Name: .... (   )

ASSUMPTION ENGLISH SCHOOL
PRELIMINARY EXAMINATION 2020

BIOLOGY
6093 / 01

LEVEL:	Sec 4 Express	**DATE:**	27 August 2020
CLASS:	Sec 4/2	**DURATION:**	1 hour

Additional Materials provided: 1 sheet of OAS paper

INSTRUCTIONS TO CANDIDATES
Do not open this booklet until you are told to do so.

Write your NAME and INDEX NUMBER at the top of this page and on the OAS paper.
Shade your index number on the OAS paper.

PAPER 1 (40 marks)
MULTIPLE CHOICE QUESTIONS
There are 40 questions in this paper. Answer **all** questions. For each question, there are four possible answers **A**, **B**, **C** and **D**.

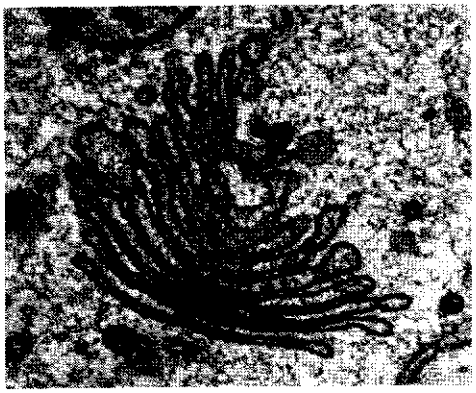
At the end of the examination, hand in your OAS paper and question booklet separately.

This Question Paper consists of 19 printed pages including this page.
[Turn over

MULTIPLE-CHOICE QUESTIONS [40 marks]

For each question, **there are four** possible answers **A, B, C** and **D**.
Choose the one you consider correct and record your choice in the OAS paper provided.

1 The figure below is an electron micrograph of a section of a cell.



What is the function of the organelle shown in the figure?

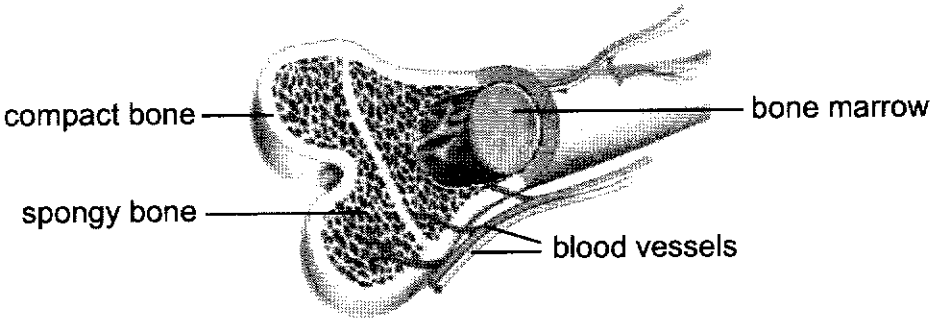
A control movement of substances into the cell

B package substances for secretion

C release of energy from glucose

D synthesis of lipids and proteins

2 The diagram shows a human bone.



Which level of organisation best describes bone?

A cell

B organ

C organ system

D tissue

3 Which cell is **not** adapted for more efficient absorption of substances?

A epithelial cell of villi

B root hair cell

C red blood cell

D xylem cell

4 What is most likely to be observed in red blood cells in a person who is severely deyhydrated?

A They become flaccid.

B They become smaller.

C They become swollen and burst.

D They become turgid.

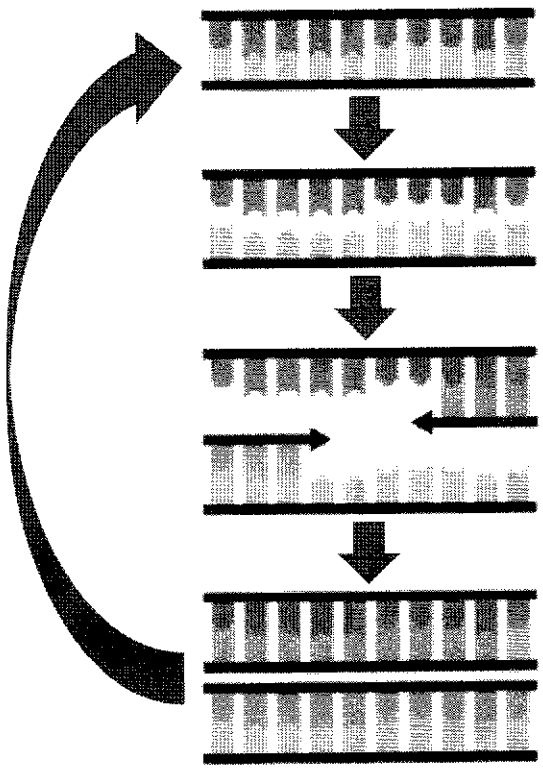
5 Which row correctly identifies basic building blocks of starch and proteins?

	starch	proteins
A	glucose	amino acids
B	maltose	amino acids
C	maltose	polypeptides
D	sucrose	polypeptides

Use the information below to answer questions **6** and **7**.

The polymerase chain reaction (PCR) is a technique used to make multiple copies of a DNA sequence from a very small sample. It has been used to identify DNA from crime scenes, or to test a person for particular viruses.

Taq DNA polymerase, an enzyme that can make copies of DNA, is added to the DNA sample at the start of the experiment. The following steps are then repeated 25 to 30 times.



Step 1: separate the DNA strands by raising temperature to 95 °C

Step 2: allow a short sequence of DNA to bind to each strand of the DNA sample at 55 °C

Step 3: taq DNA polymerase binds to the short sequence of DNA, then proceeds to make copies of the DNA sample at 72 °C

6 The action of taq DNA polymerase can be explained by the lock and key hypothesis. Where is the active site found and what do the lock and key represent?

	location of active site	lock	key
A	sample DNA	sample DNA	taq DNA polymerase
B	sample DNA	taq DNA polymerase	sample DNA
C	taq DNA polymerase	sample DNA	taq DNA polymerase
D	taq DNA polymerase	taq DNA polymerase	sample DNA

7 Which descriptions about taq DNA polymerase at the given temperatures are most likely correct?

	72 °C	95 °C
A	high enzyme activity	denatured
B	high enzyme activity	not denatured
C	low enzyme activity	denatured
D	low enzyme activity	not denatured

8 Which row correctly matches the digestive enzymes to their optimum condition?

	salivary amylase	pancreatic lipase	intestinal protease
A	acidic	acidic	alkaline
B	acidic	alkaline	acidic
C	neutral	alkaline	alkaline
D	neutral	acidic	acidic

9 What is the function of the lacteal?

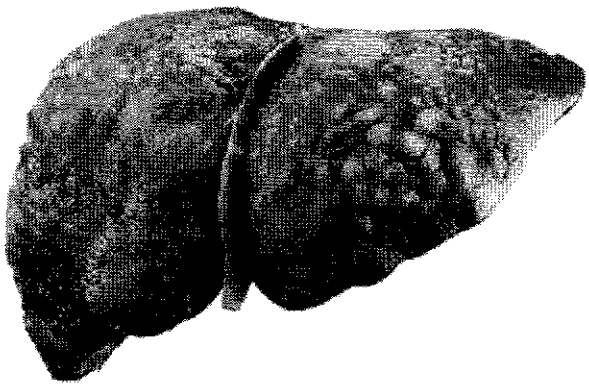
A produce bile salts

B store and release bile salts

C transport glycerol and fatty acids

D transport lipids

10 The figure below shows the liver of a person who has drank excessive amounts of alcohol over 12 years.



What processes will the person's body have difficulty in carrying out?

1 breakdown of white blood cells

2 carbohydrate metabolism

3 production of insulin and glucagon

4 urea formation

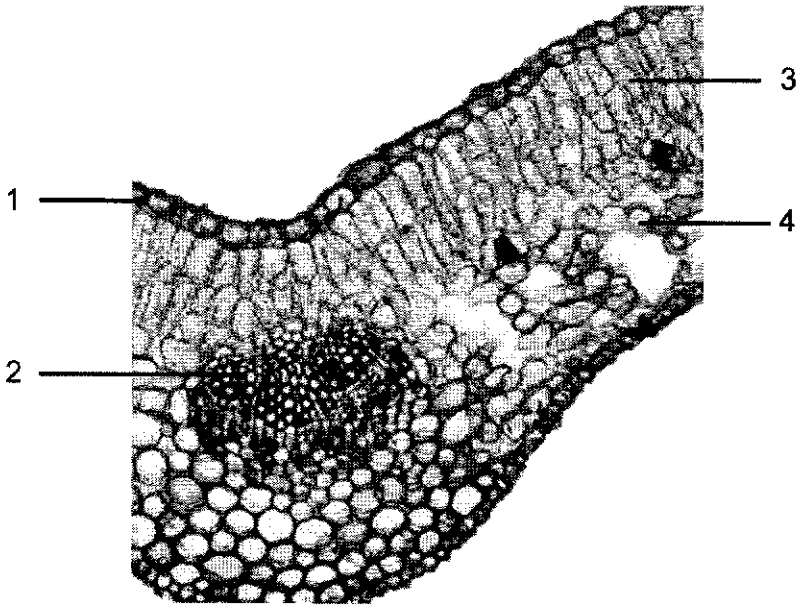
A 1 and 2 only

B 2 and 4 only

C 1, 2 and 4 only

D 2, 3 and 4 only

11 The diagram shows a photomicrograph of a section through a leaf.



Which cell(s) contain(s) chlorophyll?

