



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

CANDIDATE NAME

CLASS

CENTRE NUMBER

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INDEX NUMBER

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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.

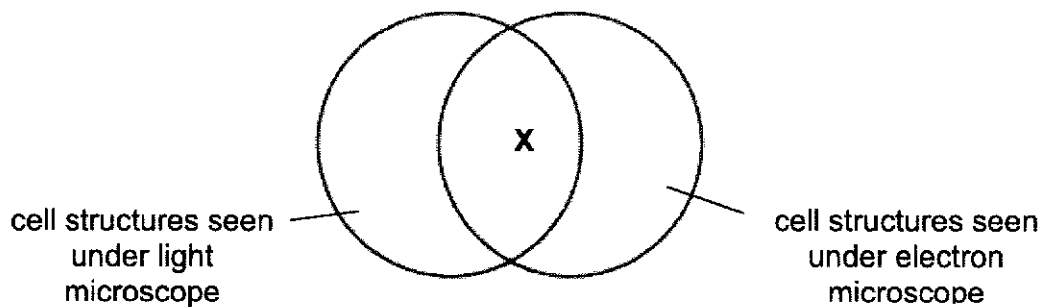
- 1 During a lesson about animal and plant cells, a student reads out a number of statements about cell structure.

Which of his statements are correct?

- 1 All cells have a cell wall.
- 2 Cell walls are made of cellulose.
- 3 Chromosomes carry DNA.
- 4 Cell walls contain starch.
- 5 All cells have a cell membrane.
- 6 A sap vacuole helps an animal cell maintain its turgor.
- 7 Chromosomes are found in the cytoplasm.

- A** 1, 3 and 7
B 2, 3 and 5
C 2, 4 and 6
D 4, 5 and 7

- 2 The diagram shows how the structural features found in a plant cell can be classified under those that can be seen under the light microscope and under the electron microscope.



Which of the following structural feature is most likely to be found in region X?

- A** chloroplasts
B endoplasmic reticulum
C Golgi body
D ribosomes

3 Which classes of food contain the elements shown?

	carbohydrates	fats	proteins
A	C, H, O	C, H, O	C, H, O and N
B	C, H, O	C, H, O and N	C, H, O
C	C, H, O	C, H, O and N	C, H, O and N
D	C, H, O and N	C, H, O	C, H, O

4 Which processes depend on the fact that water is a solvent?

key

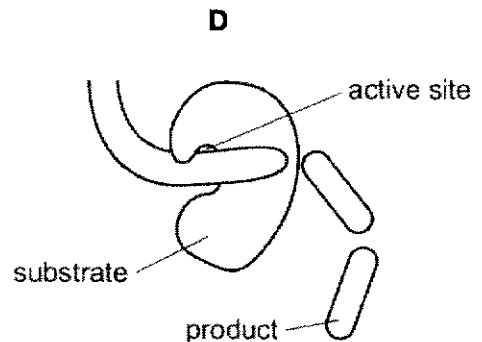
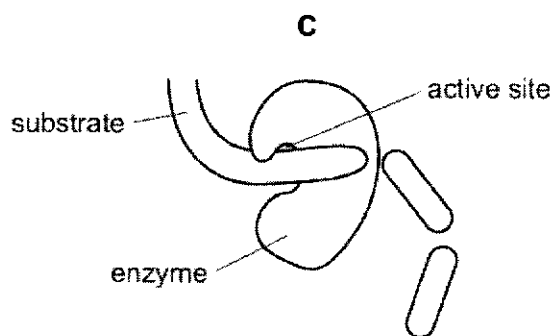
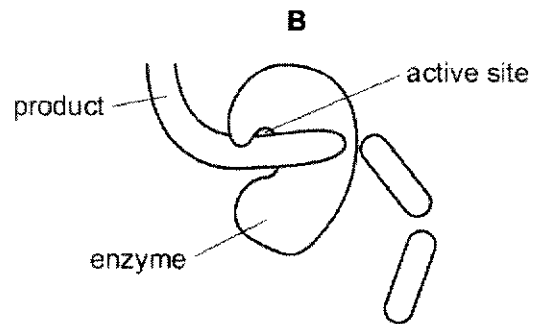
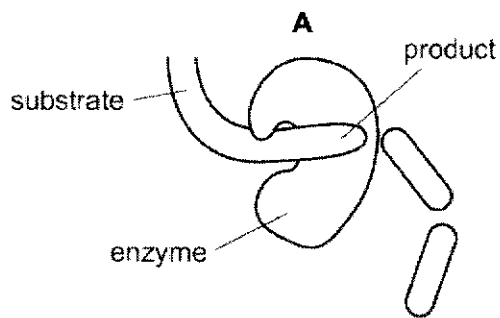
✓ : depends on

× : does not depend on

	evaporation from the spongy mesophyll cells	glucose transported in blood plasma	movement of water by osmosis	loss of sweat from the skin surface
A	✓	✓	✓	×
B	✓	✓	✓	✓
C	✓	×	×	×
D	×	✓	✓	×

- 5 The diagrams show a protease enzyme catalysing the breakdown of part of a protein molecule into smaller pieces.

Which diagram has three correct labels?



- 6 The cholera bacterium produces toxins that cause chloride ions to be secreted from the blood capillary into the small intestine.

How does this affect the water potential of blood in the intestinal capillaries and the intestinal contents?

	water potential	
	blood in capillaries	contents of small intestine
A	lowered	lowered
B	lowered	raised
C	raised	lowered
D	raised	raised

7 A student investigates the breakdown of fats in milk by lipase.

Four test-tubes labelled **A** to **D** are set up.

The table shows the contents of each test-tube.

Each of them was added with milk.

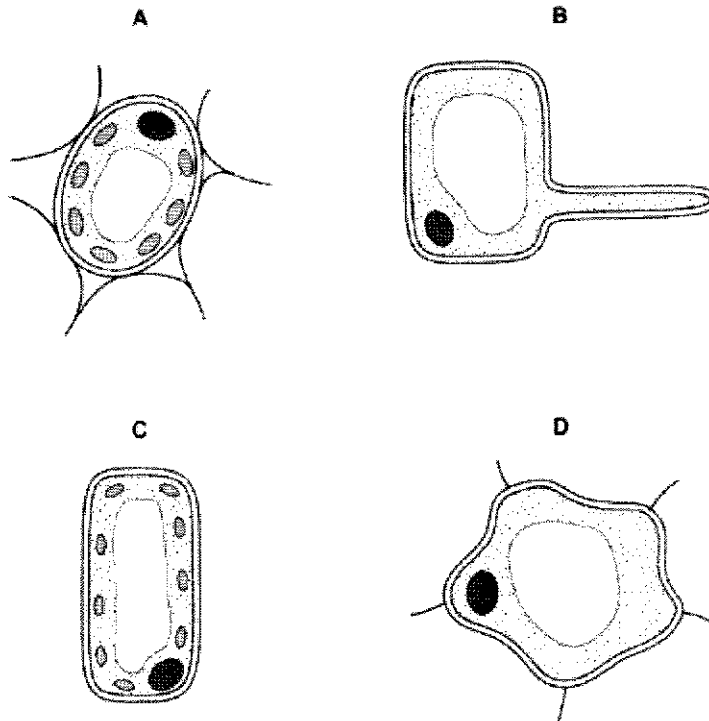
In which test-tube will the contents become acidic **most** quickly?

	bile	boiled lipase	lipase
A	✓	x	✓
B	✓	✓	x
C	x	✓	x
D	x	x	✓

key
 ✓: present
 x: absent

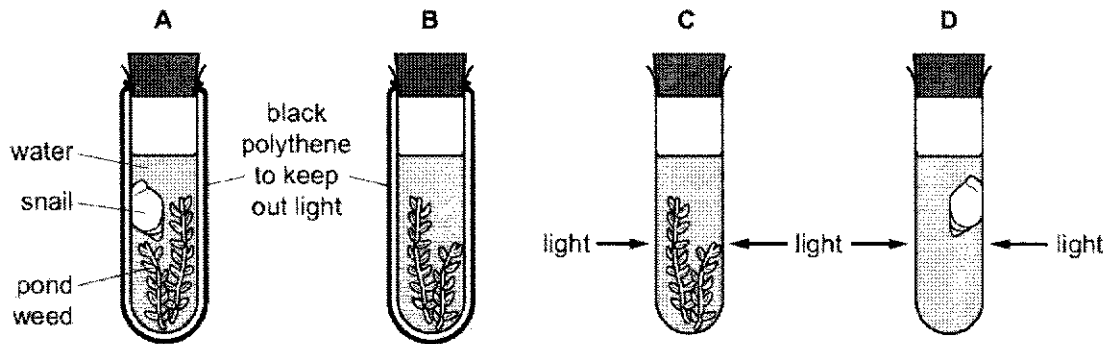
8 The diagrams show the structure of four different cells from a plant.

Which cell is from the upper epidermis of a leaf?



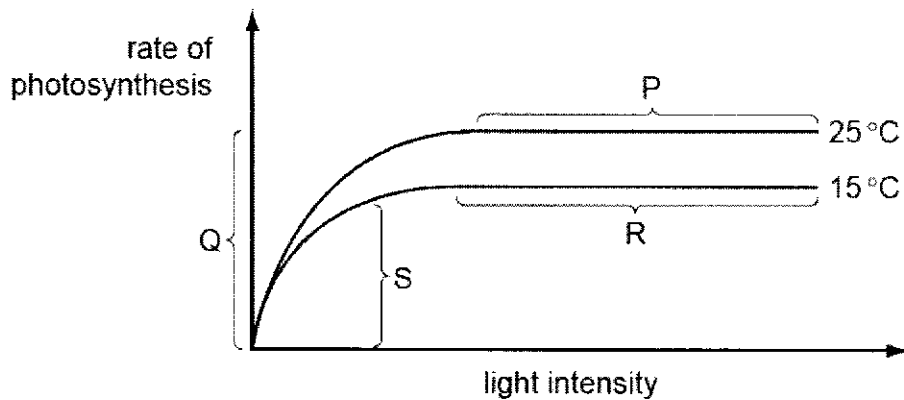
- 9 The diagram shows an experiment to investigate the balance between respiration and photosynthesis.

In which tube are photosynthesis and respiration taking place at the same time?



