Name	Index Number	Class

WOODGROVE SECONDARY SCHOOL
A SCHOOL OF CHOICE, A COMMUNITY OF DYNAMIC LEARNERS

O LEVEL PRELIMINARY EXAMINATION 2020

LEVEL & STREAM : **Secondary 4 Express**

SUBJECT (CODE) : **Biology (6093)**

PAPER NO : **1**

DATE (DAY) : **16 September 2020 (Wednesday)**

DURATION : **1 hour**

READ THESE INSTRUCTIONS FIRST

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

There are **forty** questions in this section. Answer **all** the 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 paper.
The use of an approved scientific calculator is expected, where appropriate.

For Examiner's Use	
Section	**Marks**
Total	**/40**

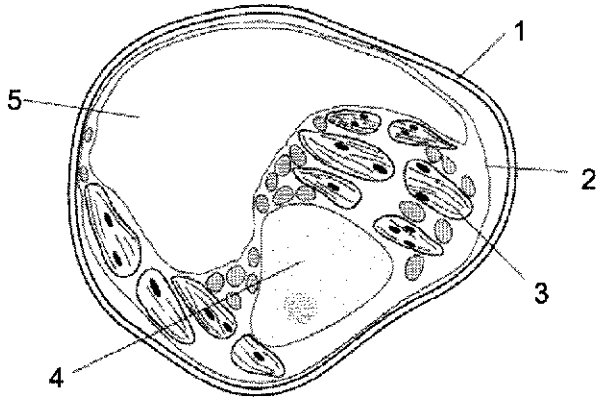
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Date		**Date**	

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1 The diagram shows a plant cell.



Which features are not found in animal cells?

A 1 and 2
B 1 and 3
C 2 and 4
D 2 and 5

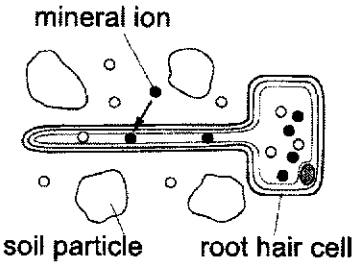
2 How is the xylem structurally adapted for its function?

I Lacks protoplasm
II Lacks cross walls between adjacent cells
III Contains cell walls strengthen with lignin
IV Contains cell walls strengthen with cellulose

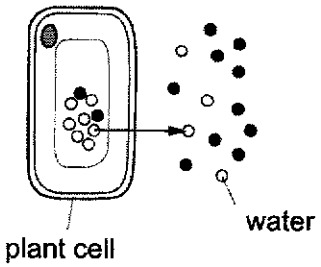
A IV only
B III and IV only
C I, II and III only
D I, III and IV only

3 Which diagram illustrates the process of active transport?

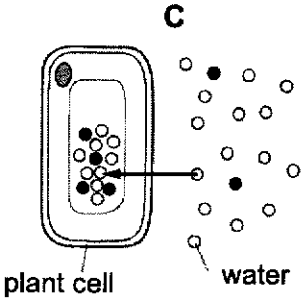
A



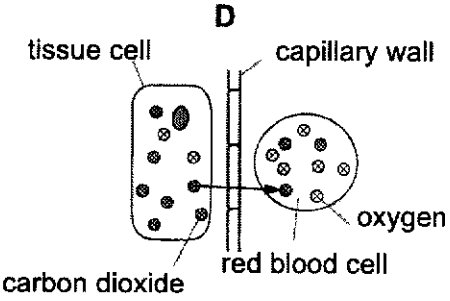
B



C



D



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4 Which statement about glycogen and cellulose is true?

A Both are sources of energy in humans.
B Both are made up of the monosaccharide, glucose.
C Both are important for maintaining shape of cells.
D Cellulose is only found in plants whereas glycogen is found in both plants and animals.

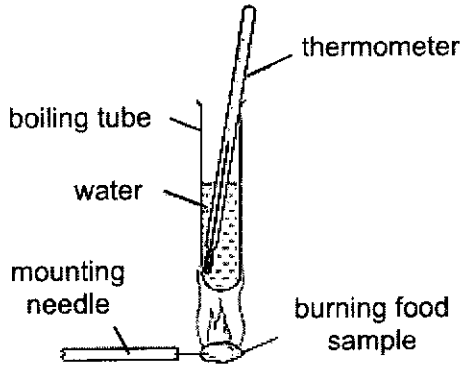
5 A mixture of food gives the following results on testing:

- A violet colour in the Biuret test
- A blue colour when heated with Benedict's solution
- A yellow colour with iodine
- A white cloudy emulsion with ethanol

What nutrients do the mixture contain?

A fat and protein
B starch and fat
C reducing sugar and starch
D protein and reducing sugar

6 Four equal masses of different foods were burned as shown.



The temperature of the water was measured before and after each food sample was burned. The results are shown in the table. Which food sample is likely to contain the most fat?

	Water temperature at the start / °C	Water temperature at the end / °C
A	16	37
B	17	95
C	18	87
D	19	22

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7 Cubes of hard-boiled egg white are placed in test-tubes containing 5 cm^3 of water. Other substances are added to each tube as shown in the chart. The tubes were left for eight hours and then tested for amino acids.

tube	solution added	results for amino acids
1	pepsin	absent
2	pepsin + alkali	absent
3	none	absent
4	pepsin + acid	large amounts
5	boiled pepsin + acid	traces
6	acid	traces
7	alkali	absent

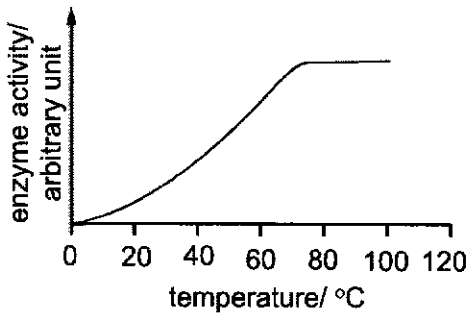
Which tubes show that pepsin is an enzyme?

A 1 and 6
B 2 and 7
C 4 and 5
D 5 and 6

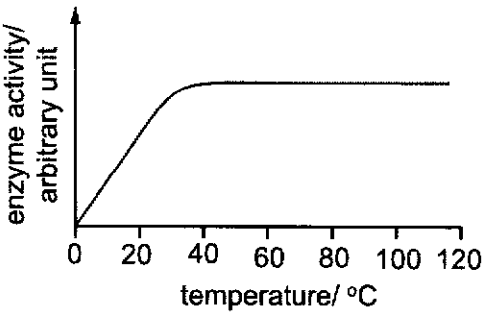
8 A bacterium lives in hot springs at temperatures of 75 °C to 85 °C.

Which graph represents the activity of enzymes found in these bacteria?

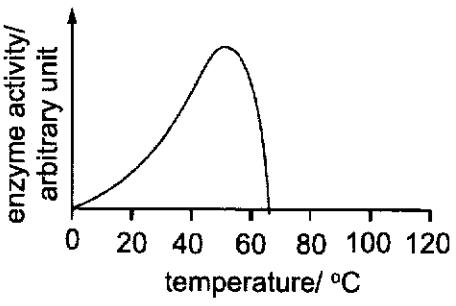
A



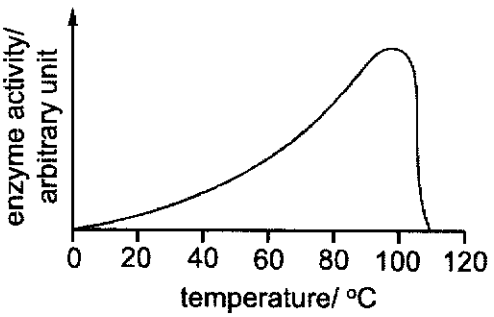
B



C



D



9 Enzyme action can be explained by the 'lock and key' hypothesis.

Where is the active site and which acts as the lock or key?

	active site	lock/ key
A	on the enzyme	substrate acts as the key
B	on the enzyme	substrate acts as the lock
C	on the substrate	enzyme acts as the key
D	on the substrate	enzyme acts as the lock

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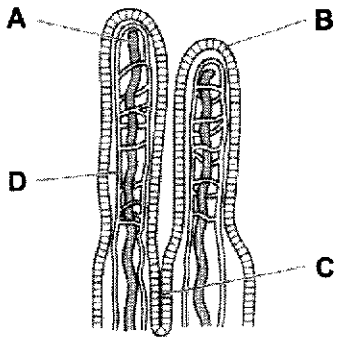
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10 What happens to an enzyme after it has catalysed a reaction?

