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ASSUMPTION ENGLISH SCHOOL
PRELIMINARY EXAMINATION 2019

BIOLOGY
6093 / 01

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LEVEL: Sec 4 Express **DATE:** 2 September 2019

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

Additional Materials provided: 1 sheet of OAS paper

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

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

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

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

This Question Paper consists of 17 printed pages including this page.
[Turn over

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MULTIPLE-CHOICE QUESTIONS [40 marks]

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

1 Four statements about mitochondria are listed as shown. Which statements are correct?

1 Detoxification of metabolic waste takes place in the mitochondria.
2 The main function of mitochondria is to synthesise proteins.
3 There is a high concentration of mitochondria in root hair cells to assist the roots to take in water.
4 There is a lower concentration of oxygen in the mitochondria as compared to the cytoplasm near the cell membrane.

A 1 and 2 only
B 1, 3 and 4 only
C 3 and 4 only
D 4 only

2 Which sequence shows the correct order of increasing size and complexity?

A cells → organelles → organs → tissues → systems
B cells → tissues → organelles → organs → systems
C organelles → cells → tissues → organs → systems
D tissues → cells → organs → organelles → systems

3 What can be found in a mature red blood cell?

A antibodies and mitochondria
B carbonic anhydrase and cell membrane
C cell membrane and nucleus
D haemoglobin and fibrinogen

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4 Which is an example of diffusion in a plant?

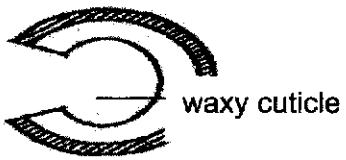
A carbon dioxide from the air moving into a photosynthesising leaf

B minerals in xylem moving up the stem to leaves

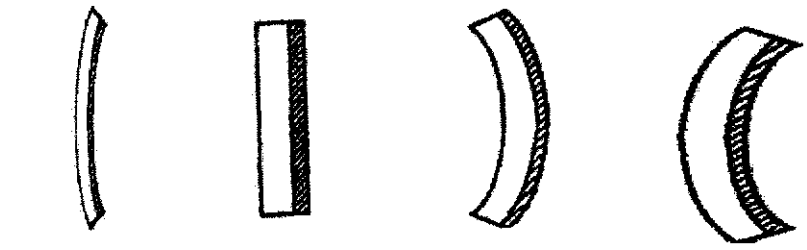
C sugars in phloem moving from leaves to roots

D water in xylem moving from roots to leaves

5 The figure shows four sections of the mustard green stem before and after immersion in solutions **P**, **Q**, **R** and **S** of different sugar concentrations.



stem before immersion



solution **P** solution **Q** solution **R** solution **S**

Which sequence shows the correct concentrations of the four solutions?

	highest concentration ⟶ lowest concentration			
A	**P**	**S**	**R**	**Q**
B	**Q**	**P**	**S**	**R**
C	**Q**	**R**	**S**	**P**
D	**R**	**S**	**P**	**Q**

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6 Which element in the molecule of urea shows that it is formed from amino acids and not from glucose?

A carbon

B hydrogen

C nitrogen

D oxygen

7 Potato contains a nutrient which is broken down by amylase when inside the human alimentary canal. Which test would detect this nutrient?

A Benedict's test

B biuret test

C ethanol emulsion test

D iodine test

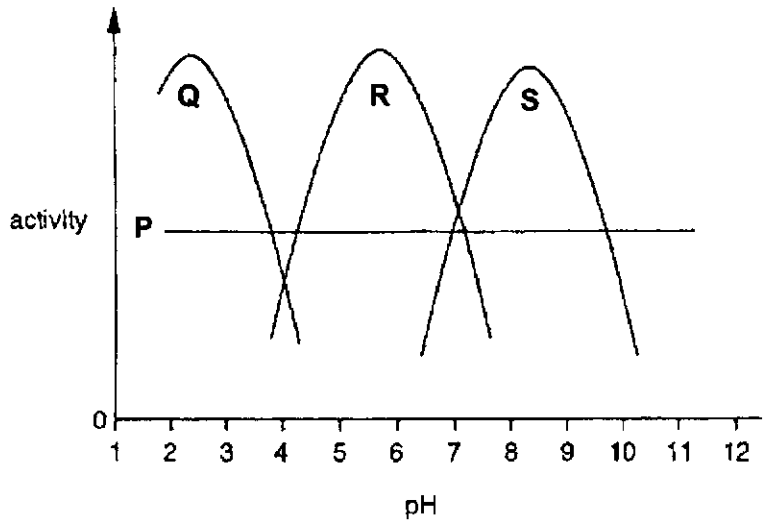
8 In an experiment, 15 g of boiled egg white was mixed with protease solution. After 1 hour at 15 °C, 5 g of protein was digested. The experiment was repeated at 25 °C and again at 60 °C. How much protein was broken down in the second and third experiments respectively?

	experiment 2 (at 25 °C)	experiment 3 (at 60 °C)
A	5 g	0 g
B	5 g	10 g
C	10 g	0 g
D	10 g	15 g

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9 The diagram below shows the effect of pH on the activity of four different enzymes.



Which pair of enzymes includes one that is not affected by pH and one that is from the stomach?

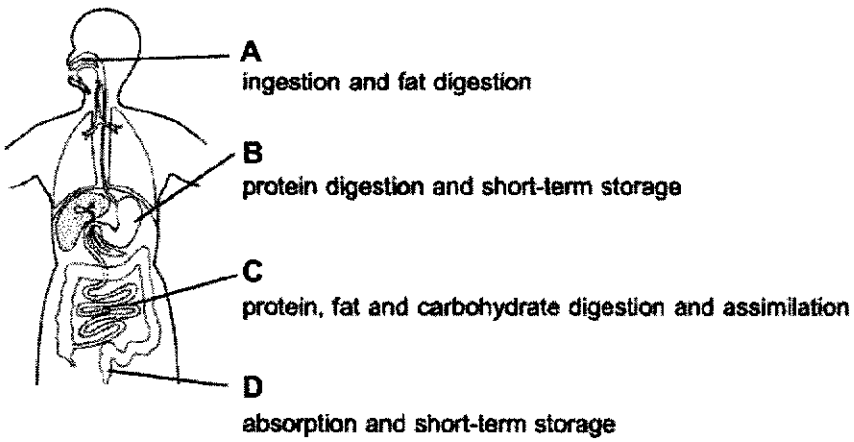
A **P** and **Q**

B **P** and **S**

C **Q** and **R**

D **R** and **S**

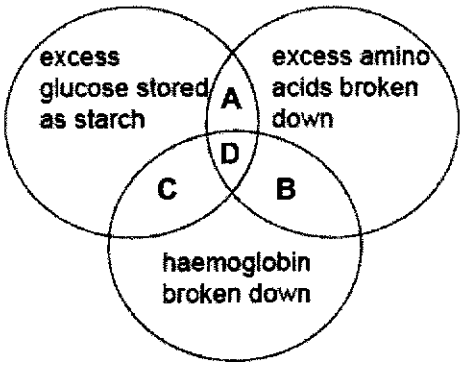
10 The diagram shows the human alimentary canal with labels for the functions of some of its parts. Which label is correct?