- 10 The graph shows how the rate of photosynthesis varies with light intensity at two different temperatures.

Other variables are kept the same.



In which sections of the graph is temperature limiting the rate of photosynthesis?

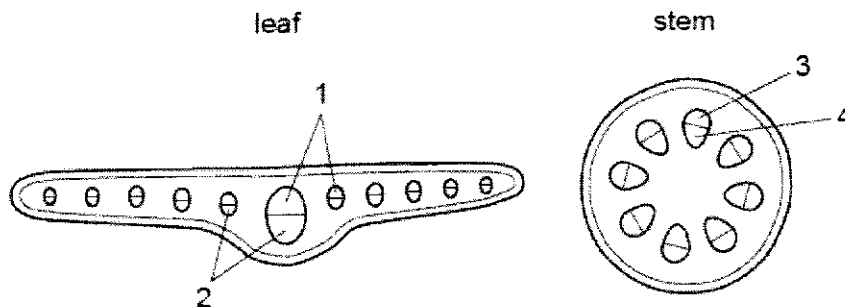
- | | | | |
|----------|---------|----------|---------|
| A | P and R | B | Q and R |
| C | Q and S | D | P and S |

11 Which conditions result in the highest rate of transpiration from a plant?

	percentage humidity	temperature / °C
A	60	15
B	60	25
C	100	15
D	100	25

12 In an experiment to investigate the transport of water, the roots of a plant are placed in water coloured with a dye.

The diagrams show sections of the leaf and the stem.



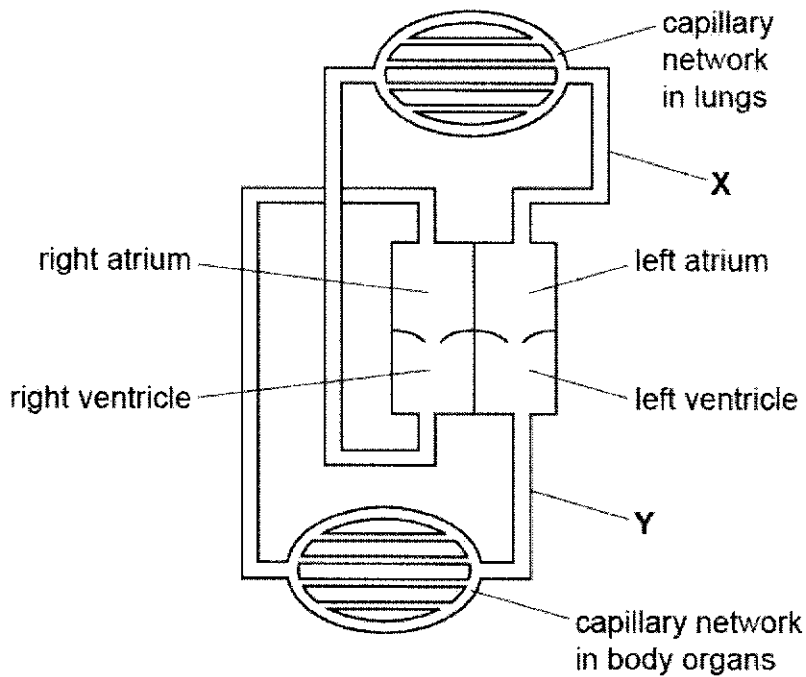
Which numbered parts will become stained by the dye as the water is initially absorbed?

	leaf	stem
A	1	3
B	1	4
C	2	3
D	2	4

13 Which type of cell in a plant is likely to contain a high number of mitochondria?

- A** companion cells
- B** epidermal cells
- C** sieve tube elements
- D** spongy mesophyll cells

- 14 The diagram shows the circulatory system of a mammal.



Which row describes the blood in vessels X and Y?

	X	Y
A	deoxygenated	deoxygenated
B	deoxygenated	oxygenated
C	oxygenated	deoxygenated
D	oxygenated	oxygenated

- 15 During the process of blood clotting, damage to blood vessels stimulates L, and M is converted to N.

What are L, M and N?

	L	M	N
A	fibrin	platelets	fibrinogen
B	fibrinogen	platelets	fibrin
C	platelets	fibrin	fibrinogen
D	platelets	fibrinogen	fibrin

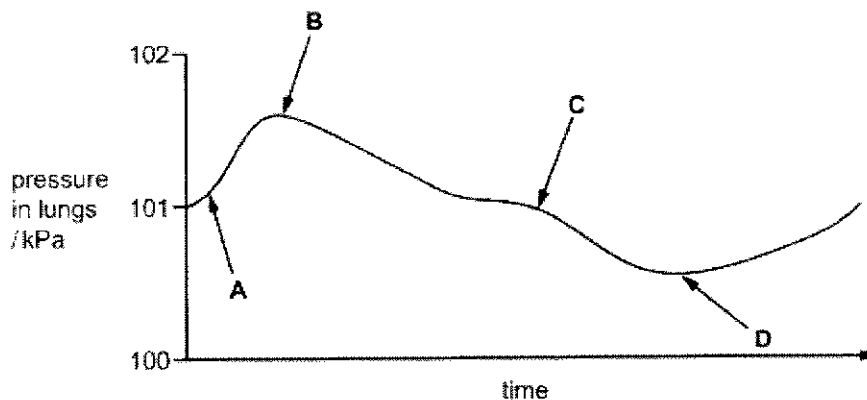
- 16 Lactic acid builds up in the muscles during vigorous exercise.

During recovery, how is this lactic acid removed?

- A aerobic respiration of lactic acid in the liver
- B anaerobic respiration of lactic acid in the muscles
- C excretion of lactic acid by the lungs
- D removal of lactic acid by the alimentary canal

- 17 The diagram illustrates changes in air pressure taking place inside the lungs during a complete cycle of breathing. Atmospheric pressure is 101 kPa.

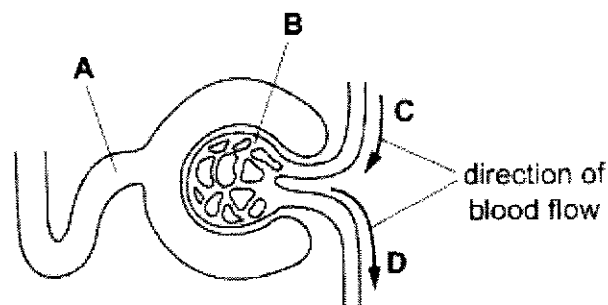
At which point on the diagram are the ribs beginning to be lowered?



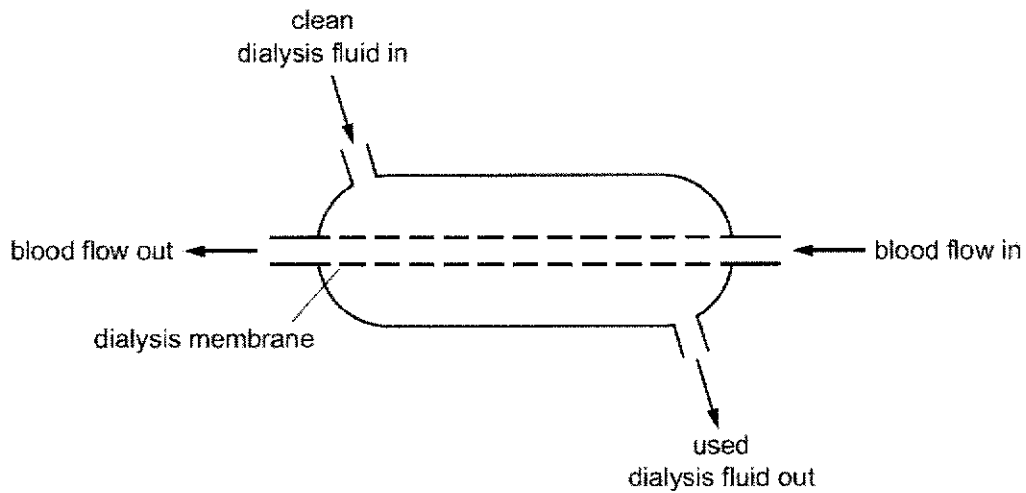
- 18 The diagram shows the first part of a kidney tubule and its blood supply.

During filtration, protein molecules do not pass through the wall of the glomerulus.

Which part contains the highest concentration of protein?



19 The diagram shows a simplified dialysis machine.

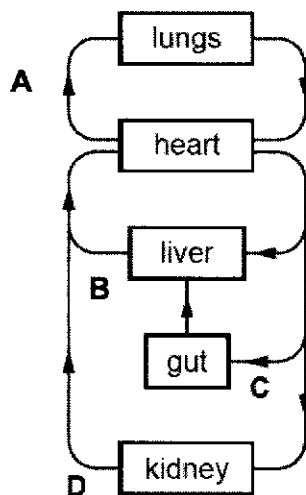


How do the urea concentrations in the blood and dialysis fluid change as they pass through the apparatus?

	urea concentration in blood	urea concentration in dialysis fluid
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

20 The diagram shows part of the human circulatory system.

In which vessel do the break-down products of hormones first appear?



- 21 The table shows a student's water losses on a cool day.

	water loss / cm ³
in urine	1500
in faeces	100
in expired air	400
in sweat	800
total	2800

The student's water intake on a hot day was the same as on the cool day.

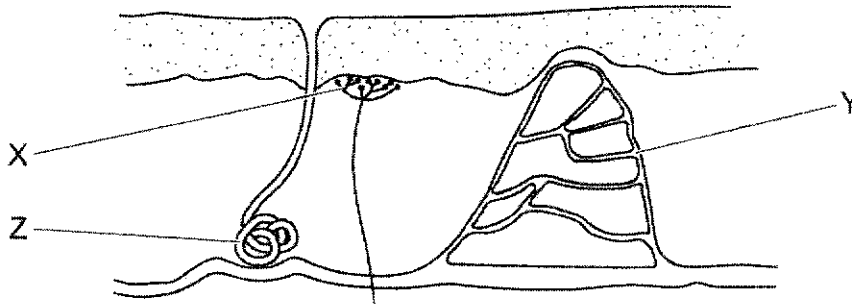
On the hot day, which water losses would increase and which would decrease?

	increase	decrease
A	in sweat	in expired air
B	in sweat	in urine
C	in urine	In faeces
D	in urine	In sweat

- 22 Why is glucose found in the urine of diabetics?

