NAME:	NO:	CLASS:

RIVERSIDE SECONDARY SCHOOL

PRELIMINARY EXAMINATION 2022

SUBJECT	: Biology
SUBJECT CODE/PAPER	: 6093/01
LEVEL/STREAM	: 4 Express
DURATION	: 1 hour

READ THESE INSTRUCTIONS FIRST

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

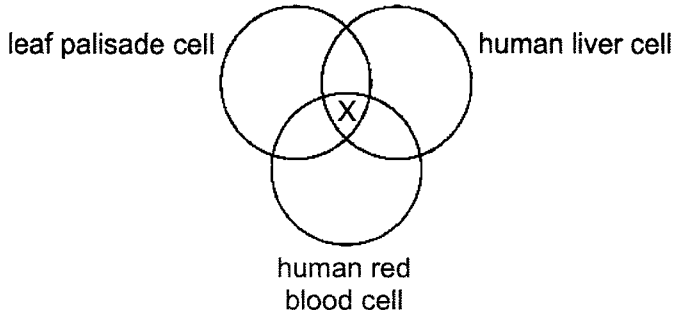
There are **forty** questions on this section. Answer **all** the questions. For each question, there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

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

This document consists of **22** printed pages.

1 The diagram represents the cell structure of a human liver cell, a leaf palisade cell and a human red blood cell.



Which cell structure is X?

A cell wall

B chloroplast

C cytoplasm

D nucleus

2 Some processes occurring in organisms are listed.

1 absorption of glucose by villi
2 reabsorption of glucose by the kidney
3 translocation of sugars in the phloem
4 movement of oxygen into leaves of a plant
5 transpiration from the leaves of a plant
6 uptake of minerals by root hairs

Which processes may involve respiration?

A 1, 2, 3 and 6

B 1, 3, 4 and 5

C 2, 3, 4 and 6

D 2, 4, 5 and 6

3 The table shows the colours obtained after testing three different foods for carbohydrates, fats and proteins.

test	food X	food Y	food Z
Benedict's	brick-red	blue	blue
biuret	blue	violet	blue
ethanol emulsion	clear	clear	white
iodine	black	brown	brown

Which nutrients are present in foods X, Y and Z?

	food X	food Y	food Z
A	carbohydrates	proteins	fats
B	fats	proteins	carbohydrates
C	carbohydrates	fats	proteins
D	proteins	carbohydrates	fats

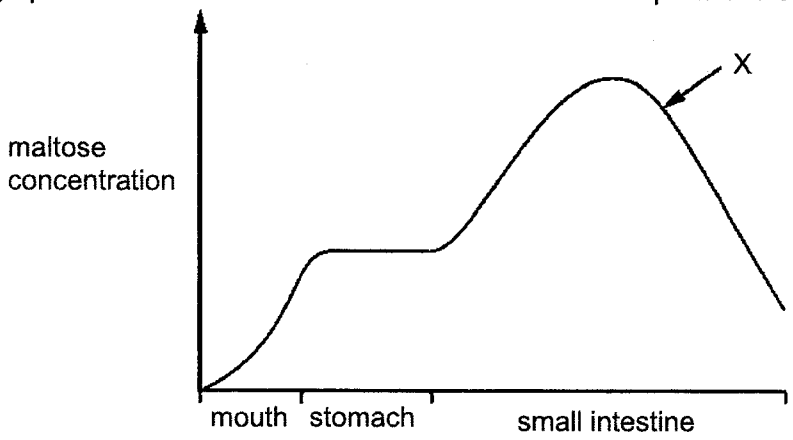
4 Seven test-tubes were set up at different pH values. They each contained the same concentration of substrate and enzyme. The table shows the time taken for the reaction to be completed in each test-tube.

pH	1	3	5	7	9	11	13
time to be completed / s	96	64	42	20	5	35	66

At which pH does the enzyme work best?

A pH 1 **B** pH 7 **C** pH 9 **D** pH 13

5 The graph shows the concentration of maltose in different parts of the alimentary canal.



What causes the change in concentration at X?

A absorption of maltose

B action of amylase

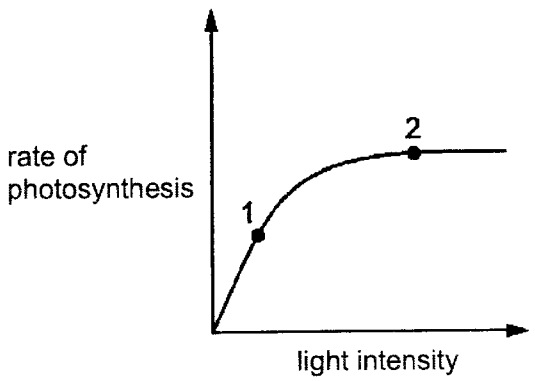
C action of maltase

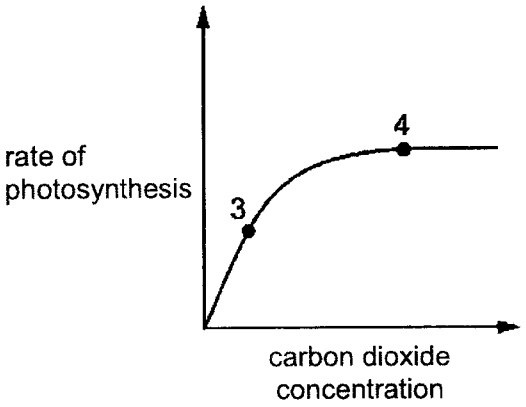
D assimilation of maltose

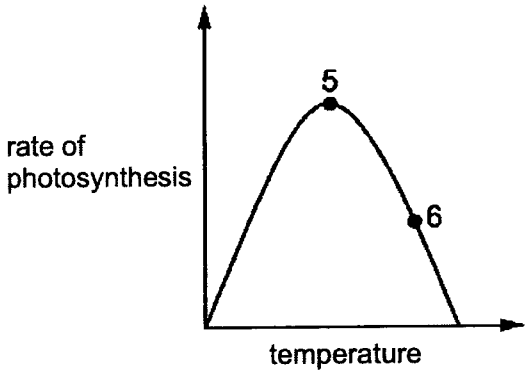
6 Which row correctly shows the number of molecules, for each substance used and produced, during photosynthesis?

	substances used	number of molecules	substances produced	number of molecules
A	CO_2 H_2O	1 1	$C_6H_{12}O_6$ O_2	6 1
B	CO_2 H_2O	6 6	$C_6H_{12}O_6$ O_2	1 6
C	$C_6H_{12}O_6$ O_2	1 1	CO_2 H_2O	6 6
D	$C_6H_{12}O_6$ O_2	6 6	CO_2 H_2O	6 1

7 The graphs show factors affecting the rate of photosynthesis.



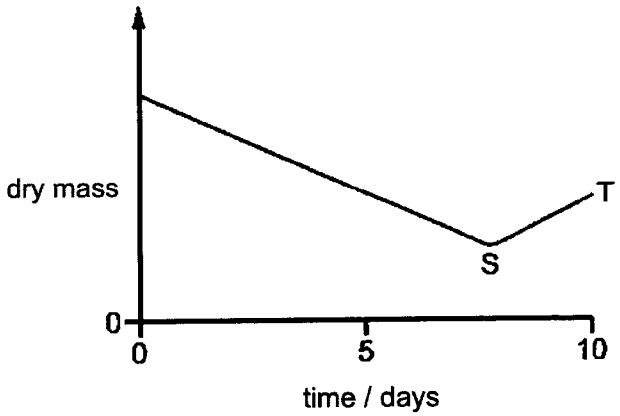




At which points on the graphs could the rate of photosynthesis be limited by light intensity?

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

8 The graph shows changes in the dry mass of a seed as it grows.



What causes the change shown between points S and T?

A osmosis

B photosynthesis

C respiration

D transpiration

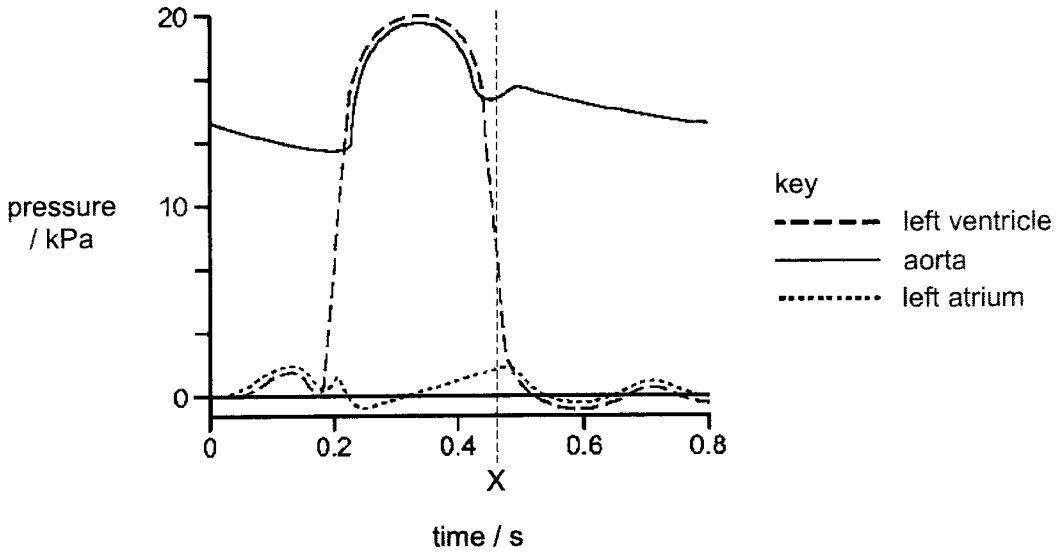
9 What is a difference between the contents of plasma and the contents of tissue fluid?