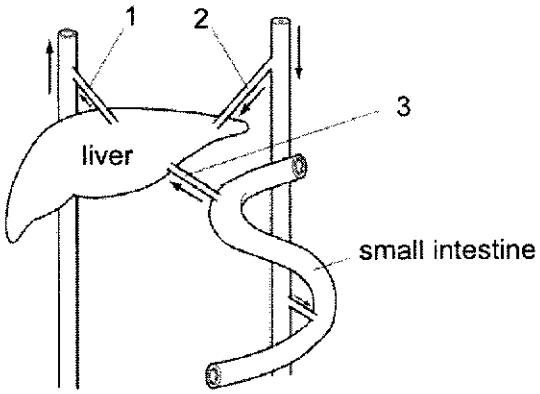
A It can no longer fit the substrate molecules.
B It can now catalyse several different reactions.
C It has become part of the product molecules.
D It is free to catalyse the same type of reaction again.

11 The diagram shows a section of the wall of the small intestine.

Into which structure are most of the lipid components of the diet absorbed for transport to the rest of the body?



12 The diagram represents the liver and the associated blood vessels.

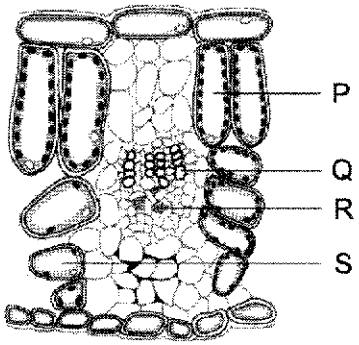


After a meal, how is the blood affected by the liver as it passes between these blood vessels?

	Blood vessels	Effect of liver
A	2 to 1	Glucose added
B	2 to 1	Urea removed
C	3 to 1	Glucose added
D	3 to 1	Urea removed

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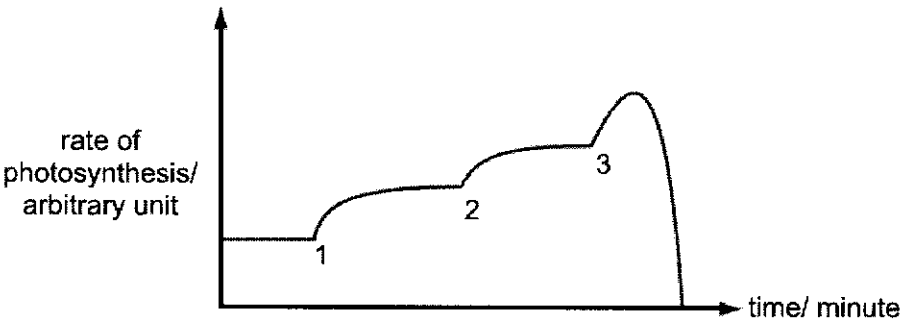
13 The diagram shows part of a transverse section of a leaf.



Which structure is correctly matched to its function?

	conduct water	conduct sugars
A	P	Q
B	Q	P
C	Q	R
D	R	Q

14 Temperature, light intensity and carbon dioxide concentration are three limiting factors in photosynthesis. In an experiment, each factor is increased in turn. The graph shows the results.



Which numbered points represent when each factor was increased?

	carbon dioxide concentration	light intensity	temperature
A	1	2	3
B	2	3	1
C	3	1	2
D	3	2	1

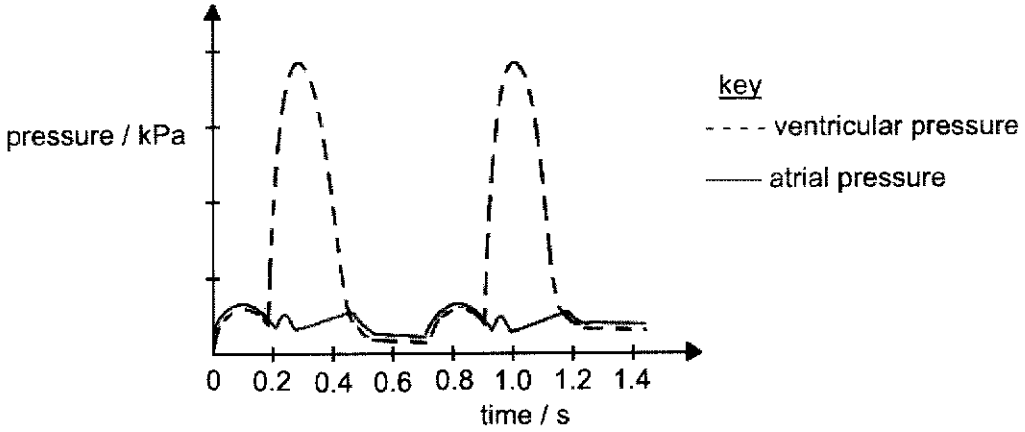
15 Which is the correct chemical equation for photosynthesis?

A $6CO_2 + 12H_2O \rightarrow 6O_2 + C_6H_{12}O_6$
B $6O_2 + 12H_2O \rightarrow 6CO_2 + C_6H_{12}O_6 + 6H_2O$
C $6CO_2 + 12O_2 \rightarrow 6H_2O + C_6H_{12}O_6 + 6O_2$
D $6O_2 + C_6H_{12}O_6 + 6H_2O \rightarrow 6CO_2 + 12H_2O$

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16 The diagram shows the pressure changes to the left side of the heart.



What is the ratio of the timing of atrial systole to atrial diastole?

A 0.1 : 0.7
B 0.2 : 0.5
C 0.5 : 0.4
D 0.5 : 1.4

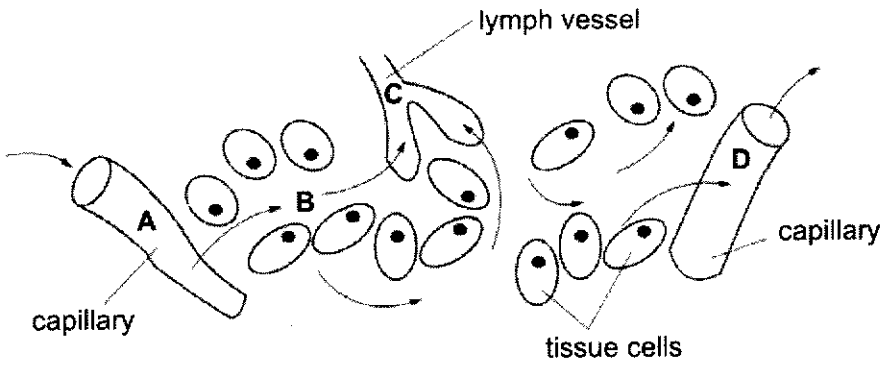
17 Hypoplastic left heart failure is a rare heart condition in which the lower left chamber of the heart is not developed properly and is much smaller than normal.

The immediate result of this condition is to cause lower than normal volume of blood flow into which blood vessel?

