XINMIN SECONDARY SCHOOL
新民中学
SEKOLAH MENENGAH XINMIN

Preliminary Examination 2017

CANDIDATE NAME

CLASS | | | | INDEX NUMBER | |

BIOLOGY

5158/01

Paper 1 Multiple Choice

24 August 2017

Secondary 4E

1 hour

Setter: Mr Gary Neo
Vetter: Mr Michael Rodrigues

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, class and index number on the Question Paper and Answer Sheet in the spaces provided.

There are **forty** questions in this paper. Answer **all** questions. For each question, there are four possible answers, **A**, **B**, **C**, **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

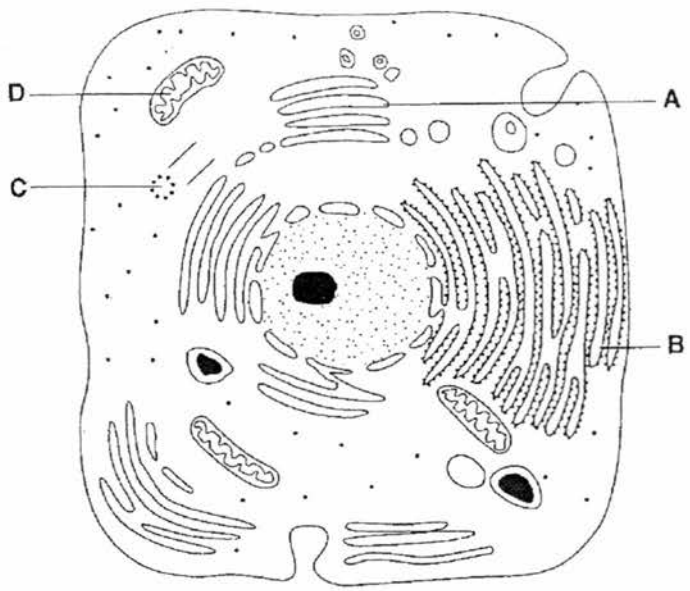
Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
The use of an approved scientific calculator is expected, where appropriate.

40

1 The diagram shows the structure of a cell.

In which cell component are proteins synthesised?



2 Which organelles would be more prominent in a secretory cell than in a non-secretory cell?

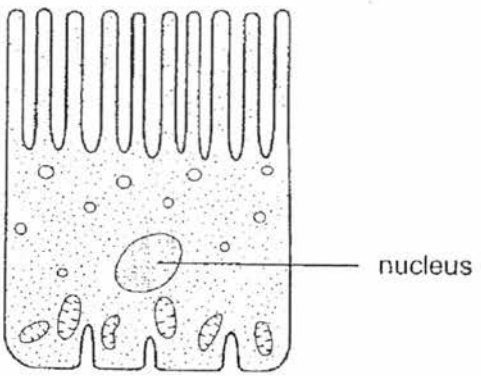
A Golgi bodies

B ribosomes

C mitochondria

D vacuoles

3 The diagram shows a cell found in an organ in the human body.



From its structure, what are the functions of this cell?

A intracellular digestion and storage of granules of product

B intake of substances and secretion

C secretion and transport of protective mucus

D uptake and transport of ions and molecules

4 Plant tissue was moved from solution **X** to solution **Y** and the cells became less turgid.

Compared with solution **X**, what was the relative water potential of solution **Y** and what caused the change in the cells?

	water potential of solution **Y**	cause of change in cells
A	higher	water diffused in
B	higher	water diffused out
C	lower	water diffused in
D	lower	water diffused out

5 Below is a series of cell processes.

1 mineral ions entering root hair cells
2 glucose uptake by villus cells
3 water entering root hair cells

Which of these involve active transport?

A 1 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 1, 2 and 3

6 A student was asked to identify the two food substances in each of three test-tubes.

The table shows the results of the student's tests.

	reagent added to test-tube		
test-tube	biuret solution	Benedict's solution	iodine in potassium iodide solution
X	purple	brick-red	brown
Y	blue	blue	blue-black
Z	purple	blue	blue-black

Which conclusion is consistent with the results?

A Egg white and sucrose had been placed in tube **X**.

B Maltose and starch had been placed in tube **Z**.

C Maltose and sucrose had been placed in tube **X**.

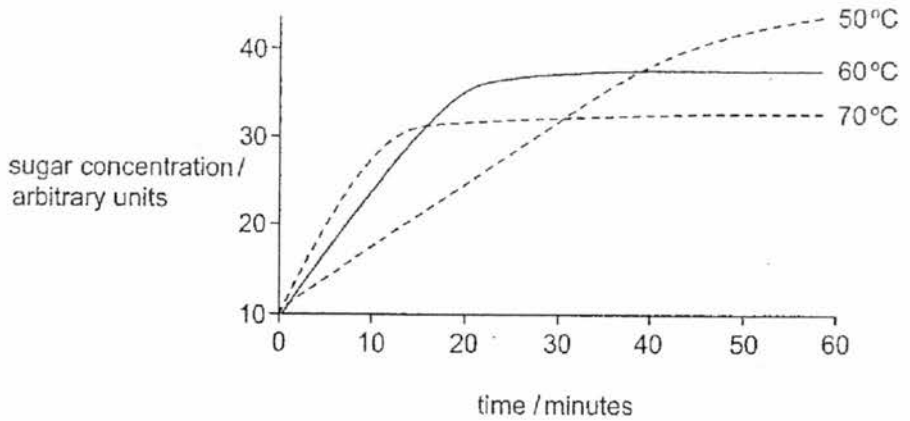
D Starch and sucrose had been placed in tube **Y**.

7 A 2% solution of starch and a 2% solution of amylase were mixed together and incubated at 25°C. After one hour, samples of the solution were tested with three reagents.

Which results would be expected?

	reagent added to samples		
	biuret solution	Benedict's solution and heated	iodine in potassium iodide solution
A	blue	brick red	brown
B	blue	blue	blue-black
C	purple	blue	blue-black
D	purple	brick red	brown

8 In beer-making, enzymes present in malting barley hydrolyse starch into sugar, ready for fermentation. The graph shows the production of sugar at three different temperatures over a period of 60 minutes. All other conditions were controlled.



What does the graph show?

A At 60°C, all the starch is hydrolysed within 30 minutes.

B At 70°C, the enzymes are denatured before hydrolysis is complete.

C Sugar is absent from the barley before malting.

D The optimum temperature for the enzymes is 50°C.

9 Which of the following best explains why physical digestion is important in the human digestive system?

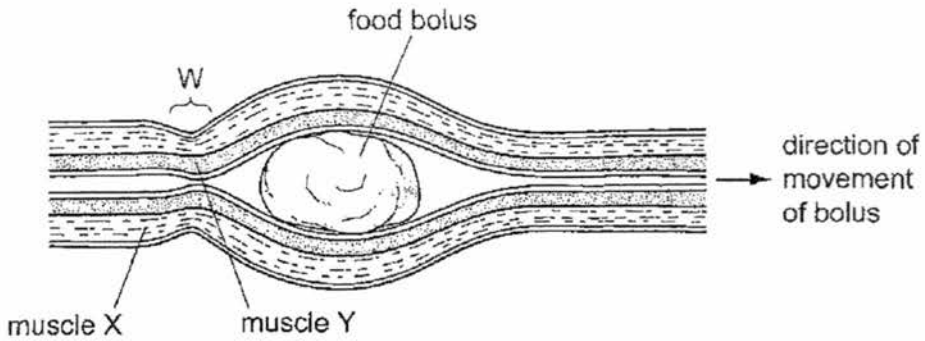
A production of simple substances

B increase the total surface area of food

C facilitating diffusion of food substances

D prolonging the time of food digestion

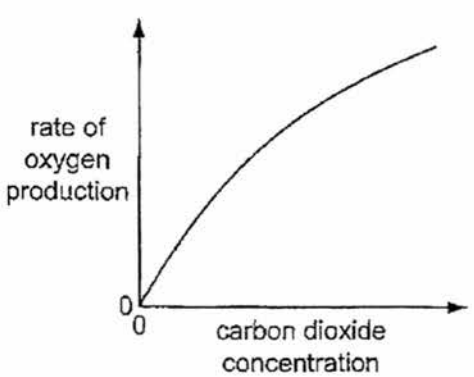
10 The diagram shows a food bolus moving down the oesophagus.



Which row identifies the muscles and their actions at region **W**?

	muscle **X**		muscle **Y**	
	muscle type	muscle action	muscle type	muscle action
A	circular	contracting	longitudinal	relaxing
B	circular	relaxing	longitudinal	contracting
C	longitudinal	contracting	circular	relaxing
D	longitudinal	relaxing	circular	contracting

11 Some students investigated gaseous exchange in a green plant. The rate of oxygen production was plotted against carbon dioxide concentration.



