Name:		Index Number:		Class:	

CATHOLIC HIGH SCHOOL
Preliminary Examination 3
Secondary 4

BIOLOGY **5158/1**

Thursday 18 September 2014
1 hour

Additional Materials: Optical Answer Sheet (OAS)

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, index number and class on the OAS in the spaces provided.
DO NOT WRITE ON ANY BARCODES.

There are forty questions on this paper. Answer all questions. For each question there are four possible answers A, B, C and D.
Choose the one you consider correct and record your choice by shading in pencil on the OAS. Erase all incorrect answers cleanly.

Each correct answer will score one mark.
Any rough working should be done in this booklet.
Electronic calculators may be used.

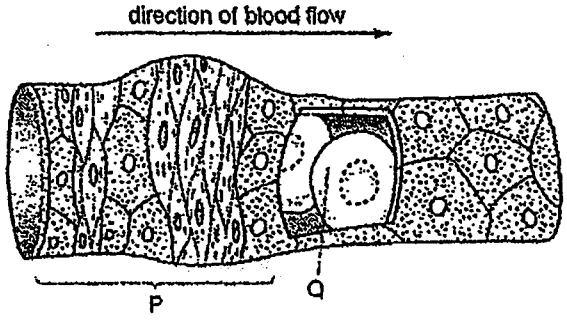
For examiner's use only:

Total	/ 40

This paper consists of 15 printed pages.

[Turn over

1 The diagram shows blood passing through an arteriole into a capillary. Part of the capillary wall has been cut away to show the blood.



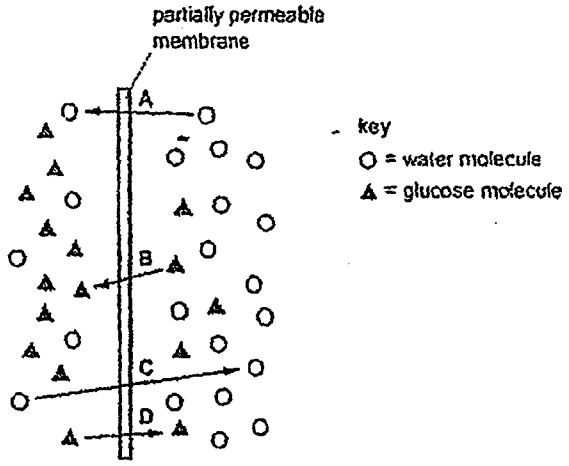
What is the level of organisation of the structures labelled P and Q?

	P	Q
A	organ	cell
B	organ	tissue
C	tissue	cell
D	tissue	tissue

2 An amino acid enters a cell and is then used to synthesise an enzyme secreted by the cell. What is the sequence of cell structures involved in the synthesis of the enzyme?

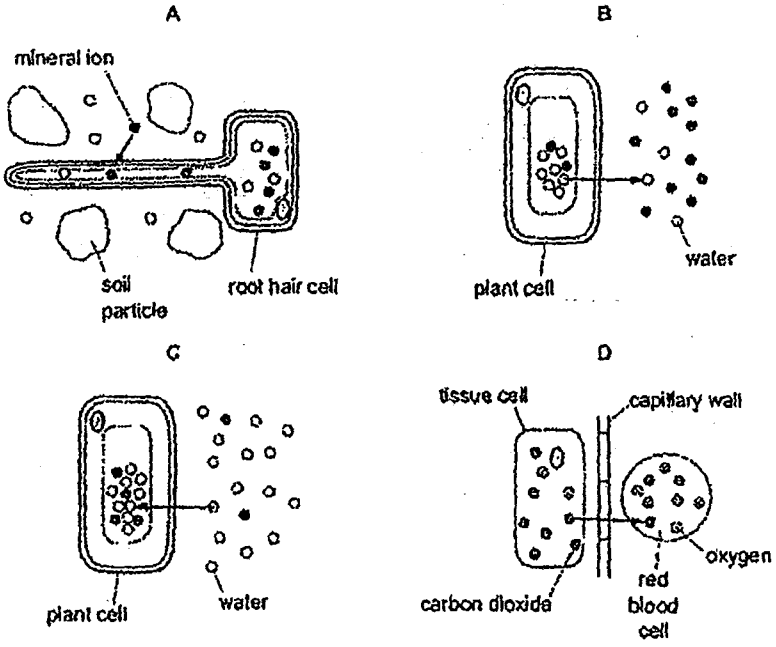
	first → last			
A	endoplasmic reticulum	Golgi apparatus	ribosome	exocytotic vesicle
B	endoplasmic reticulum	ribosome	Golgi apparatus	cell surface membrane
C	ribosome	endoplasmic reticulum	Golgi apparatus	exocytotic vesicle
D	ribosome	Golgi apparatus	endoplasmic reticulum	cell surface membrane

3 The diagram represents the passage of water molecules and glucose molecules across a partially permeable cell surface membrane.



Which arrow indicates osmosis?

4 Which diagram illustrates the process of active transport?



5 Which molecule contains peptide bonds?

A cholesterol
B deoxyribonucleic acid
C glycogen
D haemoglobin

6 What is a role of essential fatty acids in the body?

A as part of cell membranes
B as part of cell walls
C to use for DNA formation
D to use for enzyme formation

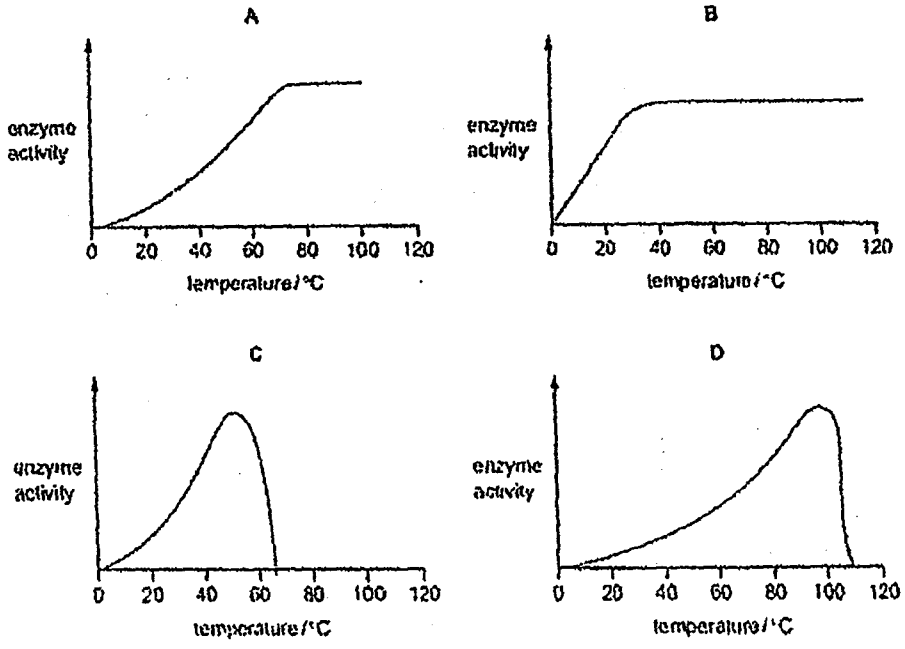
7 A student carried out four tests for biological molecules on a solution. The results are shown in the table.

test for biological molecules	observation
iodine solution	orange-brown
biuret	purple
Benedict's	orange
emulsion	clear

Which three molecules may be originally present in this solution?