	plasma	tissue fluid
A	dissolved glucose	no dissolved glucose
B	less dissolved glucose	more dissolved glucose
C	more protein molecules	no protein molecules
D	white blood cells	no white blood cells

10 Which row describes the functions of the blood components?

	plasma	platelets	white blood cells
A	antibody formation	clotting	transport of nutrients
B	clotting	transport of nutrients	antibody formation
C	clotting	antibody formation	transport of nutrients
D	transport of nutrients	clotting	antibody formation

11 The diagram shows the pressures in the left side of the heart during one heartbeat.



Which valves are open and which are closed at the time marked X?

	bicuspid	semi-lunar
A	closed	closed
B	closed	open
C	open	closed
D	open	open

12 What is the pathway taken by water as it travels through a plant?

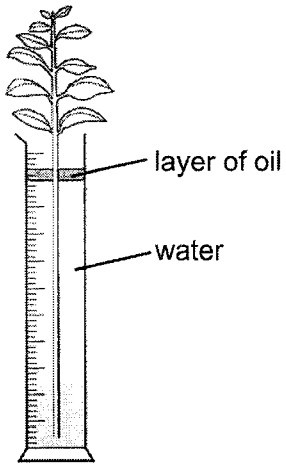
A mesophyll cells → xylem → root cortex cells → root hair cells

B root cortex cells → root hair cells → mesophyll cells → xylem

C root hair cells → root cortex cells → xylem → mesophyll cells

D xylem cells → mesophyll → root cortex cells → root hair cells

13 Four leafy plant stems were placed into measuring cylinders with 100 cm^3 of water. A layer of oil prevented the water in the measuring cylinder from evaporating.



The plant stems were exposed to different air humidities and temperatures for 48 hours as shown in the table.

plant stem	humidity	temperature / °C	final volume of water / cm^3
1	low	5	75
2	low	25	.....
3	high	5	95
4	high	25	65

The final volume of water in the measuring cylinders is shown for plant stems 1, 3 and 4.

What would be a likely final volume for plant stem 2?

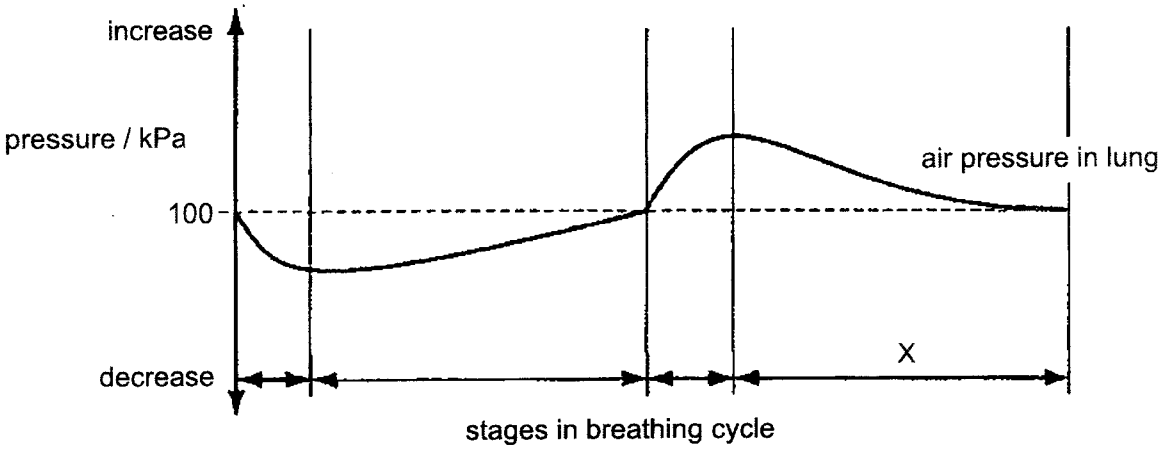
A less than 65 cm^3

B between 65 cm^3 and 75 cm^3

C between 75 cm^3 and 95 cm^3

D greater than 95 cm^3

14 The graph shows changes in air pressure within the lungs during one breathing cycle.



Which row describes the state of the breathing system during time X?

	diaphragm contracting	external intercoastal muscles contracting	internal intercoastal muscles contracting	lung volume increases
A	✓	✓	✗	✓
B	✓	✗	✗	✗
C	✗	✗	✓	✗
D	✗	✗	✓	✓

key

✓ = yes

✗ = no

15 Some structures found in the body are listed below.

1 alveolus
2 bronchus
3 small intestine
4 oviduct

Which structures are lined with cilia?

A 1 and 2

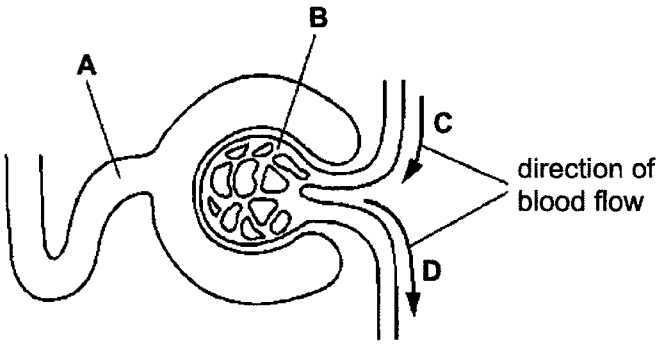
B 1 and 4

C 2 and 3

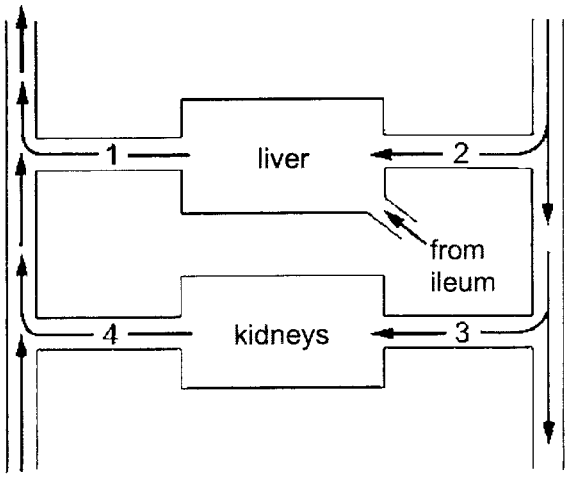
D 2 and 4

16 The diagram shows the first part of a kidney nephron and its blood supply.

Which part contains the highest concentration of protein?



17 The diagram represents the blood supply to the liver and to the kidneys.



Which blood vessels contain blood with the highest and lowest concentrations of urea?

	highest	lowest
A	1	2
B	1	4
C	3	2
D	3	4

18 Which mechanism for maintaining body temperature involves the action of muscles?

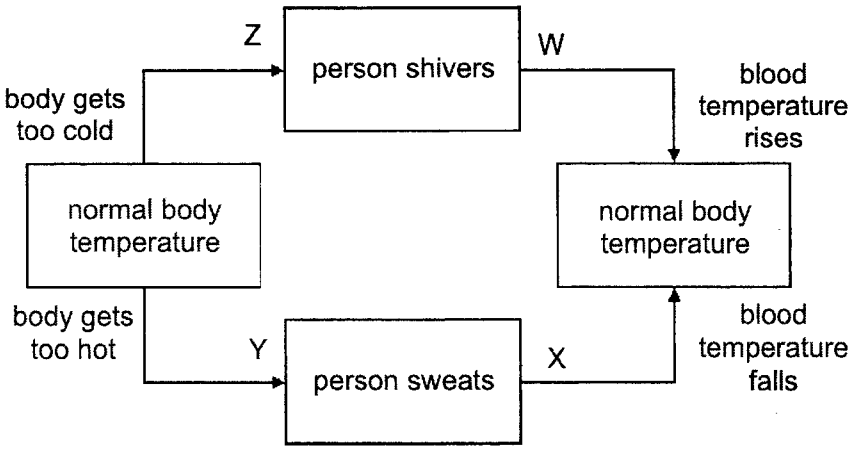
A detection of temperature

B insulation with fatty tissues

C sweating

D vasodilation of arterioles

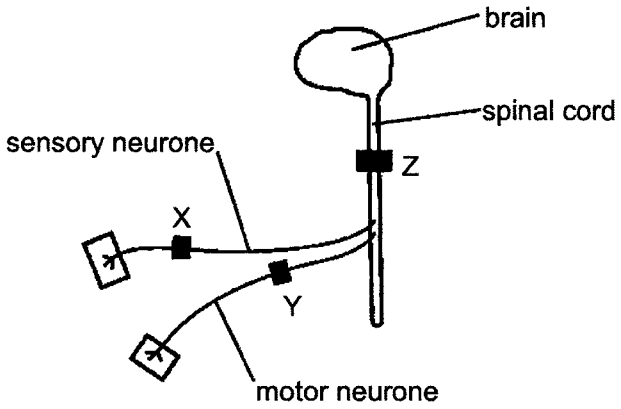
19 The diagram shows an example of homeostasis in a person.



Which letters represent negative feedback changes?

A W and X **B** W and Y **C** X and Z **D** Y and Z

20 The diagram shows three possible positions, X, Y and Z, where nerve impulses are blocked by a drug.



A person has a block at Y.

Which row describes what happens to the person?