A aorta
B pulmonary artery
C pulmonary vein
D vena cava

18 The diagram shows part of a tissue. The arrows show movement of fluids.

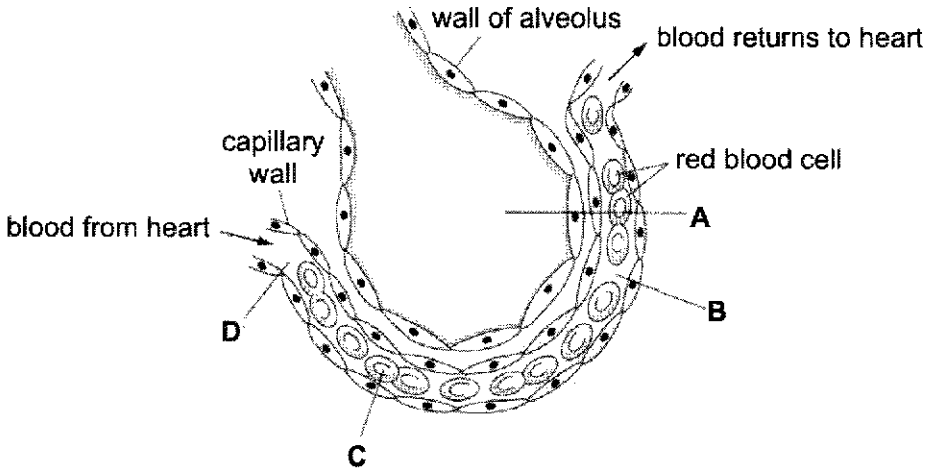
At which point is the pressure highest?



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19 The diagram shows a section through an alveolus and an associated blood capillary.

In which part is the concentration of carbon dioxide highest?

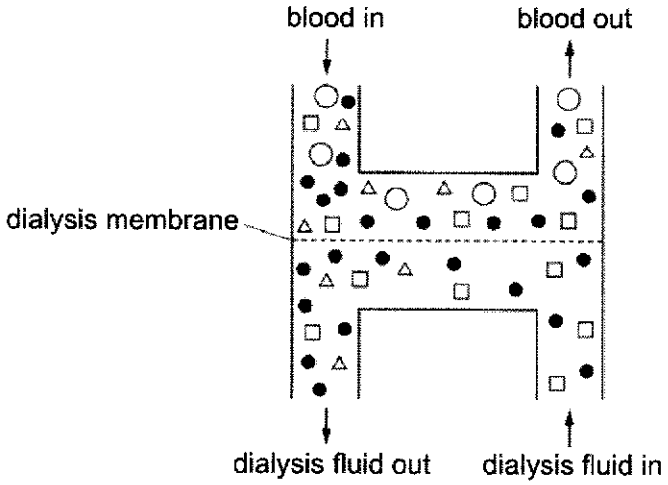


20 During a race, the contraction of leg muscles requires more energy than can be supplied by aerobic respiration.

Which substance will build up in the leg muscles?

A carbon dioxide
B ethanol
C lactic acid
D water

21 The diagram shows how a kidney dialysis machine works. Each shape represents a molecule found in blood or dialysis fluid.



Which shape represents urea?

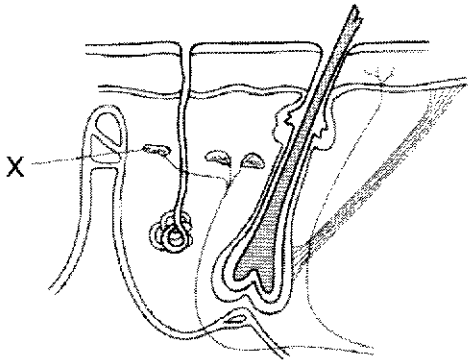
A ○ **B** ● **C** □ **D** △

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22 Why is it important that the lungs remove carbon dioxide from the body?

A Carbon dioxide is a greenhouse gas.
B Carbon dioxide is a poisonous metabolic waste product.
C Carbon dioxide binds with red blood cells irreversibly.
D Carbon dioxide is needed by plants for photosynthesis.

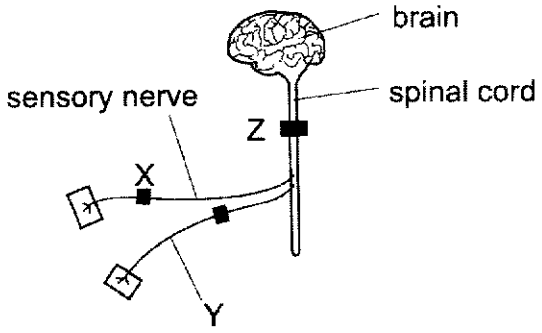
23 The diagram shows some of the structures seen in a section through human skin.



What is the function of structure X?

A to cause capillaries to constrict
B to detect changes in temperature
C to receive impulses from the central nervous system
D to stimulate sweat glands to release sweat

24 A local anaesthetic is a drug used to block nerve impulses. The diagram represents part of the nervous system. X, Y, and Z show sites where the anaesthetic can be injected.



In an experiment, one person can feel a pin prick his leg but cannot move his leg. Where was the anaesthetic injected in this person?

A At X
B At Y
C At Z
D At X and at Y

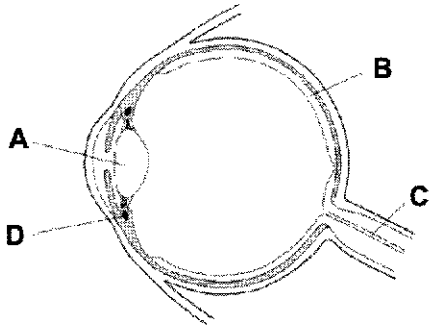
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25 Which is **not** an example of a simple reflex action?

A blinking when sand blows in your eyes
B jumping when hearing a loud noise
C removing your hand from a hot object
D steering a car to avoid hitting something

26 The diagram shows a horizontal section of a human eye.

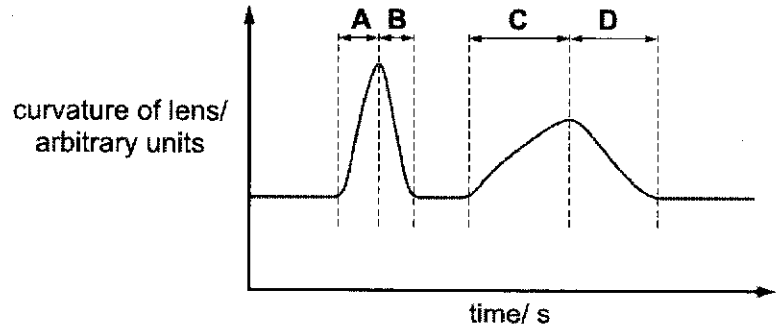
Which part contains receptor cells sensitive to light?



27 The diagram shows the curvature of the lens in a person's eye.

The shape of the lens changes as the person watches two motorbikes go past at different speeds.

During which period was a motorbike moving towards the person at the higher speed?



28 Which changes occur in the body when a person is shocked?

	increase in	decrease in
A	diameter of the pupils in the eye	the speed of food digestion
B	the rate of conversion of glycogen to glucose	the diameter of the pupils in the eye
C	the rate of urine formation	the rate of conversion of glycogen to glucose
D	the speed of food digestion	the rate of urine formation

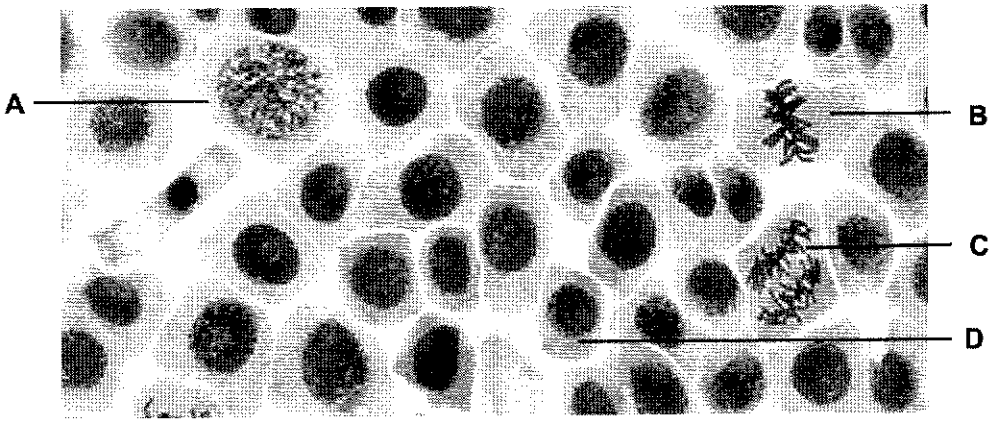
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29 Insulin is a hormone, synthesised in the pancreas and is distributed around the body by the blood.