A amylase, starch, oil
B amylase, starch, water
C egg white, glucose, oil
D egg white, sucrose, water

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?



9 The table shows the rates of absorption of two different sugars, arabinose and glucose, in living and dead intestines. The concentrations of the sugars inside the intestines were the same in each case.

	rate of absorption (arbitrary units)	
	arabinose	glucose
living intestine	31	102
dead intestine	31	34

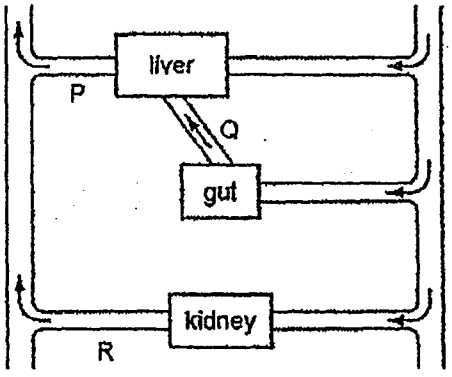
What are the main methods of absorption of arabinose and glucose in living intestine?

	arabinose	glucose
A	active transport	active transport
B	active transport	diffusion
C	diffusion	active transport
D	diffusion	diffusion

10 The small intestines of cows are similar in general structure and function to the small intestines of humans. A disease in cows reduces the number of villi in their small intestines. The cows lose weight and become weak. What explains this?

A less amylase produced
B less peristalsis
C slower absorption of nutrients
D slower digestion of proteins

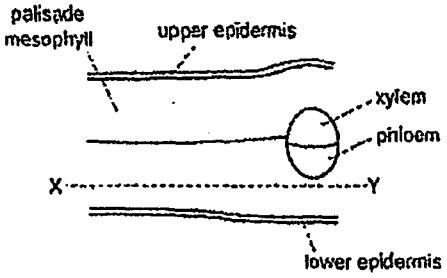
11 The diagram represents some human organs and their blood vessels.



Immediately after taking an alcoholic drink, how would the levels of alcohol compare in blood vessels P, Q and R?

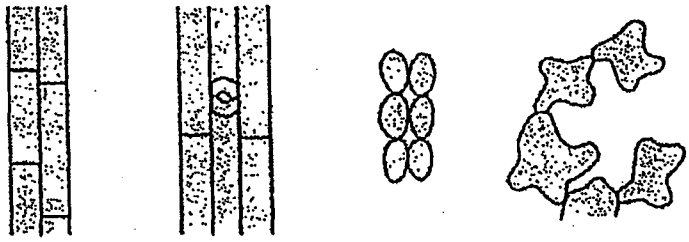
	P	Q	R
A	high	medium	high
B	medium	high	low
C	low	low	medium
D	high	low	low

12 The diagram shows the arrangement of the tissues of a leaf as seen in cross-section under the microscope.



What is the arrangement of the cells in the section X-Y?

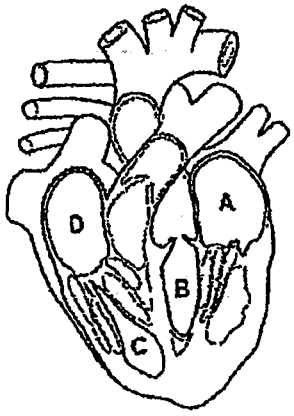
A B C D



13 What is the main source of the energy that causes water to rise up a plant stem?

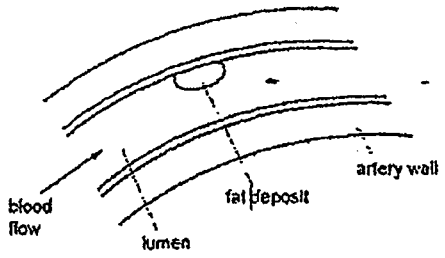
A difference in water potential between cell sap and soil water
B heat from the Sun
C light absorbed by chlorophyll
D respiration of sugars made in photosynthesis

14 In a medical investigation, a dye was injected into the renal artery of a patient. The dye was not filtered out of the blood in the kidneys.



Which chamber of the heart would be the first to receive blood with this dye in it?

15 The diagram shows a section of the coronary artery with damage that may result in a heart attack.



What best describes the events that could lead to a heart attack?

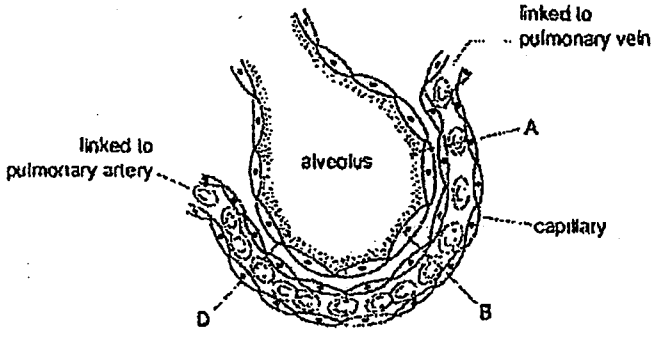
A further fat deposits followed by platelet and red blood cell destruction
B further fat deposits followed by platelets forming a fibrin mesh restricting blood flow
C hardening the artery wall preventing diffusion across the wall
D restriction of the artery lumen by a clot causing less oxygen per cm^3 of blood

16 The diagram shows a section through part of a vein.

What could be the first organs found in the directions 1 and 2?

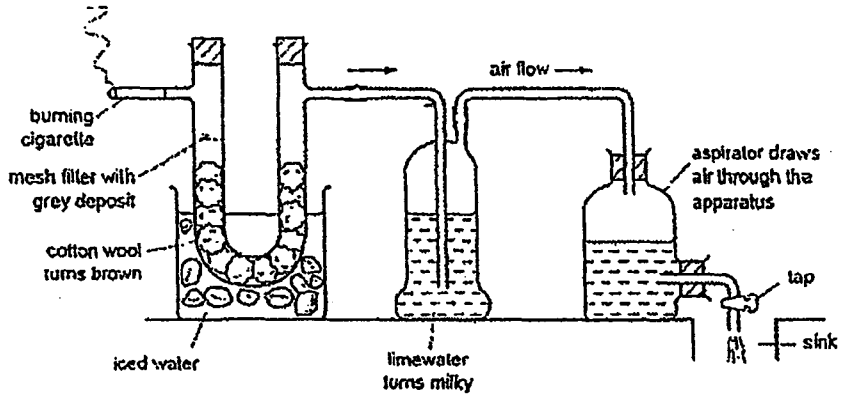
	1	2
A	heart	brain
B	intestine	liver
C	kidney	heart
D	lung	heart

17 The diagram shows an alveolus and an associated blood capillary.



At which point will the greatest rate of diffusion of carbon dioxide occur?