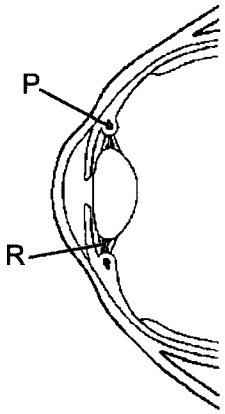
	moves the leg	feels a pinprick
A	✓	✗
B	✗	✓
C	✓	✓
D	✗	✗

key
✓ = yes
✗ = no

21 Which row best describes a reflex action?

	response	effector
A	rapid	brain
B	slow	muscle
C	rapid	gland
D	slow	spinal cord

22 The diagram shows a section through the eye.

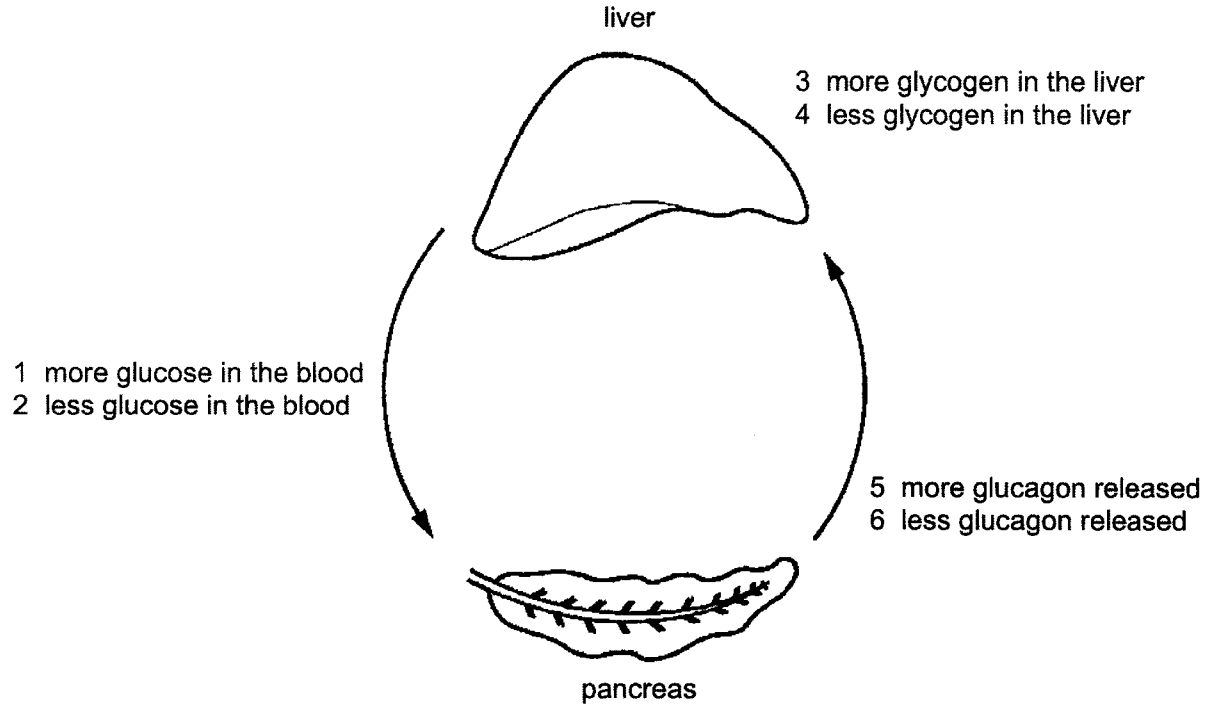


A person was looking at a plane in the sky, and looked down at his mobile phone.

What is the name and state of the structures P and R?

	P		R	
	name	state	name	state
A	ciliary muscles	contracted	suspensory ligaments	loose
B	ciliary muscles	relax	suspensory ligaments	tight
C	suspensory ligaments	contracted	ciliary muscles	tight
D	suspensory ligaments	relax	ciliary muscles	loose

23 The diagram shows part of the mechanism that controls blood sugar concentration.



A person does one hour of exercise.

Starting with the pancreas, what is the sequence of events in which glucagon is involved?

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

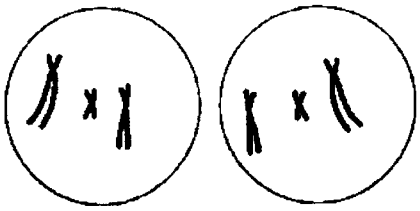
24 Which row matches each hormone to its function?

	reduces blood glucose concentration	repairs uterus lining	increases water potential of blood	dilates pupil
A	adrenaline	oestrogen	insulin	antidiuretic hormone
B	adrenaline	antidiuretic hormone	oestrogen	insulin
C	insulin	adrenaline	antidiuretic hormone	oestrogen
D	insulin	oestrogen	antidiuretic hormone	adrenaline

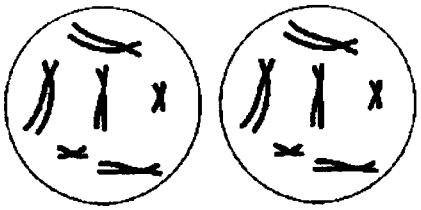
25 The diagram shows the chromosomes in a cell nucleus.

Which diagram shows the product of one division of the cell nucleus by mitosis?

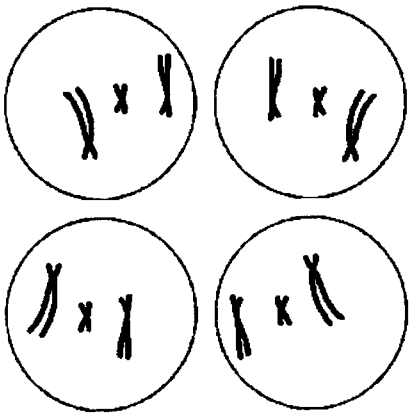
A



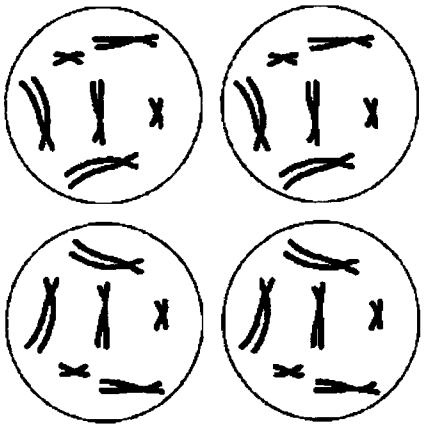
B



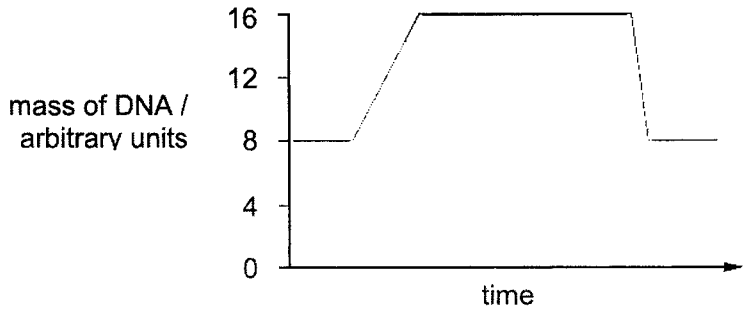
C



D



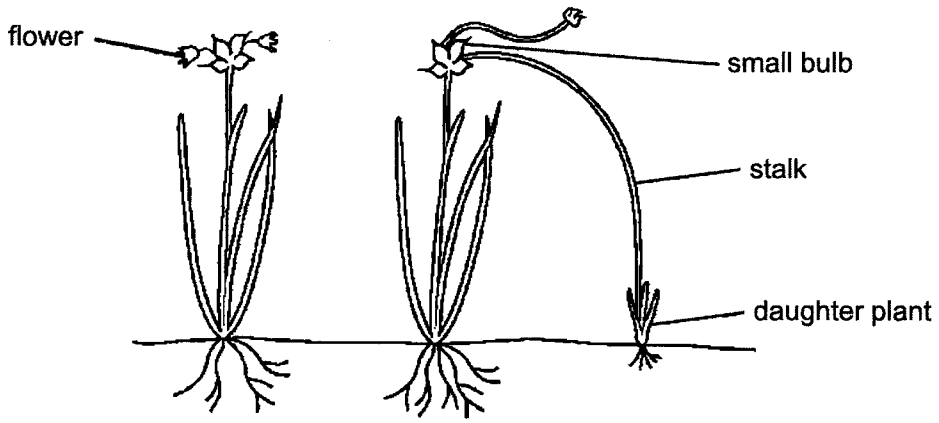
26 The diagram shows the mass of DNA in cells which are dividing.



Which row describes this type of cell division?

	type of cell division	type of reproduction using this cell division	this type of cell division gives rise to
A	meiosis	asexual	genetically identical offspring
B	meiosis	sexual	genetically dissimilar offspring
C	mitosis	asexual	genetically identical offspring
D	mitosis	sexual	genetically dissimilar offspring

27 The diagram shows two onion plants.



Using the information in the diagram, which statement about these onion plants is correct?

A Daughter plants are produced from the small bulb by meiosis.

B Daughter plants produced from the flower are genetically identical to the parent plant.

C The plants can reproduce sexually and asexually.

D Two parent plants are required for reproduction.

28 The following investigation was carried out using flower buds growing on three plants of the same species:

Plant 1 – The anthers were carefully removed and the buds left open to the air.

Plant 2 – The anthers were left untouched and a paper bag was tied tightly around each bud.

Plant 3 – The anthers were carefully removed and a paper bag was tied tightly around each bud.

Although all flowers later opened normally, only those on plant 1 produced seeds.

Which statement shows a conclusion that can be made from the results?

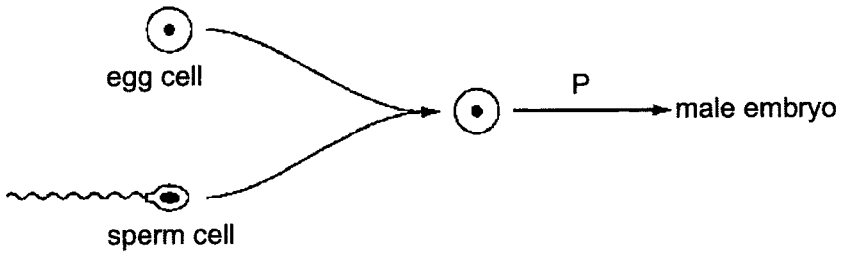
A Only cross-pollination can take place.