What describes its rate of secretion and its concentration in the blood?

	rate of secretion	concentration in blood
A	constant	constant
B	constant	varied
C	varied	constant
D	varied	varied

30 The photomicrograph shows cells obtained from the root tip of an onion.



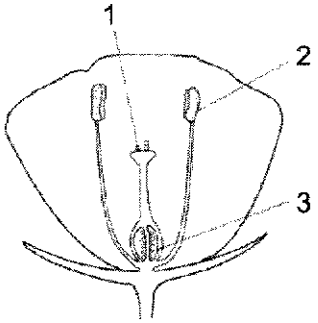
Which cell represents a cell during metaphase of mitosis?

31 A plant P was pollinated. A seed from this plant develops into plant Q. The cells of plant Q contain 14 chromosomes. How many of these chromosomes are identical to chromosomes from plant P?

	if **P** was self pollinated	if **P** was cross pollinated
A	7	7
B	7	14
C	14	7
D	14	14

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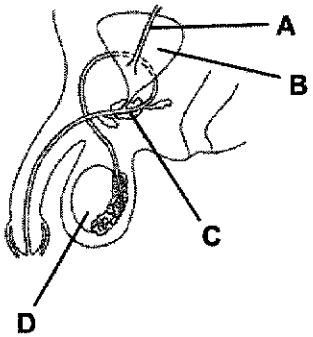
32 The diagram shows a section through a flower.



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.

33 The diagram shows the male reproductive and urinary systems.

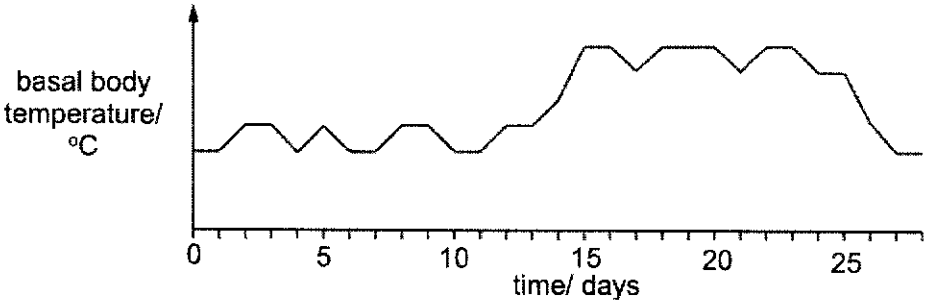


Through which structure do sperms pass to the penis?

34 A person's basal body temperature is the temperature when he first wakes up in the morning.

In women, an increase in blood progesterone concentration causes a small rise in basal body temperature.

The graph shows one woman's basal body temperature over a period of 28 days.



Which day did ovulation occur?

A day 1
B day 5
C day 14
D day 27

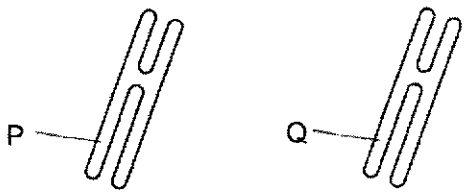
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35 When a breed of cattle with red coats is crossed with the same breed with white coats, the offspring all have coats with a mixture of red and white hairs, a condition called roan.

If roan cows were crossed with a red-coated bull, the theoretical ratio of the offspring would be

A all red.
B all roan.
C 1 red : 1 roan.
D 3 red : 1 roan.

36 The diagram shows a pair of homologous chromosomes.

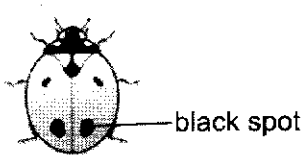


A gene is found at the point labelled P.

In an individual with a heterozygous trait, what will be found at the equivalent position labelled Q?

A a different allele of a different gene
B a different allele of the same gene
C a different gene of the same allele
D the same gene of the same allele

37 The diagram shows two distinct forms of beetle. The difference between them is controlled by a single gene. The allele for the black form is dominant to the allele for red.



red form with black spots



black form with red spots

What kind of variation is shown by the beetle and why?

A Continuous variation because there are two forms.
B Continuous variation because it is controlled by genes.
C Discontinuous variation because it is controlled by genes.
D Discontinuous variation because the two forms are distinct.

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38 Six processes in genetic engineering are listed.

1 The bacterium is cloned.
2 The gene is copied.
3 The gene is switched on.
4 The gene is transferred into a bacterium.
5 The human gene is isolated.
6 The protein, insulin, is synthesised.

Which four processes, in the correct order, show the production of human insulin by bacteria?

A 2 → 3 → 5 → 6
B 3 → 1 → 4 → 6
C 5 → 3 → 2 → 6
D 5 → 4 → 1 → 6

39 Which statement about natural selection is correct?

A Evolution is natural selection.
B Evolution results in natural selection.
C Natural selection and evolution are independent of each other.
D Natural selection results in evolution.

40 Which statement describes an example of artificial selection?

A It has been found that some strains of bacteria produce antibiotics.
B It is common practice to mate bulls with cows that produce the most milk.
C It is possible to control caterpillars on food crops by releasing small wasps which lay their eggs in caterpillars and kill them.
D Mosquitoes have developed strains that are resistant to insecticides

- END OF PAPER -

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Name	Index Number	Class

WOODGROVE SECONDARY SCHOOL
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O LEVEL PRELIMINARY EXAMINATION 2020

LEVEL & STREAM : **Secondary 4 Express**

SUBJECT (CODE) : **Biology (6093)**

PAPER NO : **2**

DATE (DAY) : **15 September 2020 (Tuesday)**

DURATION : **1 hour 45 minutes**

READ THESE INSTRUCTIONS FIRST

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

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

Section B
Answer **all** the questions.
Write your answers on the spaces provided.

The use of an approved scientific calculator is expected, where appropriate.
You are advised to spend no longer than one hour on Section A and no longer than 45 minutes on Section B.
At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
Section	**Marks**
A	/50
B	/30
Total	/80

Student's Signature		**Parent's Signature**	
Date		**Date**	

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Section A

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

1 The grape plant has many flowers clustered together on each flowering head. Fig. 1.1 shows the structure of one mature grape flower.

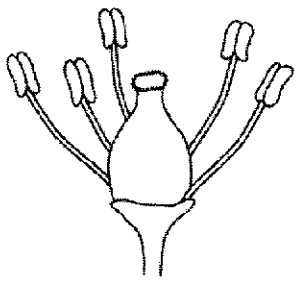


Fig. 1.1

(a) **(i)** Name two parts, normally found in other flowers, that are missing from this mature flower.

1. _____

2. _____ [2]

(ii) Suggest the type of pollination found in the grape plant and give a reason for your choice.

_____

_____

_____

_____ [2]

(b) Fig. 1.2 shows a pollen grain of a grape plant with a pollen tube growing from it.

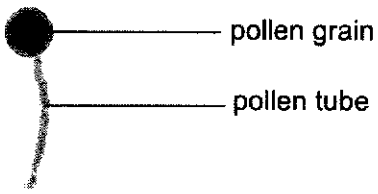


Fig. 1.2

Pollen grains were placed in sucrose solutions of different concentrations for a fixed amount of time. After this time, the pollen grains and tubes were examined using a microscope. The following observations were made for each concentration of sucrose:

- the number of pollen grains that had germinated to produce a pollen tube
- the length of each pollen tube.

