</u> in position to absorb maximum light energy; -- <u>Thin flat lamina</u> – allows max absorption of light energy and allows <u>CO<sub>2</sub> to reach inner cells</u> rapidly and enables sunlight to reach all mesophyll cells; -- <u>Waxy cuticle</u> on upper and lower epidermis – reduces water loss through evaporation from the leaf; -- <u>Stomata present</u> – <u>once open, allow CO<sub>2</sub> to diffuse in and oxygen to diffuse out</u> ; --More <u>chloroplasts</u> containing chlorophyll in palisade mesophyll cells – more light energy is absorbed near the leaf surface; --Veins containing <u>xylem and phloem</u> bring water to the leaf and carry away products of photosynthesis respectively.	3
	<b>c</b>	--Photosynthesis is the process in which <u>light energy</u> is absorbed by chlorophyll and transformed into <u>chemical energy</u> ;	4

20

		<p>--<u>Glucose</u> is then synthesised to <u>proteins</u> for <u>growth</u> and <u>reproduction</u>.</p> <p>--Glucose is stored in storage organs such as <u>tubers</u> and <u>fruits</u> and <u>seeds as starch</u>. This is <u>food for the animals</u> which feed on them.</p> <p>--All food chains start with <u>green plants</u> which <u>convert the light energy from the sun into glucose</u>.</p> <p>--Primary consumers are fed on by secondary consumers who pass the energy along to the next <u>trophic level</u>.</p> <p>--Without photosynthesis, there will <u>no food chains</u> or <u>food webs</u>.</p> <p>--<u>Oxygen</u> is released into the atmosphere during the process. all animals (and plants) need <u>oxygen</u> for cellular respiration.</p>	
9	a	<p>-Insect-pollinated/ pollen grains carried by insect/bee attracted by coloured petals L</p> <p>-crawls into flower guided by nectar guides M</p> <p>-its body brushes against the stigma K and deposits the pollen grain on the stigma</p> <p>-The insect brushes against the anther J and the pollen grains attach to the insect's body to pollinate the next flower.</p>	[3]
	b	<p>--If the ovaries were removed, no ovulation will occur. she will become infertile.</p> <p>--Progesterone and oestrogen will not be produced and so the menstrual cycle will cease to occur.</p> <p>--The female secondary sexual characteristics will reduced.</p> <p>1-the breasts will decrease in size</p> <p>2-the female rounded figure will disappear</p> <p>3- the female will lose interest in the opposite sex</p> <p>If the girl is young, then she will not develop any secondary sexual characteristics in her at all.</p>	[4]
	c	<p><u>Similarities:</u></p> <p>-Both involved fusion of a haploid male gamete with a haploid female gamete to form a diploid zygote;</p> <p>-fertilisation takes place in the female reproductive system, in the oviduct for humans and in the ovule for plants. (can also be difference)</p> <p>or</p> <p>-Male gametes move toward the female gametes.</p> <p><u>Differences:</u></p> <p>-For plants, there is double fusion (i) male gamete and ovum and (ii) male gamete and definitive nucleus</p> <p>-BUT for humans, there is single fertilization between the sperm and ovum.</p> <p>OR --in plant there are 2 male nuclei which fuse with 2 nuclei in the ovule but in human only 1 male nucleus fuse with one female nucleus.</p> <p>--The male nucleus in plant is carried by pollen tube to the ovum but in human, the sperm swims towards the ovum.</p>	[3]

The end

BSS/2019/Preliminary Examination/Sec 4E/5N Science (Biology) P4