B Only wind-pollination can take place.

C Only insect-pollination can take place.

D Both self- and cross-pollination can take place.

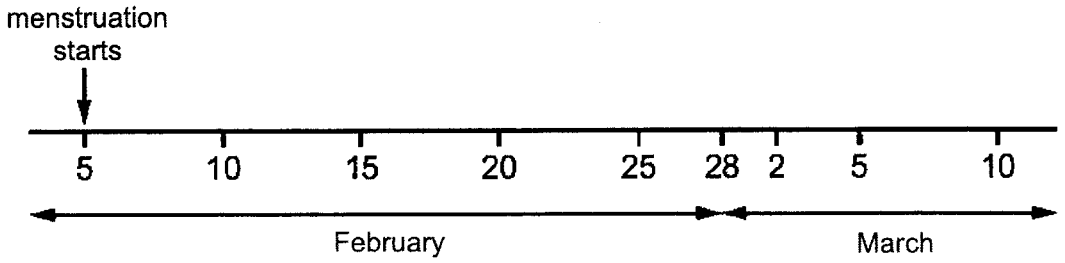
29 The diagram shows the production of a male embryo.



Which row shows the sex chromosomes in the cells and the type of cell division at P?

	sex chromosomes found in			type of cell division at P
	egg cell	sperm cell	male embryo	
A	X	X	XX	mitosis
B	X	Y	XY	mitosis
C	X	X	XX	meiosis
D	Y	X	XY	meiosis

30 The diagram shows a calendar for 33 days in February and March.



A girl, who has a regular menstrual cycle of 28 days, begins menstruation on 5 February.

During which dates would the progesterone concentration in her blood rise most rapidly?

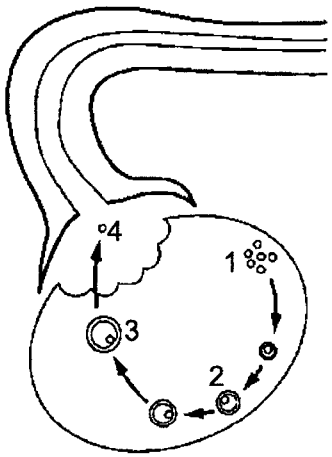
A 5 – 12 February

B 13 – 19 February

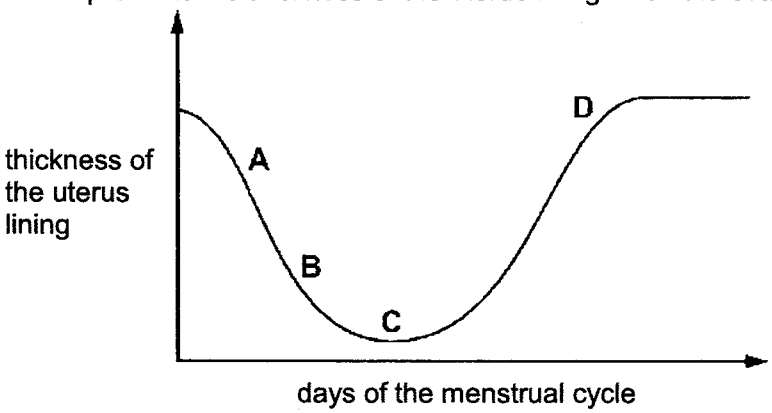
C 20 – 26 February

D 27 February – 5 March

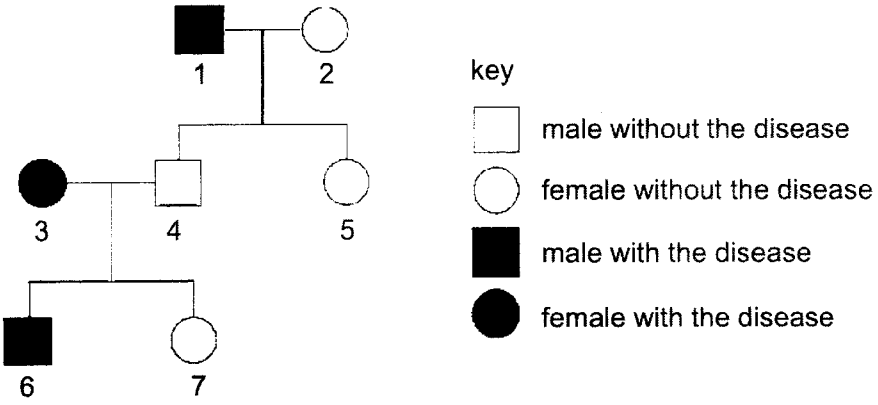
31 The diagram shows changes in the ovary.



Which point represents the thickness of the uterus lining when the ovary is at stage 4?



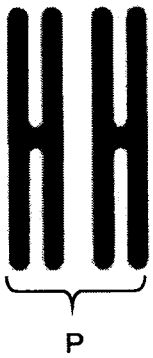
32 The diagram shows a family in which some members suffer from a disease caused by a recessive allele.



Which two members of the family must be heterozygous for the gene?

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

33 The diagram shows two human chromosomes from a muscle cell.



Which row best describes P?

	term	description
A	complementary	two chromosomes that have complementary base pairing
B	complementary	two chromosomes that have the same sequence of genes
C	homologous	two chromosomes that form a pair at the start of meiosis
D	homologous	two chromosomes that have identical alleles

34 One gene has two codominant alleles, A^E and A^F, and one recessive allele, A^G.

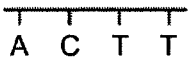
How many different genotypes and phenotypes are possible?

	genotypes	phenotypes
A	3	3
B	4	6
C	6	4
D	6	6

35 Which statements about natural selection are correct?

	natural selection can lead to better adapted species surviving	natural selection can lead to extinction of a species	natural selection can lead to gene mutations occurring
A	true	true	true
B	true	true	false
C	true	false	true
D	false	true	true

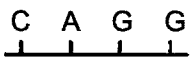
36 The diagram shows a short section of a single strand of DNA.



Which strand of DNA will combine with this strand to form part of a double helix?

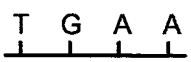
A

B



C

D



37 Which statements about the use of bacteria to produce human insulin are correct?

1 Enzymes are used to cut out the human insulin gene.
2 The human insulin gene is transferred to bacterial DNA.
3 The bacterial DNA is transferred into human cells.

	statement		
	1	2	3
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✓
D	✗	✓	✓

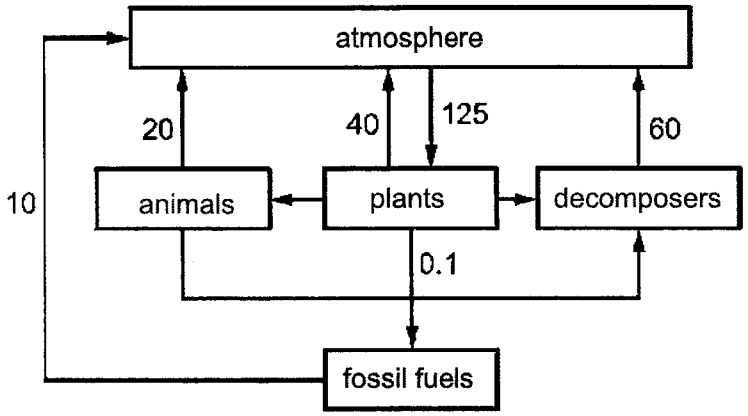
key
✓ = correct
✗ = incorrect

38 In a pyramid of biomass, the mass of producers is 800 g / m^2.

What are the likely masses of the carnivores and the herbivores?

	carnivores / g / m^2	herbivores / g / m^2
A	4	4
B	4	40
C	40	4
D	400	40

39 The diagram shows the movement of carbon in the carbon cycle, in gigatonnes per year.



How many gigatonnes of carbon are moved by respiration each year?

A 120 **B** 125 **C** 130 **D** 255

40 The statements describe some of the events that occur during eutrophication.

What is directly responsible for the increase in decomposers?

A a decrease in dissolved oxygen concentration

B an increase in nitrate concentration

C an increase in the population of algae

D an increase in the death of producers

CANDIDATE NAME

CLASS 4 INDEX NUMBER

RIVERSIDE SECONDARY SCHOOL

PRELIMINARY EXAMINATION 2022

SUBJECT : BIOLOGY
Paper 2

SUBJECT CODE & PAPER : 6093/02

LEVEL/STREAM : 4 Express

DURATION : 1 hour 45 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on all 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.
Write your answers in the spaces provided on the Question Paper.

Section B
Answer **all** the questions, the last question is in the form either/or.
Write your answers in the spaces provided on the Question Paper.

Electronic calculators may be used.

You are advised to spend no longer than one hour on Section A and no longer than 45 minutes on Section B.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **22** printed pages.

Section A

Answer **all** questions.

Write your answers in the spaces provided.

1 Fig. 1.1 shows the human lungs and associated structures.

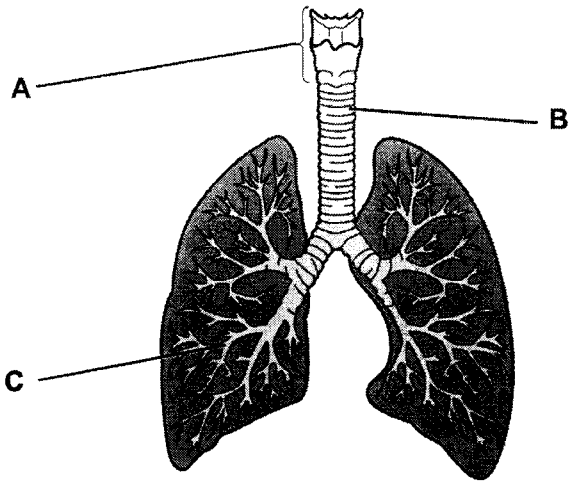


Fig. 1.1

(a) Identify structures **A**, **B** and **C** in Fig. 1.1.