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Table 1.3 shows the results of the investigation.

concentration of sucrose/ %	pollen grains germinated/ %	mean pollen tube length/ mm
1	6	0.005
2	13	0.008
4	25	0.015
8	56	0.040
10	31	0.030
20	25	0.018
40	13	0.006

Table 1.3

(i) Using the information in the table, state the optimum concentration of sucrose solution for pollen tube germination and growth.

Explain how the information in the table enabled you to reach this conclusion.

_____

_____

_____

_____ [2]

(ii) The presence of sucrose provided nutrients for the pollen grain to germinate. The germination of pollen grain to form a pollen tube also requires the movement of water into the pollen grain from its surroundings.

Suggest why placing a pollen grain in a solution with a higher sucrose concentration than in your answer to (a)(i) may result in a lower percentage of germination.

_____

_____

_____

_____

_____

_____ [4]

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2 **(a)** Fig. 2.1 shows an X-ray taken through the thorax (chest) of a person.

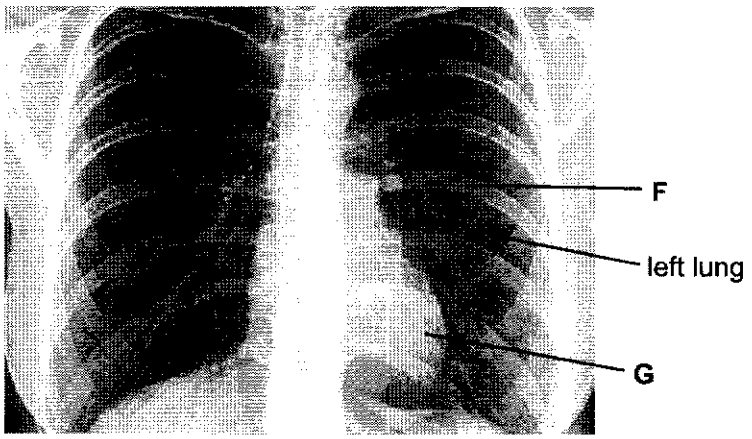


Fig. 2.1

(i) Define the term *breathing*.

_____

_____ [1]

(ii) Identify the structures **F** and **G** in Fig. 2.1.

F:_____

G:_____ [2]

(b) Fig. 2.2 shows the mean distance that molecules must travel during gas exchange between air in the lungs and blood in the circulatory system in birds and mammals.

This distance is known as the thickness of the blood-gas barrier.

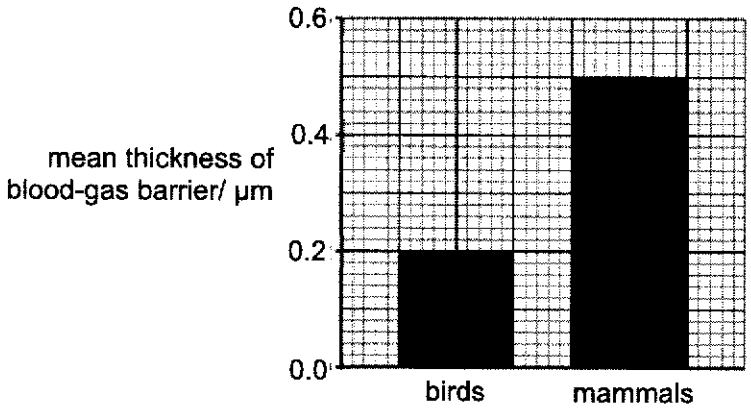


Fig. 2.2

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Using the information from Fig. 2.2, explain how the difference in thickness of the blood-gas barrier suggests that movement of a bird by flying requires more energy than movement by a mammal on land.

_____

_____

_____

_____

_____

_____ [3]

3 Fig. 3.1 shows the leaves of the same plant during daylight and during the hours of darkness

in daylight

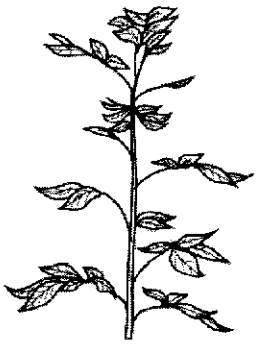


Fig. 3.1(a)

in darkness



Fig. 3.1(b)

(a) Name a process that takes place in the plant in Fig. 3.1(a) only during daylight and explain how the structure of the leaves help in this process.

process: _____

explanation: _____

_____

_____

_____ [3]

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(b) The folding of the leaves at night, as seen in Fig. 3.1(b), is called a sleep movement.

Explain the effect of the sleep movement on the loss of water in the plant.

_____

_____

_____

_____

_____ [4]

(c) Fig. 3.2 shows the uptake and loss of oxygen by a leaf during a 24-hour period.

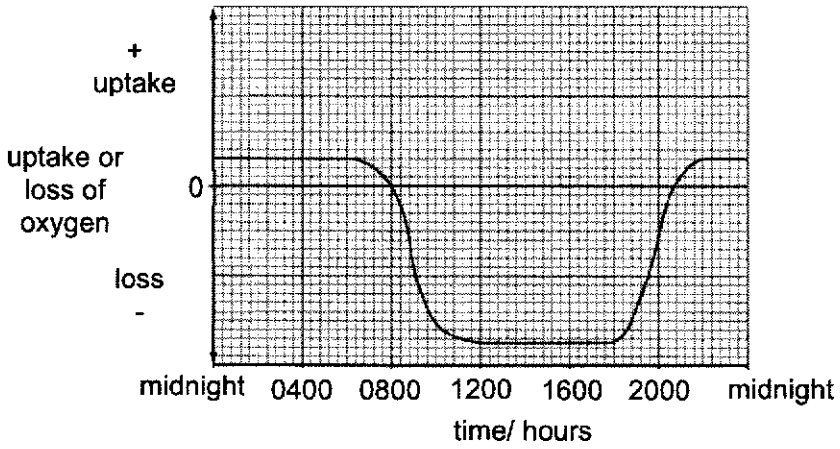


Fig. 3.2

Explain what is happening in the leaf at the following times:

(i) between 1800 hours and 2000 hours

_____

_____

_____

_____ [2]

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(ii) after 2200 hours.

_____

_____

_____

_____ [2]

4 (a) Fig. 4.1 shows changes in the thickness of the uterus lining and in the concentration of progesterone in the blood during the menstrual cycle.

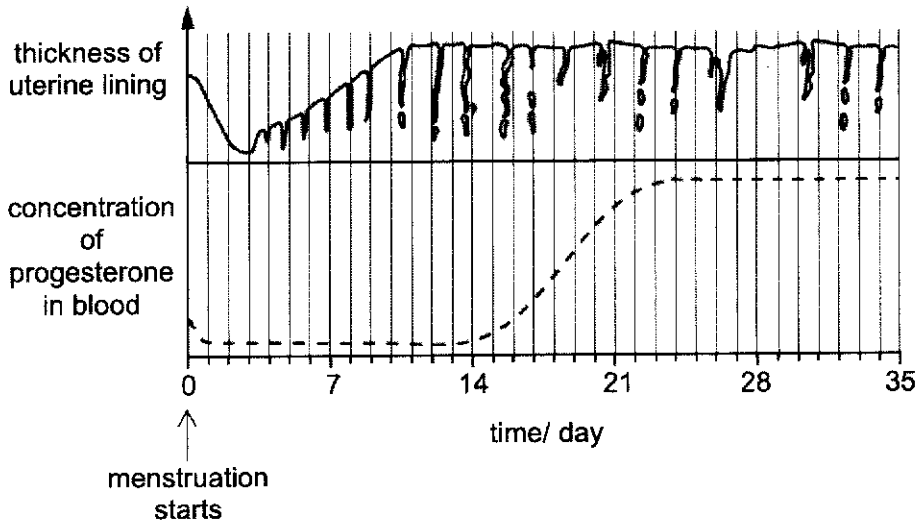


Fig. 4.1

Explain how it can be concluded from Fig. 4.1 that the woman became pregnant from the cycle shown. (The woman has a 28-day menstrual cycle)

_____

_____

_____

_____ [2]

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(b) Fig. 4.2 shows a foetus developing in the uterus of a mother. The fluid labelled **C** contains cells from the foetus.