- A** increased uptake and use of glucose by the body cells
- B** not enough glucose in the blood is converted to glycogen
- C** stored fats in the body are being oxidised
- D** too much glucose is absorbed by the kidney cells

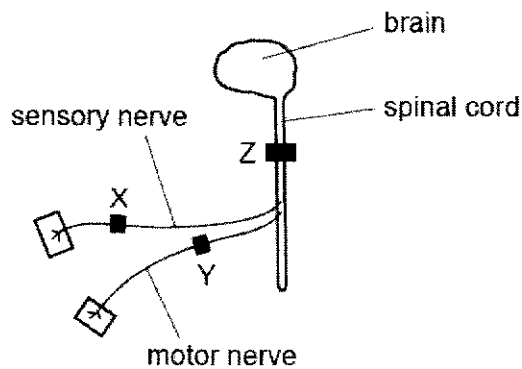
23 The diagram represents a section through the skin.



Which row shows the functions of the labelled parts?

	controls heat loss from blood	receives an external stimulus
A	Y	X
B	Y	Z
C	Z	X
D	Z	Y

24 The diagram shows the central nervous system which has been blocked in three different places by a drug used as an anaesthetic.



In an experiment involving four men, one had no anaesthetic block and the other three had only one anaesthetic block at X, Y or Z.

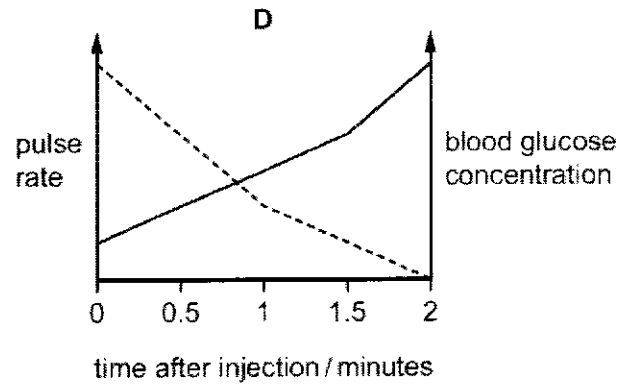
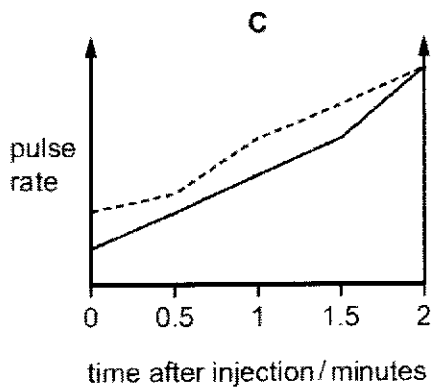
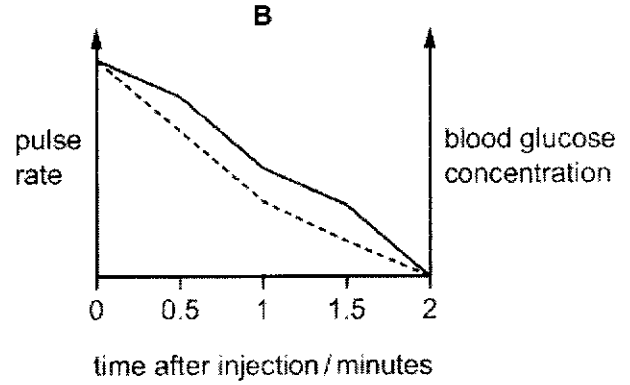
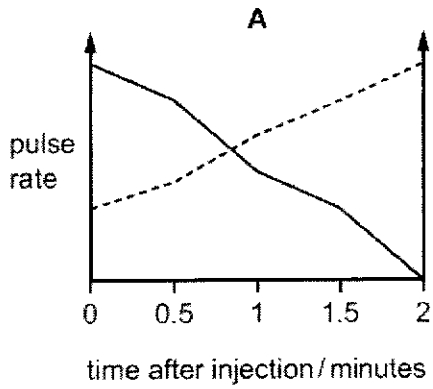
Which of the four men in the experiment can move his leg in response to a pinprick, but does not feel it?

- A** man with block at X
- B** man with block at Y
- C** man with block at Z
- D** man with no block

25 A patient is injected with adrenaline.

Which graph shows the expected changes to the patient's pulse rate and blood glucose concentration?

key
 ----- pulse rate
 ————— blood glucose concentration



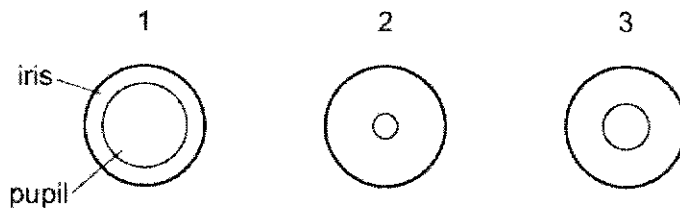
- 26 The diagram shows a vertical section through part of a human eye. A fly is coming nearer to the eye. The eye begins to focus the image of the fly on its retina.



How do the labelled parts of the diagram change?

	Q	R	S
A	contracts	thinner	tighter
B	relaxes	fatter	slacker
C	contracts	fatter	slacker
D	relaxes	thinner	tighter

- 27 The diagram shows the appearance of the iris and pupil in three different light conditions.



Which row shows the size of the pupil of the eye in each light condition?

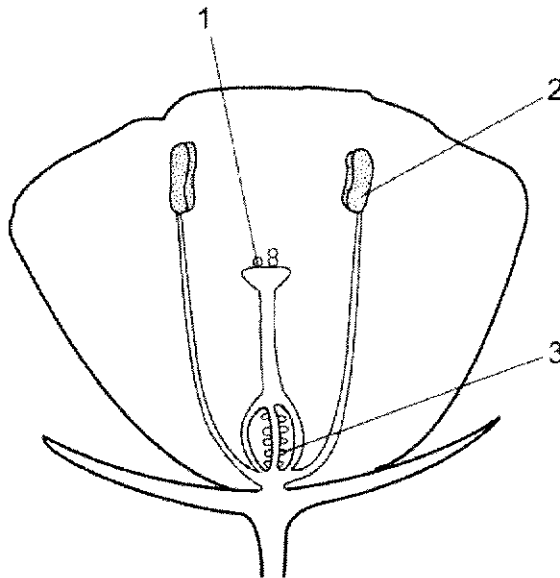
	no light	moderate light	bright light
A	1	2	3
B	1	3	2
C	2	1	3
D	3	2	1

- 28 Specific grape varieties are maintained using stem cuttings from mature plants that are then planted and cultivated to produce grapes.

This is an example of artificial asexual reproduction.

What is a disadvantage of using asexual reproduction to produce fruit?

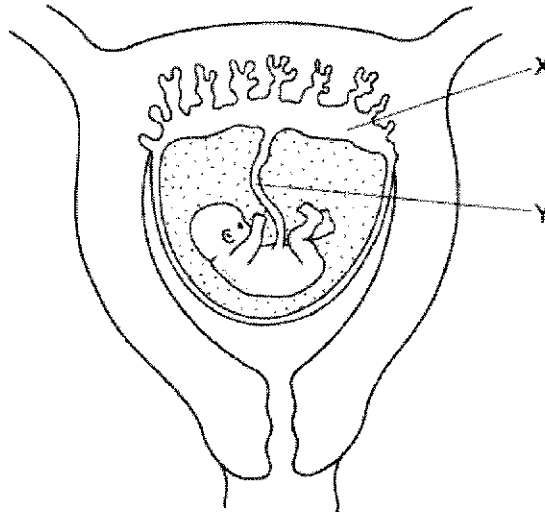
- A An outbreak of disease will affect the whole crop in the same way.
- B Genetically identical fruit is produced relatively quickly.
- C No pollination or pollinators are required.
- D The characteristics of the grapes will vary between plants.
- 29 The diagram shows a section through a flower.



Which statement is correct?

- A Fertilisation occurs at 1.
- B Haploid gametes are produced at 2 and 3.
- C Pollen is transferred by insects to 3.
- D The pollen grain fuses with the female nucleus at 2.

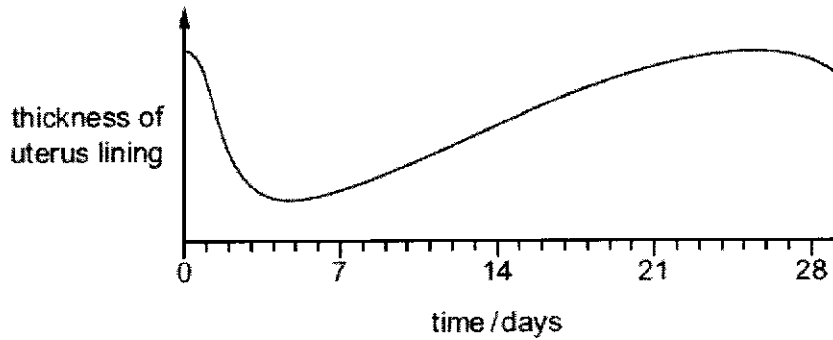
- 30 The diagram shows a fetus in the uterus.



Where is the concentration of oxygen highest?

- A an artery at X
 - B an artery at Y
 - C a vein at X
 - D a vein at Y
- 31 Which part of the male reproductive system is responsible for producing fluids to be mixed with the sperms?
- A penis
 - B prostate gland
 - C scrotum
 - D testes

- 32 The diagram shows the changes in thickness of the uterus lining during one menstrual cycle.



When would the levels of progesterone and estrogen be highest?

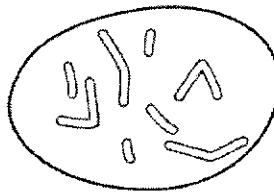
	estrogen	progesterone
A	between day 25 and 28	between day 12 and 16
B	on day 13	between day 19 and 23
C	between day 7 and 14	on day 5
D	on day 5	on day 13

- 33 In 2005 there were an estimated 2.3 million HIV-related deaths worldwide.
In 2011 there were an estimated 1.7 million HIV-related deaths worldwide.