A .....

B .....

C .....

[3]

(b) Lungs are important organs in humans.

Explain why humans need lungs.

.....

.....

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.....

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..... [3]

[Total: 6]

2 A person visits an eye doctor to have an eye test. Fig. 2.1 shows a diagram of an eye, which is on the wall of the doctor's room.

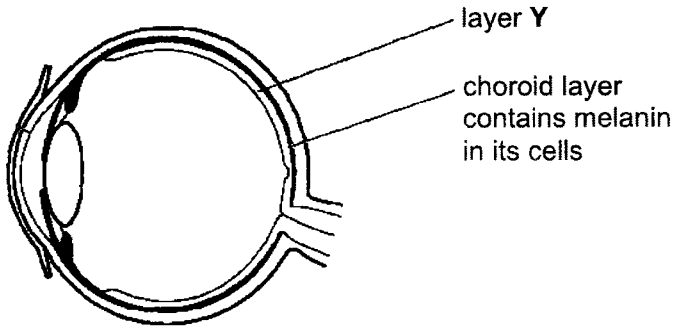

Fig. 2.1

(a) As part of the eye test, the doctor shines a bright light into the eye and takes a picture. Fig. 2.2 shows layer **Y** and the choroid layer behind it.

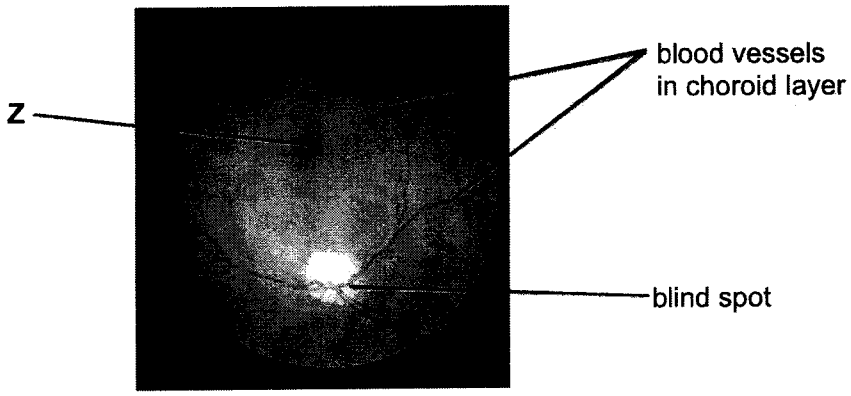

Fig. 2.2

(i) State the name of **Z**.

.....

[1]

(ii) Layer **Y** does not contain blood vessels.

Explain how the blood vessels in the choroid layer are important for layer **Y**.

.....

.....

..... [2]

(b) When the bright light is shone into the eye, there is a pupil reflex which causes the pupil to become smaller.

Explain how **named** parts of the eye and the nervous system are involved in this pupil reflex.

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..... [4]

(c) Some people inherit a condition which prevents the production of the dark pigment melanin in their choroid and skin cells. Only people with two recessive alleles have this condition.

(i) Two parents are both heterozygous for the condition. Use **A** for the dominant allele and **a** for the recessive allele to complete the genetic diagram.

	father	x	mother
genotypes of parents	.....	x	.....
gametes	.....	.....	....
genotypes of offspring	.....	.....	....
phenotypes of offspring	.....	.....	....

[4]

(ii) The parents have two children who are unaffected by the condition. The mother is pregnant with her non-identical twins.

State the probability of **both** the twins having the condition.

..... [1]

[Total: 12]

3 A man is cooking in a hot kitchen and sweating.

(a) (i) Explain the term homeostasis with reference to sweating.

.....

.....

.....

..... [2]

(ii) Explain how blood vessels in the man's skin are also involved in homeostasis when he is in the hot kitchen.

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.....

..... [3]

(b) Sweat contains very small quantities of the waste product urea.

Name the organ where urea is made in the body.

..... [1]

(c) Table 3.1 shows the concentrations of some chemicals found in the sweat, urine and blood plasma of a healthy human.

Table 3.1

chemical	concentration of chemical / mmol per dm^3		
	sweat	urine	blood plasma
urea	22	393	6
sodium	66	110	141
chloride	59	103	99

(i) Compare the chemical composition of urine and blood plasma.

.....

.....

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..... [2]

(ii) A patient has kidney disease and is about to start dialysis treatment.

With reference to Table 3.1, suggest and explain the concentration of urea in the sweat of the patient compared to that of a person who does **not** have kidney disease.

.....

.....

.....

..... [2]

[Total: 10]

4 A species of caterpillar, the holly looper, feeds on the leaves of the holly tree.

Holly tree produces red berries that are eaten by a species of bird, the song thrush.

Song thrushes also eat caterpillars and are eaten by hawks.

(a) Use the information above to complete the food web in Fig. 4.1 by naming **one species** in each box **and** draw **arrows** between the boxes to show the direction and amount of energy flow between organisms. The width of your arrows represents the amount of energy.

[2]

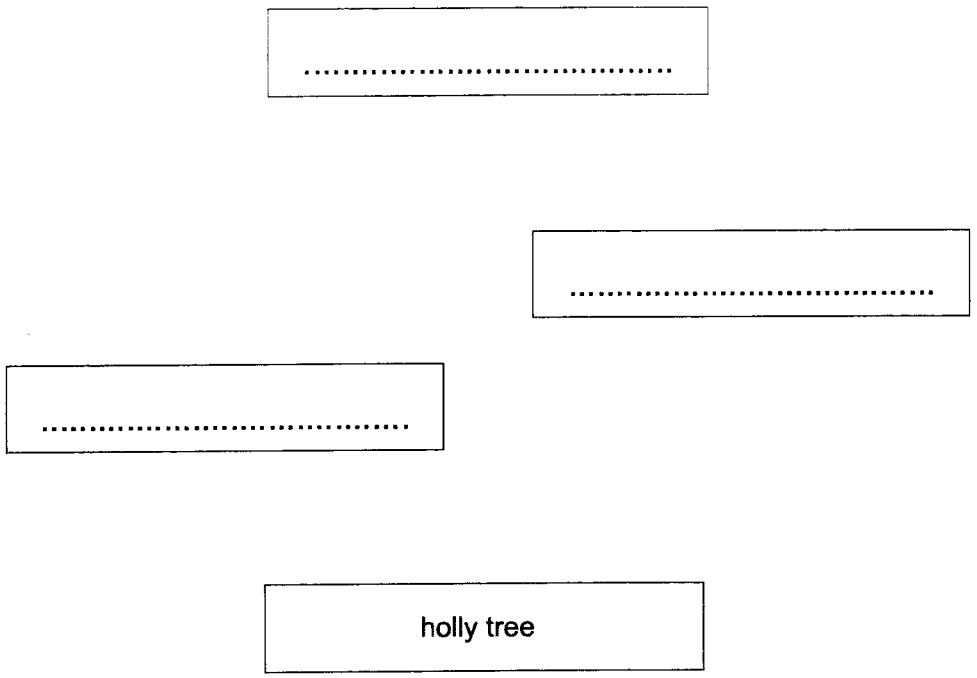

Fig. 4.1

(b) Holly trees are tall flowering plants. Bats also feed on the nectar from holly flowers and pollinate them so they can produce small, light seeds. Insects feed on its leaves and when the leaves fall to the ground, they will come into contact with soil bacteria and fungi.

(i) Suggest and explain ways in which being tall may be helpful for the survival of the holly trees.

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..... [3]

(ii) Explain why the bacteria and fungi found in the soil are important in this ecosystem.

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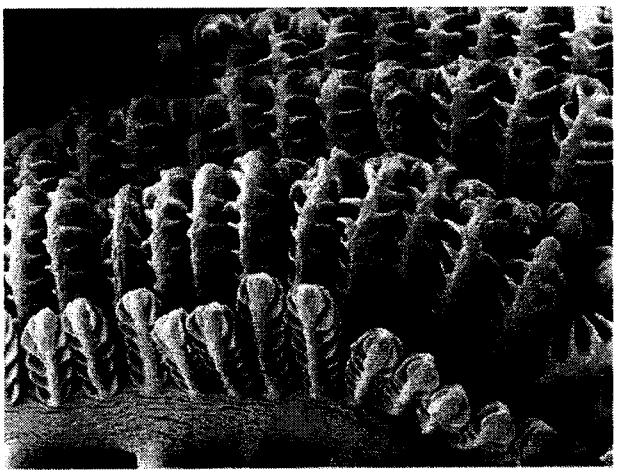
..... [3]

[Total: 8]

5 **(a)** Fig. 5.1 is a micrograph of part of some fish gills.



magnification x110

Fig. 5.1

Fish gills are adapted for gas exchange by diffusion.

(i) Define the term diffusion.

.....

.....

.....

..... [2]

(ii) Suggest **one** adaptation, **visible** in Fig. 5.1, that shows that fish gills are efficient structures for gas exchange by diffusion.

.....

..... [1]

(b) Some pollutants decrease the concentration of dissolved oxygen in rivers. This can result in the death of fish.

(i) State **one** type of pollutant that can result in a decrease in the concentration of dissolved oxygen in rivers.

..... [1]

Researchers investigated the effect of the concentration of dissolved oxygen in water on gas diffusion distance in tissues. The thickness of fish gills was used to determine the gas diffusion distance.

The researchers changed the concentration of dissolved oxygen by bubbling different concentrations of oxygen into water. The temperature of the water was kept constant at 15 °C.

Their results are shown in Fig. 5.2.