What explains these results?

A Carbon dioxide controls the rate of respiration.

B Carbon dioxide controls the rate of photosynthesis.

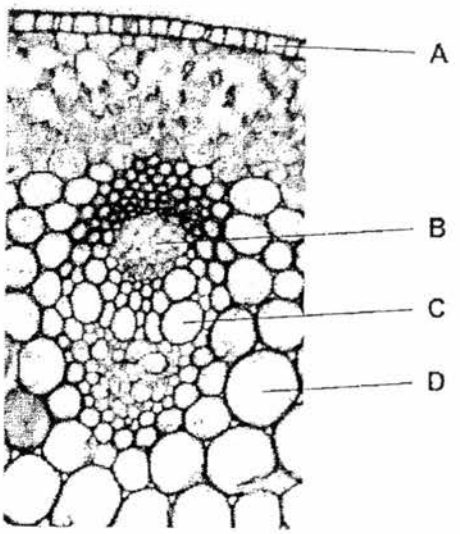
C Oxygen controls the rate of photosynthesis.

D Oxygen controls the rate of respiration.

12 Radioactively labelled carbon dioxide was supplied to the leaves of an actively photosynthesising *Ranunculus* plant.

The photomicrograph shows a section through the stem of the plant.

In which tissue would radioactivity be detected first?



13 Which of these correctly describes the structure and function of xylem vessels?

A cells that have lost their end walls and are used to transport metabolic products from a low water potential to a high water potential

B cells with nuclei, mitochondria and other organelles that supply energy and proteins to transport tissues within herbaceous dicotyledonous stems

C cytoplasm-containing cells connected to one another through sieve plates and through which sucrose moves around the plant

D dead hollow tubes up which water moves as a results of low water potential caused by transpiration

14 What contributes to the wilting of plant leaves?

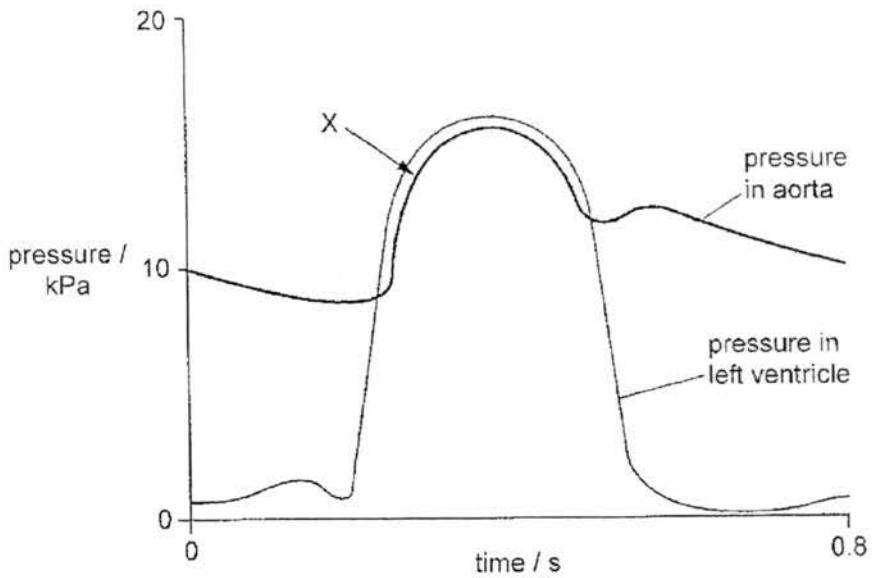
A the mesophyll cells lose turgor

B the phloem stops translocating

C the stomata close

D the xylem fills with air

15 The diagram shows changes in pressure in the aorta and the left ventricle during one complete heart beat.



What causes the increase in pressure at point **X**?

A contraction of the left atrium

B contraction of the left ventricle

C relaxation of the left atrium

D relaxation of the left ventricle

16 Which process in the cytoplasm of red blood cells is catalysed by an enzyme?

A dissociation of carbonic acid, releasing hydrogencarbonate ions

B dissociation of oxyhaemoglobin, releasing oxygen

C reaction between carbon dioxide and haemoglobin, forming carbaminohaemoglobin

D reaction between water and carbon dioxide, forming carbonic acid

17 What happens to the diaphragm when breathing in?

	muscle action	shape becomes
A	contraction	domed
B	relaxation	domed
C	contraction	flattened
D	relaxation	flattened

18 Which statement about anaerobic respiration is correct?

A Animals are unable to use lactic acid for the production of energy.

B Yeast produces carbon dioxide when they respire anaerobically.

C Muscle cells produce carbon dioxide when they respire anaerobically.

D Yeast is able to respire ethanol for the production of energy.

19 What prevents large molecules passing from the glomerular capillaries into Bowman's capsule?

A the basement membrane of the epithelial cells of Bowman's capsule

B the cell surface membrane of the endothelial cells of the capillaries

C the cell surface membrane of the epithelial cells of Bowman's capsule

D the spaces between the cells in the Bowman's capsule

20 The desert rat produces urine that is more concentrated than that of a brown rat.

Which feature of the kidney of a desert rat is responsible for this difference?

A a thick cortex

B long loops of Henle

C many glomeruli

D short collecting ducts

21 Which of these correct statements describes control by negative feedback?

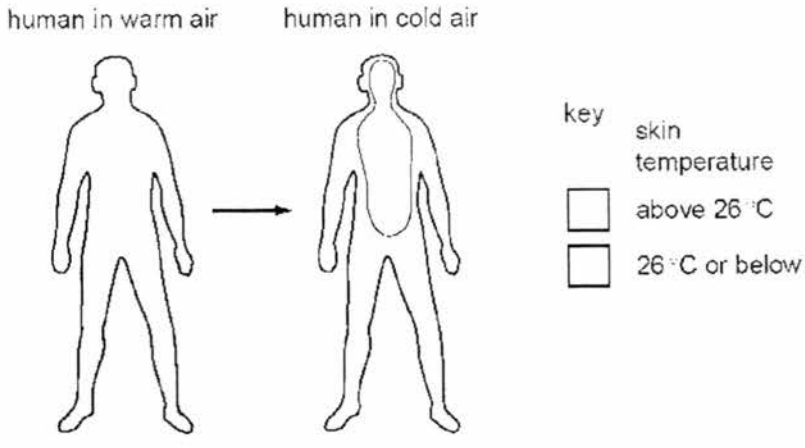
A An injury to body tissue activates platelets in the blood and these activated platelets release chemicals which activate more platelets.

B During the menstrual cycle, luteinising hormone stimulates the release of oestrogen which in turn stimulates the release of more luteinising hormone.

C The onset of contractions during childbirth causes the release of hormone which stimulates further contractions.

D When blood pressure is high, nerve impulses from the brain cause the blood vessels to dilate and blood pressure is reduced.

22 The diagram shows skin temperature of a human when exposed to warm air and then exposed to cold air.



What causes the observed change in skin temperature on exposure to cold air?

A less blood flowing just below the skin

B less blood going to the heart and lungs

C more blood flowing just below the skin

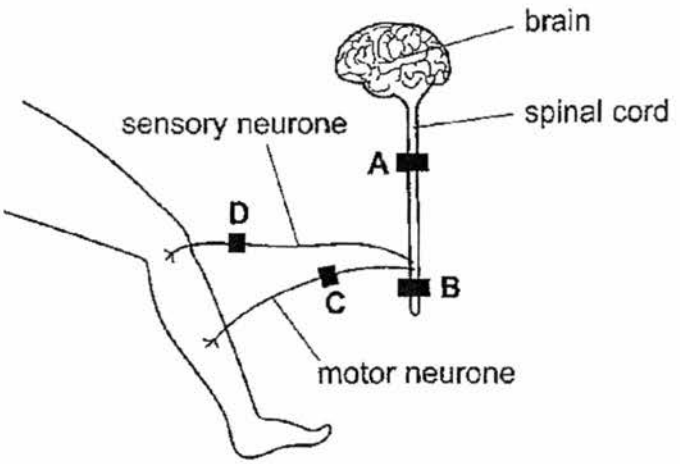
D more blood going to the heart and lungs

23 This diagram of the nervous system shows four places, **A, B, C** and **D**, where a local anaesthetic block can be applied. The block prevents nerve impulses travelling along neurones.