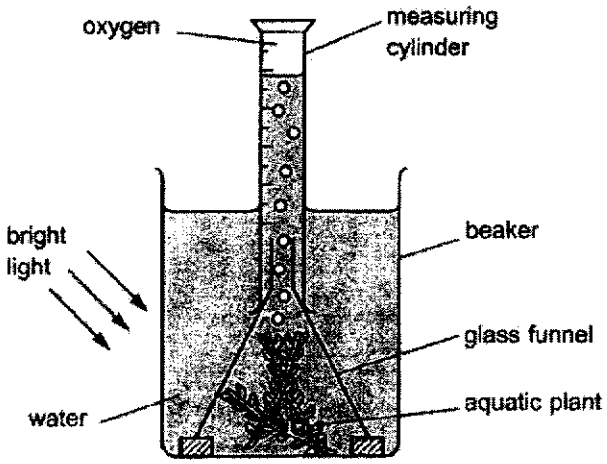
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11 Which section of the diagram represents the function of the liver?



12 The diagram shows the apparatus used to investigate oxygen production from an aquatic plant.



The experiment was repeated several times to calculate the volume of oxygen produced. Which two factors must be kept constant in each repeat experiment?

A the size of aquatic plant and the amount of oxygen in the measuring cylinder

B the size of aquatic plant and time exposed to the light

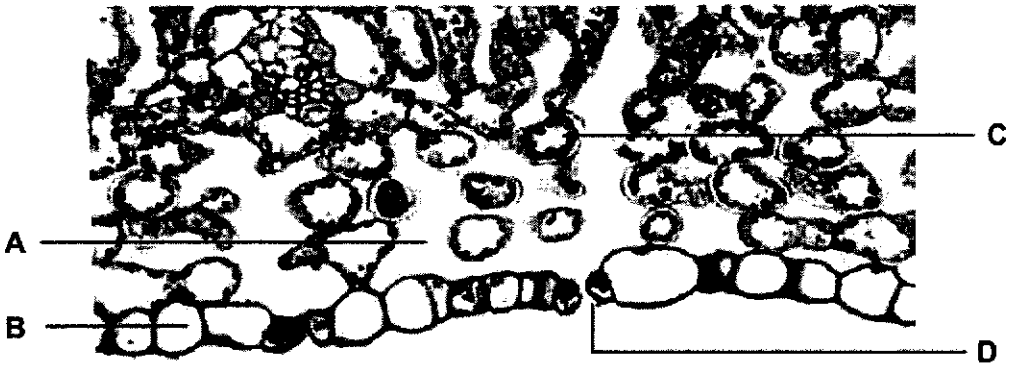
C the size of the beaker and the size of the funnel

D the volume of water in the beaker and the height of the measuring cylinder

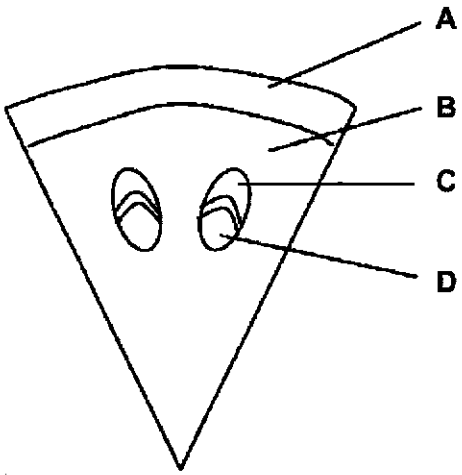
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13 The photomicrograph shows a section through the lower half of the leaf. Which region will have the lowest carbon dioxide concentration when the plant is exposed to light?



14 The diagram shows part of a transverse section of the stem of a plant. Which region is the xylem tissue?



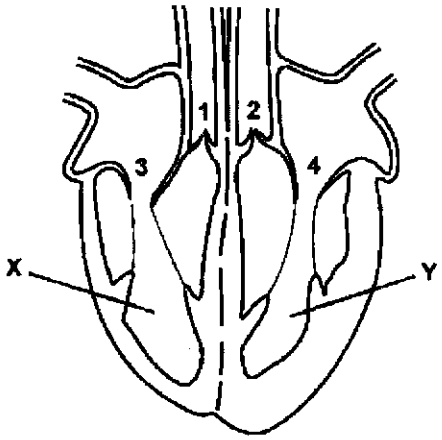
15 A plant is exposed to different temperatures and humidities. Which set of conditions causes the plant to lose the least water?

	temperature / °C	humidity / %
A	15	30
B	15	60
C	25	30
D	25	60

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16 The diagram shows a section through the heart. When X and Y are undergoing systole, which valves are opened and which are closed?



	valves **1** and **2**	valves **3** and **4**
A	closed	closed
B	closed	opened
C	opened	closed
D	opened	opened

17 Which is the shortest route that can be taken by blood travelling from a leg to an arm in the body?

A leg → heart → lungs → heart → arm

B leg → liver → heart → lungs → arm

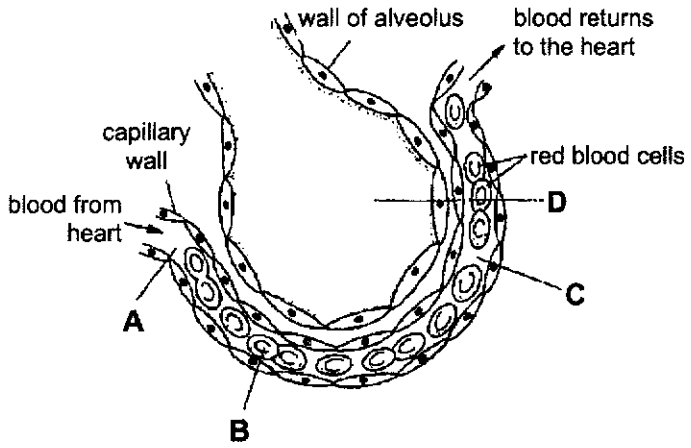
C leg → lungs → heart → liver → arm

D leg → lungs → heart → lungs → arm

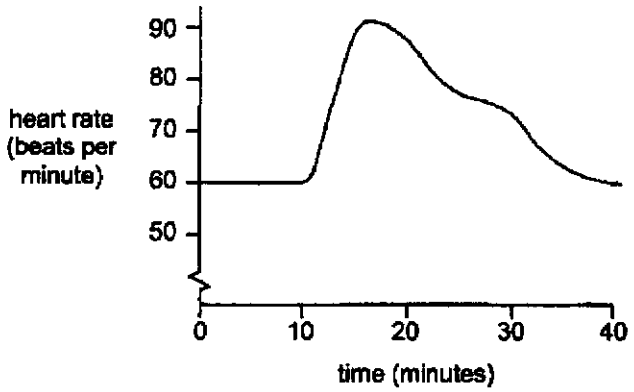
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18 The diagram shows a section through an alveolus and a blood capillary. In which region is the concentration of oxygen highest?



19 The diagram shows the short-term effect of smoking on heart rate. Which substance in cigarette smoke is the main cause of the change in heart rate between 10 and 18 minutes?



A carbon dioxide

B carbon monoxide

C nicotine

D tar

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20 The table shows the flow rate and concentration of protein and urea in the blood vessel leading into a kidney glomerulus in a healthy person.

Total flow rate / $cm^3\ min^{-1}$	Concentration / g per 100 cm^3	
	Protein	Urea
1000	7.40	0.03

What are the correct figures for the fluid in the collecting duct?