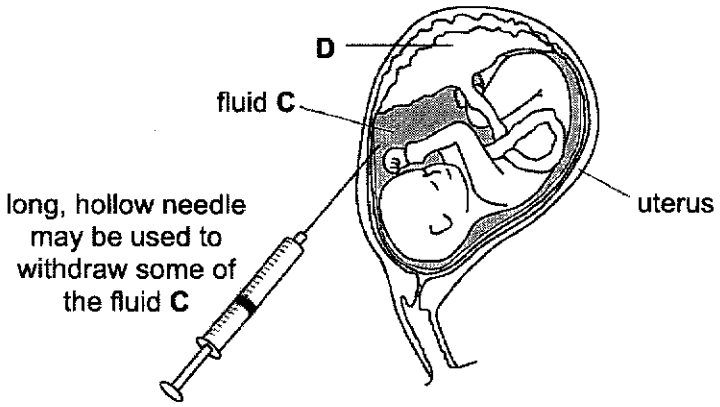


Fig. 4.2

A long, hollow needle may be used to withdraw some of the fluid into a syringe. The DNA from the cells in this fluid can then be analysed to find the sex of the foetus and to detect mutations.

(i) Name fluid **C** and state its function.

name of fluid **C**: _____

function: _____

_____ [2]

(ii) State two substances that are exchanged across structure **D**.

substance 1: _____

substance 2: _____ [1]

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(iii) Fig. 4.3 shows the chromosomes found in the nucleus of one cell of a developing fetus.

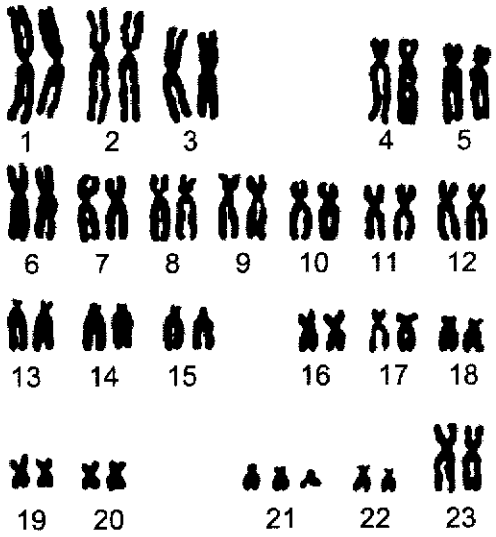


Fig. 4.3

The foetus suffers from a condition as shown in Fig. 4.3.
Name the condition. Give a reason for your answer.

_____

_____

_____

_____ [2]

(c) Draw a genetic diagram to show the possible blood groups of the child if the father is heterozygous for blood group A and the mother has blood group AB.

[4]

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5 Fig. 5.1 shows the percentage of undigested molecules of starch as they pass through the alimentary canal.

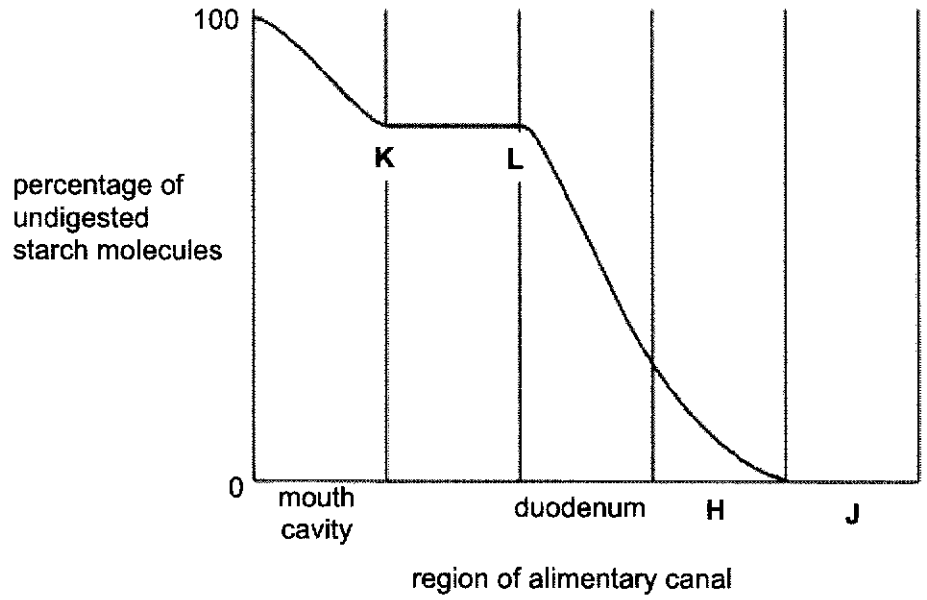


Fig. 5.1

(a) Name the parts of the alimentary canal labelled parts **H** and **J**.

H: _____

J: _____ [2]

(b) State and explain what happens to the digestion of starch between **K** and **L**.

_____

_____

_____

_____

_____ [3]

(c) Explain why the curve is not shown extending into region **J** of the graph.

_____

_____

_____

_____ [2]

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6 Fig. 6.1 shows a pair of kidneys and some associated structures

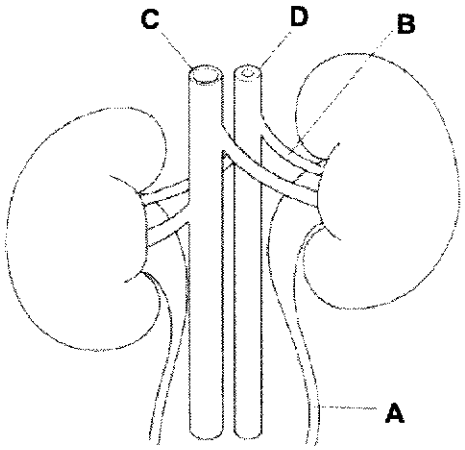


Fig. 6.1

(a) Define the term *excretion*.

_____

_____ [1]

(b) Identify structure A.

_____ [1]

(c) Using the structural features of **C** and **D** in Fig. 6.1, identify structure **B**.

_____

_____ [1]

(d) An athlete consumed only meat and large amounts of water before his training on a hot day. Explain the likely changes in the composition of the person's urine during the day

_____

_____

_____

_____ [2]

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Section B

Answer **three** questions.

Question 9 is in the form of an **Either/Or** question. Only one part should be answered.

7 Red blood cell reinfusion, often called 'blood doping', is a practice of boosting the number of red blood cells in the bloodstream to enhance an athlete's performance.

In one reinfusion technique, 900 to 1800 cm^3 of an athlete's blood is withdrawn over a period of six weeks. The plasma is immediately removed and reinfused and the packed red blood cells are placed in frozen storage. The stored red blood cells are then reinfused in the athlete in the week before the race.

Fig. 7.1 shows the average red blood cell count of a normal person over 16 weeks.