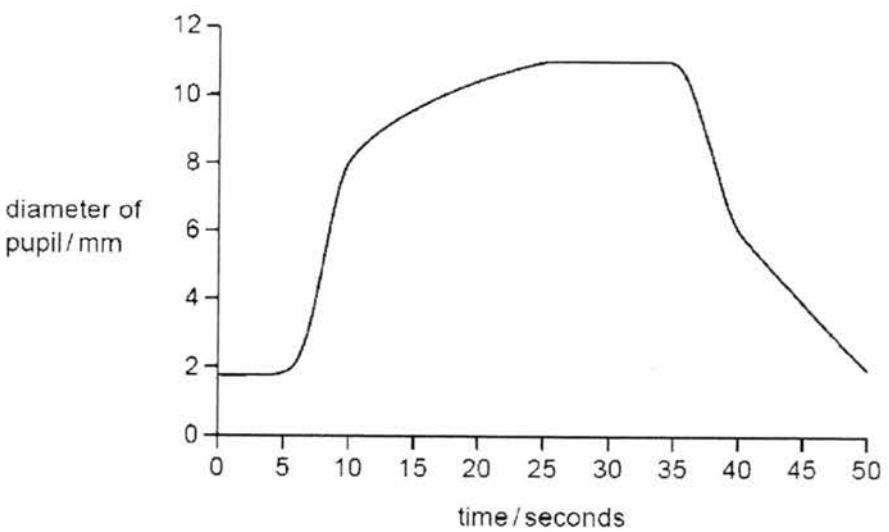
A man had an anaesthetic block applied at one of the sites shown, **A, B, C** or **D**.

He cannot feel a pinprick on his leg but can move his leg when he wants to.

Where is his anaesthetic block, **A, B, C** or **D**?



24 The graph shows the changes in the size of the pupil of the eye as the light intensity of the surroundings is changed.



Between which times is the light intensity increasing?

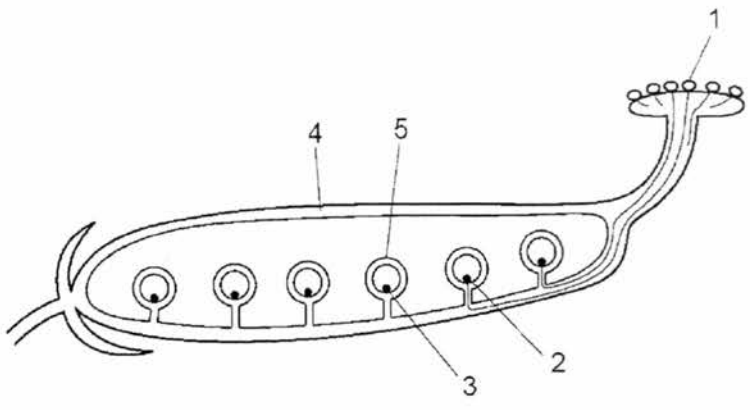
A 5 to 10 seconds

B 10 to 25 seconds

C 25 to 35 seconds

D 35 to 40 seconds

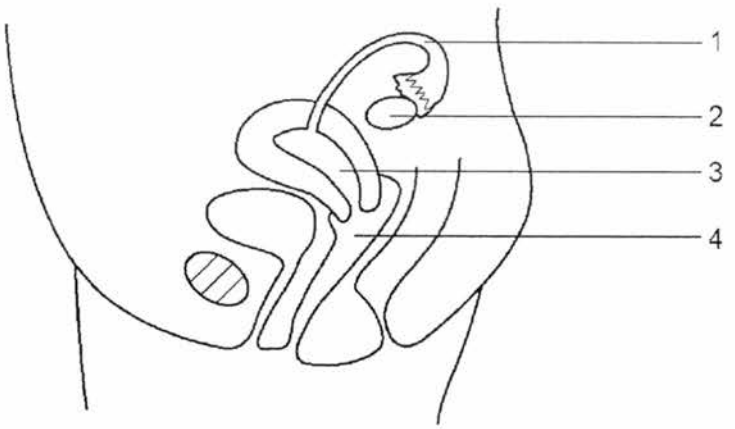
25 The diagram shows part of a flower after it has been pollinated.



Which labelled structures are diploid and which are haploid?

	diploid	haploid
A	1	4
B	2	1
C	3	2
D	4	5

26 The diagram shows a side view of the female reproductive system.

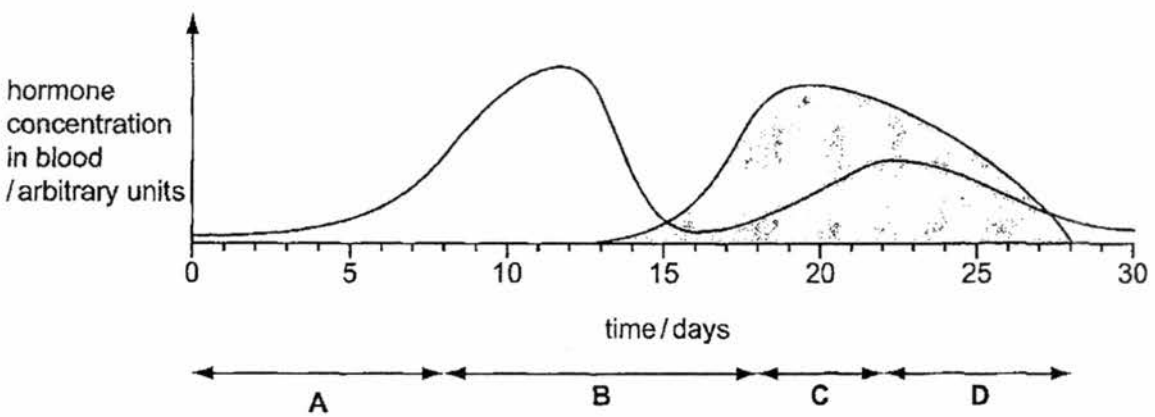


In which region are sperms released during sexual intercourse and where does fertilisation usually take place?

	sperms released	fertilisation
A	3	1
B	3	2
C	4	1
D	4	2

27 The graph shows the concentrations of two reproductive hormones in the blood of an adult female.

During which period is she most likely to become pregnant if she has sexual intercourse?



28 Where does the placenta allow the exchange of materials to take place between mother and foetus?

A oviduct wall
B umbilical cord
C uterus wall
D vagina wall

29 Between which two phases in meiosis do identical centromeres start to separate?

A metaphase I and anaphase I
B metaphase II and anaphase II
C prophase I and metaphase I
D prophase II and metaphase II

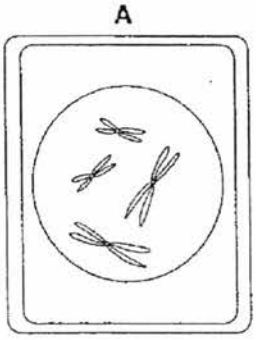
30 The second division of meiosis differs from mitosis because in meiosis

A chiasmata form between the chromatids.
B each chromosome replicates at metaphase.
C individual chromosomes line up at random on the equator.
D the separating chromatids differ genetically.

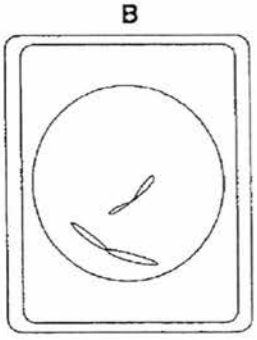
31 A diploid cell contains four chromosomes.

Which diagram shows the nucleus of prophase II of meiosis?

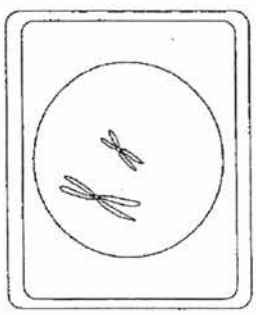
A



B



C



D

32 A chromatid consists of DNA coiled around protein molecules.

What is the form of DNA in a chromatid?

A one molecule of single-stranded DNA
B two molecules of single-stranded DNA
C one molecule of double-stranded DNA
D two molecules of double-stranded DNA

33 The table shows percentage concentrations of three bases in DNA from four different sources.

Which source is a species of mammal with a concentration of adenine of 31.0%?

source	cytosine	guanine	thymine
A	19.1	30.9	19.0
B	19.5	19.7	29.8
C	22.8	22.8	23.4
D	30.9	19.1	19.0

34 The sequence of bases on a messenger RNA molecule is shown.

A U C G A A G U U C G U

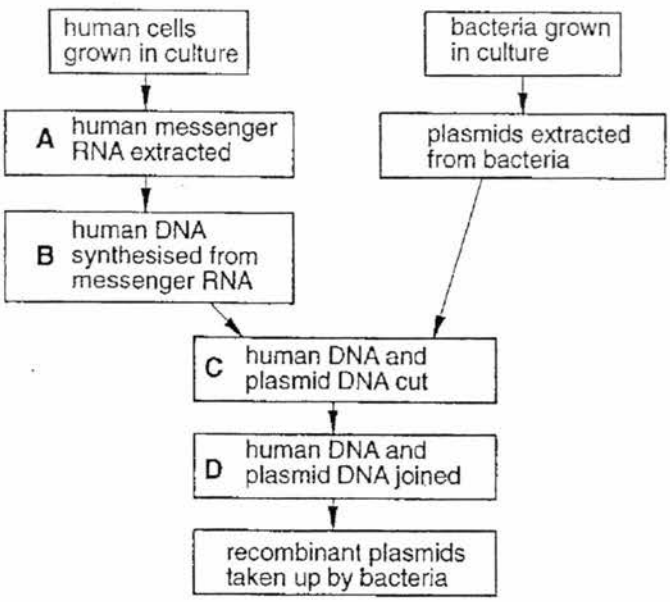
It was transcribed from one strand of DNA.