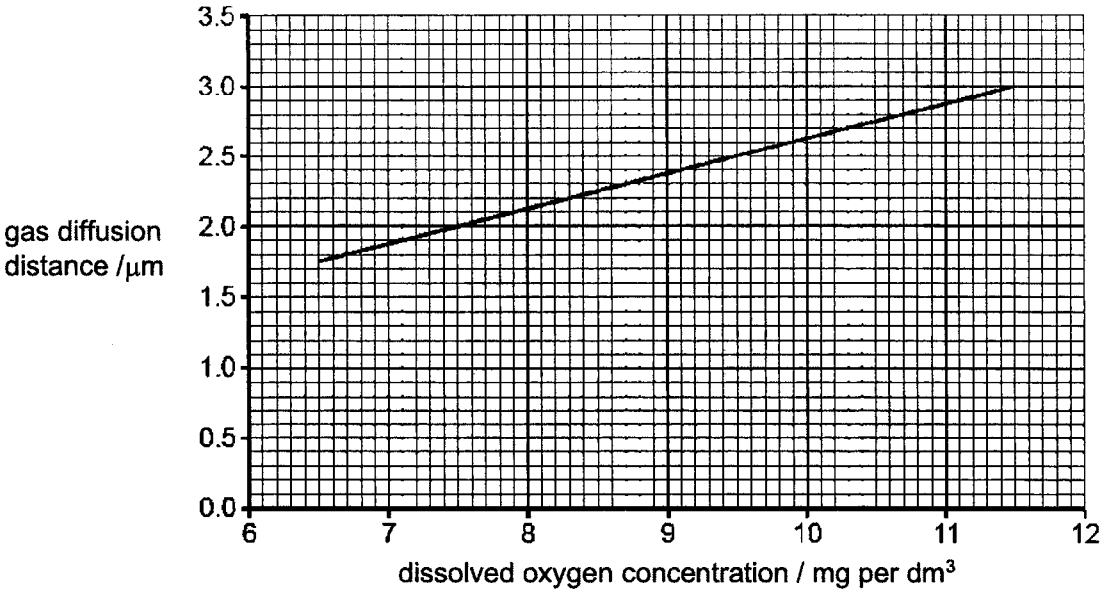


Fig. 5.2

Fig. 5.3 shows the relationship between the concentration of dissolved oxygen and water temperature.

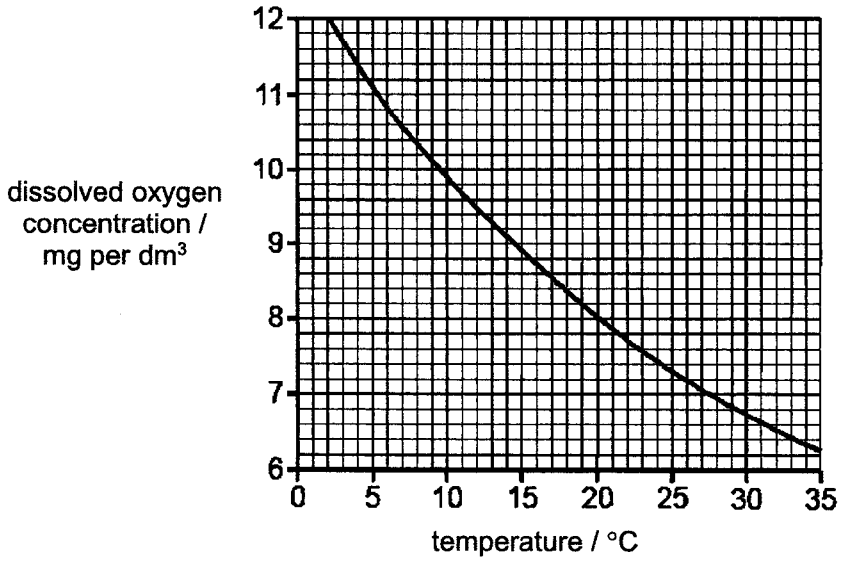


Fig. 5.3

(ii) State the concentration of dissolved oxygen from Fig. 5.3 at

15°C ..... mg per dm^3 and 25°C ..... mg per dm^3. [1]

(iii) Using the concentration of dissolved oxygen from Fig. 5.2 and 5.3, describe the effect on gas diffusion distance of increasing the temperature of the water from 15 °C to 25 °C.

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..... [2]

[Total: 7]

6 Some washing powders contain enzymes.

Fig. 6.1 shows a box of biological washing powder containing enzymes.

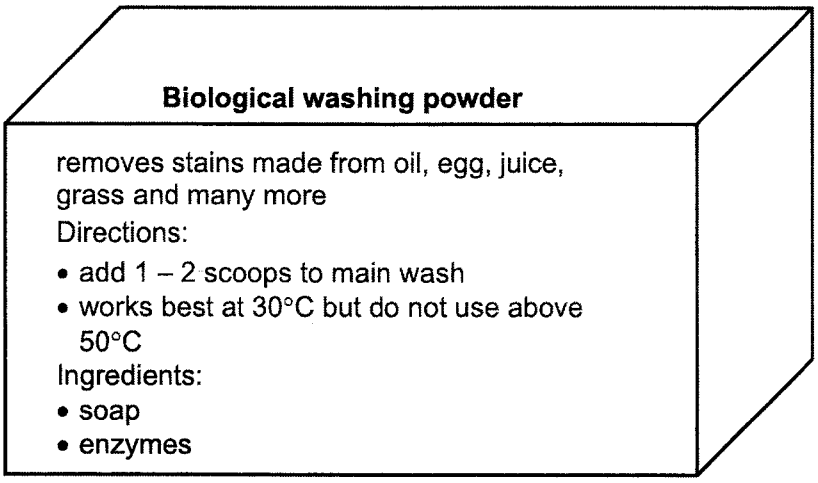

Fig. 6.1

(a) Eggs contain protein.

Describe how the biological washing powder removes egg stains.

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..... [3]

(b) Explain why the manufacturer states that the washing powder works best at 30 °C and should **not** be used above 50 °C.

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..... [4]

[Total: 7]

CANDIDATE NAME

CLASS 4

INDEX NUMBER

Question 7 starts over the page

Section B

Answer **three** questions.

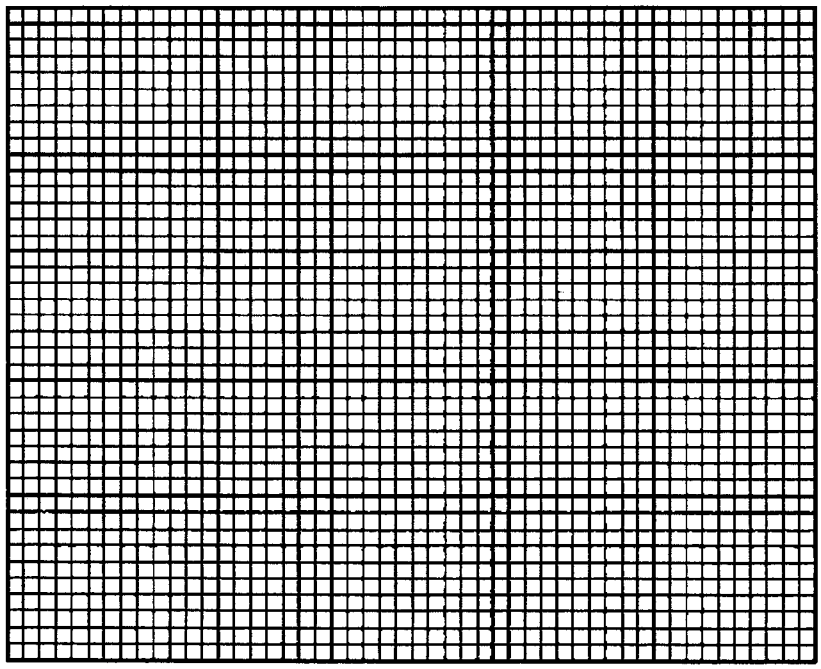
Question **9** is in the form of an **Either/Or** question. Only one part should be answered.

7 A student investigated the effect of exercise on her rate of breathing. She started exercising at two minutes and stopped exercising at eight minutes. Table 7.1 shows the data collected.

Table 7.1

time / minutes	rate of breathing / breaths per minute
0	12
2	13
4	24
6	35
8	35
10	19

(a) (i) Plot a line graph of the data in Table 7.1 on the grid.



[4]

(ii) Using your graph, state the rate of breathing at five minutes. Show your working on the graph.

..... [1]

(b) Explain the effect of exercise on the function of the student's heart, to transport blood out to the muscles.

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..... [5]

[Total:10]

8 A potometer is used to measure water uptake by a plant. Fig. 8.1 shows the stem and flower of a plant in a potometer. As water is taken up, the bubble moves in the direction shown.

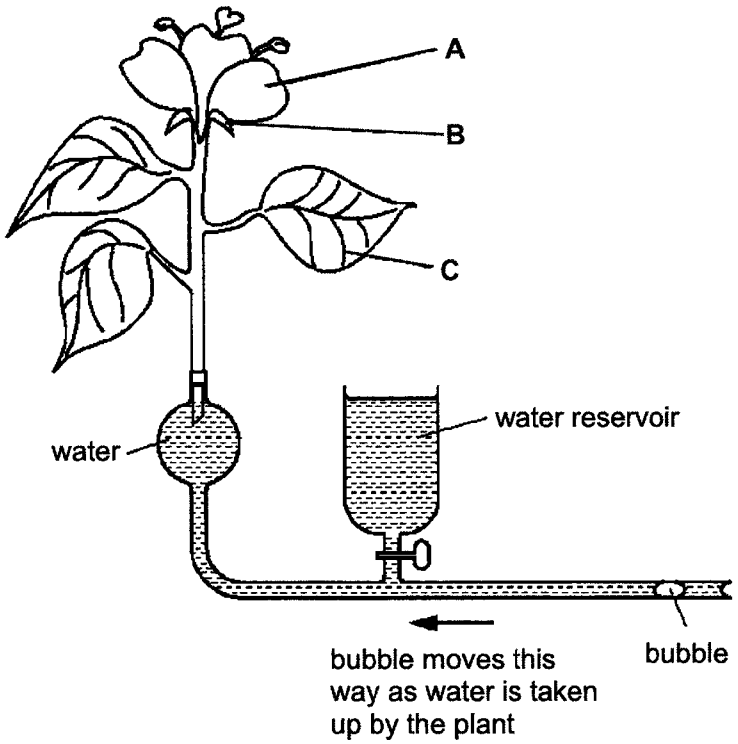

Fig. 8.1

(a) In the table below, name structures **A**, **B** and **C**, and describe their functions.

structure	name	function
A		
B		
C		

[4]

(b) Describe the pathway taken by water as it moves from the potometer, through the plant stem and into the surrounding air.