A 3 only

B 3 and 4 only

C 1, 2 and 4 only

D 1, 3 and 4 only

12 Which row correctly describes the exchange of gases at spongy mesophyll cells at different times of the day?

	day time		night time	
	carbon dioxide	oxygen	carbon dioxide	oxygen
A	enter cell	exit cell	exit cell	enter cell
B	enter cell	exit cell	enter cell	exit cell
C	exit cell	enter cell	exit cell	enter cell
D	exit cell	enter cell	enter cell	exit cell

13 A student measured light intensity over a day, as well as the rate of photosynthesis of a plant. His results were recorded in the table below.

time of day	6 am	8 am	10 am	12 pm	2 pm	4 pm	6 pm	8 pm
light intensity / kJ m^{-2} s^{-1}	0.0	0.2	0.5	0.9	0.8	0.6	0.3	0.0
rate of photosynthesis / arbitrary units	0	1	3	4	4	4	1	0

What can be concluded from the experiment?

A Carbon dioxide concentration was a limiting factor at 0.2 kJ m^{-2} s^{-1}.

B Light intensity was not a limiting factor at 0.2 kJ m^{-2} s^{-1}.

C Light intensity was not a limiting factor at 0.7 kJ m^{-2} s^{-1}.

D Temperature was the only limiting factor at 0.9 kJ m^{-2} s^{-1}.

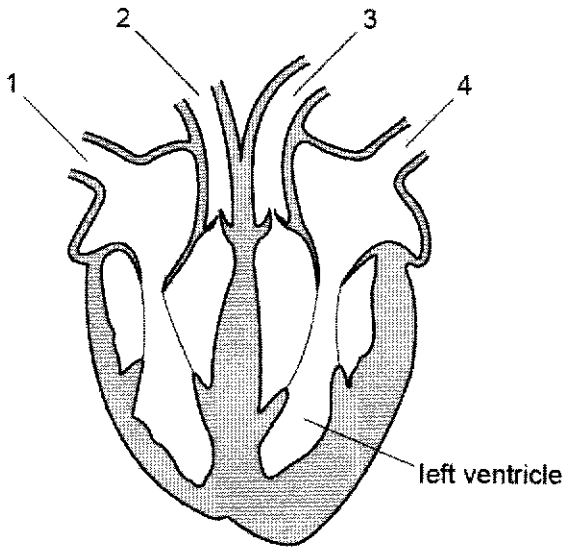
14 Which row does **not** correctly explain how rate of transpiration is affected by the given environmental factor?

	factor	explanation
A	air movement	greater air movement keeps concentration of water vapour outside the leaf low
B	humidity	greater humidity causes concentration of water vapour outside to leaf to be high
C	light intensity	greater light intensity causes stomata to close
D	temperature	higher temperatures increase rate of movement of water vapour molecules

15 Which of these blood transfusions may lead to agglutination in the recipient?

	donor	recipient
A	A	A
B	A	AB
C	AB	O
D	O	AB

16 The diagram below shows a human heart.



What path would be possible for a red blood cell to take?

A 1 → 2 → 3 → 4

B 2 → 4 → 3 → 1

C 3 → 1 → 4 → 2

D 4 → 3 → 2 → 1

17 Which statement about coronary heart disease is **not** true?

A It involves the occlusion of coronary veins.

B It is not caused by excessive alcohol consumption.

C It may be caused by high levels of stress.

D It may be prevented by not smoking.

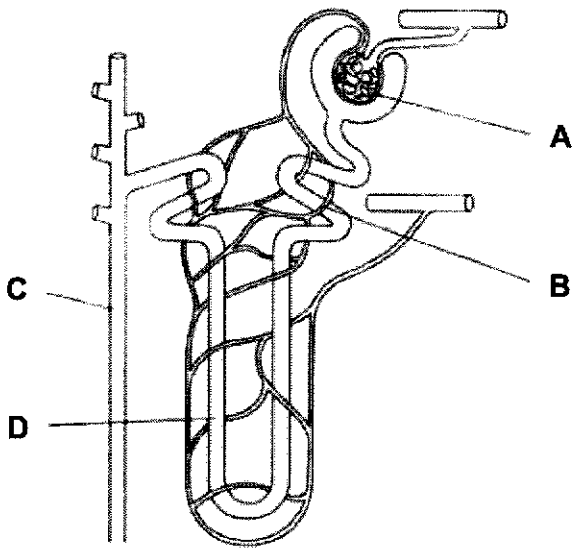
18 What are the waste products of aerobic and anaerobic respiration?

	aerobic respiration	anaerobic respiration
A	carbon dioxide only	lactic acid and carbon dioxide
B	carbon dioxide only	lactic acid and water
C	carbon dioxide and water	lactic acid and carbon dioxide
D	carbon dioxide and water	lactic acid only

19 How do the external intercostal muscles and diaphragm cause the thoracic cavity to decrease in volume?

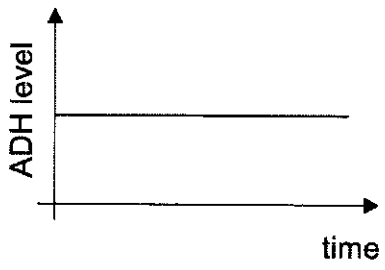
	external intercostal muscles	diaphragm
A	contract	contract
B	contract	relax
C	relax	relax
D	relax	contract

20 The glucose level of a person's urine was much higher than normal. If this was caused by damage to the nephron, which part was most likely injured?

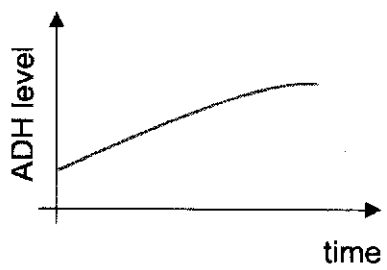


21 Which graph best represents the levels of anti-diuretic hormone in the blood of a person who has just drunk a large cup of water?

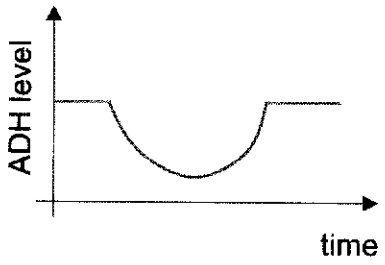
A



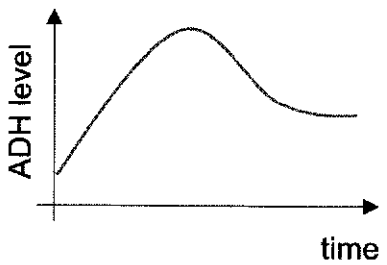
B



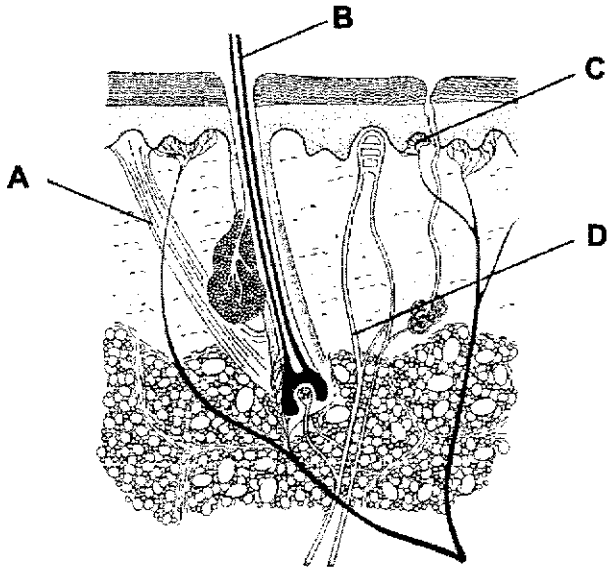
C



D

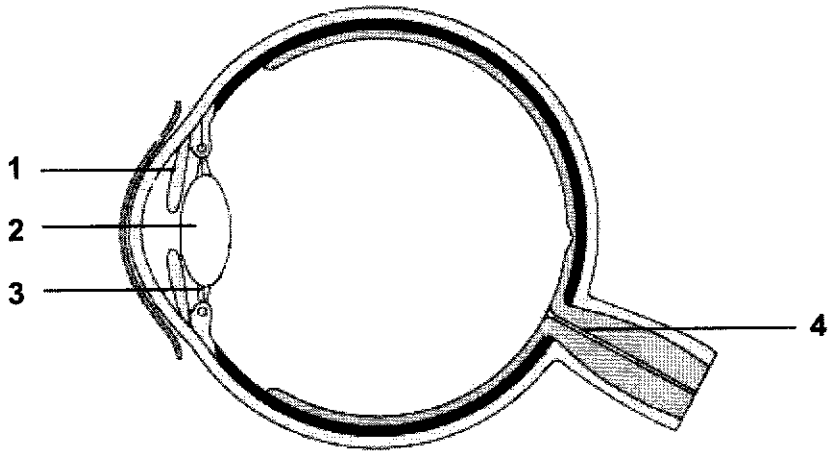


22 The skin helps the body maintain a constant temperature. Which structure is able to detect a change and send a signal?