What is the sequence of bases on the complementary, non-transcribed strand?

A A C G A A C T T C G A T
B A T C G A A G T T C G T
C T A G C T T C A A G C A
D U G C U U G A A G C U A

35 The following diagram shows some of the events in the production of a human hormone by genetic engineering.

At which stage in the process is a restriction enzyme used?



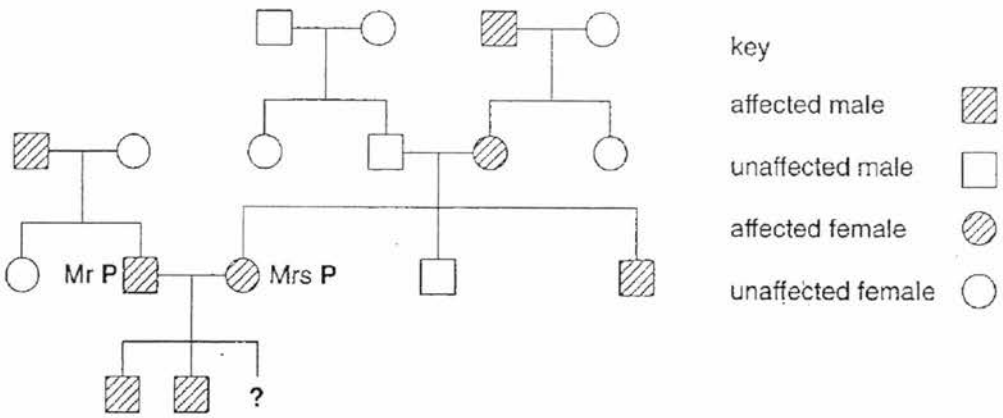
36 Potato plants are propagated asexually by tubers.

Twenty tubers are collected from one plant and are grown, producing 20 second generation plants. All the tubers from these plants are collected and weighed. The twenty largest are grown under the same conditions as before. All the third generation tubers are collected and are weighed.

How will the mean mass of these tubers and their genetic variation compare with the second generation?

	third generation tubers	
	mean mass	genetic variation
A	greater	increased
B	greater	unchanged
C	unchanged	reduced
D	unchanged	unchanged

37 The family tree was assembled by a genetic counsellor for Mr and Mrs **P** who suffer from a rare heart disease. Children who inherit the dominant mutant allele from both parents rarely survive beyond puberty.



What is the probability that Mr and Mrs **P**'s third child will be **unaffected**?

A 0.75 **B** 0.50 **C** 0.25 **D** 0.00

38 A person has blood group A.

Which statement about his genotype is correct?

A At least one of his alleles is dominant.
B He must be heterozygous.
C He must be homozygous.
D His alleles are codominant.

39 The diagram represents a food chain.

producer ⟶ primary consumer ⟶ secondary consumer ⟶ tertiary consumer

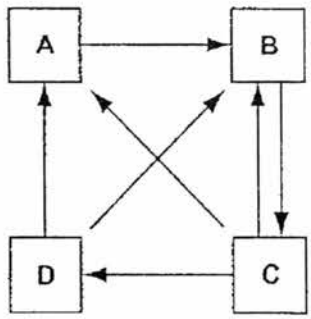
The energy present in the producer is 100 units.

Approximately how much energy is present in the tertiary consumer?

A 10 units
B 2 units
C 0.4 units
D 0.04 units

40 The diagram represents the cycling of carbon through the atmosphere, consumers, decomposers and producers in an ecosystem.

Which box represents organisms whose growth rate would be increased by a rise in levels of atmospheric carbon dioxide?



**********End of Paper**********

Source: adapted from Cambridge International Examination Papers

XINMIN SECONDARY SCHOOL
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Preliminary Examination 2017

CANDIDATE NAME

CLASS | | | | INDEX NUMBER | |

BIOLOGY **5158/02**

Paper 2 **16 Aug 2017**

SECTION A **1 hour 45 minutes**
(Section A & B)

Secondary 4 Express

Setter: Mr. Michael Rodrigues
Vetter: Mr. Gary Neo Wei Chung

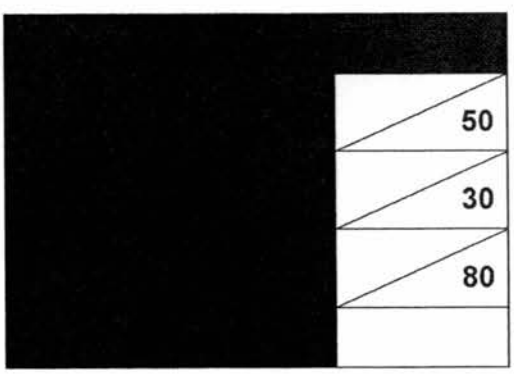
Candidates answer on the Question Paper.
No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Section A and B are separated into two booklets.
Write your name, class and index number on both booklets.
Write in dark blue or black pen in the spaces provided.
You may use an HB pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.
The use of an approved scientific calculator is expected, where appropriate.
The number of marks is given in brackets [ ] at the end of each question or part question.

At the end of the examination, hand in Section A and B **separately**.

Section A
Answer **all** questions.
You are advised to spend no longer than one hour on Section A.



Section A consists of **1** printed pages and **1** blank page.

[Turn over

Section A

Write your answers in the spaces provided.

For Examiner's Use

1 Fig. 1.1 shows how insulin, released by a beta cell, enters a capillary.

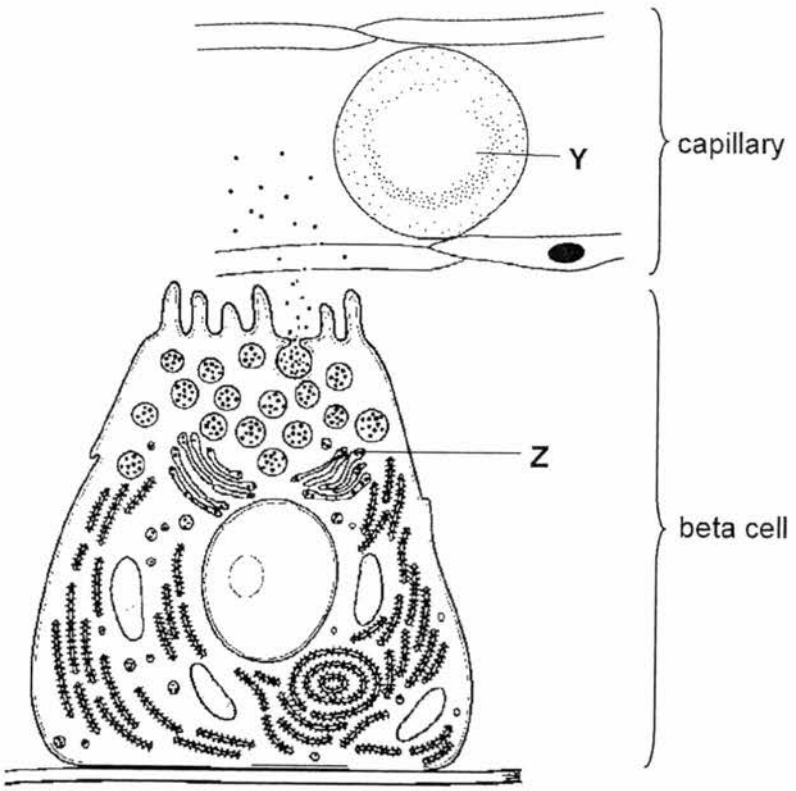


Fig. 1.1 (*Source: UCLES / Wikimedia*)

(a) (i) State the location in the body where the beta cell is found.

..... [1]

(ii) With reference to Fig. 1.1, explain why the beta cell is considered to be an endocrine gland and not an exocrine gland.

.....

.....

..... [2]

(b) Identify **Z** and describe its role in the synthesis of insulin.

identity .....

role in synthesis of insulin .....

..... [2]

(c) Describe how insulin moves from **Z** into the capillary.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(d) (i) Identify **Y**.

..... [1]

(ii) Describe two ways in which **Y** is adapted for its function.

1. .....

.....

2. .....

..... [2]

(e) A person's immune system can sometimes damage the beta cells. Suggest how damage to the beta cells may affect the health of a person.

.....

.....

.....

.....

.....