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..... [4]

(c) The experiment was repeated in an area of lower light intensity.

Explain what would happen to the rate at which the bubble moved.

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..... [2]

[Total:10]

Either

9 Glycogen is a storage carbohydrate in animals.

Fig. 9.1 shows the concentration of glycogen in the fetus of a domestic cat during pregnancy and immediately after birth.

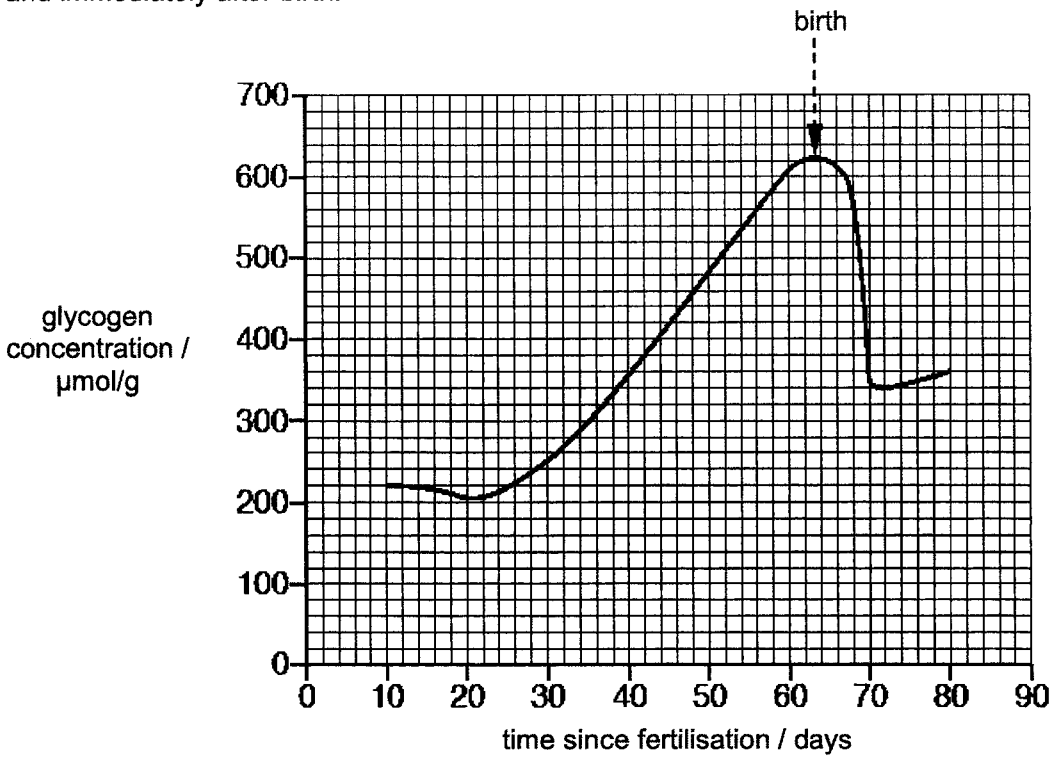

Fig. 9.1

Hormones stimulate changes in the concentration of glycogen in the fetus.

(a) Define the term hormone.

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..... [3]

(b) Calculate the percentage change in the glycogen concentration in the fetus between day 10 and birth in Fig. 9.1.

Give your answer to the nearest whole number. Show your working.

.....% [2]

(c) Use data from Fig. 9.1 to describe the changes in glycogen concentration from day **20** to **80 and** explain how hormones in the fetus cause these changes.

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.....[5]

[Total:10]

Or

9 **(a)** The Indian muntjac deer, *Muntiacus muntjak*, is recorded as the mammal with the lowest number of chromosomes.

Fig. 9.2 is an image of the chromosomes in the nucleus of a diploid cell of a male muntjac deer.

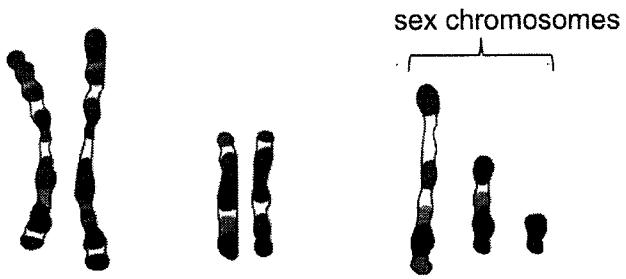

Fig. 9.2

(i) State the diploid number of chromosomes for the male muntjac deer.

..... [1]

(ii) Compare the similarity and difference between the sex chromosomes of the male muntjac deer shown in Fig. 9.2 and male human sex chromosomes.

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..... [2]

(b) Large quantities of plastic waste are polluting the oceans. Plastic products contain chemicals and a number of them have been associated with serious health problems such as infertility and cancers.

A survey published in March 2018 showed the increase in plastic waste in the Pacific Ocean. One area of the Pacific Ocean is known as the Great Pacific Garbage Patch (GPGP).

Data was collected from areas inside and outside the GPGP between 1965 and 2015 to estimate the quantity of plastic waste.

The results are shown in Fig. 9.3.

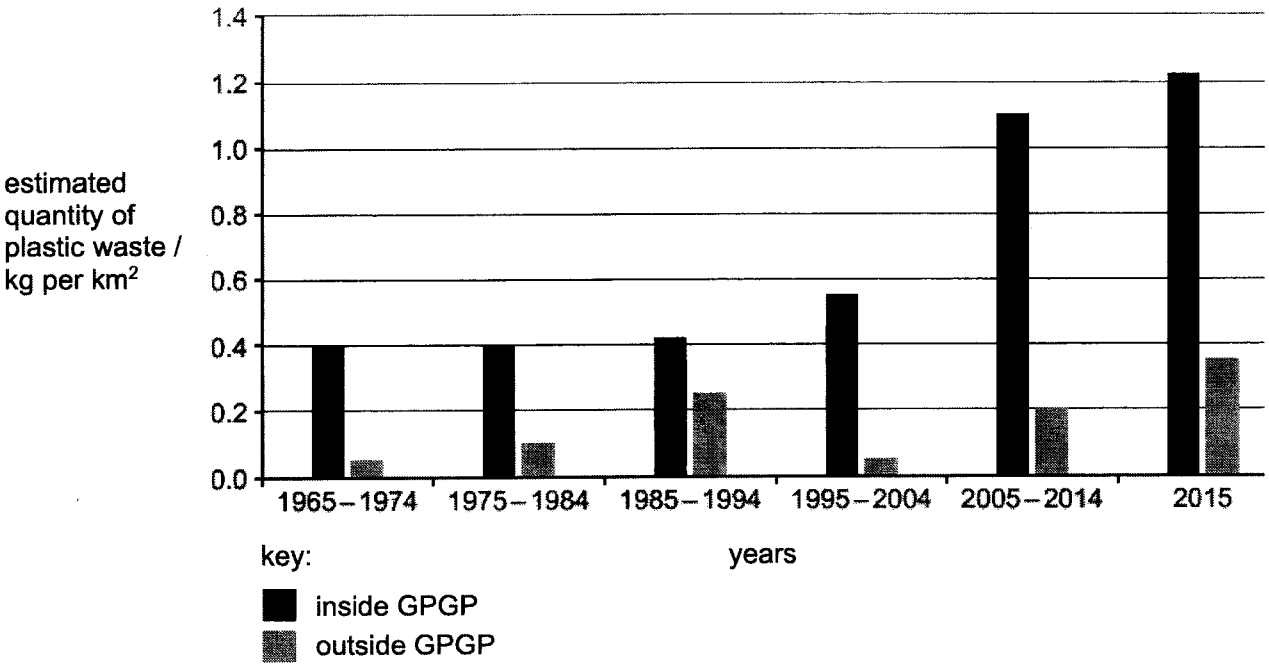

Fig. 9.3

(i) Describe the results of the survey shown in Fig. 9.3.

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..... [4]

(ii) The green turtle, *Chelonia mydas*, is a species of marine animal that is harmed by plastic waste.

Outline the effects of non-biodegradable plastic waste to plants and marine animals, such as green turtles.