23 The diagram shows a section of the human eye.

Which part(s) receive(s) nerve impulses from motor neurons?



A 1 only

B 1 and 3 only

C 2 and 4 only

D 1, 3 and 4 only

24 Where are photoreceptors in the eye found?

A choroid

B optic nerve

C pupil

D retina

25 Where do relay neurones transmit nerve impulses across?

1 from brain to muscle

2 from muscle to spinal cord

3 from spinal cord to brain

4 within the brain

A 3 only

B 1 and 2 only

C 3 and 4 only

D 1, 2 and 4 only

26 A student is stung by a bee on the arm, and says "ouch". Which part of the nervous system co-ordinates the verbal response, and which part perceives the pain?

	co-ordinator of verbal response	pain perceived by
A	brain	brain
B	brain	spinal cord
C	spinal cord	brain
D	spinal cord	spinal cord

27 Which statement about hormones is **not** true?

A Hormones are chemical substances.

B Hormones are destroyed in the pancreas.

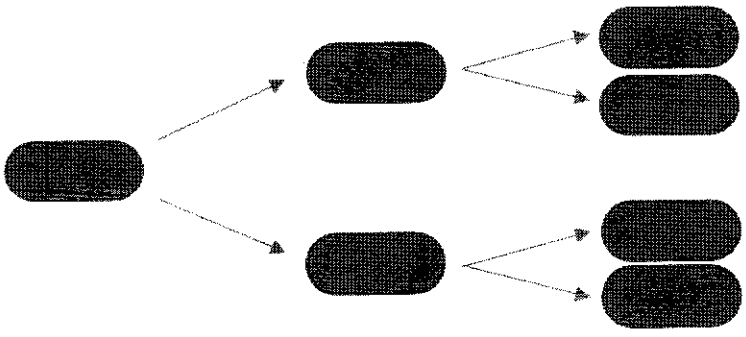
C Hormones are produced by glands.

D Hormones are transported by the blood.

28 Which row correctly states the effects of adrenaline and glucagon on blood glucose level?

	adrenaline	glucagon
A	increase	decrease
B	increase	increase
C	decrease	decrease
D	decrease	increase

29 A bacterium undergoing asexual reproduction was observed over 16 hours. The diagram below shows what occurred.



0 h 8 h 16 h

Which statement is true?

A The bacteria at 8 h were genetically identical to the one at 0 h.

B The bacteria at 16 h has ¼ of the amount of DNA as the one at 0 h.

C The bacterium is able to split into 2 bacteria every 16 hours.

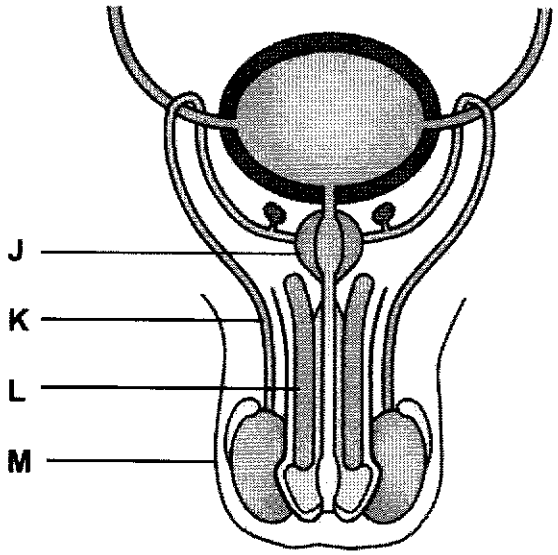
D There were 7 bacteria at the end of the 16 hours.

30 Which sequence shows the process leading up to fertilisation in plants?

1 male gametes are released
2 pollen grain germinates
3 pollen tube enters the ovule
4 style is digested by enzymes

A 1 → 2 → 4 → 3
B 1 → 4 → 1 → 3
C 2 → 1 → 4 → 3
D 2 → 4 → 3 → 1

31 The diagram shows the male reproductive system.



Which row correctly matches the labelled structure to its function?

	structure	function
A	**J**	produce sex hormones like testosterone
B	**K**	transport urine out of the body
C	**L**	deposit sperm during sexual intercourse
D	**M**	produce and store sperm

32 Which statement does **not** correctly describe how the female reproductive system is adapted to allow the development of a foetus?

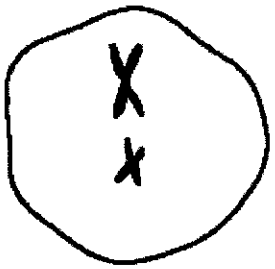
A Amniotic fluid supports and cushions the foetus.

B The amniotic sac contains amniotic fluid that surrounds the foetus.

C The placenta transports the mother's blood into the foetus.

D The umbilical cord transports carbon dioxide away from the foetus.

33 A cell with four chromosomes was photographed under a microscope during a stage of cell division.



Which stage of cell division was the cell in?

A metaphase of mitosis

B metaphase I of meiosis

C metaphase II of meiosis

D telophase II of meiosis

34 Which structure(s) contain(s) haploid cells?

1 blood vessel

2 flower

3 root

4 vascular bundle

A 2 only

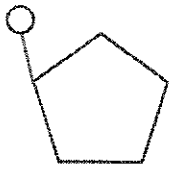
B 3 only

C 1 and 2 only

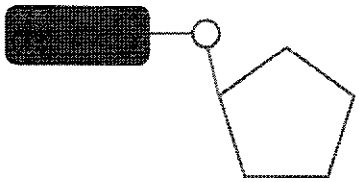
D 2 and 4 only

35 Which diagram represents a nucleotide?

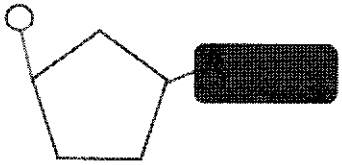
A



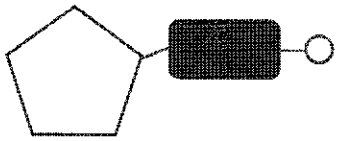
B



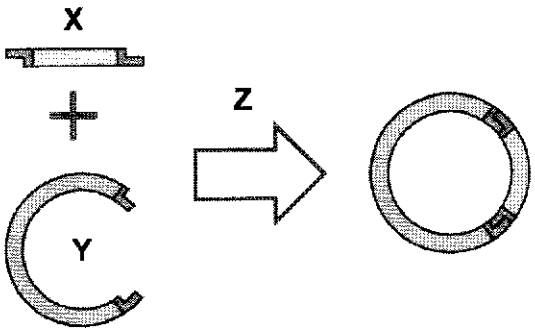
C



D



36 The diagram below shows part of the process of creating transgenic bacteria that are able to produce human insulin.



Which row correctly identifies molecules **X** and **Y** and enzyme **Z**?

	X	Y	Z
A	insulin gene	bacterial plasmid	ligase
B	bacterial plasmid	recombinant plasmid	restriction enzyme
C	insulin gene	bacterial gene	restriction enzyme
D	insulin plasmid	bacterial gene	ligase

37 A species of plant was observed to have red, yellow or orange flowers. The petal colour was determined by a single gene. The diagram below shows the results of a cross between two heterozygous individuals with orange flowers.

	K	k
K	KK red	Kk orange
k	Kk orange	kk yellow

Which statement is true about the alleles K and k?