18 The diagram shows the apparatus used to show some of the materials in cigarette smoke. The labels indicate the results after five minutes.



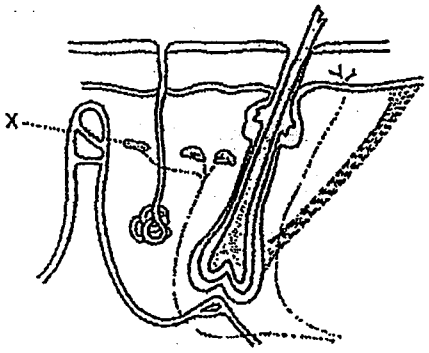
Which materials that are in cigarette smoke did this apparatus detect?

	grey deposit on mesh filter	cotton wool turns brown	limewater turns milky
A	nitrates	nicotine	carbon dioxide
B	nitrates	tar	carbon monoxide
C	particles	nicotine	carbon monoxide
D	particles	tar	carbon dioxide

19 What would be normally absent from the glomerular filtrate in the kidney?

A glucose B protein C salts D urea

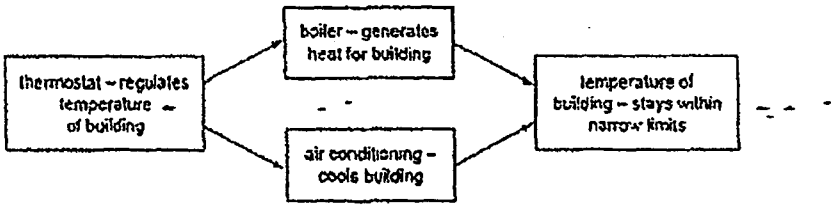
20 The diagram shows some of the structures seen in a section through human skin.



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

21 The diagram shows a way of regulating the temperature of a building.



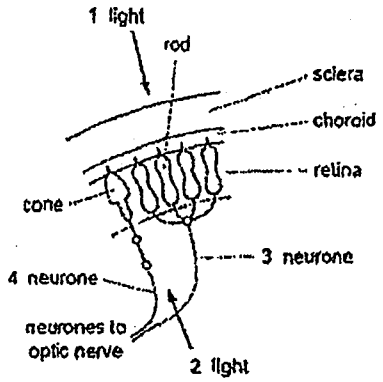
Which shows the equivalent organs that regulate the temperature of the human body?

	air conditioning	boiler	thermostat
A	brain	lungs	skin
B	lungs	brain	muscles
C	skin	liver	brain
D	stomach	skin	heart

22 What is the role of motor neurones in reflex action?

A carrying nerve impulses from the central nervous system to an effector
B connecting a receptor to the central nervous system
C forming a synapse with a sensory neurone
D transferring energy from the stimulus to a nerve impulse

23 The diagram shows a very small section of the retina with microscopic detail of four rods and a cone.



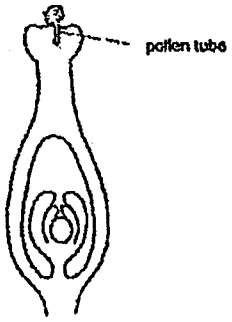
Which arrow shows the direction that the light passes to stimulate the retinal cells, and, at low level light intensity, which of the two neurones will fire impulses?

	direction of light	neurone fired
A	1	3
B	1	4
C	2	3
D	2	4

24 How does adrenaline affect glucose uptake by muscle cells and carbohydrate conversion by liver cells?

	glucose uptake	carbohydrate conversion
A	decreases	glucose to glycogen
B	decreases	glycogen to glucose
C	increases	glucose to glycogen
D	increases	glycogen to glucose

25 The diagram shows a vertical section through the carpel of a flower that has been pollinated.



What is the correct order of structures through which the pollen tube must grow in order to bring about fertilisation?

	first → last			
A	micropyle	stigma	style	ovary wall
B	ovary wall	micropyle	stigma	style
C	stigma	style	ovary wall	micropyle
D	style	ovary wall	micropyle	stigma

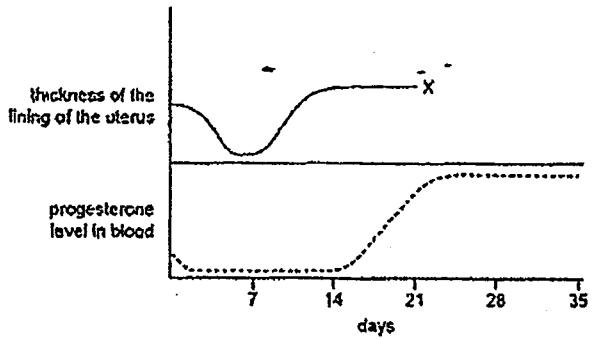
26 What are involved in reproduction in both animals and plants?

A ovary and embryo
B ovary and testes
C ovule and stigma
D uterus and embryo

27 What is the result of cutting both the sperm ducts in a man?

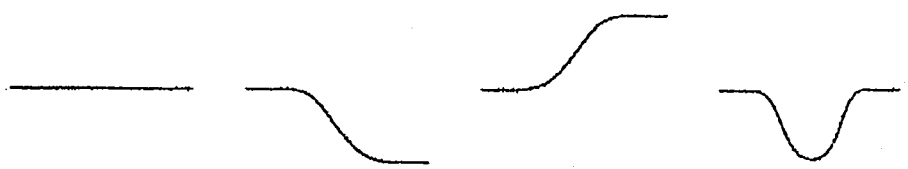
A He is unable to develop sperms.
B He is unable to pass urine.
C Male sex hormones no longer circulate in his blood.
D Sperms are not emitted from the urethra.

28 The diagram shows the relationship between progesterone levels and the thickness of the lining of the uterus.

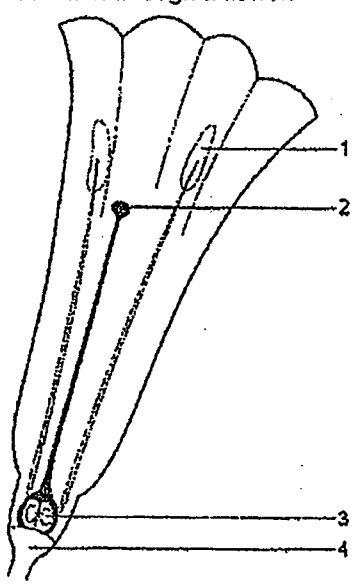


Which segment needs to be added at X to complete the diagram?