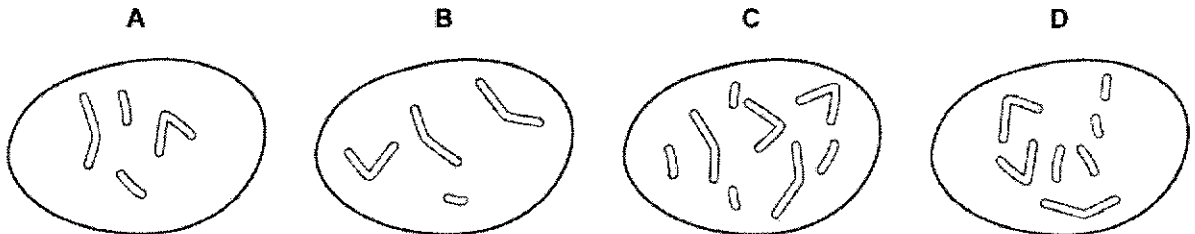
What is **not** a possible cause for this trend?

- A** increased access to anti-viral drugs
- B** increased screening and heat-treatment of blood and blood products for transfusion
- C** increased sharing of needles for intravenous drug use
- D** increased use of condoms for sex

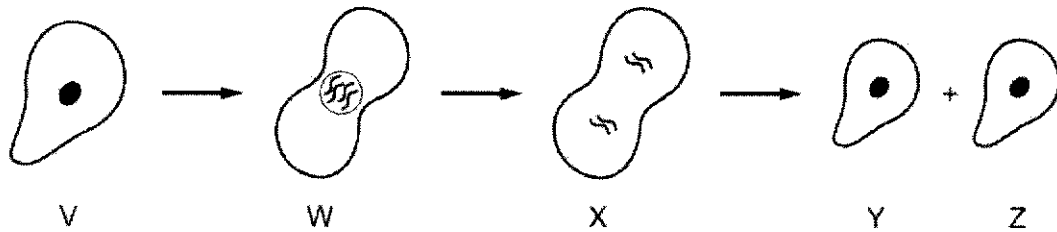
34 The diagram shows the chromosomes in the nucleus of a cell that divides by meiosis.



Which diagram shows the chromosomes in the nucleus of one of the daughter cells produced?



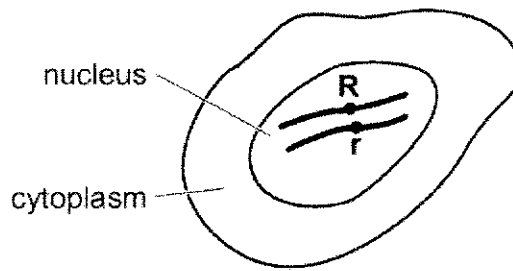
35 The diagram shows some stages during the asexual reproduction of a single-celled organism.



Which row correctly shows the relative amounts of DNA in each of the cells V, W, X, Y and Z?

	V	W	X	Y	Z
A	1	1	1	2	2
B	1	1	2	1	1
C	1	2	2	1	1
D	2	1	1	2	2

- 36 The diagram shows a diploid cell and alleles **R** and **r** on one pair of chromosomes.



When this cell divides by mitosis, which daughter cells will be produced?

	chromosome number	genotype
A	diploid	heterozygous
B	diploid	homozygous
C	haploid	heterozygous
D	haploid	homozygous

- 37 The base sequence of part of one strand of a DNA molecule is shown.

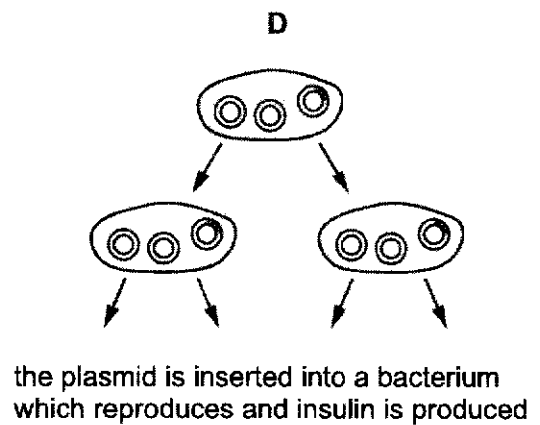
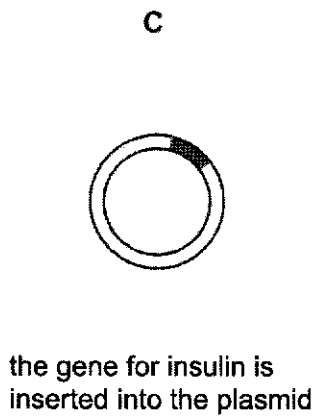
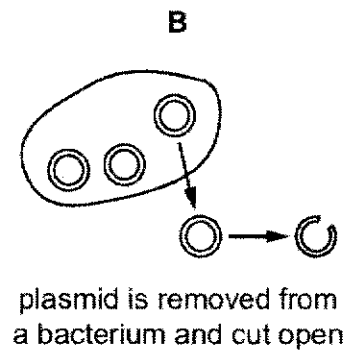
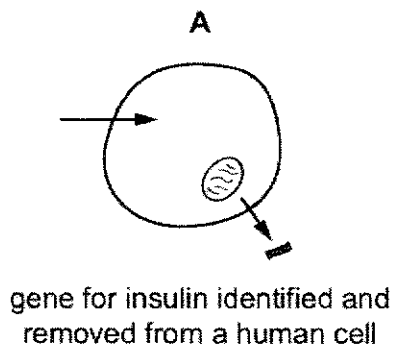
ATAGCC

What is the base sequence of the complementary strand?

- A** GCGATT
- B** CGCTAA
- C** TATCGG
- D** ATAGCC

38 The diagrams show the stages in the production of human insulin.

Which stage uses the enzyme DNA ligase?



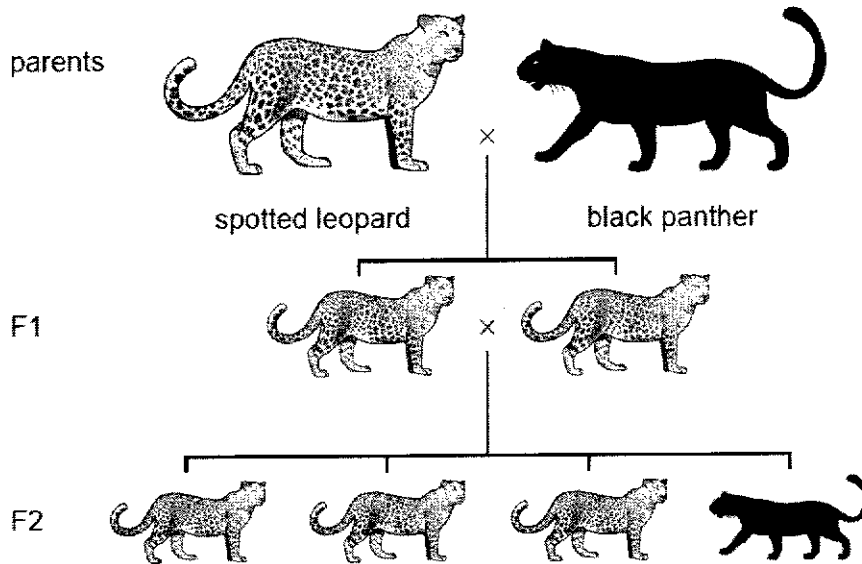
39 In the leopard, coat colour is controlled by a single gene with two alleles, H and h.

There are two varieties - black panthers and spotted leopards.

The diagram shows a cross between a spotted leopard and a black panther.

All the offspring in the F1 generation were spotted leopards.

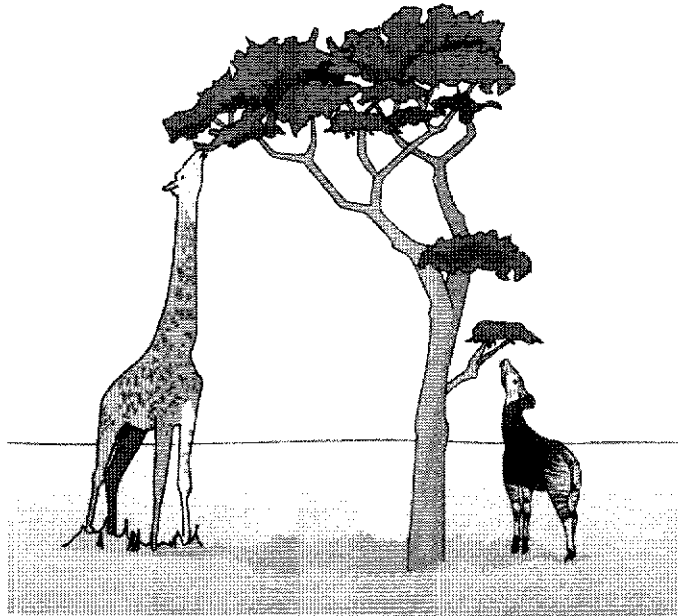
The results of a cross between two animals of the F1 generation are also shown.



What are the genotypes of the original two parents?

	spotted leopard	black panther
A	HH	hh
B	HH	Hh
C	Hh	hh
D	Hh	HH

40 The diagram shows a giraffe and an okapi.



The long neck is a feature for giraffes. It helps them to feed on leaves that other animals like the okapi cannot reach. It is believed that giraffes developed long necks through the process of natural selection.

The statements are about how natural selection occurred in giraffes.

- 1 More giraffes are born than can survive.
- 2 Giraffes have necks of different length.
- 3 The giraffes with the longest necks survive and reproduce.
- 4 The surviving giraffes pass on their alleles for long necks to their offsprings.

What is the correct sequence to explain how natural selection occurred in giraffes?

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



**FUCHUN SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2020
SECONDARY FOUR EXPRESS**

CANDIDATE NAME

CLASS

CENTRE NUMBER

INDEX NUMBER

BIOLOGY
Paper 2 Biology

6093/02
17 September 2020
1 hour 45 minutes

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class in the spaces provided at the top of this page.
Write in dark blue or black pen in the spaces provided on the Question Paper.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A

Answer **all** questions in the spaces provided.
The number of marks is given in brackets [] at the end of each question or part-question.

Section B

Answer **all** questions in the spaces provided.
The number of marks is given in brackets [] at the end of each question or part-question.

The use of an approved scientific calculator is expected, where appropriate.