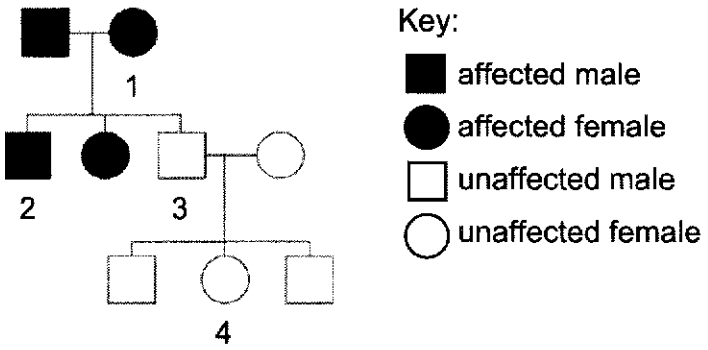
A K is the dominant allele and k is the recessive allele.

B The alleles for K and k are codominant.

C The gene that determines petal colour has 3 alleles.

D The phenotype for k is not expressed in heterozygous individuals.

38 The diagram shows the pattern of inheritance of Huntington's disease in a family.



Which statement is true about the given individuals?

A 1 must be homozygous recessive.

B 2 must be heterozygous.

C 3 must be homozygous dominant.

D 4 must be homozygous recessive.

39 Which description about discontinuous variation is **not** correct?

A An example of a discontinuous trait is blood type.

B It deals with a range of phenotypes.

C It involves the control of one or few genes.

D It is not affected by environmental conditions.

40 Which of these is an example of artificial selection?

A chickens that are better at avoiding foxes survive and reproduce

B genetically modifying a corn plant to resist infection

C giving chickens feed with extra nutrients

D planting only seeds from plants that produce more fruits

- End of Paper -

Name: .... (   )

ASSUMPTION ENGLISH SCHOOL
PRELIMINARY EXAMINATION 2020

BIOLOGY
6093 / 02

LEVEL: Sec 4 Express **DATE:** ?? September 2020

CLASS: Sec 4/2 **DURATION:** 1 hour 45 minutes

Additional materials provided: Nil

INSTRUCTIONS TO CANDIDATES
Do not open this booklet until you are told to do so.

Write your NAME and INDEX NUMBER at the top of this page.

SECTION A (50 marks)
STRUCTURED QUESTIONS
Answer all questions in the spaces provided.

SECTION B (30 marks)
FREE RESPONSE QUESTIONS
Answer three questions in this section in the spaces provided.
Question 10 is in the form of an Either / Or question.
Only one of the alternatives should be answered.

For Examiner's Use:	
Paper 1	/40
Paper 2 Section A	/50
Paper 2 Section B	/30
Paper 3	/40
Total Marks	/160
Overall	/100

This Question Paper consists of 16 printed pages including this page.
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SECTION A – STRUCTURED QUESTIONS (50 marks)

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

1 Fig. 1.1 shows a sample of tissue visualised under a light microscope.

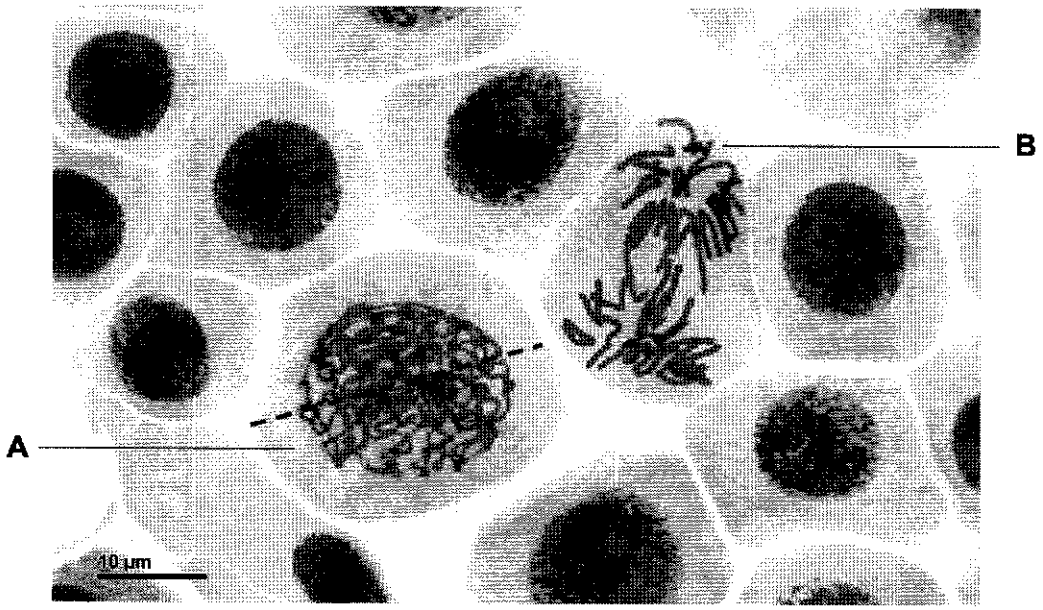


Fig. 1.1

(a) Determine the actual width of cell **A,** in µm, along the dotted line in Fig. 1.1.

actual width: ..... [1]

(b) Suggest and explain if the cells are plant or animal cells.

.....

..... [1]

(c) Cells **A** and **B** are undergoing mitosis. State which stages they are in.

A: .....

B: ..... [2]

(d) Explain why it is important for cells **A** and **B** to undergo mitosis.

.....

..... [1]

(e) State one difference between daughter cells produced from mitosis and daughter cells produced from meiosis.

.....

..... [1]

2 Paracetamol is a drug that is commonly taken to reduce fever.

A study was found that the time taken for the stomach to release its contents to the small intestine affected the peak concentration of paracetamol in the bloodstream.

Fig. 2.1 shows the results of the study.

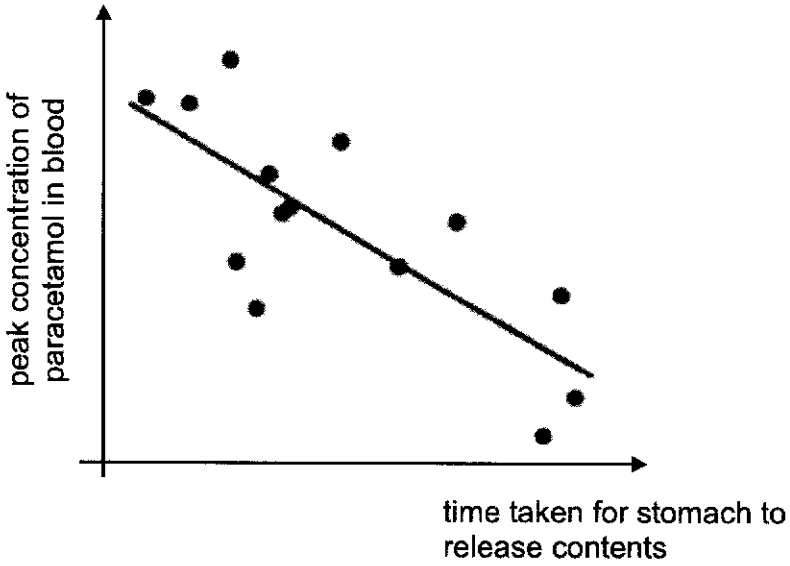


Fig. 2.1

(a) **(i)** State where absorption of paracetamol most likely occurs.

..... [1]

(ii) Describe and explain two ways the structure in **(a)(i)** is adapted for absorption of paracetamol.

.....

.....

.....

..... [2]

(b) Suggest how paracetamol can be protected from being broken down before it can be absorbed.

.....

..... [1]

(c) Suggest an explanation for the trend shown in Fig. 2.1.

.....

..... [1]

3 Using the set-up shown in Fig. 3.1, the rate of photosynthesis of the plant at varying carbon dioxide concentrations was investigated at 10 °C and 30 °C.

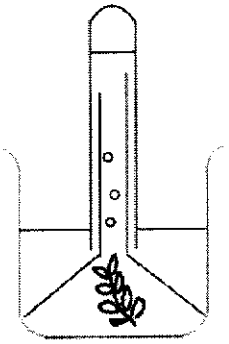


Fig. 3.1

(a) Describe how the rate of photosynthesis of the plant in Fig. 3.1 can be determined.

.....

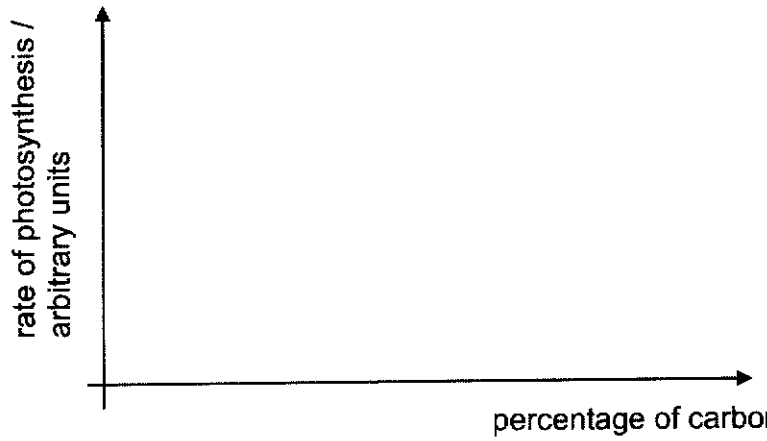
..... [1]

(b) Sketch a line graph each on the axes to show:

1 the effect of carbon dioxide on the rate of photosynthesis at 10 °C

2 the effect of carbon dioxide on the rate of photosynthesis at 30 °C

Assume all other factors are kept constant.