A B C D



29 The diagram shows a section through a flower.



In which structures are haploid nuclei formed by reduction division?

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

30 If the mass of DNA in a normal body cell is Z, how much DNA will be present in a cell after the completion of mitosis, after completion of meiosis and in an egg after completion of fertilisation?

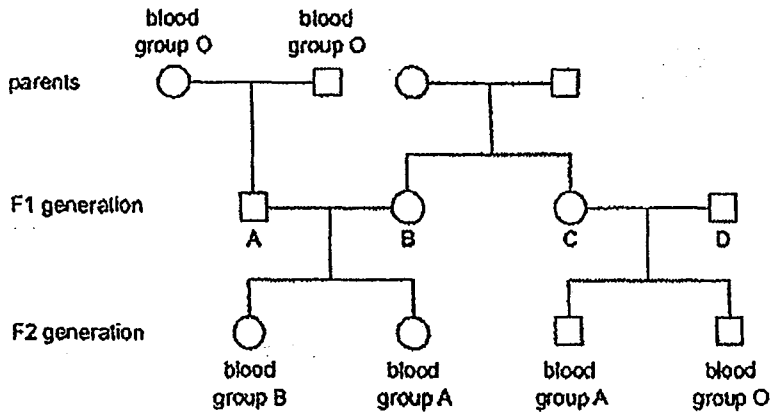
	after completion of mitosis	after completion of meiosis	after completion of fertilisation
A	Z	½Z	Z
B	Z	2Z	2Z
C	½Z	2Z	2Z
D	2Z	½Z	Z

31 Which statement is true of both chromosomes and genes?

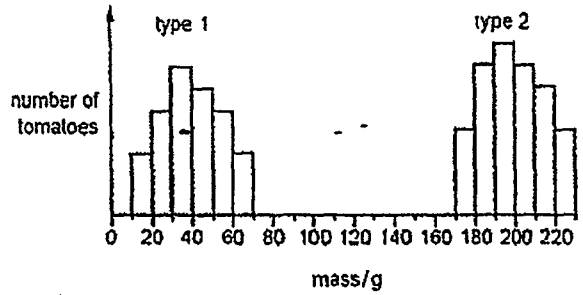
A Each codes for a specific protein.
B Each may be copied and passed on in mitosis.
C Each may be either dominant or recessive.
D Each may exist as two or more alleles.

32 The diagram shows the blood group phenotypes of some members of a family.

Which member of the F1 generation must be heterozygous, with the codominant alleles?



33 The graph shows the masses of two different types of tomato.



What can be concluded from the graph?

A Genes do not affect the mass of tomatoes.
B Type 1 tomatoes show continuous variation.
C Type 2 tomatoes are sometimes smaller than type 1 tomatoes.
D Type 2 tomatoes show discontinuous variation.

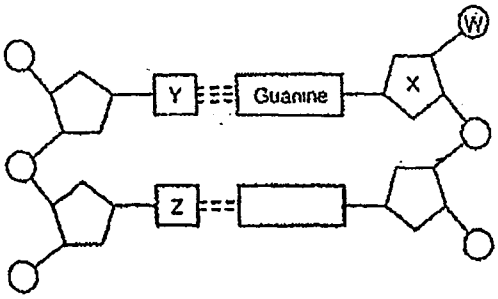
34 Which outcomes might farmers want to achieve by using artificial selection?

	increased	decreased
A	fertiliser use	pesticide use
B	growth rate	yield
C	pesticide use	growth rate
D	yield	fertiliser use

35 Which statement about chromosomes is correct?

A Chromosomes are long DNA molecules called genes which are divided into sections.
B Chromosomes include a long molecule of DNA divided into sections called genes.
C Chromosomes include genes which are divided into sections called DNA molecules.
D Genes include long DNA molecules called chromosomes.

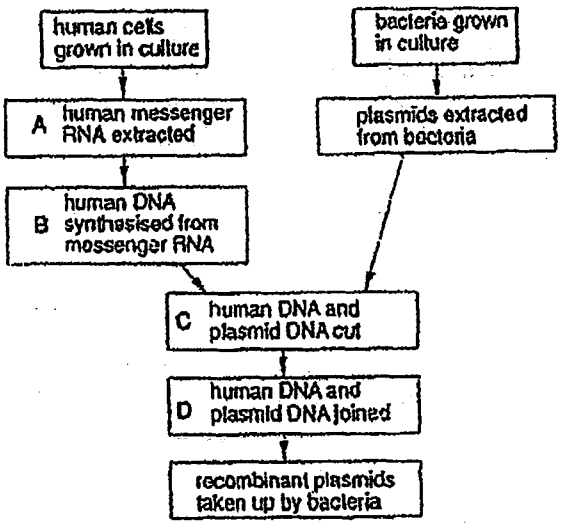
36 The diagram shows part of a DNA molecule.



Which letters indicate cytosine, pentose, phosphate and thymine?

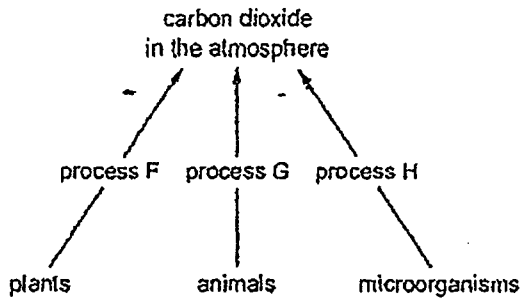
	cytosine	pentose	phosphate	thymine
A	W	X	Y	Z
B	Y	X	W	Z
C	Z	W	X	Y
D	Y	Z	X	W

37 The following diagram shows some of the events in the synthesis of a human hormone by genetic engineering.



At which stage in the process is a restriction enzyme used?

38 The diagram shows some of the stages in the carbon cycle.



What are processes F, G and H?

	process F	process G	process H
A	photosynthesis	respiration	photosynthesis
B	photosynthesis	respiration	respiration
C	respiration	respiration	respiration
D	respiration	photosynthesis	photosynthesis

39 Which pollutants of water can lead to eutrophication?

	fertilisers	herbicides	insecticides	sewage
A	✓	✓	×	×
B	✓	×	×	✓
C	×	✓	✓	×
D	×	×	✓	✓

40 Cutting down tropical rain forest trees has many consequences.

Which of these consequences could lead to global warming?

A fewer organisms decomposing
B fewer roots in ground
C less carbon dioxide absorbed
D soil erosion

- End of Paper -

Name:		Index Number:		Class:	

CATHOLIC HIGH SCHOOL
Preliminary Examination 3
Secondary 4

A1

BIOLOGY **5158/2**

18 Sep 2014
1 hr 45 minutes

Additional Materials: NIL

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.
DO **NOT** WRITE ON THE MARGINS

Answer all questions in the space provided.