For Examiner's Use	
Section A	/50
Section B	/30
TOTAL	/80

Setter: Mr Philemon Foo

This document consists of **18** printed pages.

Section A (50 marks)

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

- 1 Fig. 1.1 shows the position of some organs in the human body. The organs may be found in either a male or a female, or in both.

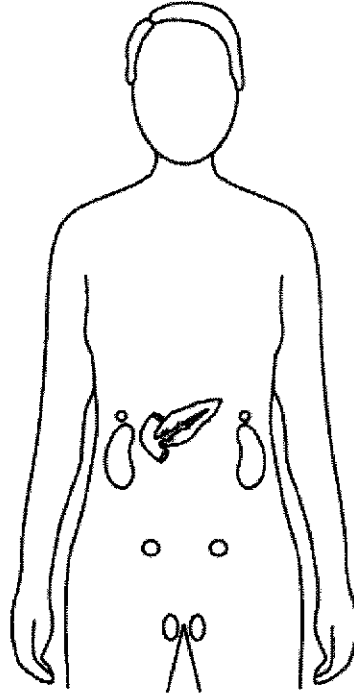


Fig. 1.1

- (a) Use the letters shown to label, on Fig. 1.1, the organs that produce the following hormones:

J – adrenaline

K – insulin

L – progesterone

M – testosterone

[4]

(b) Explain how **one** of the hormones from (a) travels from the **named** organ that produces it to its **named** target organ.

.....

.....

.....

..... [4]

[Total: 8]

2 The genes for antibodies are only active in lymphocytes.

(a) Define the term *gene*.

.....

.....

[2]

(b) Fig. 2.1 is a drawing made from an electron micrograph of a lymphocyte that produces antibodies.

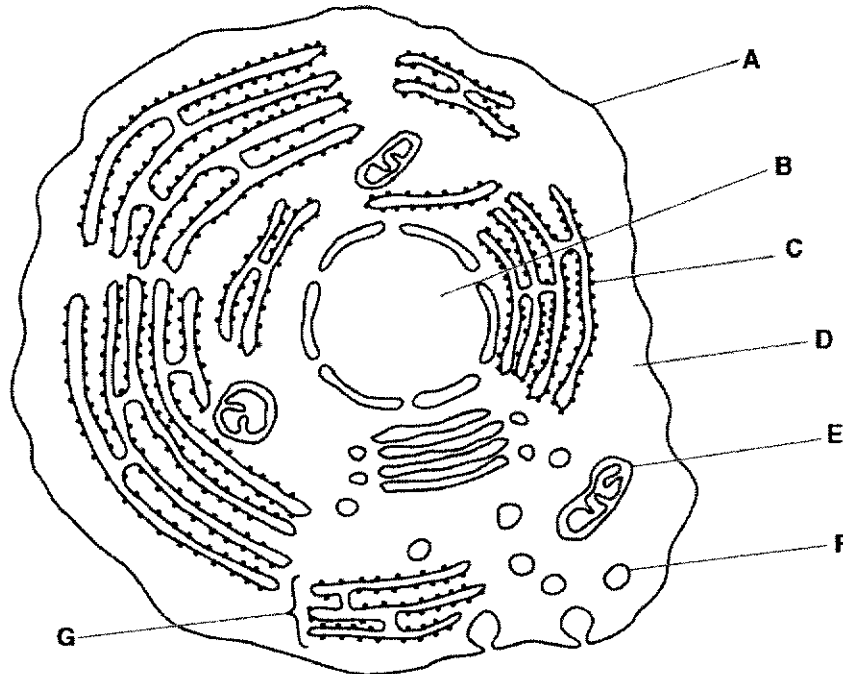


Fig. 2.1

Complete Table 2.1.

Table 2.1

function	name of structure	letter from Fig. 2.1
absorption of amino acids used in making antibodies		
stores genetic information as DNA		
provides energy for making antibodies		
site of production of antibodies		

[4]

(c) The antibody has a certain sequence of amino acids as shown in Fig 2.2.

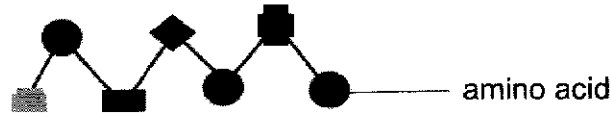


Fig. 2.2

(i) State the number of **types** of amino acids as shown in Fig. 2.2.

..... [1]

(ii) Deduce the number of nucleotides found in the part of the gene corresponding to the sequence of amino acids in Fig. 2.2.

..... [1]

(iii) Explain the significance of the order of bases in a gene.

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

[Total: 10]

3 A person who wanted to begin a fitness programme did some vigorous exercise.

A fitness trainer took a drop of blood from the person's finger before, during and after vigorous exercise and tested it for lactic acid.

(a) State the component of blood that transports lactic acid.

..... [1]

(b) The results of the tests for lactic acid are shown in Fig. 3.1.

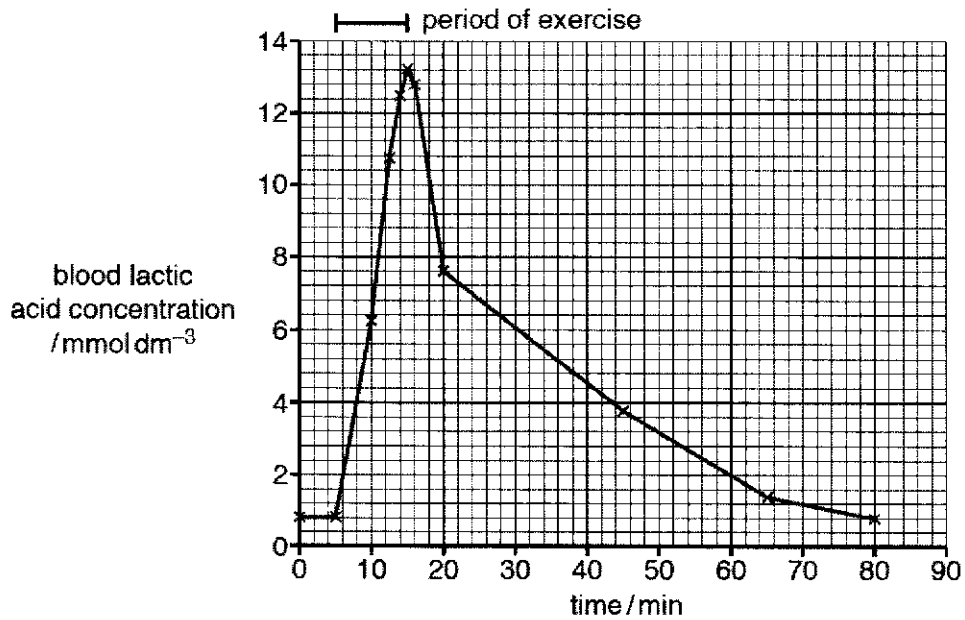


Fig. 3.1

(i) With reference to Fig 3.1, describe and explain the changes in blood lactic acid concentration.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

- (ii) Calculate the percentage increase in concentration of blood lactic acid during the exercise.

Show your working.

..... % [2]

(c) Fig. 3.2 is a diagram of the circulatory system.

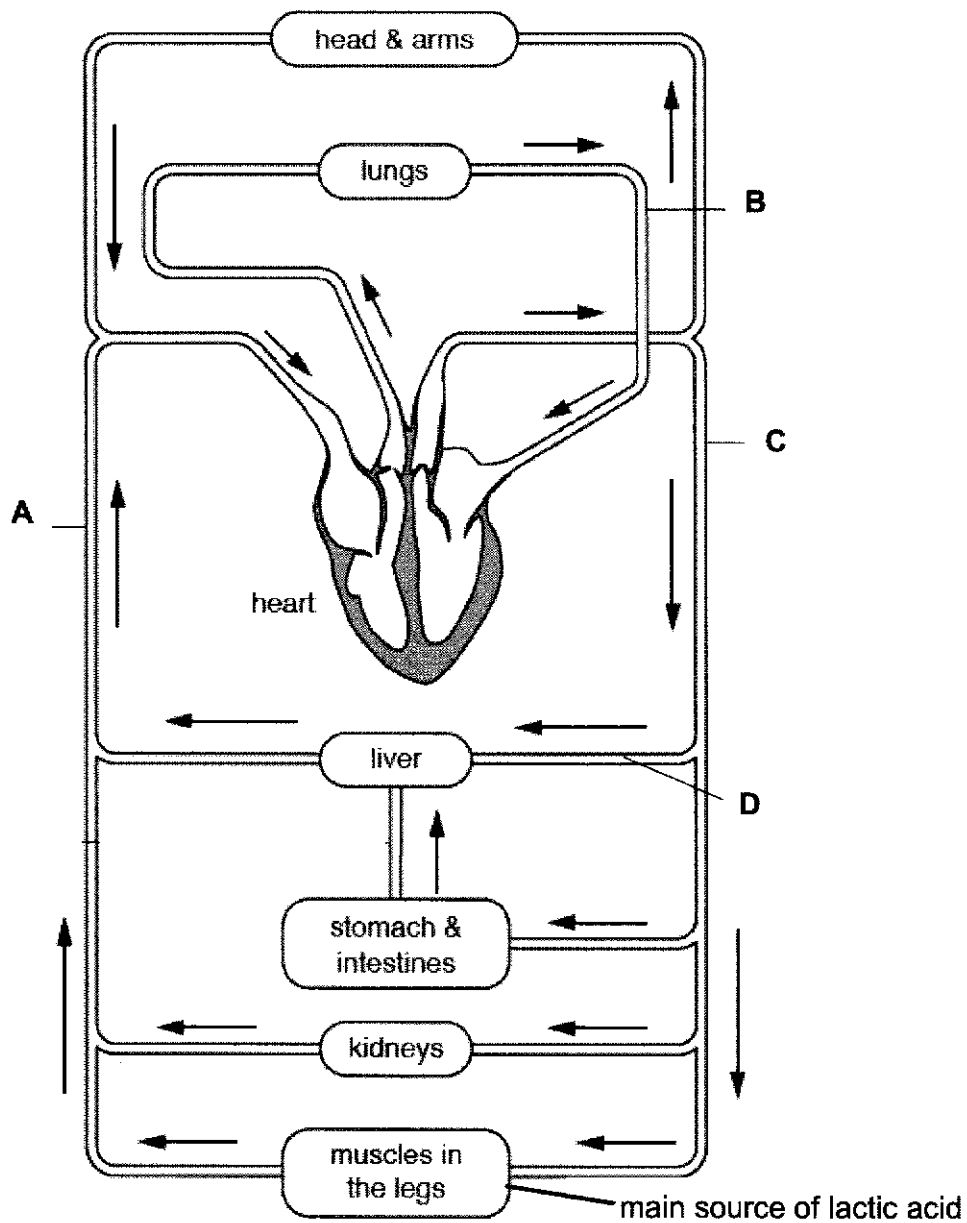


Fig.3.2

Complete Table 3.1 by naming the blood vessels, which the blood carrying lactic acid would pass through, as labelled on Fig. 3.2. [4]