	Total flow rate / $cm^3\ min^{-1}$	Concentration / g per 100 cm^3	
		Protein	Urea
A	10	0.00	1.75
B	10	7.40	0.03
C	1000	0.00	1.75
D	1000	7.40	0.03

21 Which response is not due to homeostasis?

A enlargement of iris

B increase in glucose production when blood glucose level is low

C increase in permeability of collecting duct of kidney tubules

D shivering in cold weather

22 Which statement about voluntary actions is not true?

A Motor neurones are always involved in transmitting impulses to effectors.

B Relay neurones will transmit nerve impulses to the motor neurons.

C Sensory neurones will always send nerve impulses to the brain.

D Voluntary actions are always coordinated by the brain.

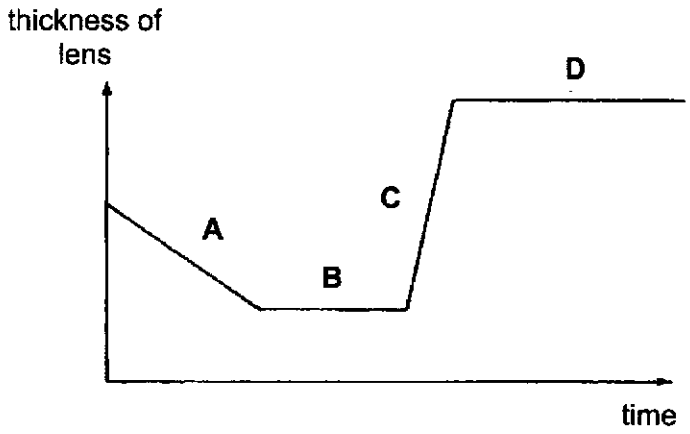
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23 When the eye of the pupil dilates in response to low light intensity, which is the receptor and which is the effector?

	receptor	effector
A	pupil	ciliary body
B	pupil	iris
C	retina	ciliary body
D	retina	iris

24 The graph below shows the changes in the thickness of the lens in the eye when a man looked at an object which either moved towards him, away from him or remained stationary. At which stage was the object moving towards the man?



25 Hormones are chemicals involved in co-ordination in the body. Which combination in the table is correct?

	hormones are carried by	hormones are destroyed by
A	blood plasma	kidney
B	blood plasma	liver
C	red blood cells	kidney
D	red blood cells	liver

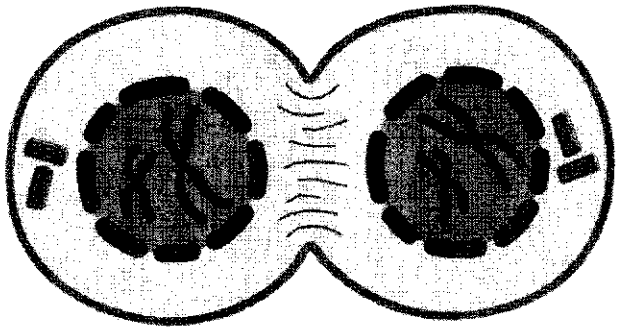
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26 What effects would an increase in adrenaline have on the body?

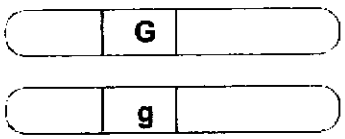
	blood flow to the gut	concentration of glucose in blood
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

27 The diagram shows a cell that is undergoing cell division. What type and stage of cell division does the diagram show?



	type of cell division	stage of cell division
A	meiosis	anaphase 1
B	meiosis	telophase 1
C	meiosis	telophase 2
D	mitosis	telophase

28 The diagram shows a pair of homologous chromosomes.



Which term best describes **Gg**?

A alleles
B gametes
C genotype
D phenotype

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29 Which statement is characteristic of asexual reproduction?

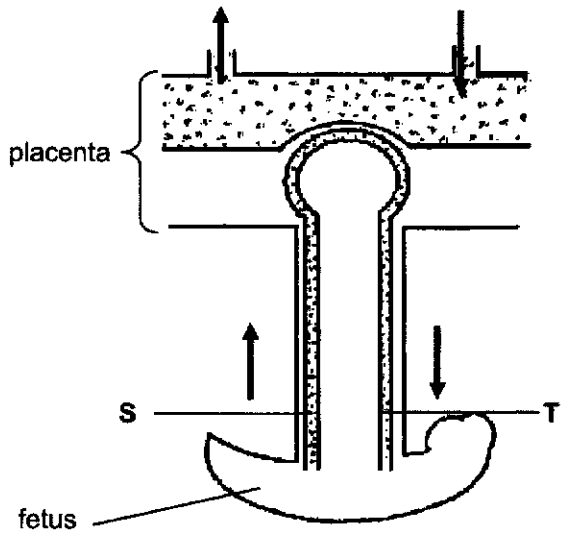
A Asexual reproduction only occurs in unicellular organisms.

B Meiosis takes place to form gametes.

C The offspring have the same genotype for all genes as their parents.

D The offspring will have the same height as their parents.

30 The diagram below shows the relationship between the blood systems of the foetus and that of the mother. The arrows indicate the direction of blood flow.



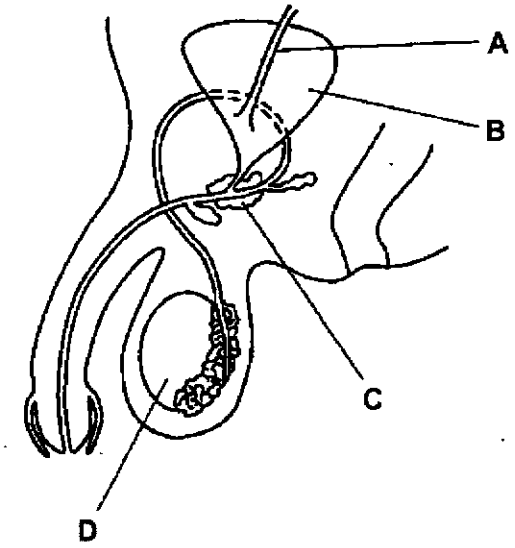
What are the identities of **S** and **T** and the nature of their contents?

	umbilical artery	umbilical vein	higher percentage of nutrients	higher percentage of waste
A	**S**	**T**	**S**	**T**
B	**S**	**T**	**T**	**S**
C	**T**	**S**	**S**	**T**
D	**T**	**S**	**T**	**S**

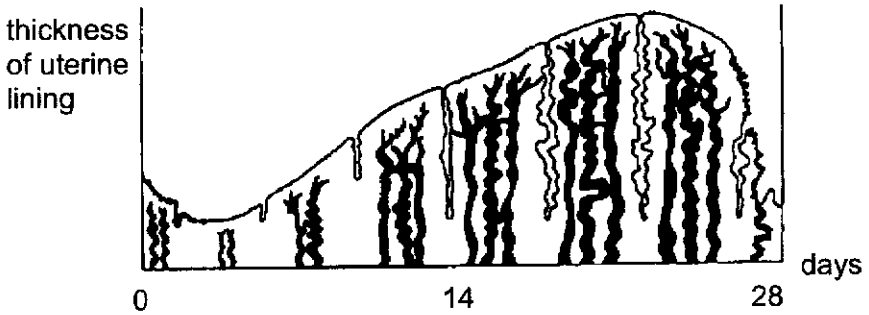
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31 The diagram shows the male reproductive and urinary systems. Which structure produces the fluid part of semen?