For examiner's use only:

Question 1	/ 9
Question 2	/ 7
Question 3	/ 9
Total	/ 25

At the end of the examination, fasten all your work for each section securely together.
Hand in each section separately.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of 20 printed pages.

[Turn over

Section A: Answer all questions in this section in the spaces provided.

1

Fig. 1.1 shows a vertical section of the stomach, together with the parts of the alimentary canal leading into and out of it.

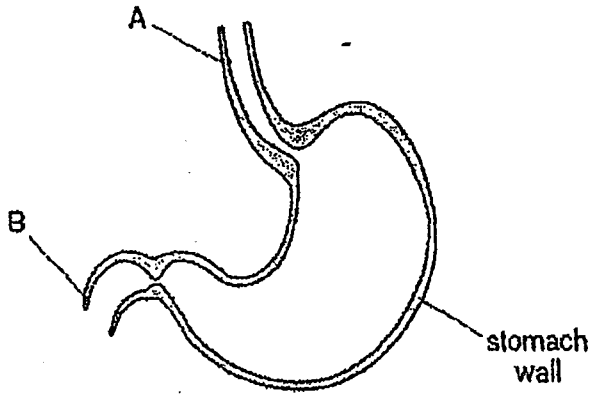


Fig. 1.1

(a) Name the parts A and B.

A .....

B .....[2]

The stomach is a bag-like structure with very muscular walls.

(b) Explain the role of the muscles in the stomach wall.

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.....[3]

(c) Pepsin is a substance produced in the stomach. An investigation was carried out into the action of pepsin on proteins.

10 cm^3 of a cloudy egg white suspension, the protein, was placed into each of four test-tubes. Other substances were added as shown in Table 1.1.

The test-tubes were kept in a water-bath at 37°C for ten minutes.

Table 1.1

test-tube	volume / cm^3			
	egg white suspension	hydrochloric acid	pepsin	water
1	10	2	3	0
2	10	0	3	2
3	10	2	0	3
4	10	0	0	5

At the beginning of the investigation the contents of all the test-tubes were cloudy. At the end only test-tube 1 had become clear.

Describe and explain the processes and conditions that cause the change in appearance of test-tube 1.

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.....[4]

[Total: 9]

2

(a) Fig. 2.1 shows a section through a leaf. A leaf is designed for photosynthesis and this process provides a supply of simple sugars for a plant.

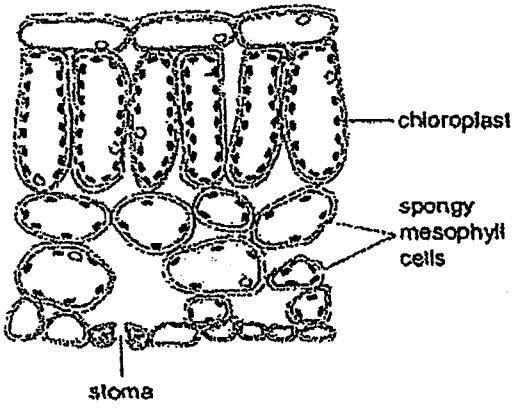

Fig. 2.1

(i) State the function of the chloroplasts in photosynthesis.

.....

.....[1]

(ii) Describe and explain the advantage of the distribution of the chloroplasts as shown in Fig. 2.1.

.....

.....

.....[2]

(iii) Suggest the function of the stomata and the spaces between the spongy mesophyll cells in the process of photosynthesis.

.....

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.....

.....[3]

(b) Name the tissue that transports amino acids around the plant.

.....[1]

[Total: 7]

3
Fig. 3.1 shows an incomplete diagram of the female urinary system.

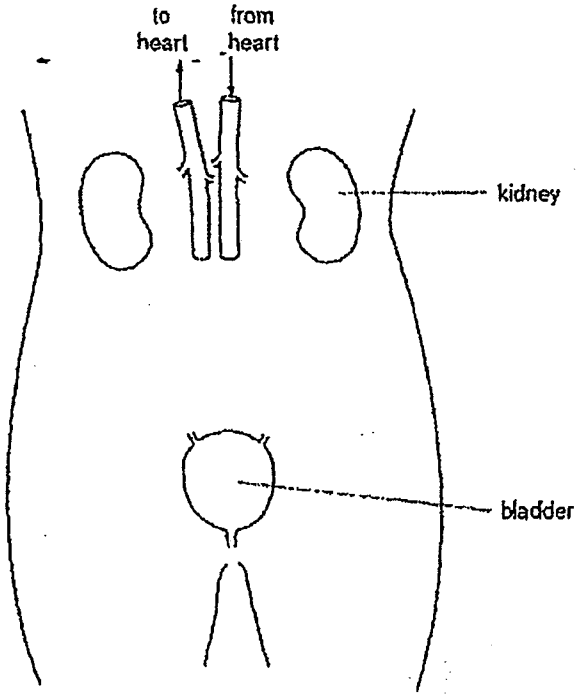

Fig. 3.1

(a) On Fig. 3.1, draw and label the following parts:

renal artery, urethra and ureter. [3]

(b) If the kidneys fail, the patient may be put on a kidney machine. Explain how a kidney machine works.

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.....[4]

(c) Outline the role of the kidneys in homeostasis.

.....

.....

.....

.....[2]

[Total: 9]

Name:		Index Number:		Class:	

CATHOLIC HIGH SCHOOL
Preliminary Examination 3
Secondary 4

A2

BIOLOGY **5158/2**

18 Sep 2014
1 hr 45 minutes

Additional Materials: NIL

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.
DO **NOT** WRITE ON THE MARGINS

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

For examiner's use only:

Question 4	/ 7
Question 5	/ 5
Question 6	/ 7
Question 7	/ 6
Total	/ 25

At the end of the examination, fasten all your work for each section securely together.
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This document consists of 20 printed pages.

[Turn over

Section A: Answer all questions in this section in the spaces provided.

4
Fig. 4.1 shows part of the internal structure of the human eye.

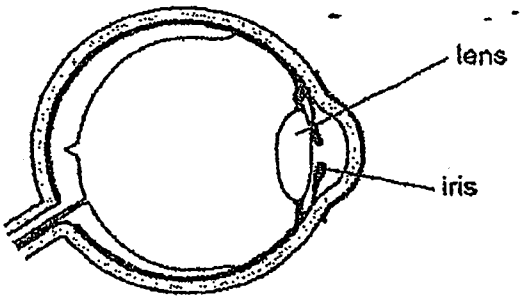


Fig. 4.1

(a) On the following two diagrams, the lens and the iris are missing.
(i) On Fig. 4.1a below, draw the iris to show how it would appear when the eye is receiving **less light** than the eye in Fig. 4.1.