..... [3]

[Total: 15]

2 Fig. 2.1 shows the flow of blood during a particular phase of the cardiac cycle.

For Examiner's Use

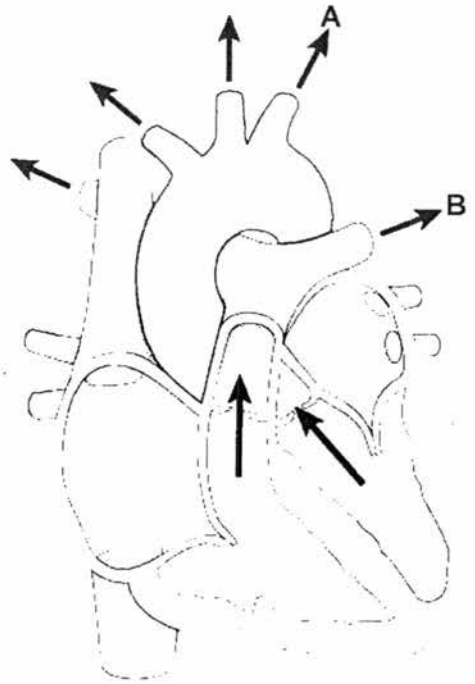


Fig. 2.1 (*Source: cnx.org*)

(a) (i) Name the phase of the cardiac cycle that the heart (Fig. 2.1) is in.

.....

[1]

(ii) Fig. 2.2 shows the blood pressure changes during one cardiac cycle in the left side of the heart. On the x-axis, mark with the letter '**S**' when the phase you've named in **(i)** starts and with the letter '**E**' when it ends.

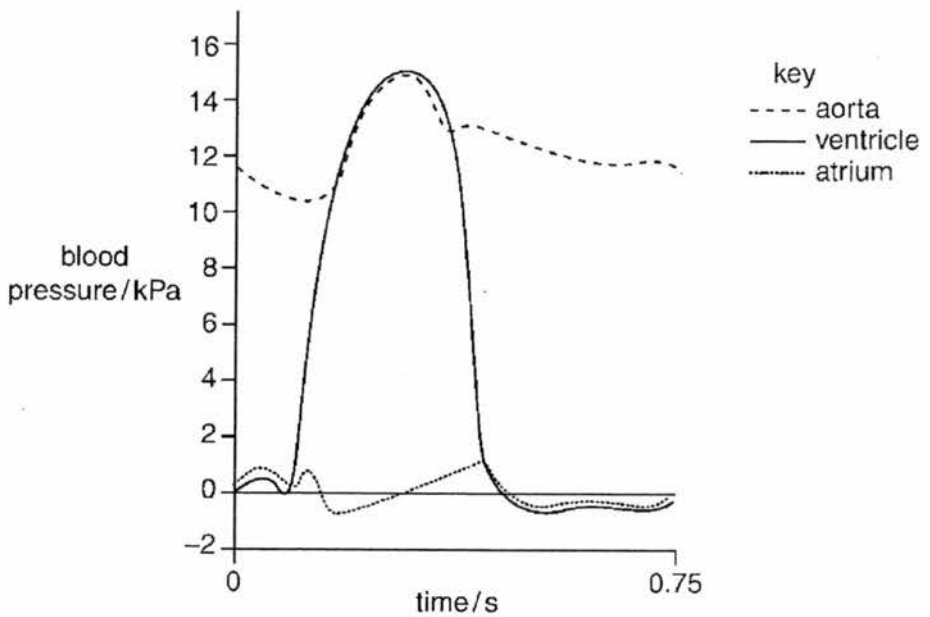


Fig. 2.2 (*Source: UCLES*)

[2]

For Examiner's Use

(b) Explain differences in the following between the blood at **A** and **B**.

(i) oxygen levels

.....

.....

.....

.....

..... [2]

(ii) blood pressure

.....

.....

.....

.....

..... [2]

(c) (i) On Fig. 2.1, label the bicuspid valve with the letter '**C**' using a label line. [1]

(ii) The bicuspid valve is also known as the mitral valve. Some people suffer from a condition known as *mitral valve prolapse* where the valve cannot close properly when put under pressure during the cardiac cycle.

Suggest how this condition affects the function of the heart.

.....

.....

.....

.....

..... [2]

[Total: 10]

For Examiner's Use

3 Figs contain flowers that are pollinated by a particular species of insect that is able to squeeze itself through the tiny opening at the bottom of the fig to get to the flowers inside. Fig. 3.1 shows two types of flowers, **G** and **H**, and where they are found inside a fig. The fig is shown in transverse section.

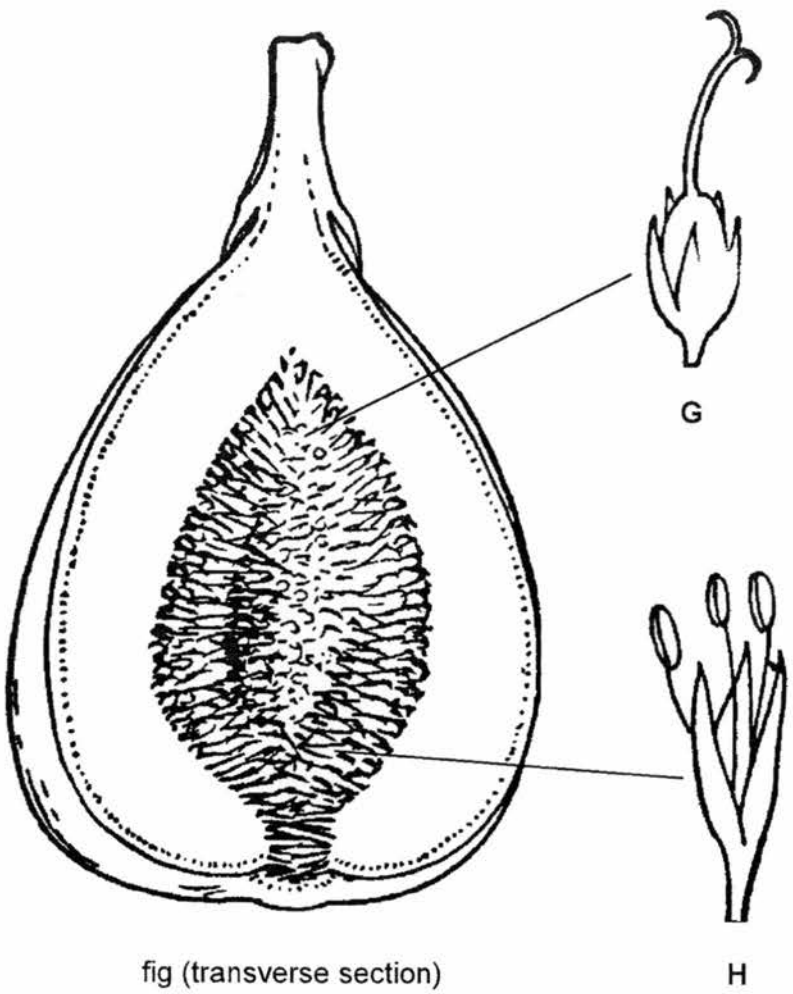


fig (transverse section)

Fig. 3.1 (*Source: etc.usf.edu*)

(a) Identify which flower is male and which is female.

G ..... **H** ..... [1]

(b) On Fig. 3.1, draw an arrow, from one flower to the other, to show the path of pollen grains if self-pollination took place. [1]

(c) Based on what can be observed in Fig. 3.1, describe one way, **other than having unisexual flowers**, by which the chances of self-pollination are reduced in the fig.

.....

..... [1]

(d) What are two advantages that cross-pollination has over self-pollination?

1. .....

.....

2. .....

..... [2]

(e) Flowers **G** and **H** have no petals.

Suggest two other characteristics that the flowers may have to attract their insect pollinators in the absence of petals.

1. .....

2. ..... [2]

(f) On Fig. 3.1, label, using label lines, two parts where meiosis takes place with the letters '**M1**' and '**M2**'. [2]

[Total: 9]

4 Fig. 4.1 shows two respirometers set up to investigate the effect of temperature on the rate of oxygen uptake by germinating seeds.