32 The diagram shows the variation in thickness of the uterine lining throughout a menstrual cycle of a healthy female.



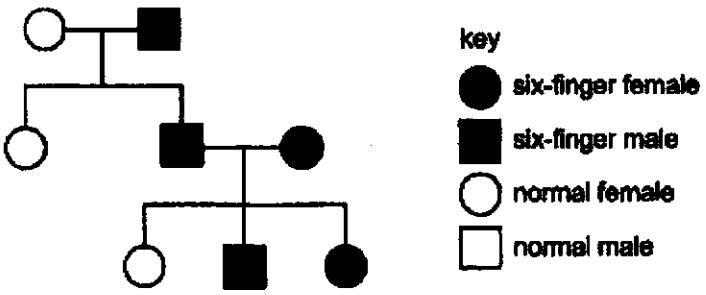
During which days of the menstrual cycle does the level of oestrogen and progesterone rise?

	oestrogen	progesterone
A	1 to 5	15 to 20
B	5 to 10	15 to 25
C	15 to 20	5 to 10
D	20 to 25	1 to 10

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33 A mutation sometimes occur in humans which causes each hand to have six fingers. The diagram shows how this condition is inherited in a family.



What does the family tree show about the mutated allele?

A It could be dominant or recessive.

B It is co-dominant.

C It is dominant.

D It is recessive.

34 Which fertilisation would result in a male child with Down syndrome?

	chromosomes in ovum	chromosomes in sperm
A	22 + 1 X	22 + 1 Y
B	22 + 1 X	23 + 1 Y
C	23 + 1 Y	22 + 1 X
D	23 + 1 Y	23 + 1 X

35 Which phrase describes a gene?

A a pair of alleles

B a sequence of nucleotides

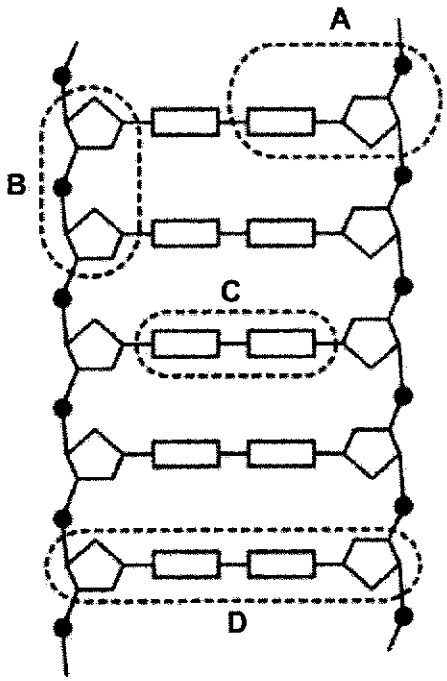
C a whole DNA molecule

D the chain of alleles on a chromosome

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36 The diagram shows a section of a DNA molecule. Which segment is part of the sugar-phosphate backbone?



37 What happens to energy after it has flowed through a food chain?

A It is lost as heat.

B It is recycled.

C It is stored as carbohydrate.

D It is used in respiration.

38 Which substance is produced by anaerobic bacteria during sewage treatment?

A carbon monoxide

B carbon dioxide

C lactic acid

D methane

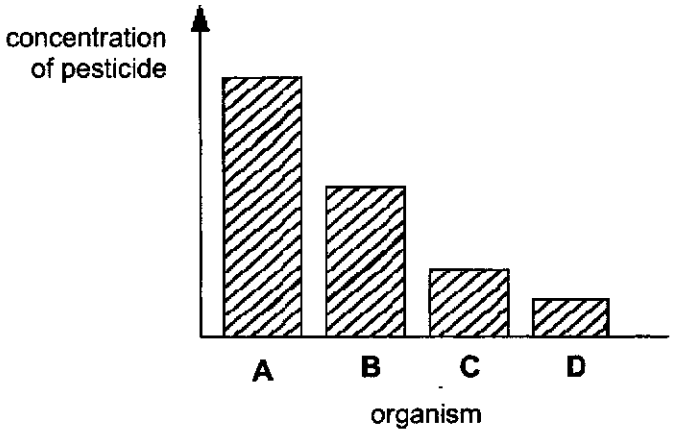
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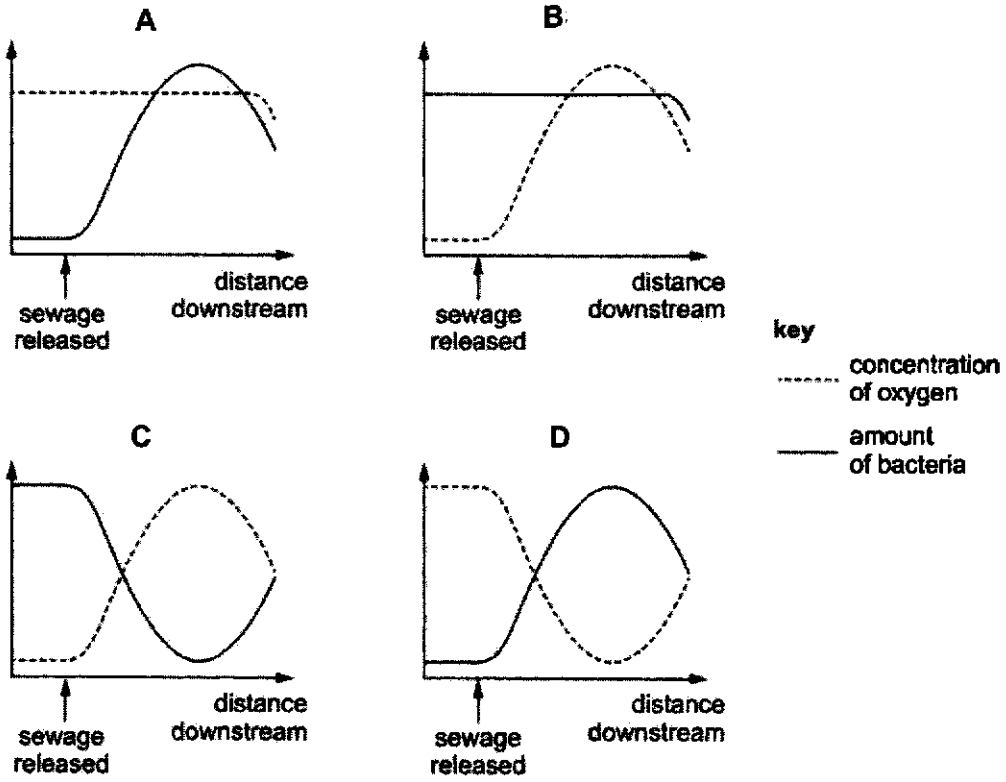
39 A food chain is listed as shown.

phytoplankton → small crustacean → frog → carnivorous bird

The chart below shows the concentration of pesticide in the bodies of the different organisms in the food chain. Which organism represents the small crustacean?



40 Untreated sewage is released into a river. This causes the amount of bacteria and the concentration of oxygen in the river water downstream to change. Which graph shows these changes?



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LEVEL: Sec 4 Express **DATE:** 3 September 2019

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

Additional Materials provided: NIL

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

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

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

SECTION B (30 marks)
FREE RESPONSE QUESTIONS
Answer three questions in this section in the spaces provided.
Question 3 is in the form of an Either / Or question.
Only one of the alternatives should be answered.