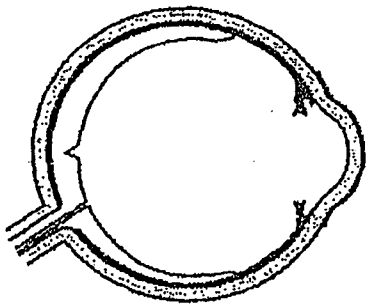


Fig. 4.1a

[1]

(ii) On Fig. 4.1b, draw the lens to show how it would appear when the eye is focused on an object **closer to the eye** than in Fig. 4.1.

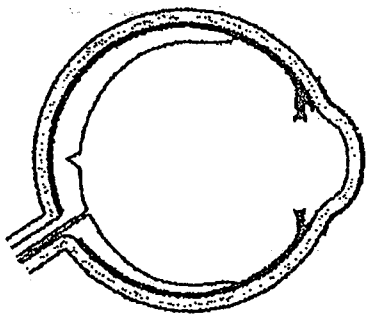


Fig. 4.1b

[1]

In an experiment, a person looked at the same light source from various different distances. The diameter of their pupil was measured at each position. Fig. 4.2 shows how the diameter varied.

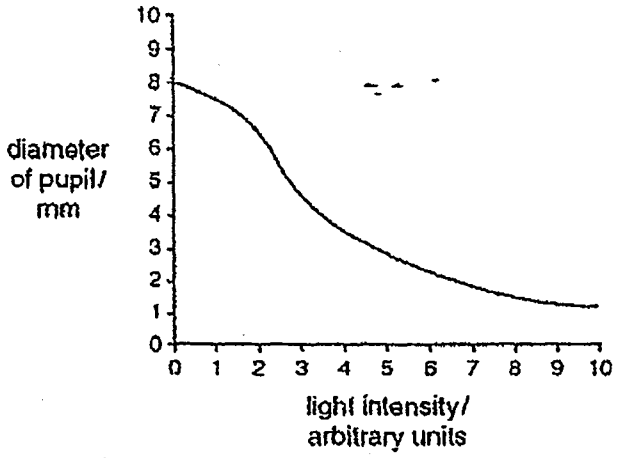


Fig. 4.2

(b) Explain how the response is brought about as the light intensity is increased from 2 to 4 arbitrary units.

.....

.....

.....

.....

.....

.....[5]

[Total: 7]

5
The production of chlorophyll in a variety of tomato plant is controlled by a gene. The dominant allele causes normal chlorophyll production and the recessive allele causes a lack of chlorophyll in the leaves.

(a)(i) Using the symbols, G to represent the dominant allele and g to represent the recessive allele, explain, using a genetic diagram, the expected outcome of crossing two heterozygous tomato plants.

[4]

(ii) If 500 seeds from the heterozygous cross were germinated, how many seedlings would you expect to have green leaves and how many white leaves?

green leaves ..... white leaves ..... [1]

[Total: 5]

6
Fig. 6.1 shows a cell of a female fruit fly, *Drosophila melanogaster*, during a stage of mitosis.

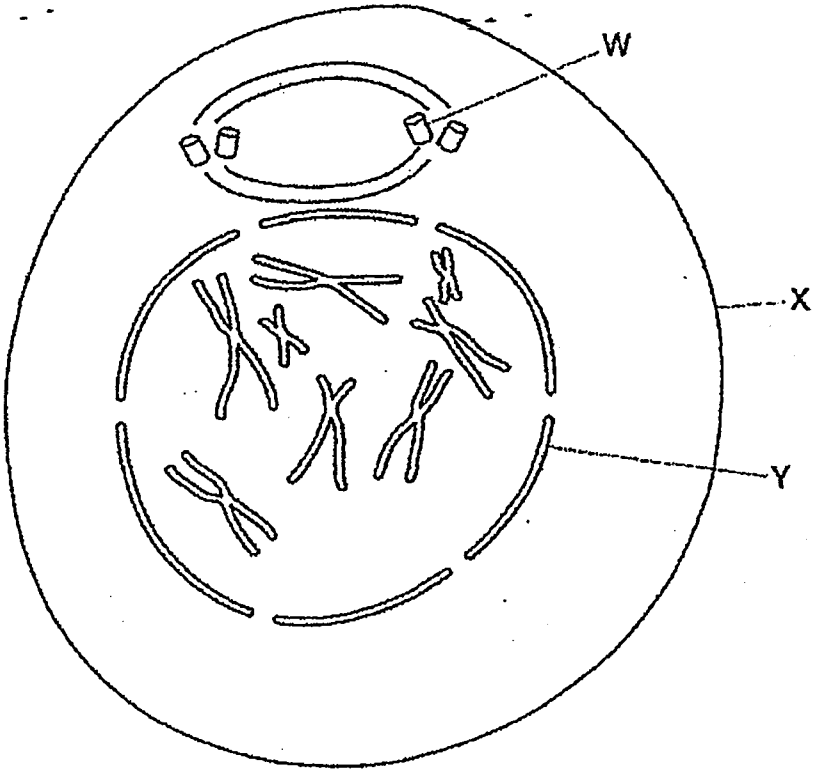


Fig. 6.1

(a)(i) Name the stage of mitosis shown in Fig. 6.1.

.....[1]

(ii) Shade a pair of homologous chromosomes. [1]

(iii) Name the structure labelled W and state its function.

.....

.....

.....[2]

(b) State what happens to structure **X** and to structure **Y** between the stage shown in Fig. 6.1 and the end of cell division.

.....

.....

.....

.....

.....

.....

.....

.....[3]

[Total: 7]

7

Fig 7.1 below shows what happens to energy as it passes through an herbivorous mammal (an ox).

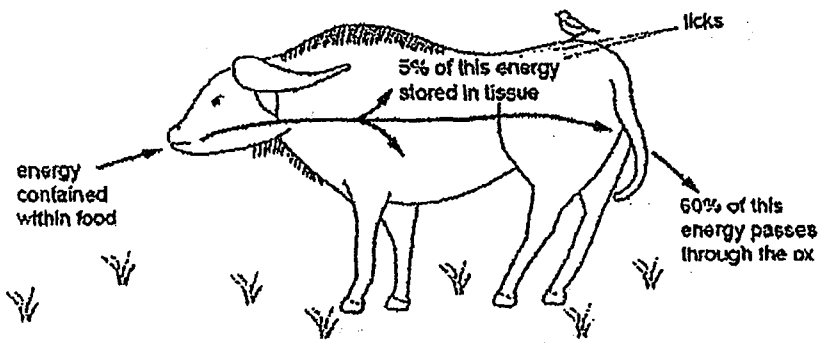


Fig. 7.1

(a) State the source of the energy in the food eaten by the ox.