Table 3.1

letter on Fig. 3.2	name of blood vessel
A	
B	
C	
D	

[Total: 13]

4 Fig. 4.1 represents the early stages in the development of a female embryo.

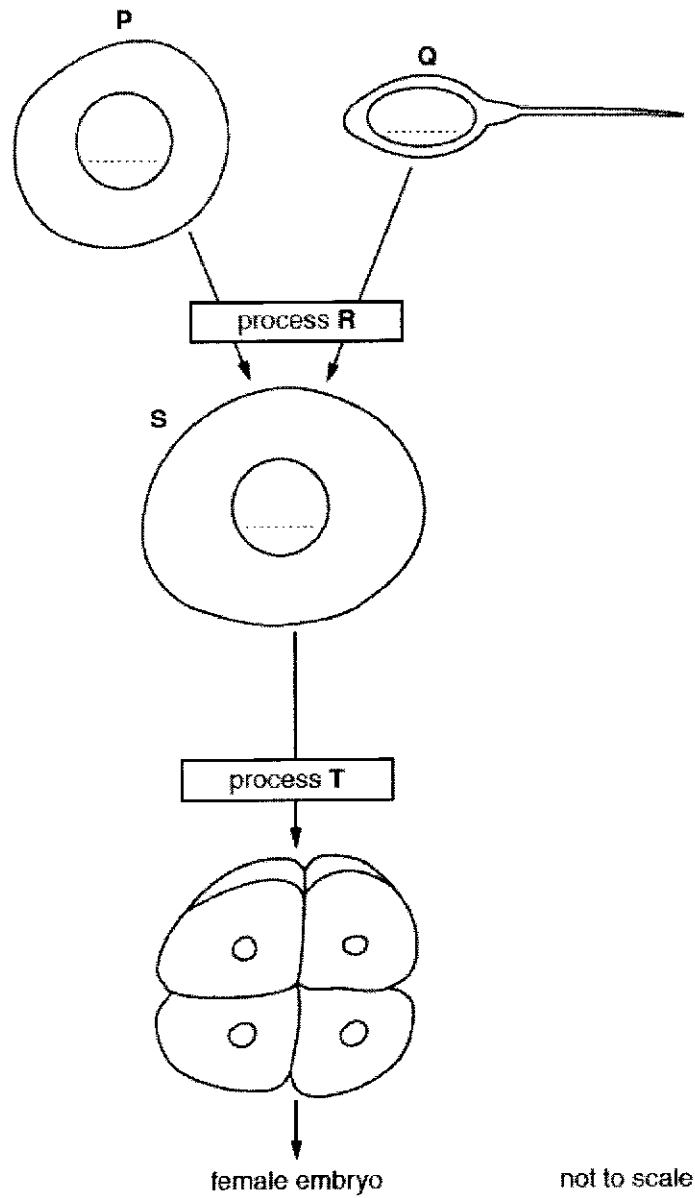


Fig. 4.1

(a) State the name of the cells labelled **P**, **Q** and **S** in Fig. 4.1.

P

Q

S

[3]

(b) Complete Fig. 4.1 by writing the correct sex chromosomes in structures **P**, **Q** and **S**.

[3]

(c) State the names of processes R and T in Fig. 4.1.

R

T [2]

(d) Fig 4.2 shows four events, W, X, Y and Z in one of the cells in a human embryo.

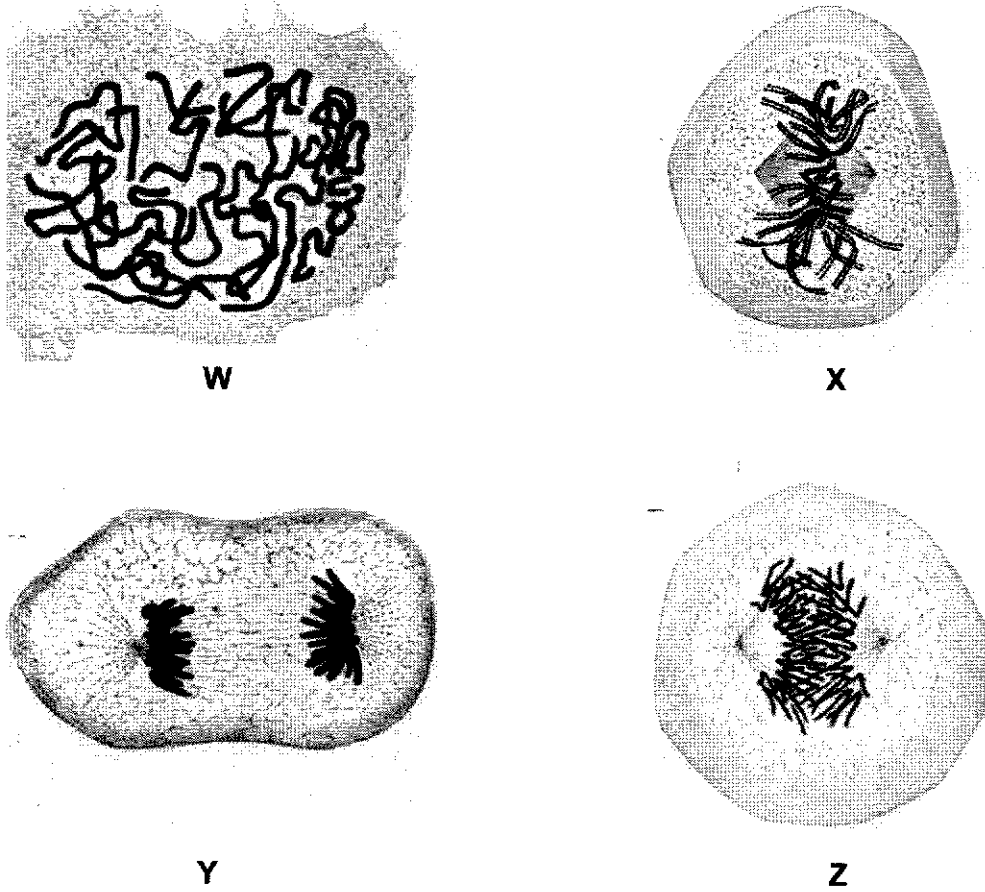


Fig. 4.2

(d) State the correct sequence of events by filling in the blanks with the letters W, X, Y and Z.

..... → → →

[1]

[Total: 9]

5 Fig. 5.1 shows stages in the life cycle of a flowering plant.

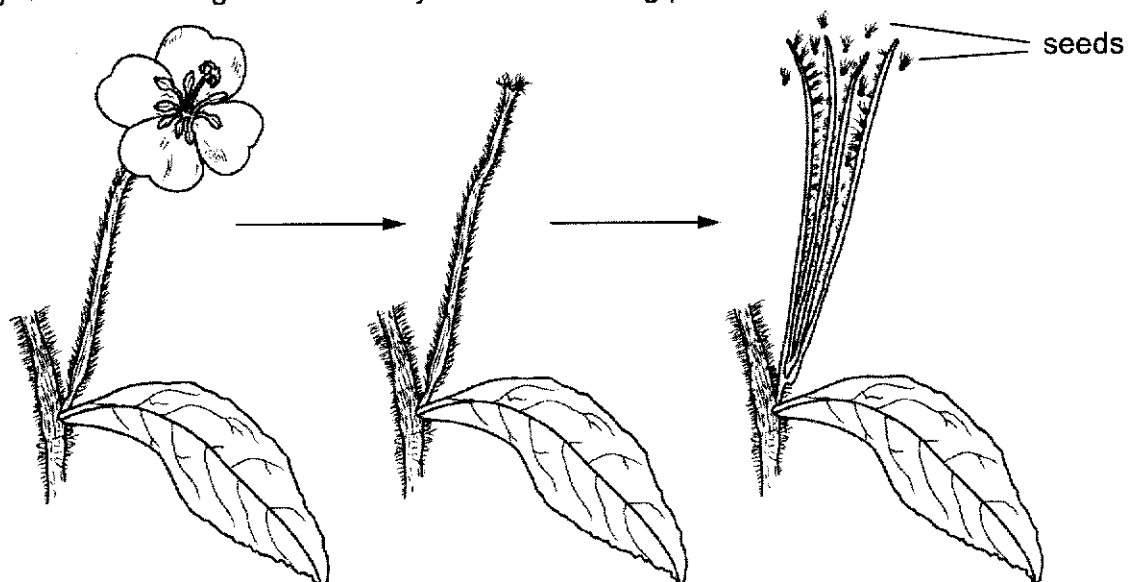


Fig. 5.1

(a) State the number of each of the following parts of the flower as shown in Fig. 5.1.

petal

filament

[2]

(b) On Fig.5.1, label the stamen and the style.

[2]

(c) (i) For this plant, state whether it is pollinated by wind or by insects.
Give reasons for your answer.

method of pollination

reasons

[3]

(ii) Describe the process that happens after pollination.

.....

.....

.....

[3]

[Total: 10]

Section B (30 marks)
 Answer **all** the questions.

- 6 In an investigation by a scientist, measurements were made of the mass of water taken in and lost by a plant every two hours for 24 hours.

Fig. 6.1 shows the mass of water lost from the plant.