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

This Question Paper consists of 18 printed pages including this page.
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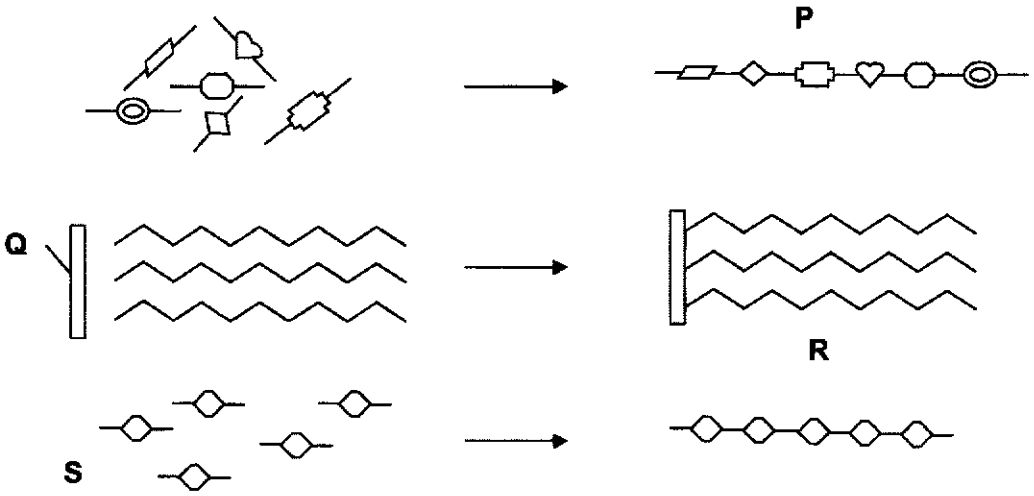
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SECTION A – STRUCTURED QUESTIONS (50 marks)

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

1 The figure below shows some chemical molecules found in the human body and how they are joined to form larger molecules.



(a) Identify molecules **P**, **Q**, **R** and **S**.

P: ..... **Q**: .....

R: ..... **S**: ..... [2]

(b) **(i)** State a test that a student can use to test for the presence of **S** in a liquid sample of food.

..... [1]

(ii) Describe how this test is carried out and the observations that can confirm the presence of **S** in the food.

.....

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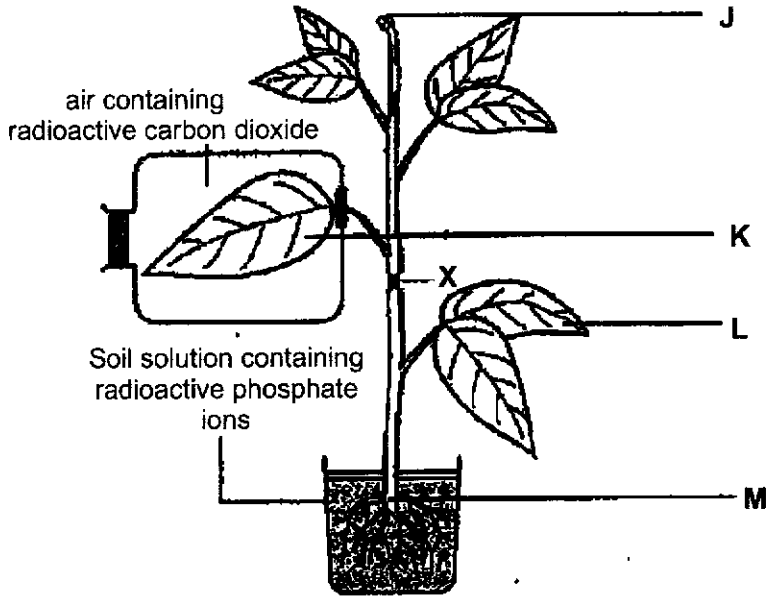
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2 The figure shows a potted plant with an outer ring of bark removed at point **X**. Leaf **K** is enclosed within a bottle containing carbon dioxide with radioactive carbon. The soil was watered with a solution containing radioactive phosphate ions. The entire plant was exposed to sunlight for 6 hours.



(a) Which tissue of the vascular bundle is removed at point **X**?

..... [1]

(b) Which labelled part(s) **J, K, L** and / or **M** will be tested positive for radioactive sugar? Explain your answer.

.....

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..... [4]

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(c) Which labelled part(s) **J, K, L** and / or **M** will be tested positive for radioactive phosphate ions? Explain your answer.

.....

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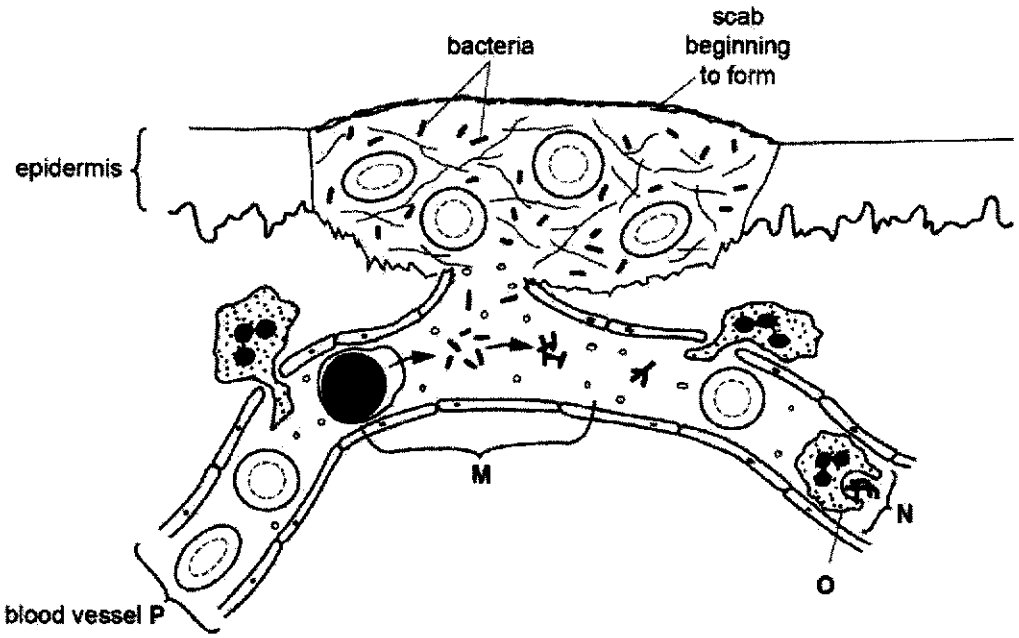
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..... [3]

3 The diagram shows a section through a small surface wound to the skin.



(a) Name cell **O** and the type of blood vessel **P** shown in the diagram.

O: ..... **P**: ..... [2]

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(b) Explain what is happening to the bacteria at **M** and **N**.

M: .....

.....

N: .....

..... [2]

(c) Explain how the wound is being sealed in the region under the scab.

.....

.....

.....

.....

..... [2]

(d) **(i)** Complete the table by circling the changes in concentration of glucose and oxygen after passing through blood vessel **P**.

substance	concentration after passing through **P**
glucose	higher / lower / remain the same
oxygen	higher / lower / remain the same

[1]

(ii) Explain the changes in the concentration of oxygen and glucose, if any, in part **(d)(i)**.

.....