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..... [3]

[Total:10]

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Answer Scheme

Paper 1

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

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Marking Scheme

Paper 2

Question		Answers	Marks
1	a	A larynx ; reject voice box B trachea ; reject windpipe C bronchiole ; Reject wrong spelling	1 1 1
	b	needs a large surface area / moist surface / blood capillaries close to air for gas exchange ; oxygen diffuse from the alveoli into the blood capillaries / carbon dioxide diffuse out from blood capillaries into alveoli ; [*idea of oxygen into blood or carbon dioxide out into alveoli*] oxygen is needed for respiration / carbon dioxide is produced from respiration ; energy released from respiration used for a named activity e.g. muscles contraction for movement or active transport to absorb glucose / amino acids;	3
2	ai	yellow spot / fovea ;	1

Question		Answers	Marks
	aii	blood capillaries (in choroid) transport glucose and oxygen (to Y) ;	1
		for aerobic respiration to release energy ;	1
		OR	
		blood capillaries (in choroid) transport amino acids	
		for repair of Y / tissue ;	
		OR	
		blood capillaries (in choroid) remove carbon dioxide away ;	
		by diffusion ;	
		OR	
		blood capillaries (in choroid) carry white blood cells ;	
		to fight infection ;	
	b	extra light (intensity) stimulates the photoreceptors / retina and nerve impulse is produced in the receptor ;	1
		nerve impulse is transmitted along the sensory neurone / optic nerve +	1
		to the relay neurone in the brain ; ignore CNS	
		(nerve impulse) is transmitted by the motor neurone to the *iris ; ignore effector	1
		radial muscles in the *iris relax and circular muscles in the *iris contract ;	1
		*iris mention at least once	

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Marking Scheme

Question		Answers	Marks
	ci	parental genotypes Aa + Aa ;	1
		gametes A a A a ;	1
		offspring genotypes AA, Aa, Aa and aa ;	1
		correctly linked phenotypes: AA & Aa = produce melanin, aa does not produce melanin ;	1
	cii	¼ × ¼ =	
		1/16 or 0.0625 ;	1
3	ai	water in the sweat evaporates to remove latent heat of vaporisation ;	1
		and cools / decreases / returns temperature to norm / set-point, through negative feedback ;	1
		OR	OR
		water in the sweat evaporates to remove latent heat of vaporisation ;	1
		to maintain a constant internal environment / temperature, through negative feedback ;	1
		award 1m for (homeostasis is) the maintenance of a constant internal environment / temperature ;	
	aii	vasodilation of arterioles / arterioles dilate ; reject blood vessels / capillaries	1
		more blood flows to the blood capillaries near skin surface / more blood flows to the sweat gland ;	1
		increase loss of heat / thermal energy by radiation (conduction and convection) / more sweat is produced ;	1
		3rd marking point must match the 2nd marking point	
	b	liver ;	1

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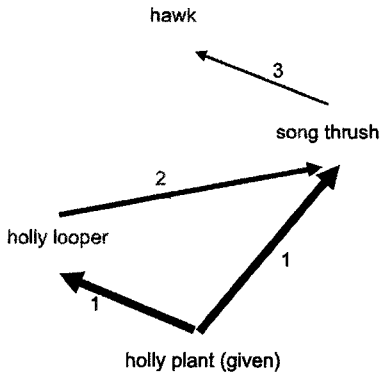
Question		Answers	Marks
	ci	blood plasma has less urea than urine by 387 mmol per dm^3 / 65.5x ; blood plasma has more sodium than urine by 31 mmol per dm^3 ; blood plasma has less chloride than urine by 4 mmol per dm^3 ;	2
	cii	higher than 22 mmol per dm^3 urea in patient (than healthy person) ; less urea is filtered from kidneys / into kidney tubules, from blood plasma ;	1 1
4	a	all 3: holly looper, song thrush and hawk correctly written in the boxes ; all arrows and thickness of width correct, decreasing thickness going up the food web ; 1 > 2 > 3	1 1



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Question		Answers	Marks
	bi	(tall tree) receive more / maximum light energy for photosynthesis / to make glucose ; ignore food	1
		exposed to wind for seed dispersal ;	1
		easier for bats to find flowers for pollination ;	1
	bii	(bacteria and fungi) are decomposers ;	3
		break down dead organisms / dead leaves / organic matters into smaller and simpler substances ;	
		recycled / returned carbon (compounds) / nutrients to the soil ;	
		carbon / named nutrient (e.g. nitrate) can be used by plants / producers for correct use such as photosynthesis / growth ;	
		correct use: carbon / nitrate for photosynthesis	
5	ai	net movement of particles / molecules ;	1
		from a region of their higher concentration to a region of their lower concentration / down a concentration gradient ;	1
	aii	(the gills have) large surface area to volume ratio ;	1
		OR (the gills are) thin ;	
	bi	phosphate / nitrate (ions) / (untreated) sewage / fertilisers ;	1
	bii	*15 °C* : 8.9 ± 0.1 (mg per dm^3) **and** *25 °C* : 7.3 ± 0.1 (mg per dm^3) ;	1
	biii	As the temperature of the water increases from 15 °C to 25 °C, the gas diffusion distance decreases ;	1
		by 0.4 μm / from 2.35 ± 0.05 μm to 1.95 ± 0.05 μm [correct unit written at least once]	1

Question		Answers	Marks
6	a	protease / pepsin / trypsin digests (protein) to polypeptides ; reject break down	1
		protease / peptidase / erepsin digests (polypeptides) to amino acids ;	1
		converting insoluble molecules to soluble molecules / ref to amino acids are soluble / dissolve in water;	1
	b	30 °C is the optimum temperature and the enzymes are the most active at 30 °C ;	1
		active site (in enzyme) has a complementary shape to the substrate / active site (in enzyme) has a unique / specific (three dimensional) shape to fit the substrate ;	1
		above 50 °C, enzymes are denatured / lost its (three dimensional) shape and active site ;	1
		substrate cannot bind to the active site to form an enzyme-substrate complex / for chemical reaction / for digestion to take place ;	1

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Marking Scheme

Question		Answers	Marks
7	ai	axes fully labelled with units horizontal axis : time / minutes + vertical axis: breathing rate / breaths per minute + appropriate scale for both axes + origin labelled 0 + line occupies more than half the grid ; all 6 points plotted correctly and clearly ;; best fit line ;	 1 2 1
	aii	31 breaths per min + working shown on graph ; read from student's graph refer to graph attached	1
	b	Effect: heart rate increases / heart contracts faster ; Explanation: muscles in the wall of the left ventricle ; contracts faster / stronger ; increases the blood pressure (in the left ventricle) ; force the semi-lunar valve in the aorta open (and bicuspid valve closed) ; force blood out of the aorta (to the muscles) ; reject pump	5

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Marking Scheme

Question		Answers	Marks
8	a	**A** petal + large to attract insects / large for insect to land ;	1
		B sepal + protect flower in the bud stage ;	1
		C vein (most accurate) / vascular tissue / xylem and phloem + transport water and mineral salts to the leaf ;	1
		transport sugar / sucrose (and amino acids) to other parts of the plant ; reject food	1
	b	water is transported up the xylem vessels to the leaves / flower(s) ;	1
		water molecules move into mesophyll *cells and the surface of the *cells by osmosis ;	1
		*mention at least once	
		water evaporates (from the surface of cells) to form water vapour ; reject water vapour evaporates	1
		(water vapour) diffuse into the (intercellular) air spaces and out of the leaves through the stomata ;	1
	c	(the rate at which) the bubble moves decreases / bubble moves slower ;	1
		lower rate of photosynthesis and less water is used ;	1
		OR	
		stomata are closed / smaller stomatal pores and slower diffusion of water vapour out / slower (rate of) transpiration ;	

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Marking Scheme

Question		Answers	Marks
9E	a	chemical substance produced by an endocrine gland ; carried by the blood and alters the activity of specific target organs ; destroy by the liver after it has carried out its effect ;	1 1 1
	b	(620 – 220) ÷ 220 × 100 ; = + / increase by 182 (%) ;	1 1
	c	describe changes: glycogen concentration increases from 200 µmol per g on day 20 to 620 µmol per g on day 62 – 64 OR by 420 µmol per g from day 20 to day 62 - 64 ; (glycogen concentration) decreases steeply (from 620) after birth / after day 62-64 to 340 µmol per g on day 70 OR by 280 µmol per g after birth / after day 62-64 to day 70 ; (glycogen concentration) starts to increase slowly, (from 340) on day 70 to 360 µmol per g on day 80 OR by 20 µmol per g ; Must state units, µmol/g and day, at least once. explanation: an increase in blood glucose concentration causes pancreas to release insulin ; insulin stimulates the liver cells to convert excess glucose to glycogen (store in liver and muscles) ; a decrease in blood glucose concentration causes pancreas to release glucagon ; glucagon stimulates the liver cells to convert glycogen to glucose ; Reject insulin / glucagon convert excess glucose to glycogen / converts glycogen to glucose	At least 2 changes, max 3m for all 3 changes with data At least 2 explanation, max 3m Max 5

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Marking Scheme

Question		Answers	Marks
9O	ai	seven / 7 ;	1
	aii	*similarity* Y chromosome is shorter than X chromosome / X chromosome is longer than Y chromosome ; *difference* The deer has three sex chromosomes but human has two ; One Y chromosome is longer than the other but human has only one shorter Y chromosome ;	1 Either 1 difference, 1
	bi	quantity of plastic waste is always higher **inside** GPGP than outside it ; quantity inside GPGP is constant (from 1965) to, any year 1975 to 1994 ; quantity increases in GPGP, steeply (overall from 1965 to 2015) ; smaller (overall) increase **outside** the GPGP ; quantity of plastic waste outside the GPGP, increases from 1965 to 1994 then decreases to 2004 and increases again to 2015 ;	4

Question		Answers	Marks
	bii	*direct effects* (non-biodegradable plastic) does not break down **and** reduces the ability (of marine animals) to breathe / reduces the ability to move ; (plastic / toxin) consumed by marine animals / turtles, die of starvation or malnutrition ; *indirect effects* blocks (sun)light, so algae / plants / producers, cannot photosynthesise ; (so) less food / energy, enters, food chains / food webs ; plastic / toxin accumulates along the food chain and kills the animal / turtle OR bioaccumulation / highest concentration of toxin / plastic in animal / turtle and kills them ; Reject chemicals, need to use toxin [applies to bioaccumulation marking point]	3

Setter: Tang Wai Yin