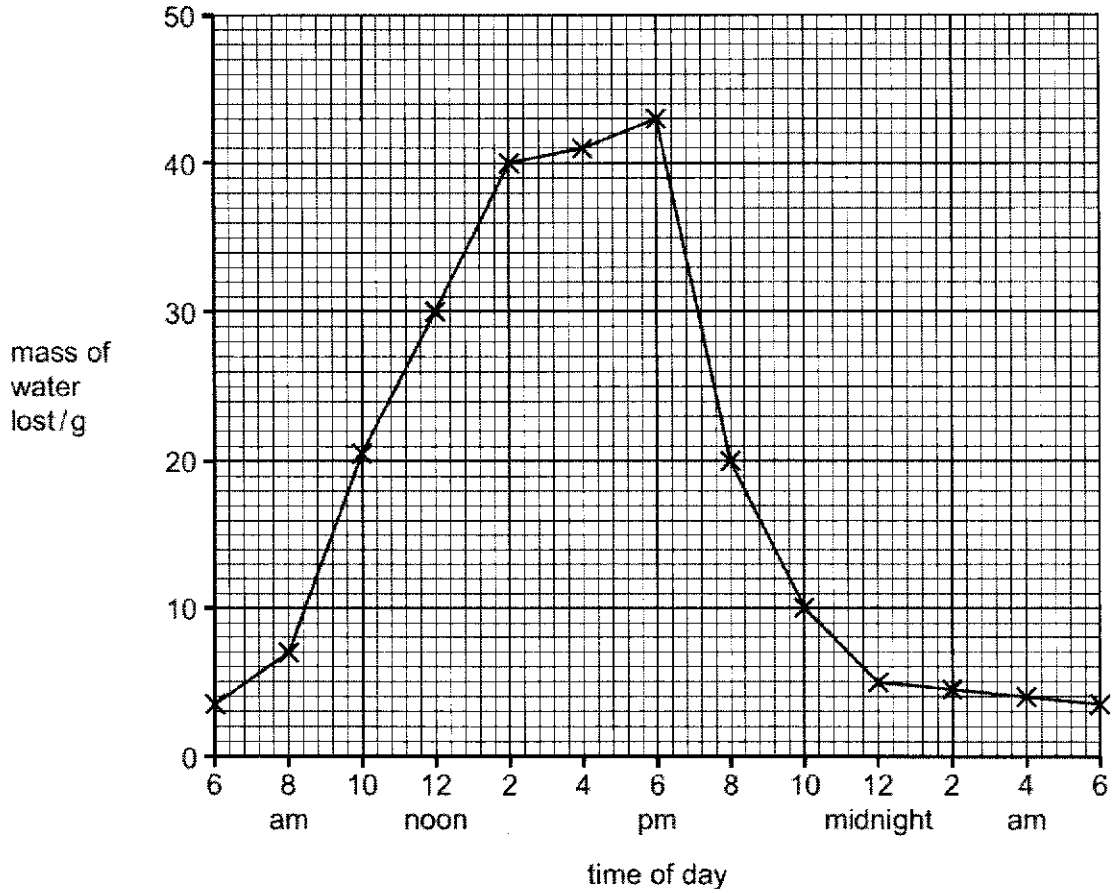


Fig. 6.1

- (a) State the process by which water is mainly lost from the plant.

..... [1]

- (b) (i) State the time when the mass of water lost was greatest.

..... [1]

- (ii) Calculate the rate of loss of water for the period from 8 am to 6 pm.
 Show your working.

..... g per h [1]

Table 6.1 shows the mass of water taken in by the plant every two hours.

Table 6.1

time of day	mass of water taken in by plant / g
6 am	plotted
8 am	plotted
10 am	22
12 noon	40
2 pm	50
4 pm	44
6 pm	30
8 pm	10
10 pm	plotted
12 midnight	plotted
2 am	plotted
4 am	plotted
6 am	plotted

Fig. 6.2 shows the mass of water lost and the mass of water taken in by the plant during the same period.

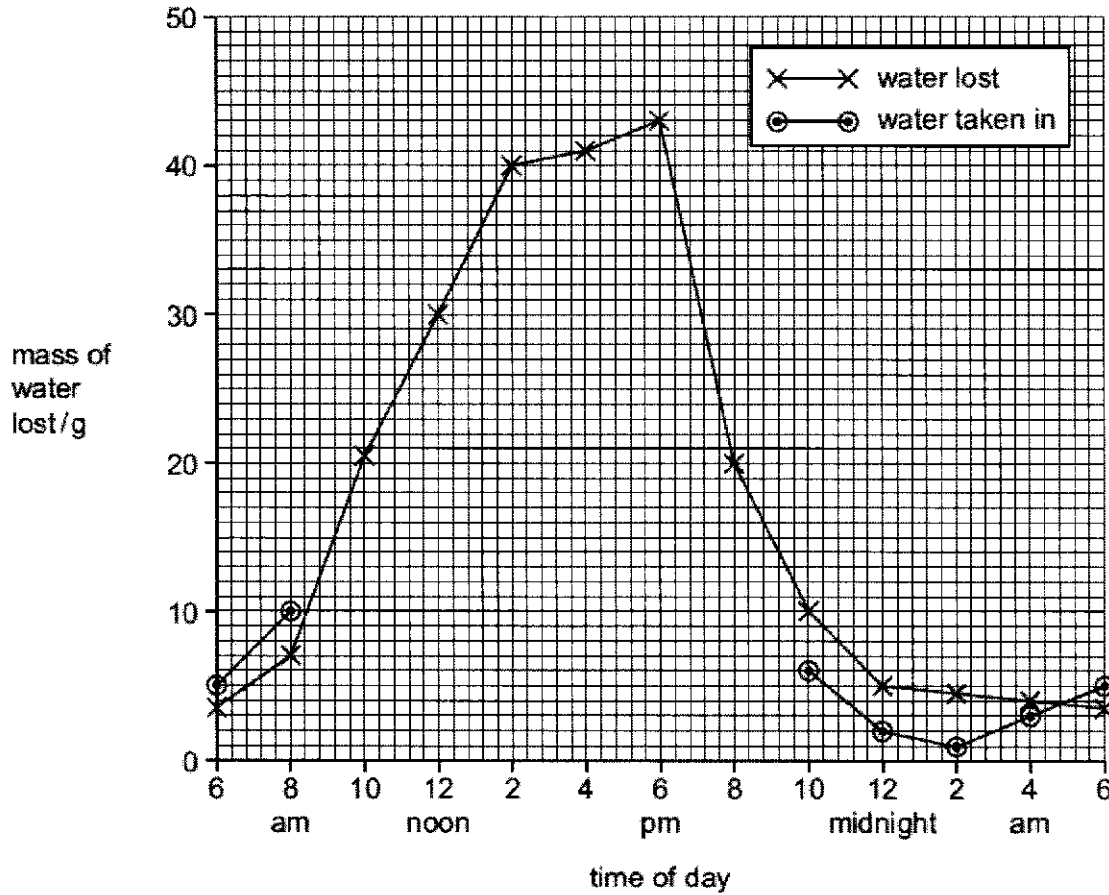


Fig. 6.2

- (c) (i) Complete the graph, Fig. 6.2, to show the mass of water taken in by the plant from 8 am to 10 pm. [2]
- (ii) State the period of time during which water taken in was less than water lost. [1]

- (iii) Describe the state of the stomata between 6 am and 2 pm. [1]

- (iv) Suggest **one** factor that caused the state in (c)(iii). [1]

- (v) State and explain **one** factor, other than your answer in (c)(iv), that might increase the loss of water from a leaf during the day.

.....

.....

.....

.....

[3]

[Total: 11]

7 Gregor Mendel studied inheritance in the garden pea, *P. sativum*.

The flowers of *P. sativum* that he studied were either purple or white. The gene that controls flower colour has two alleles, **B** and **b**.

When Mendel crossed purple-flowered plants with white-flowered plants all the plants in the next generation had purple flowers.

- (a) Table 7.1 shows five genetic terms that can be applied to Mendel's study of the inheritance of flower colour.

Complete Table 7.1 by stating an example of each genetic term.

The first one has been completed for you.

Table 7.1

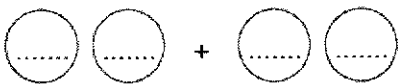
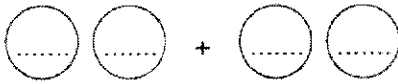
term	example in <i>P. sativum</i>
dominant trait	purple flowers
recessive allele	
phenotype	
homozygous genotype	
heterozygous genotype	

[4]

(b) Test crosses can be used to determine the genotype of a plant with purple flowers.

The genetic diagrams show test crosses for purple-flowered plants with two different genotypes.

Complete the genetic diagrams for test cross 1 and test cross 2.

	test cross 1		test cross 2
<i>parental phenotype</i>	purple flowers × white flowers		purple flowers × white flowers
<i>parental genotype</i>	Bb ×		BB ×
<i>genotypes of gametes</i>			
<i>offspring genotypes</i>
<i>offspring phenotypes</i>

[5]

[Total: 9]

8

(a) Define *homeostasis*.

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

(b)(i) Explain the concept of control by negative feedback.

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

(ii) Describe how **two named** components of the skin are involved in regulating body temperature in **hot** conditions.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
..... [6]

[Total: 10]

End-of-Paper

End Of Year Answer Key

1	B	11	B	21	B	31	B
2	A	12	B	22	D	32	B
3	A	13	A	23	A	33	C
4	D	14	D	24	C	34	A
5	C	15	D	25	C	35	C
6	C	16	A	26	C	36	A
7	A	17	A	27	B	37	C
8	D	18	D	28	A	38	C
9	C	19	B	29	B	39	A
10	A	20	B	30	A	40	A

General notes

Symbols used in mark scheme and guidance notes.

/ separates alternatives for a marking point

; separates points for the award of a mark

MP mark point – used in guidance notes when referring to numbered marking points

OVP other valid points

OWTTE or words to that effect

ORA or reverse argument / approach

ref./refs. answer makes appropriate reference to

ecf error carried forward

AW alternative words of equivalent meaning

A accept – as a correct response

R reject – this is marked with a cross and any following correct statements do not gain any marks

I ignore / irrelevant / inadequate – this response gains no mark, but any following correct answers can gain marks.