For Examiner's Use

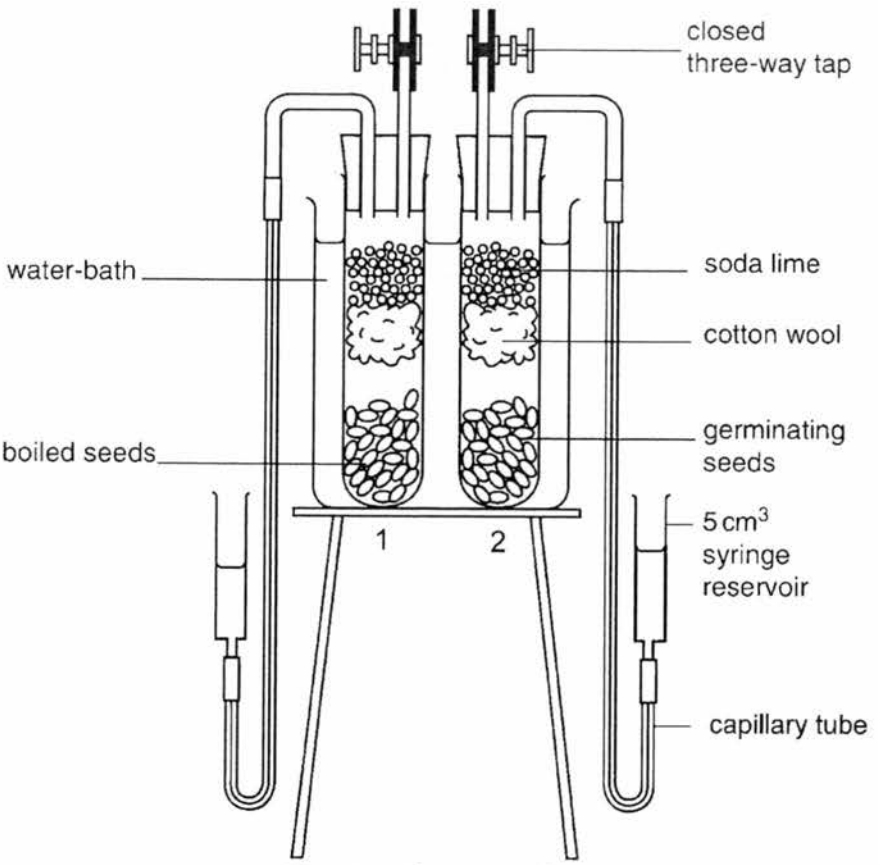
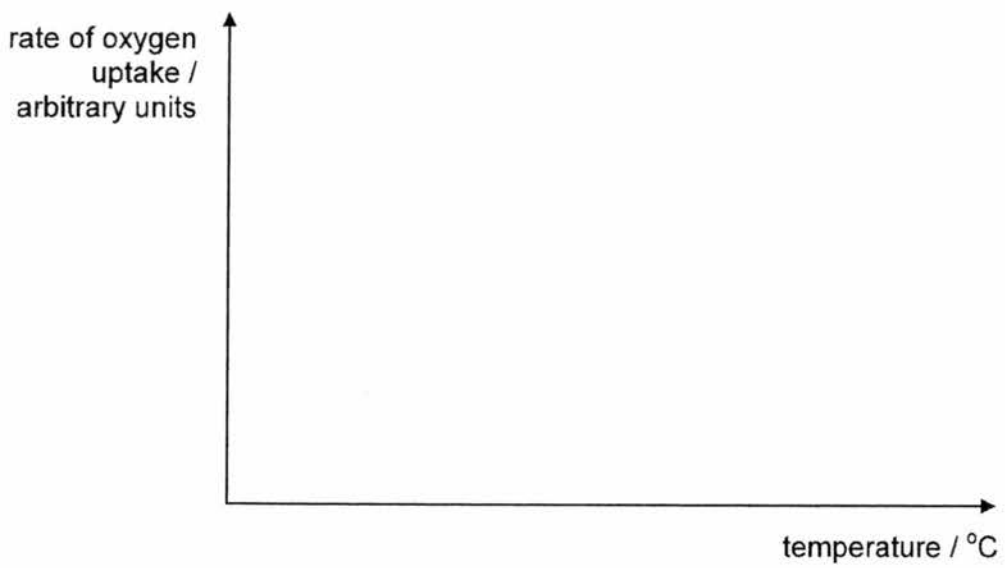


Fig. 4.1 (*Source: UCLES*)

(a) Sketch two graphs – one for tube 1 and the other for tube 2 – on the axes below to show how temperature affects the rate of oxygen uptake in the two tubes. Label your graphs '1' and '2'.



[2]

For Examiner's Use

(b) Explain the shape of your graph for

(i) tube 2;

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..... [4]

(ii) tube 1.

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..... [1]

(c) In the space below, write the chemical equation for the type of respiration that took place in tube 2.

[2]

[Total: 9]

5 Fig. 5.1 shows a cross section through a leaf.

For Examiner's Use

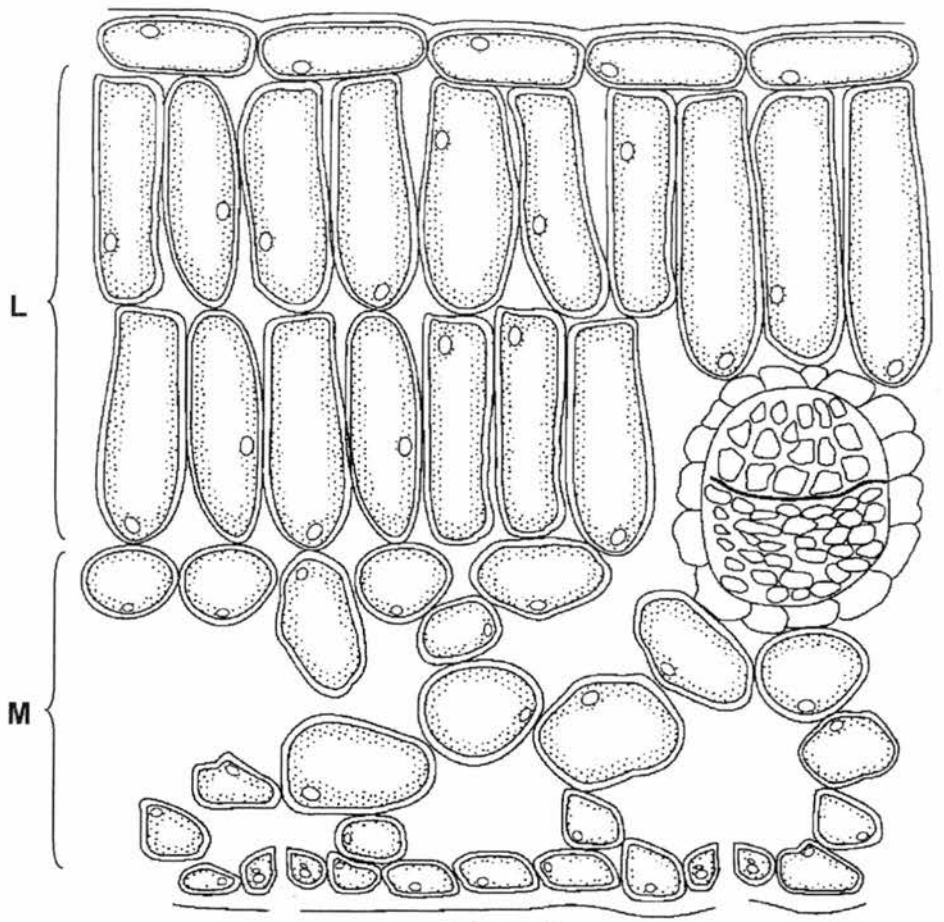

Fig. 5.1
(*Source: UCLES*)

(a) Identify structures **L** and **M**.

L ..... **M** ..... [2]

(b) How are structures **L** and **M** adapted for photosynthesis?

(i) structure **L**

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..... [2]

(ii) structure **M**

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..... [2]

(c) On Fig. 5.1, label the cells that transport water and mineral ions to the leaf with the letter '**N**' using a label line. [1]

[Total: 7]

End of Section A

XINMIN SECONDARY SCHOOL
新民中学
SEKOLAH MENENGAH XINMIN

Preliminary Examination 2017

CANDIDATE NAME

CLASS | | | | INDEX NUMBER | | |

BIOLOGY **5158/02**

Paper 2 **16 Aug 2017**

SECTION B **1 hour 45 minutes**
(Section A & B)

Secondary 4 Express

Setter: Mr. Michael Rodrigues
Vetter: Mr. Gary Neo Wei Chung

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

READ THESE INSTRUCTIONS FIRST

Section A and B are separated into two booklets.
Write your name, class and index number on both booklets.
Write in dark blue or black pen in the spaces provided.
You may use an HB pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.
The use of an approved scientific calculator is expected, where appropriate.
The number of marks is given in brackets [ ] at the end of each question or part question.

At the end of the examination, hand in Section A and B **separately**.

Section B
Answer all **three** questions.
The last question is in an Either/Or form.
You are advised to spend no longer than 45 minutes on Section B.

	11
	9
	10
	30

Section B consists of **8** printed pages.

[Turn over

Section B

Answer three questions

Question 8 is in the form of an **Either/Or** question.
Only one part should be answered.