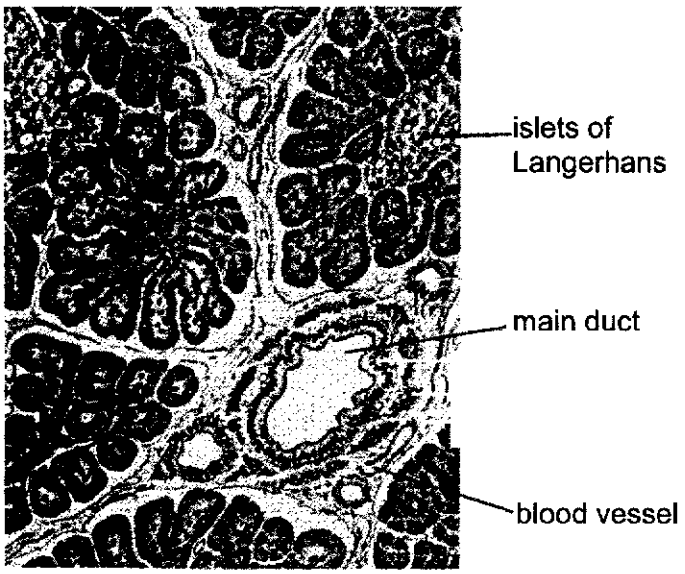
.....

..... [2]

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4 The figure shows a section of a pancreas, as seen using a light microscope.



(a) **(i)** Name one soluble protein which can be found in the main duct after a meal.

..... [1]

(ii) State the organ in which the main duct empties its contents into.

..... [1]

(b) **(i)** State the substance that will be released by the islets of Langerhans into the blood vessel after a meal.

..... [1]

(ii) Explain how the substance identified in **(b)(i)** helps to regulate blood glucose concentration.

.....

.....

.....

.....

..... [3]

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5 Four girls, who were adopted and brought up by different sets of foster parents, were brought together after their step-parents realised that they may be long lost siblings and had the same biological parents. The following data were recorded after they met up with each other.

	Amy	Bernadette	Christie	Diane
height / cm	168	168	160	165
weight / kg	52	57	67	57
blood type	O	AB	O	A

(a) Group the characteristics (height, weight, and blood type) into the table below.

continuous variation	discontinuous variation

[1]

(b) Two of the girls are identical twins. Identify the girls and give a reason for your answer.

.....

..... [1]

(c) The girls got together to search for their biological parents. They narrowed the search to 4 couples. The blood types of the couples are as shown.

	father	mother
couple 1	A	B
couple 2	AB	AB
couple 3	A	AB
couple 4	O	AB

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(i) Which couple do you think are the biological parents of the four girls? Explain your answer.

.....

.....

.....

.....

..... [3]

(ii) All the couples listed in **(c)(i)** had brown eyes. Bernadette and Diane had brown eyes as well while Christie was found to have blue eyes. The allele for brown eyes is a dominant allele over the allele for blue eyes. What is the probability that Amy has blue eyes?

..... [1]

6 The diagram shows parts of an insect-pollinated and a wind-pollinated flower.

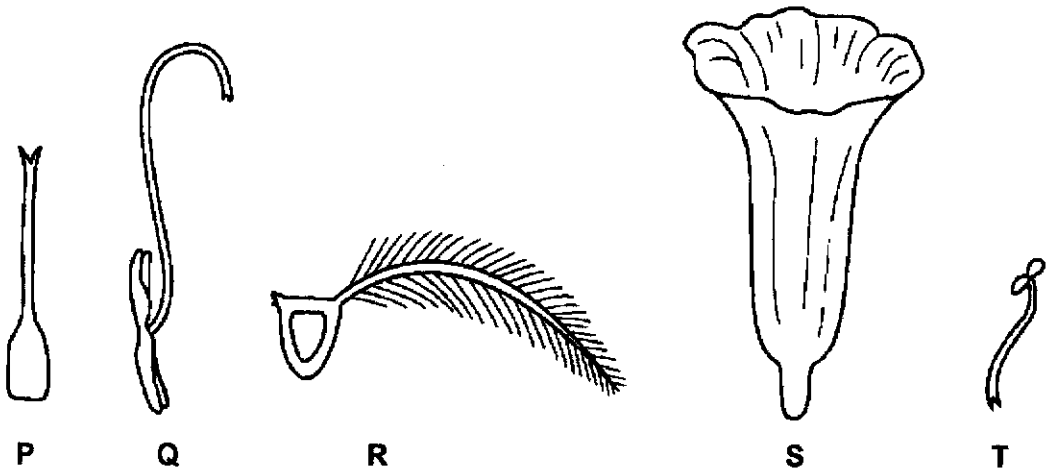


Fig. 6.1

(a) Using the letters **P**, **Q**, **R**, **S** and **T**, list the parts that are from

the insect-pollinated flower: .....

the wind-pollinated flower: ..... [2]

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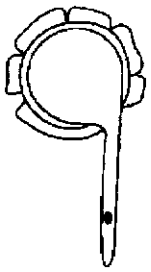
(b) Explain how the structure of **R** helps it to carry out its function.

.....

.....

..... [2]

(c) The diagram shows a pollen grain with its pollen tube.



(i) On Fig. 6.1, use a line labelled **L** to show exactly where the pollen grain as shown is found. [1]

(ii) Explain how the pollen tube shown in the diagram is formed.

.....

.....

..... [2]

(d) State and explain the difference between a nucleus in a pollen grain and a nucleus in a cell in structure **S**.

.....

.....

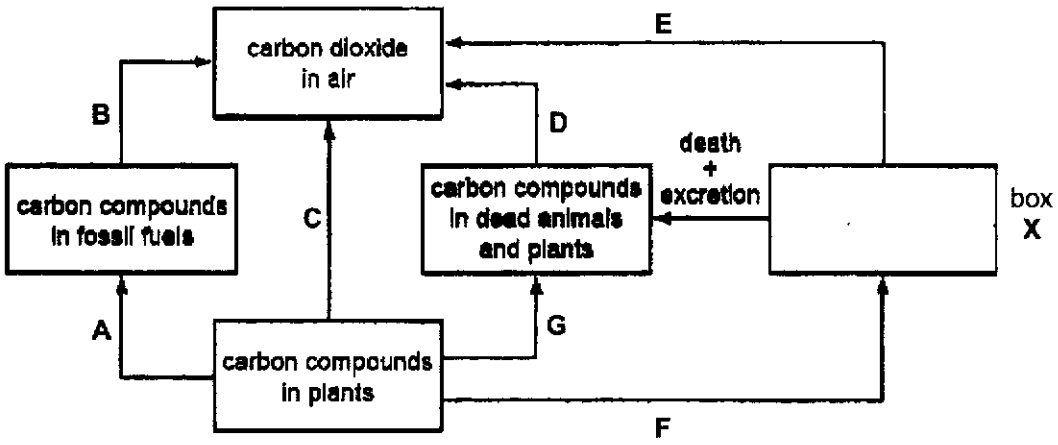
.....

..... [2]

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7 The figure shows the carbon cycle. The arrows represent the various processes that take place in the cycle.



(a) Complete the diagram by filling in 'box **X**'. [1]

(b) Which two letters represent respiration?

..... [1]

(c) **(i)** Draw an arrow in the diagram to indicate another process that can occur in the carbon cycle. [1]

(ii) State the process indicated by the arrow drawn in **(c) (i)**.

..... [1]

(d) Describe how oceans can also be part of the carbon cycle and acts as carbon sinks.