[2]

4 Fig. 4.1 shows a photomicrograph of a section of a human lung.

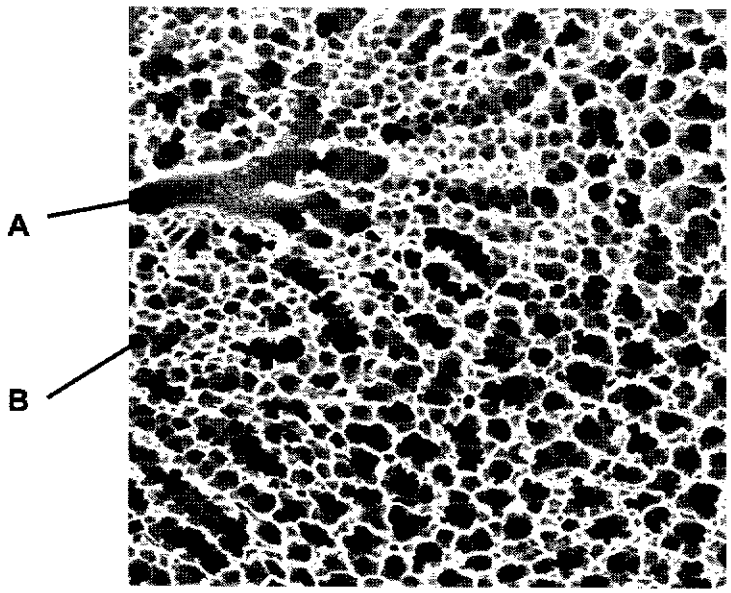


Fig. 4.1

(a) Identify the structures labelled **A** and **B.**

(i) **A:** ..... [1]

(ii) **B:** ..... [1]

(b) Explain the advantage of having multiple small alveoli instead of fewer but larger alveoli.

.....

..... [1]

(c) Pneumonia is a condition in which inflammation of the lungs cause alveoli to be filled with fluid.

Suggest how gaseous exchange is affected by pneumonia.

.....

.....

..... [1]

(d) Suggest why smokers may be more severely affected by pneumonia than non-smokers.

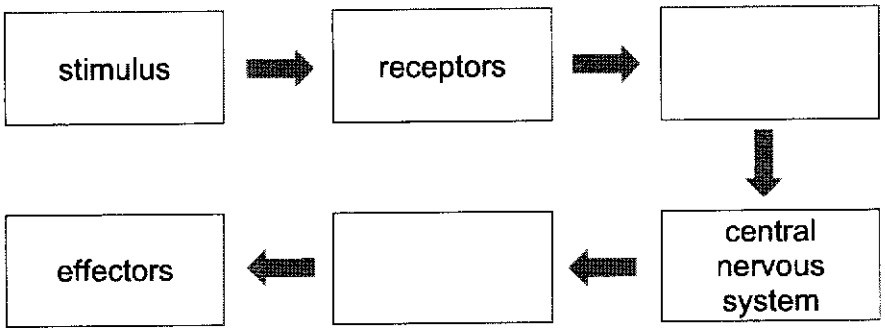
.....

.....

.....

..... [2]

5 The figure shows how the human nervous system coordinates certain responses.



(a) Complete the figure by filling in the empty boxes. [1]

(b) Suggest a possible stimulus and receptor that would lead to the contraction of a muscle.

stimulus: .....

receptor: ..... [2]

(c) When a person has a fever, the body maintains the body temperature above the normal temperature.

Suggest two ways the body can raise its temperature to cause the fever.

.....

.....

.....

..... [2]

6 Fig. 5.1 shows part of a flower of a *Lilium candidum.*

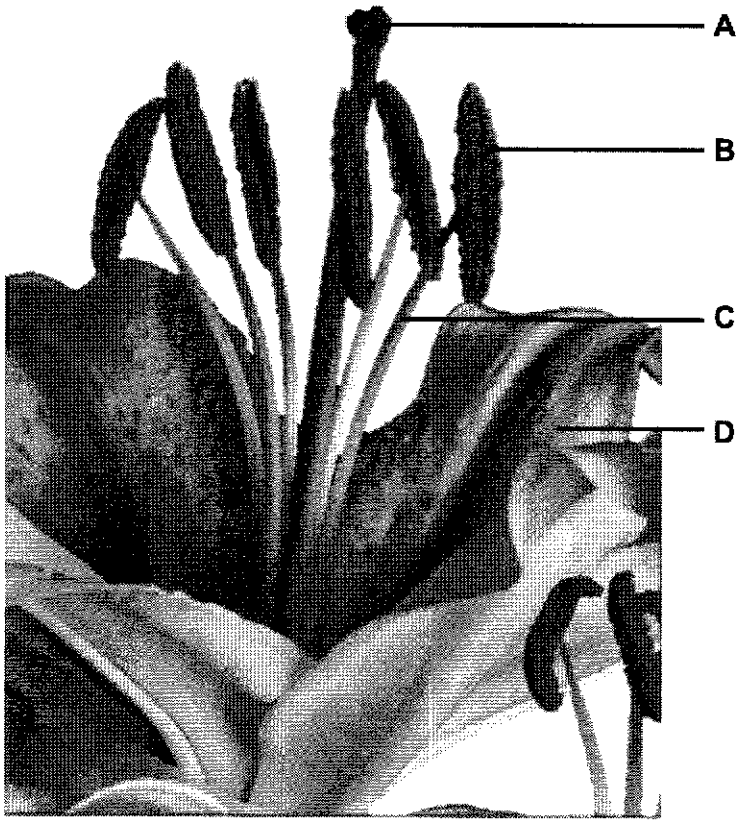


Fig. 5.1

(a) Name the parts labelled **C** and **D**.

C .....

D ..... [2]

(b) Identify the parts labelled **A** and **B**, and describe their roles in pollination.

.....

.....

.....

..... [3]

(c) **(i)** Define *fertilisation.*

..... [1]

(ii) State where fertilisation occurs in a flower.

..... [1]

7 The graph shows the concentration of two reproductive hormones in the blood of an adult female. It also shows the thickness and percentage by mass of blood capillaries in her uterine lining.

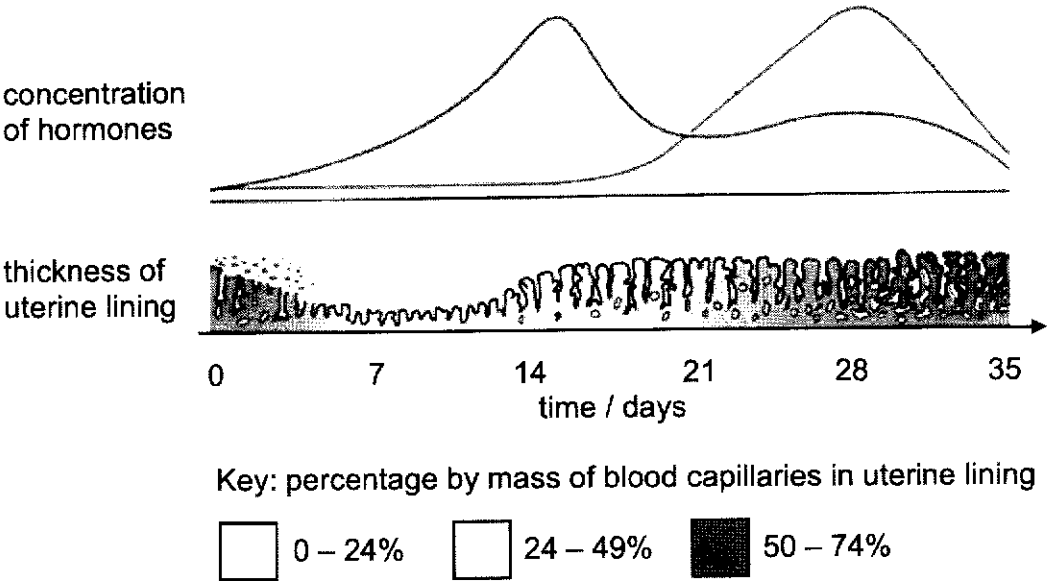


Fig 7.1

(a) Describe and explain what happens to the uterine lining in days 0 – 5.