.....[1]

(b) State two ways in which the energy may be used within the ox.

1. .....

2.....[2]

The bird on the ox's back is an oxpecker that feeds both on blood-sucking parasites (ticks) living on the ox, and on blood from the ox's wounds.

(c) Explain why there must always be fewer oxpeckers than ticks in this food web.

.....

.....

.....

.....

.....[3]

[Total: 6]

Name:		Index Number:		Class:	

CATHOLIC HIGH SCHOOL
Preliminary Examination 3
Secondary 4

B

BIOLOGY **5158/2**

18 Sep 2014
1 hr 45 minutes

Additional Materials: NIL

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.
DO NOT WRITE ON THE MARGINS

Answer **all** questions in the space provided.
Question 10 is in an Either/OR form. Write an E (for Either) or an O (for Or) next to the number 10 in the grid below to indicate which question you have answered.
Additional lines are provided at the end of booklet B (on page 20) to continue answers for parts of the essay question.
You must indicate the question number and the relevant part that is continued.

For examiner's use only:

Question 8		/ 10
Question 9		/ 10
Question 10		/ 10
Total		/ 30

At the end of the examination, fasten all your work for each section securely together.
Hand in each section separately.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of 20 printed pages.

[Turn over

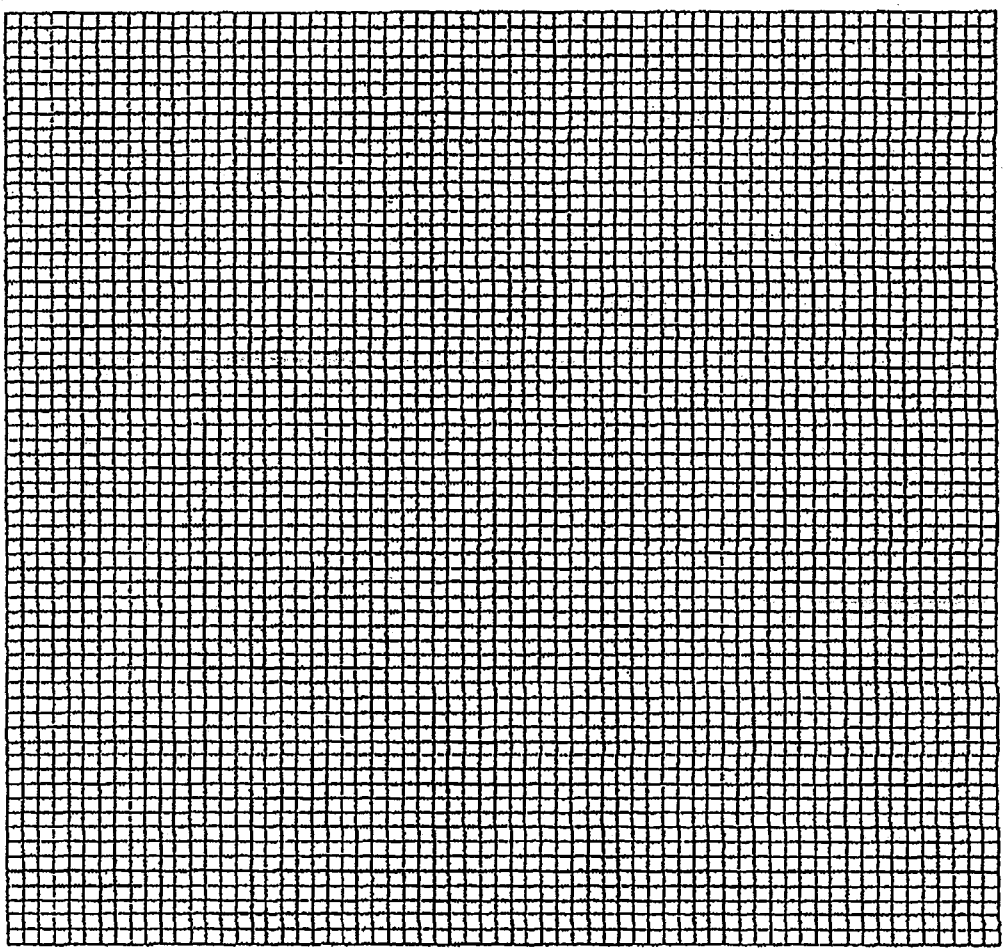
Section B: Answer all questions in this section in the spaces provided.

8
Table 8.1 shows the rate of water loss by a plant over a period of 15 hours.

Table 8.1

time /hours	rate of water loss /grams per hour
0600	12
0900	18
1200	24
1500	24
1800	20
2100	10

(a) Plot the data in **Table 8.1** on the graph paper below. [4]



(b) State two environmental factors, apart from humidity, that can cause a change in water loss and explain how each of these has its effect.

1 factor .....

explanation .....

.....

.....

.....

.....

.....

2 factor .....

explanation .....

.....

.....

.....

.....

.....[6]

[Total: 10]

9

(a) State the equation for anaerobic respiration in yeast.

.....[1]

(b)(i) Describe and explain the changes that occur in breathing and heartbeat as a person climbs a mountain.

.....

.....

.....

.....

.....

.....

.....[4]

(ii) Explain how these changes affect the working of the leg muscles during the climb.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[5]

[Total: 10]

10 EITHER

(a) State the products of an ovary in a woman and describe the roles of each of these products.

.....

.....

.....

.....

.....

.....

.....

.....

.....[5]

(b) With reference to named substances, describe the functions of the placenta and the umbilical cord.

.....

.....

.....

.....

.....

.....

.....

.....

.....[5]

[Total: 10]

10 Or

(a) Explain what is meant by the terms

(i) gene;

.....

.....

.....

.....

(ii) allele.

.....

.....

.....

.....

[4]

(b) Describe the part played by genes in the process of evolution.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[6]

[Total: 10]

Additional Lines for answers
Please indicate Question number and part of question that is continued here.