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..... [3]

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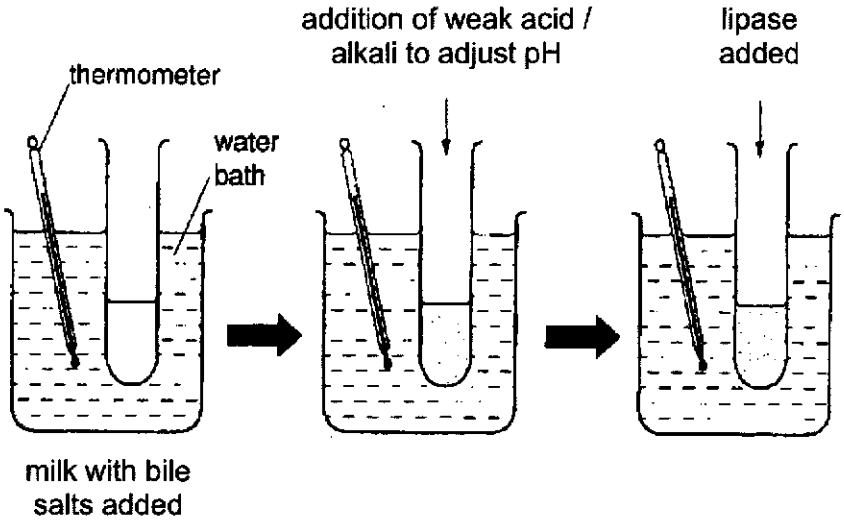
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SECTION B – FREE-RESPONSE QUESTIONS (30 marks)

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

1 An experiment was carried out on digestion of fat using a sample of milk. Bile salt was added to 5 cm^3 of milk. The pH of the mixture was adjusted to pH 8.0 and lipase was then added to the mixture.



The pH of the mixture was recorded at ten minute intervals for 60 minutes using a pH meter. The table shows the results of the investigation.

time / min	pH
0	8.0
10	7.1
20	6.8
30	6.6
40	6.5
50	6.4
60	6.4

(a) Suggest why the pH of the milk was adjusted to 8.0 before the lipase was added.

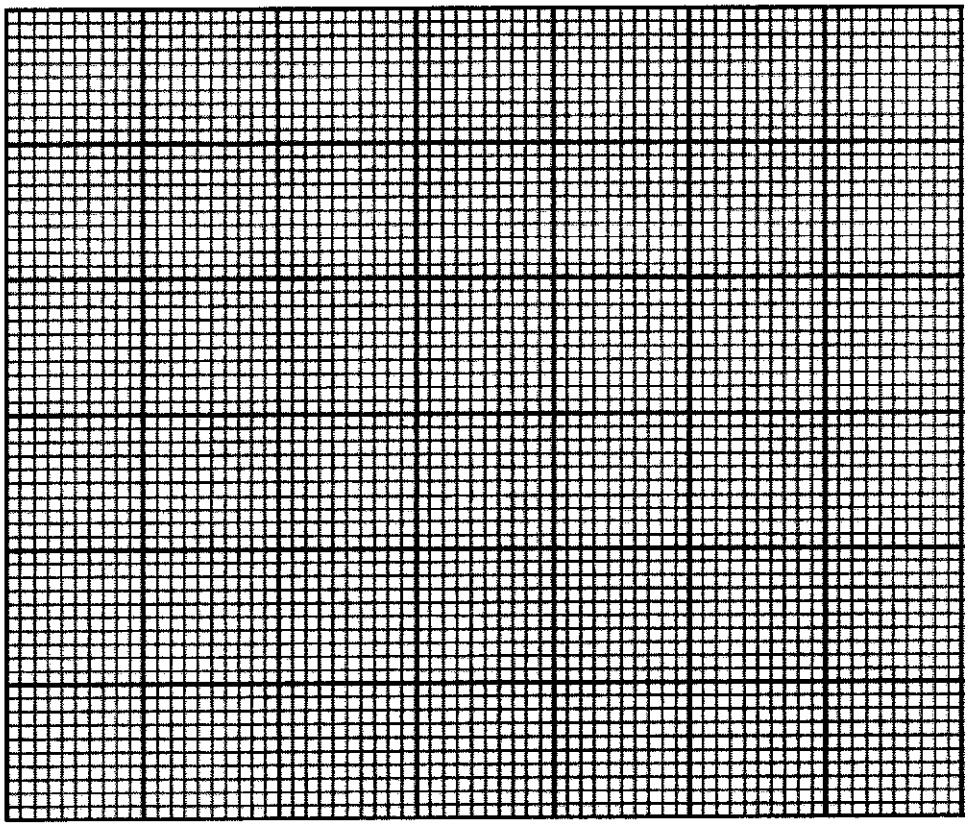
.....

..... [1]

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(b) **(i)** Plot a graph to show the results of the experiment.



[3]

(ii) Using the graph, state the pH of the mixture after 5 minutes.

..... [1]

(c) Using the 'lock and key' hypothesis, explain the results of the experiment.

.....

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..... [3]

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(d) Describe and explain how the experiment results will change if no bile salts were added.

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.....

..... [2]

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2 **(a)** Describe what is meant by the term *mutation*.

.....

.....

..... [2]

(b) The familiar orange-pink colour of salmon (a type of fish) flesh is due to a gene that allows salmon to process carotene, a type of protein, found in its diet. In the wild, about 1 in 20 salmon are white fleshed. White flesh in salmon is a recessive trait. A salmon breeder wanted to find out the genotype of his orange-pink colour salmon. Suggest how he could determine the genotype with the help of clearly labelled genetic diagram(s).

.....

.....

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.....

.....

..... [4]

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(c) Scientists have genetically modified salmon to grow faster. They have taken a gene from the ocean pout (another type of fish) and inserted it into salmon. The pout gene permanently 'switches on' the salmon gene to make growth hormone, allowing the salmon to grow all year round instead of only in spring and summer. The resulting genetically modified (GM) salmon grows to maturity in 18 months instead of 3 years and appears to be larger than its wild-type counterparts.

Outline the procedure by which scientists combine the ocean pout gene with a bacterial plasmid to form a recombinant DNA which is reintroduced into bacterial cells. (The recombinant DNA is eventually inserted into salmon DNA to create GM salmon).

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..... [4]

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EITHER

3 **(a)** Define *homeostasis.*

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..... [1]

(b) Explain what is meant by *negative feedback.*

.....

.....

.....

..... [2]

(c) Describe how the various parts of the human skin work together to prevent the body from overheating when a person is under the sun.

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..... [7]

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OR

3 **(a)** Describe how the nephron is involved in the production of urine.

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..... [6]

(b) Describe and explain how the kidneys perform their roles as osmoregulators when a person drinks a large volume of water.