.....

.....

..... [2]

(b) Using information from the graph,

(i) suggest which day ovulation could have occurred.

..... [1]

(ii) describe two effects of progesterone.

.....

.....

..... [2]

8 **(a)** The diagram shows a sequence of double stranded DNA. Each row represents a strand of DNA. Complete the diagram by filling in the missing bases.

T	T	T				C	G	T
			A	C	G			

[2]

(b) State what is meant by a *transgenic plant*.

.....

..... [1]

(c) Discuss three social and ethical implications of transgenic rice plants that produce more rice grains than normal rice plants.

.....

.....

.....

.....

.....

.....

..... [3]

9 **(a)** Apart from the presence of haemoglobin, explain how red blood cells are adapted to their function.

.....

.....

..... [2]

(b) Sickle cell anaemia is caused by a mutation in the gene controlling haemoglobin production. The mutated gene is recessive. Individuals who are homozygous recessive have the disease. Individuals who are heterozygous are called carriers.

Complete the genetic diagram below to show the possible offspring of parents who are both carriers. Use H to represent the dominant allele, and h to represent the recessive allele.

	father		mother	
parental genotype	.....		.....	
gametes	.....	.....	.....	.....
offspring genotype	.....	.....	.....	.....
offspring phenotype	.....	.....	.....	..... [4]

(c) The couple in **(b)** have three children who have normal haemoglobin, and are not carriers. Explain why this does not follow the phenotypic ratio in **(b)**.

.....

.....

..... [1]

SECTION B – LONG-STRUCTURED QUESTIONS (30 marks)

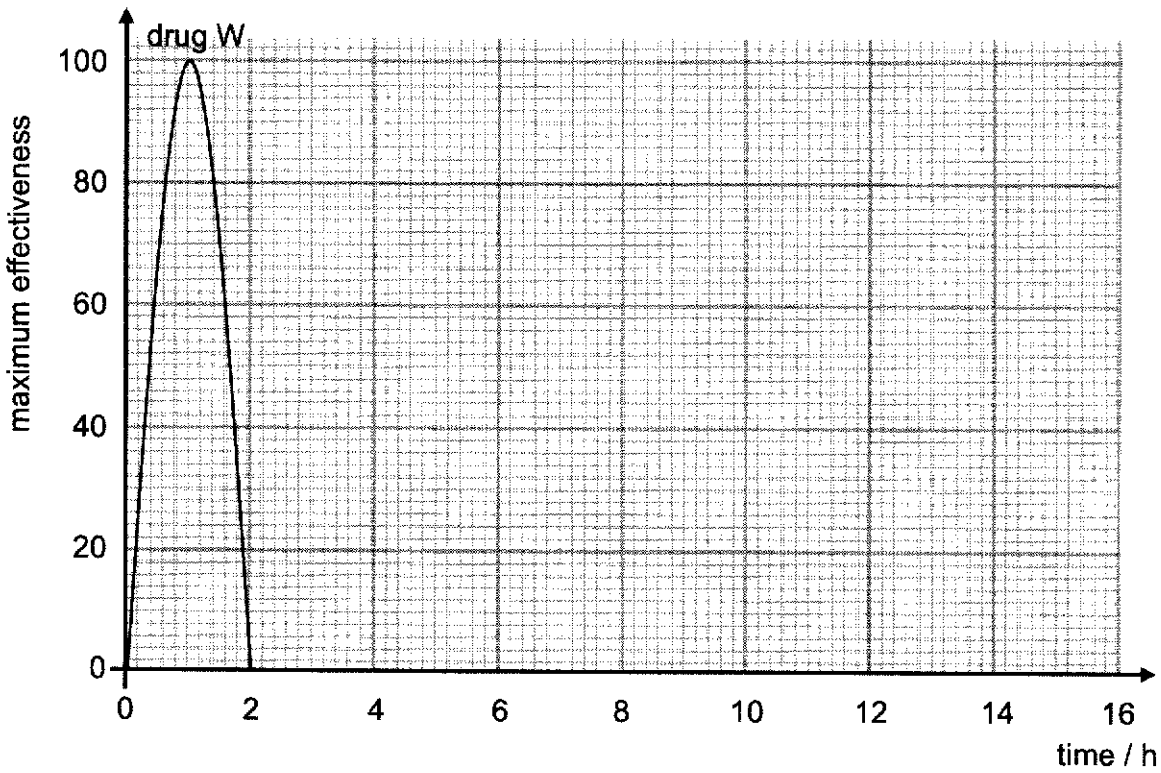
Answer **three** questions in the spaces provided. Question 3 is in the form of an Either / Or question. Only one of the alternatives should be answered.

10 Four types of insulin were studied for their effectiveness in treating diabetes mellitus. The results of the study were recorded in the table below. All the times recorded were from the point of ingestion of the drugs.

Table 1.1

drug	W	X	Y	Z
time taken for drug to start working / h	0	1	1.5	1.5
time taken for drug to reach maximum effectiveness / h	1	2	3	8
time taken for effect to wear off /h	2	4	12	16
maximum effectiveness / arbitrary units	100	80	60	40

(a) Plot the data below. The graph for drug W has already been plotted for you.



[4]

(b) Explain how insulin helps regulate blood glucose concentration.

.....

.....

.....

.....

..... [3]

(c) Suggest one advantage and one disadvantage of using drug Y to treat diabetes mellitus.

advantage: .....

.....

disadvantage: .....

..... [2]

(d) A person with diabetes mellitus is planning to have a meal at 12 pm. Suggest and explain what time the person should consume drug W.

.....

.....

..... [1]

11 **(a)** Define a *gene*.

.....

..... [1]

(b) State how variation occurs in

(i) meiosis

.....

..... [2]

(ii) fertilisation

.....

..... [1]

(c) Explain how natural selection can lead to evolution.

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

EITHER

12 (a) Describe the differences in structure of xylem and phloem tissue.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

(b) Describe how a water molecule enters and eventually leaves a plant.

.....

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.....

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.....

.....

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.....

.....

.....

..... [6]

Or

12 **(a)** Describe the differences in the structure and function of arteries, veins and capillaries.

.....

.....

.....

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.....

.....

.....

.....

.....

.....

..... [6]

(b) Outline the pathway an amino acid molecule takes from its entry into the bloodstream to its absorption by a heart muscle cell. Include the names of relevant blood vessels and organs.

.....

.....

.....

.....

.....

.....

..... [4]

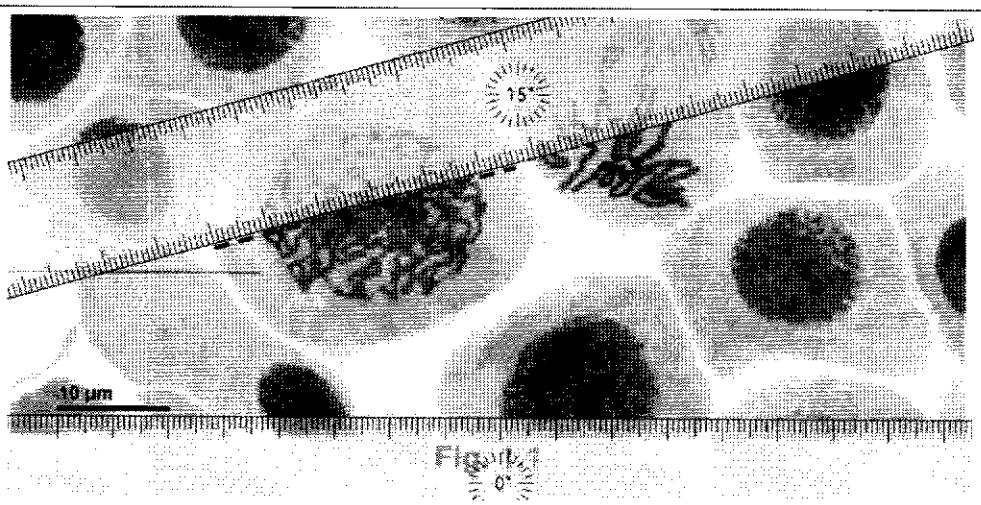
- End of Paper -

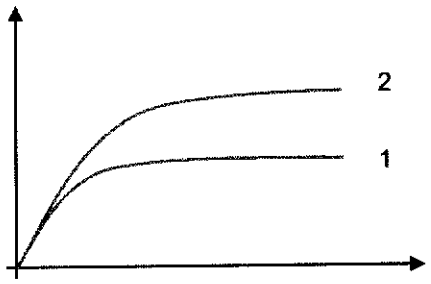
ASSUMPTION ENGLISH SCHOOL
Sec 4 Biology 6093 Marking Scheme
Prelims 2020