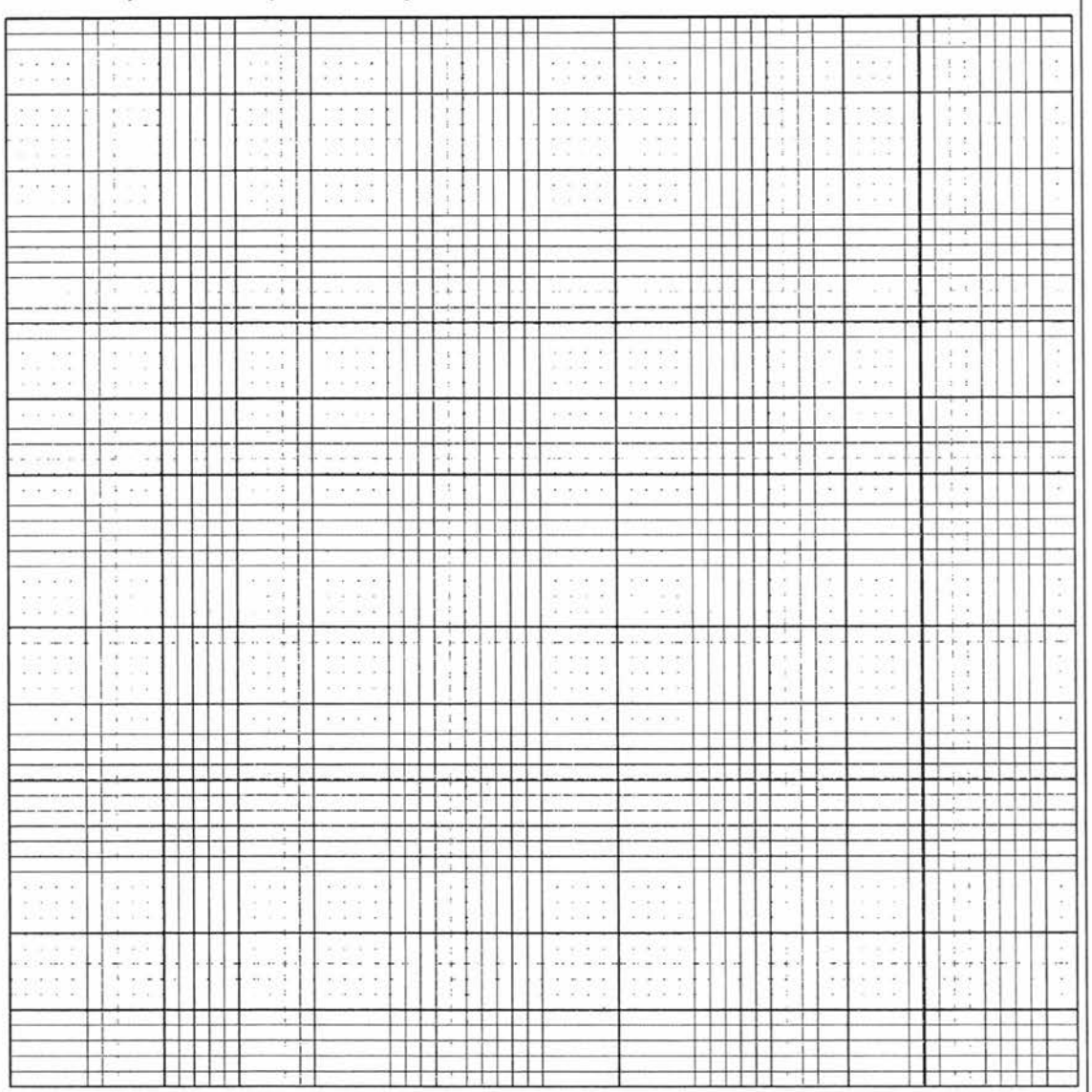
For Examiner's Use

6 Table 6.1 shows the effect of drinking one litre of distilled water on urine production by the kidney.

Table 6.1

Time / min	0	30	60	90	120
Volume of Urine / cm^3	53	81	246	182	56

(a) Use the data in Table 6.1, to plot a graph to show the change in volume of urine produced by the kidney over time. .



[4]

(b) Use your graph to determine the rate of change in volume at time = 40 min. Show your working below. Show how you obtained your values on the graph.

For Examiner's Use

[2]

(c) Determine from your graph the time at which the volume of urine production was highest. Show how you obtained this value on your graph.

Volume of urine production was highest at time = _____ min [1]

(d) With reference to anti-diuretic hormone (ADH), explain the change in the volume of urine produced over time.

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[4]

[Total: 11]

7 Describe how the following are digested in the human alimentary canal.

For Examiner's Use

(a) proteins .....

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..... [5]

(b) fats .....

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..... [4]

[Total: 9]

8 **Either**

For Examiner's Use

(a) With reference to *natural selection*, explain why the widespread use of insecticides to reduce the mosquito population becomes ineffective after some time.

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For Examiner's Use

(b) (i) With reference to a named example, describe how a farmer can use the process of *artificial selection* to obtain greater quantities of better quality produce.

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..... [3]

(ii) What are the potential disadvantages of *artificial selection*?

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..... [2]

[Total: 10]

8 **Or** Discuss the causes and consequences of the following processes.

For Examiner's Use

(a) *eutrophication* ....

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For Examiner's Use

(b) *bioaccumulation* .....

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..... [4]

[Total: 10]

End of Section B

4E Pure Bio Prelim P1 MS

Question	Answer
1	B
2	A
3	D
4	D
5	A
6	D
7	D
8	B
9	B
10	D
11	B
12	B
13	D
14	A
15	B
16	D
17	C
18	B
19	A
20	B
21	D
22	A
23	D
24	D
25	B
26	C
27	B
28	C
29	B
30	D
31	C
32	C
33	B

XINMIN SECONDARY SCHOOL
新民中学
SEKOLAH MENENGAH XINMIN
Preliminary Examination 2017

Subject	:	**Biology (5158)**
Level	:	**Secondary 4 Express**
Setter	:	**Mr Michael Rodrigues**
Moderator	:	**Mr Gary Neo Wei Chung**

MARK SCHEME

Paper 2

Symbols and abbreviations used in mark scheme

; – separates points for the award of a mark

/ – separates alternatives for a marking point

ref. – makes reference to

( ) – points within brackets need not be in the answer for a mark to be awarded

cf. – compared to

ecf – error carried forward

wrt – with respect to

R – reject

Ig – ignore/irrelevant

A – accept

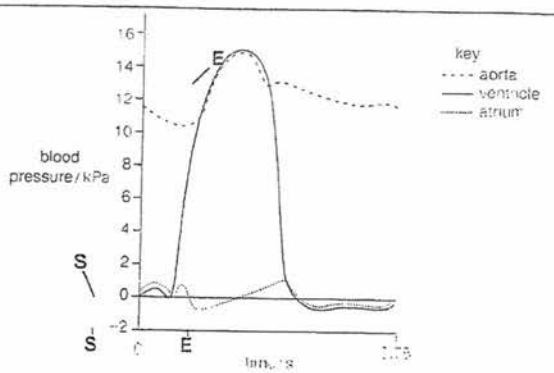
AW – alternative wording

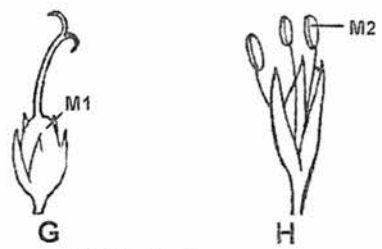
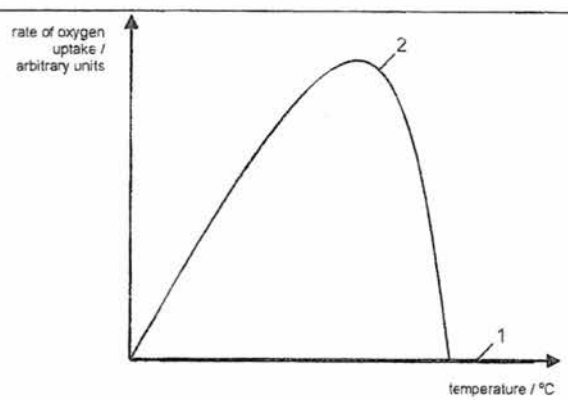
ORA – or reverse argument

<u>underlined</u> – this and no other

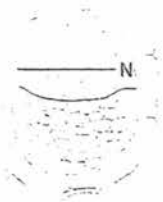
± – doubtful (For each question, the first doubtful answer is awarded a mark, the second doubtful answer gets no mark, and so on.)