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..... [4]

- End of Paper -

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ASSUMPTION ENGLISH SCHOOL
Sec 4 Biology 6093 Marking Scheme
Preliminary Examination 2019

Paper 1 (40 m)

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

Paper 2 Section A (50 m)

	a	P – protein/polypeptide Q- glycerol R – fat/lipid S – glucose/monosaccharide every 2 correct – 1 m	2
	b i	Benedict's test	1
	b ii	Add an **equal volume** of Benedict's solution into the sample; Shake the mixture and place the test tube into a **boiling water bath** for 3 minutes; If glucose is present, a **brick-red precipitate** will be formed; 3 points – 2 marks, 2 points – 1 mark, 0 to 1 point – no marks	2
2	a	phloem	1
	b	J and K; K is a leaf which takes in radioactive carbon dioxide for photosynthesis; The radioactive sugars formed in leaf K (through photosynthesis) can be translocated / transported up to J; Radioactive sugars cannot move down to the roots M or leaf L as the phloem at X is removed;	4
	c	All parts/ J, K, L and M; The phosphorus will be present in the roots M as water is absorbed by the root / plant roots absorbed radioactive phosphate ions; The radioactive phosphate ions can be transport up the xylem to the J, K and L as it remains intact;	3
3	a	O: phagocyte/white blood cell P: capillary	1 1

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	b	M: the lymphocyte produces **antibodies** that causes the bacteria to **clump** together; N: The bacteria is being engulfed and ingested by phagocytes /phagocytosis of bacteria;	1 1
	c	The **platelets** are activated; Causing soluble **fibrinogen** to be converted into insoluble **fibrin**; The fibrin forms a **mesh**; to **trap red blood cells**; to form a **clot**; 5 points – 2 marks, 3 to 4 points – 1 mark;	2
	d i	lower for both	1
	d ii	Glucose and oxygen **diffused** through the capillary into the skin cells; for the cells to perform **aerobic respiration**;	1 1
4	a i	pancreatic trypsin/amylase/lipase	1
	a ii	small intestines / duodenum	1
	b i	insulin	1
	b ii	Insulin helps to decrease blood glucose concentration when it increases after absorption of glucose after a meal; Insulin helps to decrease blood glucose concentration by • increasing permeability of cell membrane to glucose, increasing rate of glucose uptake; • stimulating the liver to convert glucose into glycogen for storage; • increasing oxidation of glucose during tissue respiration; (any 2 of 3 points)	1 2
5	a	Continuous Variation: height, weight Discontinuous variation: blood type	1
	b	Amy and Christie. They are the only ones with identical blood groups;	1
	c	Couple 1.; They are the only ones with possibility of having allele I^O. I^O is a recessive allele and must be present in both the paternal and maternal genes in order for Amy and Christie to have blood group O.	1 1 1
	d	100%	1
6	a	insect: P, S, T wind: Q, R 5 correct – 2 marks, 3 or 4 correct – 1 mark	2
	b	The stigma is **feathery**; to provide a **larger surface area**; to capture **more;** **pollen grains**; every 2 correct – 1 mark	2
	c i	line + label L on stigma of **P** or **R**	1
	c ii	After **pollination**; the pollen grain **germinates**; The pollen tube grows as it secretes enzymes to digest; the tissue of the stigma/style; Every 2 points – 1 mark	2

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	d	The nucleus in the pollen grain is **haploid** while the nucleus in a cell in structure S is **diploid**; The nucleus in the pollen grain is formed by **meiosis** while that of structure S is formed by **mitosis**.	1 1
7	a	carbon compounds in animals	1
	b	C & E	1
	c i	Draw from air to plants	1
	c ii	Photosynthesis	1
	d	Oceans can absorb carbon dioxide when the carbon dioxide **dissolves** in the water; The dissolved carbon dioxide is used by phytoplankton and algae during **photosynthesis**; Carbon compounds found in oceans can also be buried in the seabed and be converted into **fossil fuels**;	1 1 1

Paper 2 Section B (30 marks)

1	a	It is the **optimum pH** for lipase action;	1
	b i	correct axis with units; appropriate scale; correct plots; best-fit curve; 4 points – 3 marks, 3 points – 2 marks, 2 points – 1 mark, 0 to 1 point – no marks	3
	b ii	mark based on student's graph	1
	c	The milk molecule is complementary to the active site of the lipase; The lipase catalyses the breakdown of the fat molecule into fatty acids and glycerol; The fatty acids lowers the pH of the mixture;	1 1 1
	d	The **pH** will **decrease less rapidly**; The bile salts causes the **emulsification** of the fats; The **surface area to volume ratio** is increased when the fats are emulsified; Thus, allowing the **lipase** to **digest** the fats **more rapidly**; every 2 points – 1 mark	2
2	a	Mutation is a spontaneous / sudden and random change; in the structure of the gene; or in chromosome number; 3 points – 2 marks, 2 points – 1 mark, 0 to 1 point – no marks	2
	b	Method; How results are interpreted; correct genetic diagrams;; Perform a **test cross** with a **homozygous recessive** salmon to determine if the orange-pink salmon is homozygous dominant or heterozygous; If the orange-pink salmon is homozygous, all the offspring will be orange-pink. If the salmon is heterozygous, only half the offspring will be orange-pink; Let P the the allele for orange-pink and p be the allele for white	1 1

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		If the orange salmon is homozygous, Parental phenotype orange pink x white Parental genotype PP x pp Gametes formed P P p p F1 genotype Pp Pp Pp Pp F1 phenotype All orange pink If the orange salmon is heterozygous, Parental phenotype orange pink x white Parental genotype Pp x pp Gametes formed P p p p F1 genotype Pp pp Pp Pp F1 phenotype pink white pink white	1 1
	c	The ocean pout gene is isolated using a suitable **restriction enzyme**; The bacteria plasmid is cut using the **same restriction enzyme**; The ocean pout gene is mixed with plasmid and they form a recombinant plasmid in the presence of **DNA ligase**; Recombinant DNA is inserted into the bacterial cell after **heat/electric shock**;	1 1 1 1
E3	a	Homeostasis is the **maintenance** of a **constant internal environment**.	1
	b	Negative feedback is a corrective mechanism which **reverses** the **effects** of a **stimulus**; It **restores** the **normal** condition of the body;	1 1
	c	Detection of stimulus The **thermoreceptors** of the skin **detects** the **rise** in **temperature**; Nerve impulses are generated and sent to the **hypothalamus** which initiates the corrective mechanism; Corrective mechanism **Arterioles** in the skin **dilate** (and shunt vessels constrict); **More blood** flows to skin **capillaries**; increasing heat loss by conduction, convection and radiation; **Sweat glands** become **more active**, **more sweat** is produced; More **water evaporates;** causing **more latent heat of vapourisation** to be lost from the body; 7 points – 5 marks, 6 points – 4 marks, 4 to 5 points – 3 marks, 3 points – 2 marks, 2 point – 1 mark, 0 to 1 point – no marks.	2 5
O3	a	**Ultrafiltration** occurs between the glomerulus and Bowman's capsule; due to • wider afferent arteriole as compared to efferent arteriole; • partially permeable membrane of the Glomerulus; This allows water and small molecules to enter the Bowman's capsule; Every 2 points – 1 mark **Selective reabsorption** starts at the proximal convoluted tubule; **All**; the **glucose** and **amino acids** ;	2 3

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		are reabsorbed through the tubule into the bloodstream by **diffusion** and **active transport**; Most of the **mineral salts** are reabsorbed as well (by diffusion and active transport) **Water** is also reabsorbed by **osmosis** along the nephron; Every 2 points – 1 mark (Composition) Excess water, excess salts and metabolic waste such as urea are passed on to the renal pelvis/bladder as urine;	1
	b	The **water potential** of blood increases; The **hypothalamus** is **stimulated** ; and the **pituitary gland releases less anti-diuretic hormone** (ADH) into bloodstream; Cells in **walls** of **collecting duct** become **less permeable** to water; **Less water** is **reabsorbed** from collecting ducts into blood capillaries; The body will **release more water** as urine, maintaining water potential of blood; 6 points – 4 marks, 4 to 5 points – 3 marks, 3 points – 2 marks, 1 to 2 points – 1 mark	4

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