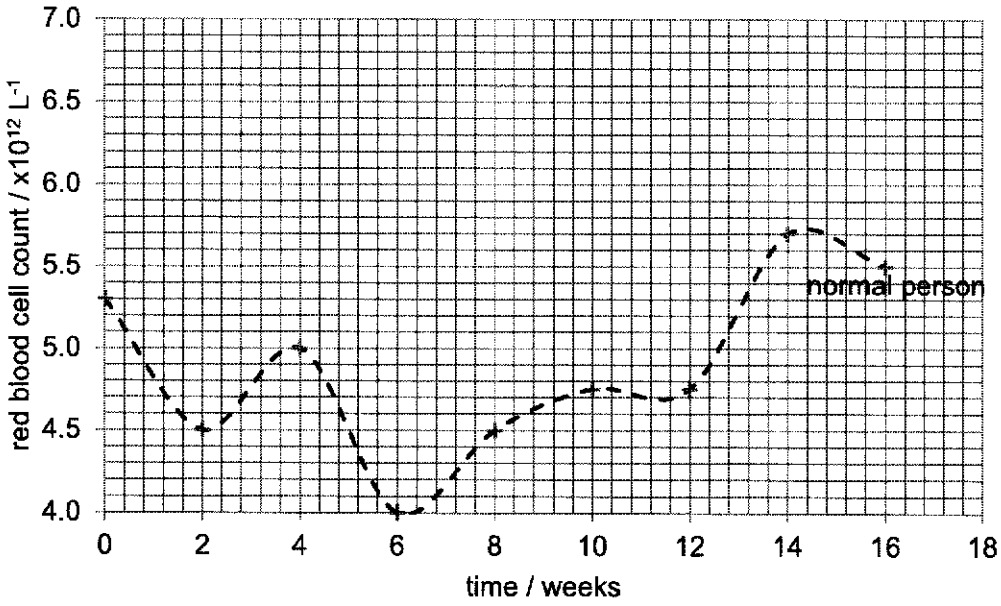


Fig. 7.1

Table 7.2 shows the effect of this reinfusion technique on an athlete's red blood cell count in the weeks following reinfusion.

time / weeks	red blood cell count / $x10^{12}$ L^{-1}
0	7.0
2	6.7
4	6.5
6	6.1
8	5.7
10	5.5
12	5.3
14	5.2
16	5.0

Table 7.2

(a) Plot the data for the red blood cell count of the athlete on Fig. 7.1. [2]

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(b) Calculate the maximum percentage increase in red blood cell count of the athlete after the reinfusion.

[2]

(c) State the difference in the red blood cell count between the athlete and a normal person at the start of the experiment.

_____ [1]

(d) Explain, how the reinfusion technique helps to improve the athlete's performance.

_____

_____

_____

_____

_____

_____

_____ [4]

(e) Explain why the red blood cell count falls steadily in the weeks following the reinfusion.

_____

_____ [1]

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8 (a) (i) Describe and explain how the pupil of the eye responds to an increase in light intensity.

[4]

(ii) Albino people lack colouring pigment in their bodies, including in the choroid and iris. Suggest why albino people should avoid looking at bright lights.

[2]

(b) Explain, using a named example, what is meant by an *endocrine gland*.

[4]

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9 **(a)** Define the term *homeostasis*.

[1]

(b) Compare and contrast between nervous and endocrine control.

[5]

(c) Using the concept of control by negative feedback to explain what would happen when a person walks out of the house, wearing only shorts and a short-sleeved shirt where the air temperature is 5 °C.

[4]

END OF PAPER

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O LEVEL PRELIMINARY Examination 2020

Secondary 4 Express

Biology 6093 Paper 1

Mark Scheme

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

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Woodgrove Secondary School
Science Department

Answer Scheme
4E Preliminary Exam Biology 2020
Setter: Ong Seow Wei

Section A				
1	(a)	(i)	sepals / calyx; OR petals / corolla; OR max	1 1 2
	(a)	(ii)	type of pollination: self /wind; reason for wind: exposed/ large stamens/anthers; OR reason for self: anthers above stigma; OR reason for either: absence of petals/nectaries to attract insects; OR *any 1 type pollination + 1 corresponding correct reason* max Reject: no large/big petals; filament <u>hanging out</u> of the flower/ stamen is long.	1 1 1 1 2
	(b)	(i)	8% sucrose concentration; greatest % (56%) pollen grains germinated and mean pollen tube length is the longest (40mm); max	1 1 2
		(ii)	water potential of sucrose solution is lower than water potential of cell sap of pollen tube cell; water molecules move out of the cell sap of pollen tube cell by osmosis; pollen tube cell shrinks instead of growing longer/larger/germinating; as concentration of sucrose solution increases, water potential decreases causing decrease in percentage germination/ decrease in water affects germination; Accept: water potential gradient will get less steep after 8%, resulting in lesser water molecules moving into pollen grain;	1 1 1 1

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			max	4
			total	**10**
2	**(a)**	**(i)**	Breathing is a mechanical process that results in an exchange of gases between organism and environment, draws air rich in oxygen into the body by inhalation and releases air rich in carbon dioxide by exhalation; Max Accept: exchange of gas through inhalation/ taking in of oxygen and exhalation of carbon dioxide Reject: exchange of gas between lung and environment/surrounding/atmosphere	1 1
		(ii)	**F**: ribs (of the ribcage); **G**: heart; max	1 1 2
	(b)	**(i)**	blood-gas barrier is thinner in birds, 0.2 µm, compared to mammals, 0.5 µm; thinner membrane/barrier allows for shorter diffusion distance of gases resulting in faster rate of diffusion oxygen into blood from alveoli; allowing for increased rate of aerobic respiration to release energy at a faster rate in the muscle cells; max	1 1 1 3
			total	**7**

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3 (a) process: photosynthesis; — 1

explanation: — 2

structure	adaptation	function
leaf blade/ lamina	large/broad flat surface	increases surface area to obtain maximum amount of sunlight
	thin	carbon dioxide molecules can diffuse and reach inner cells rapidly
network of veins	consists of the vascular bundle (xylem and phloem vessels)	o transport water and mineral salts from roots to photosynthesising cells o transport manufactured food away from photosynthesising cells to other parts of plant
cuticle	transparent	o allows light to enter leaf
presence of chlorophyll/ chloroplasts	many layers present (in spongy and palisade mesophyll cells)	o chlorophyll in chloroplasts traps light and converts light energy to chemical energy
intercellular air spaces	large and numerous in spongy mesophyll layer	o allows for rapid diffusion of carbon dioxide and oxygen into and out of mesophyll cells

any 1 correct structure + adaptation + function;

max

(b) effect: reduces transpiration/ reduce loss of water; — 1
explanation: presence of a larger number of stomata on the lower surface of the leaves; — 1
sleep movements reduces the exposure/ total surface area exposed to wind/ air movement in the atmosphere surrounding the stomata; — 1
reducing the concentration gradient of water vapour between the inside of the leaves and the surrounding atmosphere; resulting in lower transpiration rate — 1

max — 4

(c) (i) reduced light levels causes closure of stomata; — 1
photosynthetic rate reduces hence less oxygen is produced and released; — 1

max — 2

Accept: Rate of photosynthesis decreases, resulting in a decrease in oxygen production; AR
Rate of photosynthesis decrease as the light intensity decreases; AR