Paper 1 (40 m)

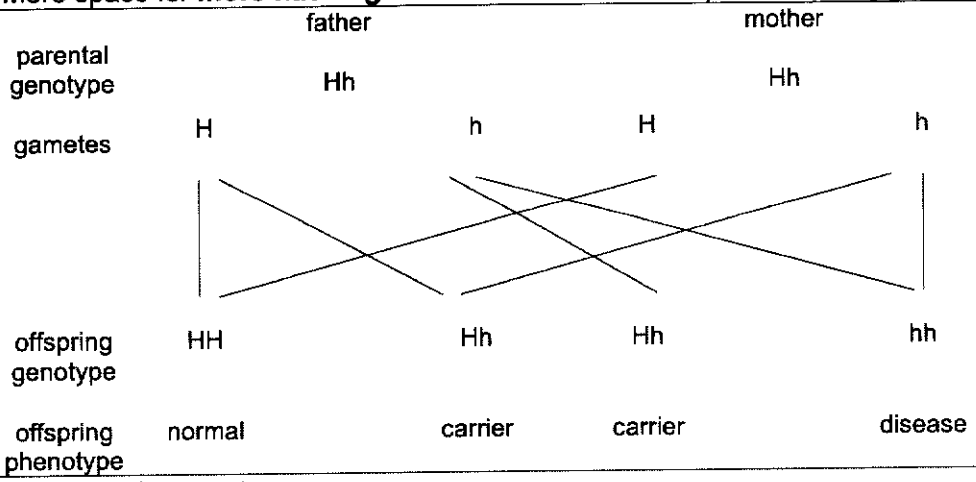
Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
B	B	D	B	A	D	B	C	D	B
Q11	**Q12**	**Q13**	**Q14**	**Q15**	**Q16**	**Q17**	**Q18**	**Q19**	**Q20**
B	A	C	C	C	B	A	D	C	B
Q21	**Q22**	**Q23**	**Q24**	**Q25**	**Q26**	**Q27**	**Q28**	**Q29**	**Q30**
C	C	A	D	C	A	B	B	A	D
Q31	**Q32**	**Q33**	**Q34**	**Q35**	**Q36**	**Q37**	**Q38**	**Q39**	**Q40**
C	C	C	A	C	A	B	D	B	D

Paper 2 Section A (50 m)

1	a	 56 ÷ 20 x 10 = 28 µm *Accept 26 – 30 µm*	1
	b	Animal – the cells do not have a large central vacuole Plant – the gaps between the cells could be cell walls *Any reasonable answer*	1
	c	A: Prophase B: Anaphase	1 1
	d	For **growth** of the organism/for **repair** of damaged tissues R: *repair of damaged cells*	1
	e	Daughter cells of mitosis are **genetically identical/diploid** Daughter cells of meiosis are **not genetically identical/haploid**	1

2	**ai**	Ileum/small intestine	1
	aii	It is **long,** allowing **more time for absorption** It contains **many villi, increasing surface area to volume ratio** for more efficient absorption The epithelial cells of the villi have **many microvilli, increasing surface area to volume ratio** for more efficient absorption The villi contain **a network of capillaries** that **constantly transport absorbed paracetamol away, maintaining a low concentration of paracetamol** within the villi for **more efficient absorption/diffusion** *Description + matching explanation required for credit*	Any 2
	b	An acid resistant coat/mucus coat to prevent it from reacting with stomach acid. *Any reasonable answer.*	1
	c	*Trend: The more time taken for stomach to release contents, the lower the peak concentration of paracetamol in blood* The longer the time taken for the stomach to release its contents, the **lower the amount of paracetamol available in the small intestine for absorption at any point in time**, reducing the peak concentration of paracetamol in blood.	1
3	a	As the plant photosynthesises, it produces oxygen. Rate of photosynthesis can be determined by measuring the **number of bubbles/volume of gas** produced **per unit time.**	1
	b	 *Both graphs must increase then plateau* *2 must plateau higher than 1* *Increase at decreasing rate not required.*	1 ea

4	a	A: Bronchiole B: Alveolus	1 1
	b	Increased **surface area to volume ratio** of the lungs to allow for more efficient gas exchange.	1
	c	The liquid **increases the distance** that **oxygen** needs to travel in order to reach the bloodstream OR the distance that **carbon dioxide** needs to travel to leave the fluid in the lungs Reducing efficiency of gas exchange.	1
	d	**Tar** from tobacco **smoke** may prevent **cilia** from working properly, And the smoker **may not be able to remove fluid from the lungs** as quickly as a non-smoker 1m – Effect of toxic component of tobacco smoke 1m – Link to pneumonia/comparison to non-smoker *Any logical answer*	1 1
5	a	sensory neurone motor neurone	1
	b	Stimulus: touching a hot object Receptor: temperature receptor in the skin Stimulus: entering a dark/bright room/looking far/near Receptor: photoreceptors on the retina *Any reasonable answer*	1+1 1+1
	c	Shivering; Increasing rate of respiration; Reducing the amount of sweat secreted by sweat glands; vasoconstriction of arterioles near skin surface	Any 2
6	a	C: filament D: petal	1 1
	b	**Stigma:** receives **pollen grains** during pollination. **Anther: produces pollen grains** *[4 correct – 3m, 3 correct – 2m, 1-2 correct – 1m]*	3
	c i	The **fusion** of the nucleus **of a sperm** and **egg** to form a **zygote**	1
	c ii	Ovary/ovule	1
7	a	The uterine lining **breaks down** and is **discharged** from/**flows out** of the body As **progesterone and oestrogen levels are low**.	1 1
	b	Accept any day from 19 – 23 (between peaks of oestrogen and progesterone)	1
	c	**Maintain thickness** of the uterine lining **Increase the number of blood capillaries** in the uterine lining.	1 1

8	a	<table><tr><td>T</td><td>T</td><td>T</td><td>T</td><td>**G**</td><td>**C**</td><td>C</td><td>G</td><td>T</td></tr><tr><td>**A**</td><td>**A**</td><td>**A**</td><td>A</td><td>C</td><td>G</td><td>**G**</td><td>**C**</td><td>**A**</td></tr></table> 2m if all correct, 1m for 7 or 8 correct.	2
	b	A plant that has **received genes** from **another individual of the same/a different species**	1
	c	*Social* Rich farmers may have greater access to these plants than poorer ones Greater yield may mean rice can be sold more cheaply/more people can have access to food Companies with the transgenic rice grains may make them unable to germinate, causing farmers to have to bear greater costs *Ethical* Vegetarians may object to consuming rice plants with animal genes If untested, the transgenic protein may cause allergies in some people It may be morally wrong if animals are exploited for research on the transgenic rice plant Some people may object to transgenic organisms as it is deemed playing god/going beyond what humans should be allowed to do. Irresponsible handling of ecological/health impacts *Max 2 for either social or ethical implications.* *1m each, accept any reasonable answer,*	3
9	a	**Biconcave shape;** **increases surface area to volume ratio** to increase **efficiency of oxygen uptake** into the cell OR **No nucleus;** More space for **more haemoglobin** so the cell can transport **more oxygen**	1+1 1+1
	b	 1m for each correct row	4
	c	**Each fertilisation** is **independent** of each other, and they do not affect the outcomes of the rest ***OR*** The phenotypic ratio does not translate to the number of children with each phenotype. It **only accounts for** the **percentage chance** of offspring having a specific phenotype. *owtte*	1

Paper 2 Section B (30 marks)

10	a	Start, max, end correctly plotted for X, Y, Z – 1m ea (Graphs can be straight lines/curves) Graphs labelled/legend provided – 1m	4
	b	When blood glucose concentration **rises above normal**; insulin is **released** by the islets of Langerhans in the **pancreas;** Insulin stimulates the **conversion of glucose to glycogen** in the **liver/muscles** OR causes the **liver/muscles** to take up **more glucose** from the blood; This causes **blood glucose concentration to decrease** to normal levels. *4 points – 3m, 3 points – 2m, 1/2 points – 1m.*	3
	c	Advantage: Drug Y takes a longer time to wear off, so the person doesn't need to consume the drug too many times a day Disadvantage: Drug Y takes 3h to reach max effectiveness/takes 1.5h to start working, and will not be effective at treating an immediate spike in blood glucose concentration Drug Y's effectiveness s only 60 AU, so a larger dose may be required each time *Link drug property to real life effects/compare it to other drugs*	1 1
	d	1 pm. Digestion takes some time, consuming the drug after the meal will allow the drug to be effective when blood glucose concentration is increasing. *Accept any reasonable timeframe that matches the spike in blood glucose level after digestion and absorption.*	1
11	a	A **unit of inheritance/A sequence of DNA** nucleotides that codes for a **particular protein/polypeptide.**	1
	b i	**Crossing over** and **independent assortment** during meiosis produce gametes that are not genetically identical to each other or to parent cells.	1 1
	b ii	Fertilisation involves the meeting of **random gametes** that carry **different alleles** for different genes from each parent.	1
	c	a. **Mutations** in individuals in a species b. result in **variation** in the organisms. c. In the presence of selection pressures such as **competition for food** or **predators** d. **Favourable traits** will confer a **selective advantage.** e. Allowing those individuals to **survive and reproduce** f. Causing most of the population to be made out of **individuals with that trait**	1 1 1 1 1 1

either

12 a

	xylem	phloem
Type of cells	Made up of xylem cells	Made up of sieve tube cells and companion cells
Protoplasm	No protoplasm	Little protoplasm in sieve tube cells
Mitochondria	No mitochondria	Many mitochondria in companion cells
Lignin	Cell walls contain lignin	Cell walls do not contain lignin
Cross walls	No cross walls	Have sieve plates between sieve tube cells