() the word / phrase in brackets is not required to gain marks but sets the context of the response for credit e.g. (waxy) cuticle. Waxy not needed but if it was described as a cellulose cuticle then no mark is awarded.

mitosis underlined words – this word only

Section B

Qn no	part	Answer	Marks	guidance
1	(a)	J adrenal glands ; K pancreas ; L ovary ; M testis;	[4]	
	(b)	production organ + named hormone ; in solution / dissolved ; in blood / plasma ; tissue fluid ; target organ(s) + named for hormone selected ;	[4]	
			Total: 8	

2	(a)	part / segment / length of DNA ; sequence of nucleotides; that codes for a polypeptide ;	[max: 2]																
	(b)	one mark per row <table border="1" data-bbox="359 1048 975 1350"> <thead> <tr> <th>function</th> <th>name of structure</th> <th>letter from Fig 2.1</th> </tr> </thead> <tbody> <tr> <td>absorption of amino acids to make antibodies</td> <td>cell membrane</td> <td>A</td> </tr> <tr> <td>stores genetic information as DNA</td> <td>nucleus</td> <td>B ;</td> </tr> <tr> <td>provides energy for making antibodies</td> <td>mitochondrion</td> <td>E ;</td> </tr> <tr> <td>site of production of antibodies</td> <td>ribosome / endoplasmic reticulum / ER</td> <td>C / G ;</td> </tr> </tbody> </table>	function	name of structure	letter from Fig 2.1	absorption of amino acids to make antibodies	cell membrane	A	stores genetic information as DNA	nucleus	B ;	provides energy for making antibodies	mitochondrion	E ;	site of production of antibodies	ribosome / endoplasmic reticulum / ER	C / G ;	[4]	A mitochondrion and E
function	name of structure	letter from Fig 2.1																	
absorption of amino acids to make antibodies	cell membrane	A																	
stores genetic information as DNA	nucleus	B ;																	
provides energy for making antibodies	mitochondrion	E ;																	
site of production of antibodies	ribosome / endoplasmic reticulum / ER	C / G ;																	
	(c) (i)	5;	[1]																
	(ii)	21;	[1]																
	(iii)	ref to codon; specific amino acid; order of amino acids would be changed;	[max: 2]																
			[Total: 10]																

3	(a)	<u>plasma</u> ;	[1]	
	(b)	1 low (concentration) of lactic acid in blood at, rest / the start / before ; (i) 2 lactic acid (concentration) increases, steeply / quickly / AW, during exercise ; 3 reaches a peak ; 4 decreases steeply, then gradually after exercise ; 5 any use of figures ; <i>explanation</i> 6 oxygen, demand increases / does not reach muscles fast enough / AW ; 7 anaerobic respiration ; 8 provides / releases, energy ; 9 anaerobic respiration produces lactic acid ; 10 lactic acid diffuses from muscles into the blood ; 11 lactic acid is, broken down / respired / oxidised / converted to glucose / AW ; 12 in the liver ; 13 ref. to oxygen debt ;	[6]	e.g. peak at 13.2 mmol dm ⁻³ at 15 minutes ± 0.2 mmol A produces ATP R produce / makes, energy'
	(ii)	13.2 – 0.8 = 12.4 (12.4 / 0.8)*100 = 1550 %	[2]	
	(c)	(inferior) vena cava; pulmonary vein; aorta; hepatic artery;	[4]	
			Total: 13	

4	(a)	P egg cell / ovum / ova ; Q sperm ; S zygote / fertilised egg cell ;	[3]	
	(b)	P X ; Q X ; S XX ;	[3]	
	(c)	R fertilisation ; T mitosis ;	[2]	
	(d)	W – X – Z – Y;	[1]	
			Total: 9	

5	(a)	petals 4 ; filaments 8 ;	[2]	
	(b) (i)	stamen labelled; style labelled;	[2]	
	(ii)	insect ; petals ; attract insects ; landing platform for insects AW ; contact with stamens / anther / pollen / stigma ;	[3]	A: AVP related to stigma or anther
	(c)	germination of pollen tube; breakdown of tissues of style; entry through micropyle; fertilisation / fusion of gametes ;	[3]	
			Total: 10	

6	(a)	transpiration;	[1]	
	(b) (i)	6pm;	[1]	
	(ii)	working: 43 – 3.5 g / 10h + answer: 3.95 (g her h)	[1]	A: 3.9 or 4
	(c) (i)	points correctly plotted; \pm half mm square points joined by line;	[2]	
	(ii)	from 4:30 pm (\pm 10) to 4:50 am (\pm 10);	[1]	
	(iii)	open;	[1]	
	(iv)	light;	[1]	
	(v)	wind speed increases; removes saturated air from area of leaf; increases diffusion gradient / easier for diffusion to occur / increase rate of diffusion; OR rise in temperature; rate of evaporation higher; increases rate of diffusion / increases diffusion gradient; OR fall in humidity (in atmosphere); air can hold more water vapour; increases diffusion gradient / increases rate of diffusion / easier for diffusion to occur; Any set of three – 1 mark each	[3]	If (b)(iv) wrong or blank accept set of responses below: A – light intensity increases; A – stomata open more; A – easier for diffusion to occur

		Total: 11														
7	(a)	<table border="1"> <thead> <tr> <th>term</th> <th>example in <i>P. sativum</i></th> </tr> </thead> <tbody> <tr> <td>dominant trait</td> <td>purple flowers</td> </tr> <tr> <td>recessive allele</td> <td>b ;</td> </tr> <tr> <td>phenotype</td> <td>(flower colour / purple (flowers) / white (flowers) ;</td> </tr> <tr> <td>homozygous genotype</td> <td>BB and /or bb ;</td> </tr> <tr> <td>heterozygous genotype</td> <td>Bb ;</td> </tr> </tbody> </table>	term	example in <i>P. sativum</i>	dominant trait	purple flowers	recessive allele	b ;	phenotype	(flower colour / purple (flowers) / white (flowers) ;	homozygous genotype	BB and /or bb ;	heterozygous genotype	Bb ;	[4]	
term	example in <i>P. sativum</i>															
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phenotype	(flower colour / purple (flowers) / white (flowers) ;															
homozygous genotype	BB and /or bb ;															
heterozygous genotype	Bb ;															
	(b)	<p>parental phenotype purple flowers x white flowers purple flowers x white flowers</p> <p>parental genotype Bb x bb BB x bb ;</p> <p>genotypes of gametes B b + b (b) B B + b (b) ;</p> <p>offspring genotypes Bb bb Bb (Bb);</p> <p>offspring phenotypes purple flowers, white flowers ; purple flowers ;</p>	[5]													
		Total: 9														

8	O (a)	maintenance of / constant ; internal environment / conditions within the body ;	[2]	A regulating / control lg specific examples
	(b)(i)	parameter / condition e.g. temperature ; change from set point / norm AW ; detected ; reference to communication or named method (e.g. nerve / impulse / hormone) ; reference to control centre / coordinator / hypothalamus / brain ; response / corrective mechanism(s) ; reversal / correction of initial change / return to set point or norm ;	[max: 2]	
	(b)(i)	any two from nerve ending / blood vessels / sweat gland / hair ;;	[2]	
		(nerve ending) detects / receptor ; change / increase in temperature ; nerve impulse / to brain ; (blood vessels) dilate ; more blood to surface of skin ; reference to capillaries ; reference to increased radiation / heat loss ; (sweat gland / duct) secretion / release / skin surface + sweat ; reference to evaporation ; (hair) lowers ; less air trapped / loss of insulation ;	[4]	

		Total: 10	
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4E Biology End Of Year Exams Paper 3 2020 – Answer Key

Sec 4E Biology Paper 3 - Section A

Qn	part	Answer	Marks	Guidance
1	(a)	MMO	[1]	
	(i)	two solutions selected;		
	(iii)	MMO all measurements recorded concentration + final length;; change in length; means correctly calculated and stated; (+) and – indicated in last column; R : data with units placed in table;	[5]	
	(b)	PDO		
	(i)	graph marks: 1. labelled (+) above, – below axis. 2. x-axis labelled 'concentration / mol per dm ³ . y-axis labelled 'change in length / %' . 3. appropriate scale – 75% of grid used for graph 4. clear and accurate plotting of own data. 5. curve / line of best fit.	[5]	
	(ii)	MMO independent - concentration of salt solution; dependent – percentage change in length of potato strip;	[2]	R
	(iii)	ACE accurately read from graph (± 1 mm on x-axis) + units (%);	[1]	
	(iv)	ACE water potential the same (equal) / solution in cell(sap) same concentration as external (ambient) solution ; no net exchange of water; no change in length / size / dimensions;	[2]	
	(v)	ACE cells may already be turgid or plasmolysed; insufficient time for change to be shown;	[2]	
	(c)(i)	PDO avoid parallax error / eye level at the same as meniscus / AW;	[1]	
	(ii)	Ref biological variability / same thickness ;	[1]	

	(d)	<p>P 1 mark for table - suitable table with column headings with appropriate units ;</p> <p>award three marks for any three of the following:</p> <p>states that the, independent variable/variable that is being changed, is the concentration of salt/sugar solution; uses at least 5 different concentrations uniformly spaced; mention of physical quality to be checked for <i>e.g. texture/firmness/smooth</i>; controlled variable/variable that is kept the same, stated <i>e.g. soaking time/ same tuber/same original condition</i>;</p> <p>award two marks for two of the following:</p> <p><i>data use to reach a conclusion:</i> change in named physical quality vs concentration;</p> <p><i>reliability:</i> repeat the experiment at least three times / use two strips for each solution ;</p>	[6]	
			Total: 26	

2	(a)(i)	<p>PDO clear outline; good size and correct shape; details of stamens; (3 stamens accurate and double line for filament) details of carpel; (stigma above stamens and double structure below stigma down towards ovary)</p>	[4]	
	(ii)	<p>ACE X correction location and label line to anther; Y correct location and label line to stigma; Z correct location and label line to style;</p>	[3]	
	(iii)	<p>ACE lines drawn on Fig. and (in same place) on drawing + both measurements correct; correct calculation with no units and no more than 1 dp + x symbol indicated;</p>	[2]	
	(b)(i)	<p>MMO add Benedict's (reagents); ref to heating /water bath;</p>	[2]	
	(ii)	<p>ACE from <u>blue</u> to red orange + precipitate;</p>	[1]	
	(c)(i)	<p>ACE rough surface/hooks/not smooth/spikes/projections/ thorns/horns;</p>	[1]	
	(ii)	<p>ACE odour/scent/smell/nectar guides or markings AVP</p>	[1]	
			Total: 14	

end of answer key