Reject: Photosynthesis stops/ Uptake of oxygen increases

(ii) in darkness, photosynthesis stops; — 1

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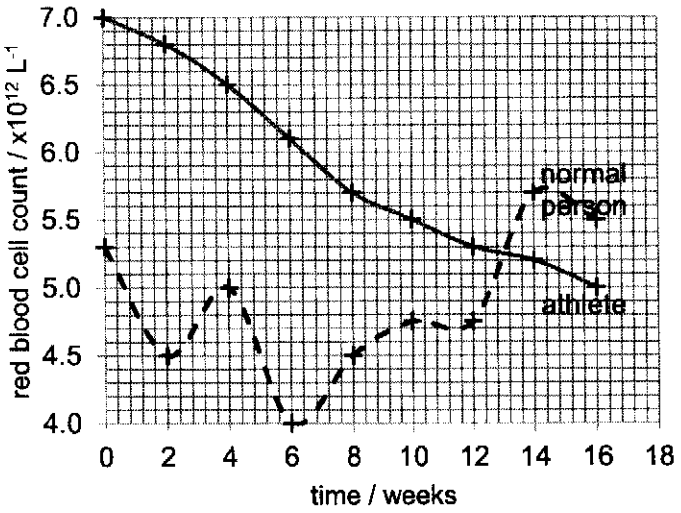
			oxygen is absorbed and used during respiration of cells in the leaf hence net oxygen uptake by the leaf; max	1 2
			total	**10**
4	**(a)**		Beyond day 28, level of progesterone remains high and uterine lining thickness is maintained; Corpus luteum did not disintegrate and continues to produce progesterone, maintaining the thickness of uterine lining for implantation; max	1 1 2
	(b)	**(i)**	amniotic fluid; ▪ supports and cushions the foetus; OR ▪ shock absorber ad protects foetus against physical injury; OR ▪ promotes muscles development by allowing movement; OR ▪ lubricates and reduces friction in vagina or birth canal during childbirth; *any one* max	1 1 2
		(ii)	from foetus to mother: urea/dissolved carbon dioxide; OR from mother to foetus: oxygen/ glucose/ amino acids/ protective antibodies; Reject: metabolic waste/oxygenated blood/ deoxygenated blood/ digested food max	1 1
		(iii)	Down's syndrome; foetus has a chromosomal mutation in his karyotype where there is an additional copy of chromosome in chromosome 21; max	1 1 2
	(c)		father mother genotype of parents I^AI^O I^AI^B gametes I^A I^O I^A I^B genotypes of offspring I^AI^A I^AI^B I^AI^O I^BI^O	1 1 1

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		phenotypes of offspring: blood group A; blood group AB; blood group A; blood group B	1 max 4
			total **11**
5	**(a)**	**H**: ileum/jejunum *[*R small intestine]* **J**: large intestine/colon	1 1 max 2
	(b)	no digestion of starch occurs as the starch molecules passes between K &L/ undigested starch remains the same; no amylase is produced in both organs (stomach and oesophagus; salivary amylase from the mouth cavity will be denatured in the acidic pH of the stomach contents and stops working;	1 1 max 1 3
	(c)	no more starch molecules are present in the contents of alimentary canal/ all starch molecules have been digested; and the soluble products (glucose) absorbed into the bloodstream;	1 max 1 2
			total **7**
6	**(a)**	Excretion is the process by which <u>metabolic waste products</u> and toxic materials are removed from the body of an organism;	1 max 1
	(b)	ureter;	1 max 1
	(c)	renal artery as **C** has thinner walls than **D**; OR renal artery as **C** has wider lumen than **D**; *any one*	1 max 1
	(d)	increased amounts of urea in urine as excess proteins are deaminated to form urea to be excreted; urine is more concentrated/ decreased volume of urine as more <u>water is reabsorbed</u> in the kidneys due to increased sweating to remove excess heat by evaporation of water in sweat;	1 1

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		max	2
		total	**5**
Section B			
7	**(a)**	 correct points (accept 1 wrong); best fit line/curve (can join point to point) with label; max	1 1 2
	(b)	maximum increase in red blood cells = 7.0 x 10^{12} – 5.0 x 10^{12} = 2.0 x 10^{12} rbc L^{-1} % increase in mass = (2.0 x 10^{12}/5.0 x 10^{12}) x 100% = 40% max	1 1 2
	(c)	difference in rbc count = 7.0 x 10^{12} - 5.3 x 10^{12}	1

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			= 1.7 x 10^{12} rbc L^{-1} max		1
	(d)		during exercise, demand of oxygen increases as muscle tissues increases; the rate of aerobic respiration to release more energy for increased muscle contraction; haemoglobin in red blood cells transports oxygen; increase in the number of red blood cells increases the volume of oxygen; transported to the muscles for release of more energy increase in volume of oxygen transported to the muscles also allows muscles to respire aerobically for a longer period of time; with less buildup of lactic acid and oxygen debt allowing athlete to sustain longer; max Accept: Oxygen debt can be paid off rapidly for faster muscle recovery ; AR		1 1 1 1 4
	(e)		Absence of nucleus in red blood cells resulting in inability to reproduce and repair worn out cells overtime leading to destroy of red blood cells in spleen; Max Accept: RBC dies off		1 1
				total	**10**
8	**(a)**	**(i)**	pupil reflex (involuntary action) occurs; increase in light intensity entering the eye stimulates the photoreceptors on the retina; nerve impulses (electrical) are produced and transmitted along the optic nerve to the brain, motor neurone and to the effector (muscles of the iris); circular muscles (of the iris) contract, the radial muscles relax; the pupil becomes smaller reducing the amount of light entering the eye; max		1 1 1 1 4
		(ii)	absence of pigment (melanin) in the choroid of the eye causes internal reflection of light within eyeball; decreased ability of iris to filter out light (due to lack of melanin) allows excess/stray light to enter; max Accept: damaged eyes with light shines directly into the eyes/ blurred image formed due to increase in internal reflection/ any logical answers.		1 1 2

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Reject: Harm to the eye/ negative impact on eye

(b) 4

Name of hormone – 1	Role of hormone – 1	Effect on target organ – 2 [max 2 needed, if in excess]
Insulin	Blood glucose concentration regulation	Liver and muscles convert excess glucose to glycogen for storage; Permeability of cell surface membrane to glucose increases & glucose absorbed faster;
Glucagon	Blood glucose concentration regulation	Glycogen stored in liver is converted to glucose; and released into the blood stream;
Anti-diuretic hormone	Regulation of blood plasma water potential	Less ADH, cells in CD become less permeable to water & less water is reabsorbed by kidney tubules producing diluted urine; More ADH, cells in CD become more permeable to water & more water is reabsorbed by kidney tubules producing concentrated urine;
Adrenaline	Prepare body for 'flight' or 'fight' action	Stimulates the conversion of glycogen back to glucose; Increases rate and depth of ventilation; Increases rate of heartbeat and causes rise in blood pressure; Increases the diameter of arterioles in the muscles/constricts arterioles in skin allowing more blood to muscles; Pupils dilate;

any other reasonable answers

Accept: If students mentioned both insulin and glucagon = 1; and state only that insulin is released when blood glucose level is above norm, while glucagon is released when blood glucose is below norm = 1.

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<table>
<tr><td></td><td></td><td>total</td><td>10</td></tr>
<tr><td>9
O</td><td>(a)</td><td>homeostasis is the maintenance of a constant internal environment; OR
the process that keeps the body temperature constant and ensures that the composition of the body fluids is kept within narrow limits

max</td><td>1

1</td></tr>
<tr><td></td><td>(b)</td><td>similarities:
• both require a stimulus
• both bring about a response in the organism
differences:
<table><tr><th>nervous control</th><th>endocrine control</th></tr><tr><td>quick responses</td><td>slow responses</td></tr><tr><td>responses that are short-lived</td><td>responses can be short or long-lived</td></tr><tr><td>may be voluntary or involuntary</td><td>always involuntary</td></tr><tr><td>usually localized/ involved effectors</td><td>may affect one or more target organs</td></tr><tr><td>Transmit along <u>neurons</u></td><td>Secrete chemical hormones into <u>blood</u> stream</td></tr></table>any 1 similarity + all 4 differences

max</td><td>5

5</td></tr>
<tr><td></td><td>(c)</td><td>Only temperature receptors of skin are stimulated as external environment temperature is low and excessive loss of heat causes blood temperature to decrease below norm;
Impulses are sent to the hypothalamus of brain stimulating it;
Vasoconstriction of arterioles near <u>skin's surface</u> and dilation of shunt vessels allowing <u>less</u> blood flow through capillaries;
decreased heat loss through conduction, convection, radiation;
Decreased production of sweat so that less latent heat is lost;
Metabolic rate increases and shivering (reflex contraction of skeletal muscles to increase heat released) occurs to increase blood temperature;

max</td><td>1

1

1

1

1

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

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