1m for every difference in which structure of xylem AND phloem are both stated — 4

b

Absorbed by **root hair cells** via **osmosis**.
Travels down the **water potential gradient** inwards within the root
Transported up the **xylem** in the stem via **transpiration pull**
Moves from xylem to **mesophyll cells** via **osmosis**
Moves out of cells to thin **film of moisture** via osmosis
Evaporates to **water vapour** in **intercellular air spaces**
Water vapour molecules **diffuse out** of the **stomata** — 6

All points – 6m; 6 points – 5m; 5 points – 4m; 4 points – 3m, 3 points – 2m; 1 to 2 points – 1m.

or

12 a

	Arteries	Veins	Capillaries
Thickness of wall	Thick, muscular, elastic walls	Thinner, muscular, less elastic walls	Cells are one cell thick/no muscular or elastic tissue
Lumen	Smaller lumen than veins	Largest lumen	Smallest lumen
Valves	Absent	Present	Absent
Direction of blood flow	Carry blood away from heart	Carry blood towards heart	Carry blood from arteries/arterioles to veins/venules
Oxygen level of blood	Oxygenated (except for pulmonary artery)	Deoxygenated (except for pulmonary vein)	Oxygen level falls as blood is transported from artery to vein end.

2m each for accurate comparison between artery, vein and capillary.
1m max for accurate comparison between 2 blood vessels — 6

b

Absorbed in **small intestine/ileum** via diffusion/active transport into a capillary
Carried in blood via **hepatic portal vein** to the **liver**
Transported via **hepatic vein** to the
vena cava to the heart
Transported via the **pulmonary artery** To the **lung**
Transported by the **pulmonary vein** back to the heart
Where it's pumped into the **aorta**
Then to the **coronary artery**
Where it **diffuses** out of a capillary and into a heart muscle cell. — 4

1m for every 2 points.

Paper 3 (40m)

<table>
<tr><td>1</td><td>a</td><td>**Carbon dioxide** can be found in **exhaled** air.
The carbon dioxide dissolved into the indicator to form a weak acid (carbonic acid), **lowering** the **pH**</td><td>1

1</td><td>ACE</td></tr>
<tr><td></td><td>b</td><td>sample values

Table 1.1

Temperature = 33.0 °C

<table>
<tr><th>Test-tube</th><th>time at start</th><th>time at end</th></tr>
<tr><td>1</td><td>2 min 10 s</td><td>6 min 56 s</td></tr>
<tr><td>2</td><td>6 min 59 s</td><td>8 min 26 s</td></tr>
<tr><td>3</td><td>8 min 30 s</td><td>9 min 30 s</td></tr>
<tr><td>4</td><td>9 min 32 s</td><td>10 min 34 s</td></tr>
<tr><td>5</td><td>10 min 34 s</td><td>11 min 11 s</td></tr>
</table>

Table 1.2

Temperature = 36.0 °C

<table>
<tr><th>Test-tube</th><th>time at start</th><th>time at end</th></tr>
<tr><td>1</td><td>16 min 30 s</td><td>20 min 30 s</td></tr>
<tr><td>2</td><td>20 min 34 s</td><td>22 min 54 s</td></tr>
<tr><td>3</td><td>23 min 00 s</td><td>24 min 20 s</td></tr>
<tr><td>4</td><td>24 min 25 s</td><td>24 min 45 s</td></tr>
<tr><td>5</td><td>24 min 52 s</td><td>25 min 35 s</td></tr>
</table>

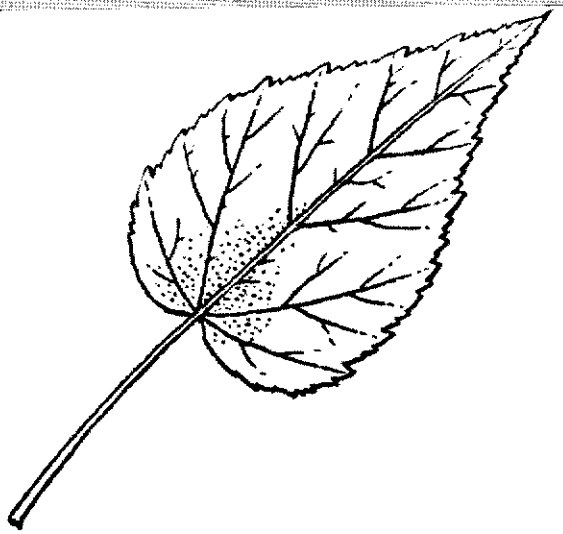
a. data collected for all tubes;
b. temperature recorded to 0.5 °C;
c. at least two results circled;
d. mean time corrected accurately in seconds (**in whole numbers**);
e. test-tube 1 timing does not start at zero;
f. Table 1.2 start timing is after test-tube 5 (table 1.1) end timing</td><td>6</td><td>MMO
PDO</td></tr>
<tr><td></td><td>c</td><td>The first tube takes a much longer time to change colour than the rest.
Taking the mean from all the results will cause the time taken to be longer than expected/include unnecessary outliers;</td><td>1
1</td><td>PDO</td></tr>
<tr><td></td><td>d</td><td>correct calculations to three s.f for both</td><td>2</td><td>PDO</td></tr>
<tr><td></td><td>e</td><td>S - appropriate width and scale;
L - correct bar labels;
A - correct axis label;
P - correct bar heights;</td><td>4</td><td>PDO</td></tr>
<tr><td></td><td>f</td><td>Similarity: the time taken for tube 1 to change colour is much more than the other tubes.
Explanation: The air in the syringe and rubber tubing needs to be removed first before the carbon dioxide can reach the indicator.

Difference: the time taken for the second experiment is shorter than the first experiment.
Explanation: The enzymes in the yeast in the second experiment is closer to optimum temperature. The rate of respiration is higher.</td><td>1

1

1

1</td><td>ACE</td></tr>
</table>

	g	The control would be a **glucose solution without yeast**. The control would show that **yeast is responsible** for the respiration and **change of colour**;	1 1	P
	h	measure temperature increase; measure volume of carbon dioxide released;	1 1	P
	i	repeat the experiment using yeast-glucose suspension at **different pH** (pH 4,5,6,7,8,9,10 [at least 5 readings]) ; but at the **same temperature**; The pH can be altered by **adding drops of acid or alkali** and measuring the pH using a pH meter; the **mean time** for the indicator to turn yellow can be recorded at each pH; The rate of respiration for each pH can be calculated using the same formula: **1000/t** and any effect of pH changes can be seen by difference in values;	4	P
2	a	 a. large drawing; b. continuous, clean lines; c. network of veins clearly seen; d. jagged edges clearly seen;	4	MMO
	b	correct measurements and calculation and **indication on drawing**; correct magnification with units;	1 1	PDO
	c i	A: guard cell B: (palisade) mesophyll cell C: cuticle D: xylem every 2 correct – 1 m	2	ACE
	c ii	every 2 correct – 1m	2	ACE
	d	The air spaces allow **more carbon dioxide** to **enter** the leaf/allow carbon dioxide to **reach more mesophyll cells/**allow the leaf to **store carbon dioxide**. The carbon dioxide can **diffuse** into the mesophyll cells **more quickly**	1 1	ACE

FUCHUN SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2020
SECONDARY FOUR EXPRESS / FIVE NORMAL (ACADEMIC)

CANDIDATE NAME		CLASS	
CENTRE NUMBER	S	INDEX NUMBER	

BIOLOGY
Paper 1

6093/01
2 September 2020
1 hour

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

READ THESE INSTRUCTIONS FIRST

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

There are **forty** questions in this section. Answer **all** questions.
For each question there are four possible answers **A**, **B**, **C** and **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.

Setter: Mr Philemon Foo

This document consists of 22 printed pages.