Q No.	Marking Points	Part Marks	Examiner's Remarks
1 (a) (i)	• islets of Langerhans / pancreas ;	1	
(ii)	• secretes directly into blood/plasma ; • ductless / does not secrete into a duct ;	2	
(b)	• Golgi body/apparatus/complex ; • modification and packaging of (pro)insulin/protein ;	2	
(c)	1. vesicles ; 2. fuse with cell (surface) membrane / exocytosis ; 3. tissue fluid ; 4. diffusion ; 5. (blood) plasma ; 6. ref. movement across (cell surface) membranes of endothelial cells ;	max 4	
(d) (i)	• red blood cell / erythrocyte ;	1	
(ii)	• (circular) biconcave + increased surface area (for absorption of oxygen) ; • no nucleus + store more haemoglobin (for oxygen transport) ; • haemoglobin + binds with oxygen ; • flexible (membrane) + change shape to squeeze through narrow capillaries ;	max 2	
(e)	• little or no insulin produced ; • <u>diabetes mellitus</u> ;	max 1	
	• reduced conversion of glucose to glycogen (by liver / muscle cells) ; • reduced uptake of glucose by cells / persistently high blood glucose levels ; • decreased oxidation of glucose during respiration ; • ref. oxidation of fat / production of ketones ; • ref. weakness/lethargy / weight loss ;	max 2	
2 (a) (i)	• ventricular systole ;	1	

Q No.	Marking Points	Part Marks	Examiner's Remarks
(ii)	 • start of ventricular systole correctly marked with '**S**' on x-axis ; • end of ventricular systole correctly marked with '**E**' on x-axis ; [A '**S**' and '**E**' correctly marked on graph instead of x-axis as shown above]	2	
(b) (i)	• ('**B**') oxygen used up by respiring body tissues ; • ('**A**') blood oxygenated by alveoli / lungs ; [**I** description of difference e.g. '**A**' oxygenated / '**B**' deoxygenated]	2	
(ii)	• ('**A**') walls of left ventricle, more muscular / contract with greater force / **ORA** for '**B**' ; • ref. longer distance to body ('**A**') / shorter distance to lungs ('**B**') ; [**I** description of difference e.g. '**A**' higher than '**B**' / **ORA**]	2	
(c) (i)	• bicuspid valve correctly labelled '**C**' [**A** labelled as bicuspid/mitral valve instead of '**C**'] ;	1	
(ii)	• blood flows into left atrium [Award ± for backflow of blood unqualified] ; • blood pumped at lower pressure (through aorta) ; • body receives less oxygen ;	max 2	
3 (a)	• ('**G**') female + ('**H**') male ; [Both must be correct.]	1	
(b)	• arrow drawn from anther of '**H**' to stigma of '**G**' ;	1	
(c)	• ref. distance between anther/'**H**' and stigma/'**G**' ; • ref. gravity ; [**R** different maturing times]	max 1	

Q No.	Marking Points	Part Marks	Examiner's Remarks
(d)	• greater genetic variety / genes/traits inherited from two parents instead of one ; • increased chance of surviving changes in the environment (as not all varieties will be adversely affected) ; • less chance of harmful recessive alleles coming together (with increased chance of offspring being heterozygous) ; • more viable seeds produced ;	max 2	
€	• nectar/nectary ; • scent/smell/odour ; • edible pollen ;	max 2	
(f)	 • ovary of '**G**' labelled ; • anther of '**H**' labelled ;	2	
4 (a)	 • graph 1 is flat, on/close to x-axis, below graph 2 + labelled '1' ; • graph 2 is a skewed inverted U/V shape as shown above + labelled '2' ; [**R** unlabelled graphs; **A** if graph, does not start at junction of x and y axes / is not in contact with x-axis but relative positions of graph 1 and 2 must be correct with 2 being above 1]	2	

Q No.	Marking Points	Part Marks	Examiner's Remarks
(b) (i)	*ref. rise in rate of oxygen uptake* 4.1 (rising temperature) increases kinetic energy of (enzyme and substrate) molecules ; 4.2 increase in rate of, collision between substrate and enzyme molecules / formation of enzyme-substrate complex ; 4.3 ref. optimum temperature + rate of respiration/oxygen uptake highest ; *ref. fall in rate of oxygen uptake* 4.4 enzyme denatures / enzyme unwinds / peptide bonds broken ; 4.5 active site, is lost/changes shape ; 4.6 substrate can no longer fit active site ;	max 4	
(ii)	4.7 enzymes denatured (by boiling / in boiled peas / at start of experiment) ; *Award once in either (i) or (ii)* 4.8 respiration is an enzyme-catalysed reaction / AW [Award this mark only if student states this explicitly] ;	min 1	
(c)	• $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$;; [Award one mark for correct reactants and one mark for correct products. I ref. energy release]	2	
5 (a)	• ('L') palisade mesophyll/layer/tissue ; • ('M') spongy mesophyll/layer/tissue ;	2	
(b) (i)	• closely packed / more chloroplasts; • increased light absorption ;	2	
(ii)	• inter-cellular/interconnected air spaces ; • gaseous exchange / diffusion of carbon dioxide in (correctly linked) ; • moisture layer ; • CO_2 dissolves (correctly linked) ;	max 2	

Q No.	Marking Points	Part Marks	Examiner's Remarks
(c)	 • xylem correctly labelled '**N**' / 'xylem' ;	1	
6 (a)	• (**P**) points correctly plotted with time on the x-axis and volume of urine on the y-axis ; • (**A**) axes correctly labelled with units ; • (**S**) appropriate scale (plotted points occupy at least half the area provided) ; • (**BF**) line of best fit o line reflects trend shown by data o points distributed equally above and below the line o sum of variations in y-value between plotted points and line equally distributed o line reaches but does not exceed x = 0 min and x = 120 min ;	4	
(b)	• tangent at t = 40 min correctly drawn ; • correct calculation + correct units [No marks awarded for incorrect calculation] ;	2	
(c)	• shown on graph + value correctly determined from x-axis of graph ;	1	
(d)	*ref. positive gradient / increase in volume* **1.** (blood) water potential rises above norm ; **2.** hypothalamus stimulated / detects change ; **3.** less ADH secreted + (by) pituitary gland ; **4.** cells in walls of collecting duct become less permeable to water / less water (re)absorbed (into blood) ;	max 3	
	ref. negative gradient / decrease in volume **5.** blood water potential returns to norm ; **6.** ref. negative feedback ; **7.** ref. rise in ADH to normal levels results in less urine produced ;	min 1	

Q No.	Marking Points	Part Marks	Examiner's Remarks
7 (a)	1. pepsin + stomach / gastric juice ; 2. trypsin + pancreas / duodenum / pancreatic juice ; 3. proteins digested into polypeptides ; 4. ref. role of HCl / acidity in stomach (pH / sterilise / activate pepsinogen) ; 5. peptidases / erepsin + small intestine / intestinal juice ; 6. polypeptides digested into amino acids ;	max 5	
(b)	7. bile ; 8. produced by liver / stored in gall bladder ; 9. emulsification / described ; 10. pancreatic lipase ; 11. intestinal lipase ; 12. fat digested into fatty acids and glycerol ;	max 4	
8E (a)	1. mutation ; 2. resistance (R: immunity) to insecticide (develops in mutants) ; 3. mutant best adapted in population to survive (application of) insecticide / **ORA** ; 4. survivors (reproduce and) pass on mutation to offspring/future generations ; 5. mutant genotype becomes dominant (making insecticide ineffective) ;	5	
(b) (i)	6. plausible plant or animal example ; 7. parents with *desired trait* are selected as breeding stock ; 8. (only) off spring that possess desired trait *to the greatest extent* are bred ; 9. process carried out over *many generations* ;	max 3	
(ii)	10. less genetic variety / smaller gene pool ; 11. greater chance for two harmful recessive alleles [R genes] to come together / **AW** ;	2	

Q No.	Marking Points	Part Marks	Examiner's Remarks
8O (a)	Cause: 1. relevant examples of pollutants that are a source of mineral ions (e.g. sewage / detergents / fertilisers) (R: insecticides / herbicides) 2. waters enriched by mineral ions / phosphates / nitrates ; Consequence: 3. algal bloom ; 4. (bottom-dwelling) aquatic plants receive insufficient sunlight/cannot photosynthesise without light ; 5. death of algae/aquatic plants ; 6. decomposition by bacteria / microorganisms ; 7. oxygen depleted (by respiring bacteria) ; 8. aquatic animals (that cannot escape) die from lack of oxygen ;	max 6	
(b)	Cause: 9. ref. relevant examples of pollutants (e.g. insecticides / DDT / compounds of heavy metals/mercury/lead) ; 10. cannot be, metabolised in organism / broken down (by liver) ; 11. stored in organisms' tissues / increases in concentration in organisms' tissues over time ; Consequence: 12. ref. biomagnification / bioamplification along food chain / described e.g. organisms in higher trophic levels consume many organisms in the lower trophic levels ; 13. organisms in higher trophic levels receive harmful levels of pollutant ;	max 4	