Mark Scheme of 2014 Preliminary Examination 3

Paper 1 (40 marks)

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

Catholic

2014 Biology Preliminary 3 Paper 2
Answer Scheme

Section A

1 (a) [A] oesophagus/gullet [1]
[B] duodenum [1] I: small intestines

1 (b)
- contract + mix food [1] I: squeeze
- and gastric/digestive juices/(named) enzymes/HCl [1]
- (mechanical) break down food/increase surface area [1]
- moving food along/emptying/peristalsis [1]
- sphincters [1]
- control the entry and exit (to and from the stomach) [1]
- gastric glands secrete mucus [1]

[max 3]

1 (c)
- protein/egg white has been, digested/broken down + (converted) into, (poly)peptides/amino acids [1] which are soluble [1]
- (caused) an enzyme/protease/pepsin [1]
- acid/lower pH (as environmental factor) [1] I: acid acting alone
- 37°C/body temperature + ref to optimum temp [1]

[max 4]

[Total: 9]

2 (a) (i) To trap/capture/absorb light/convert light energy to chemical energy [1]
A: take in light I: refs. to catch light/hold chlorophyll/make starch/food etc

2 (a) (ii)
- more in upper part of mesophyll/palisade layer/palisade mesophyll [1]
- to get maximum absorption of light/nearer the light/closer to light [1]

A: increase amount of light taken in
-arranged in cells to avoid overlap/orientated at right angles to light [1] (refers to chloroplasts)

[max 2]

2 (a) (iii)
- (open) stomata allow diffusion/entry [1] of carbon dioxide [1]

(CO_2 into leaf – 2 marks
CO_2 and oxygen moving in and out – 2 marks
oxygen and CO_2 moving in and out – 1 mark)
- stomata open in the light/during day [1]
- spaces allow circulation/diffusion of gas/carbon dioxide [1]
- distribution/availability to <u>all</u> mesophyll cells/reach all mesophyll cells [1]

I: refs. to oxygen/water/transpiration

[max 3]

2 (b) Phloem/sieve tubes/phloem tubes [1]

[Total: 7]

3 (a) one mark for each part (drawn) and labelled correctly:
renal artery [1]
urethra [1]
ureter [1]
Max 2 for only labels without drawings

3 (b)
- ref. to blood enters machine from patient AW [1] (ONLY CREDIT ONCE)
- blood passes along + dialysis tubing AW / visking tubing / cellulose or cellophane tubing [1]
- ref. to tubing AW being semi-permeable / selectively permeable/ acting as a filter AW [1]
- ref. to surrounding fluid containing + some salts / glucose/ no urea [1]
- waste materials/excess materials + pass from blood [1]
- ref. to diffusion [1]
- ref. to pump/bubble trap/counter flow [1]
- 'cleaned' blood returns + to patient's circulation/body AW [1] (CREDIT ONCE)
[max 4]

3 (c)
- ref. to maintaining level of named substance in blood [1]
- method outlined, e.g. filtration/reabsorption/osmosis/diffusion [1]

[Total: 9]

4 (a) (i) Iris drawn with wider gap [1]

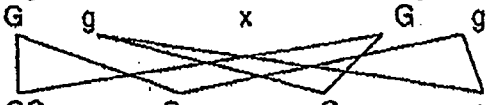
4 (a) (ii) Lens drawn with greater bulge [1]

4 (b)
- light sensitive/receptor (cells) or named/retina [1]
- neurones/nerve cells or fibres [1] A: optic nerve
- impulses [1]
- contraction + circular muscles [1] R: if reference ciliary
- relaxation + radial muscles [1] R: if reference ciliary
- correct reference iris [1]
[max 5]

[Total: 7]

5 (a) (i)

Parents:	phenotype	green		x		green	
	genotype	Gg		x		Gg	[1]
	gametes	G	g	x	G	g	[1]
Offspring:	genotype	GG	Gg	Gg	gg		[1]
	phenotype	green	green	green	white		[1]



Accept – normal chlorophyll/normal for green, lacks chlorophyll for white
Reject – lacks/affected/abnormal for white

5 (a) (ii) green – 375 white – 125 [1]

[Total: 5]

6 (a) (i) prophase [1] R: prophase I

6 (a) (ii) two homologous chromosomes shaded [1]

6 (a) (iii) - centriole [1] A: centrosome/microtubule organising centre -
one from
- produces spindle/produces spindle fibres [1]
- produce/organises, microtubules [1]
- disassembles/AW, spindle/spindle fibres/microtubules [1]
[max 2]
A: one e.g. of role of, spindle fibres/microtubules if a link to centriole has been made
allow if centriole incorrectly named or if not given

6 (b) *max 2 if no attempt made at both X and Y*

X/cell surface membrane
- forms a (cleavage) furrow [1] A: 'pinches in' / constricts / AW
- ref. fusion [1]
- to divide cell into two [1] A: idea of formation of two (separate) cells linked to behaviour of (cell surface) membrane
- ref. to cytokinesis [1]

Y/nuclear envelope
- disassembles/breaks down/AW [1]
- during prophase/by end of prophase/before metaphase [1]
- re-forms/AW, during telophase (from ER) [1]

[max 3]

[Total: 7]

7 (a) Sun/light [1]

7 (b) *any two from*
- muscle contraction/movement [1]
- impulses [1]
- temperature maintenance/(body) heat [1]
- cell division / growth / cell repair [1]
- metabolic or anabolic reactions/building up molecules [1]
- active transport/ATP production [1]
R: excretion/digestion/reproduction/respiration

7 (c) - energy loss along the chain [1]
- last organism receives least energy [1]
- need large number of ticks + to supply required energy [1]
- ticks would be in danger of extinction/effect on ecosystem if ticks removed [1]
- ref. to tick size or mass smaller/very small ticks/large oxpeckers [1]

[max 3]

[Total: 6]

Section B

8 (a)
- A labelling of axes (x-axis labelled time/hours + y-axis labelled rate of water loss / grams per hour) [1] R: if wrong orientation
- S scale (graph needs to be more than half of the graph paper) [1]
- P all points plotted correctly [1]
- L line (a best-fit curve + no extrapolation) [1]

8 (b)
- light/sunlight [1]
- affects opening of stomata [1]
- brighter light (- wider opening) increases water loss [1]

- temperature/heat [1]
- affects humidity of air/concentration gradient/higher temp particles/molecules move quicker [1]
- higher temperature (– lower humidity) increases water loss/rate of transpiration rises [1]

- wind/air movement [1]
- moves humid air/water molecules/particles away from stomata/alters concentration gradient [1]
- more wind (– more dispersal of water vapour) increases water loss [1]

Any two factors plus explanation – 3 marks each [6]

[Total: 10]

9 (a) $C_6H_{12}O_6$/glucose → $2C_2H_5OH + 2CO_2$ / alcohol or ethanol + carbon dioxide [1]

9 (b) (i)
- (breathing) fast(er) [1] and deep(er) [1] I: 'breathe more'
- (heart beat) fast(er) [1] and more powerfully/ref. higher blood pressure [1]
I: beat 'more'
- faster circulation of blood [1]
- supplying more oxygen*/compensation for lower O_2 concentration [1]
- removing more carbon dioxide* [1]
[max 4]
[* or in (ii)]

9 (b) (ii)
- (muscles) increased + supplies of glucose (to muscles) [1]
- increased + work-rate (person)/contraction (muscle) [1]
- faster + respiration (in muscle cells) [1]
- more + energy [1] A: ATP
- increased supply of O_2 [* or in (i)] [1]
- increased removal of CO_2 [* or in (i)] [1]
- delays lactic acid production/removes lactic acid [1]
[max 5]

[Total: 10]

10 Either (a)
- produces haploid + ovum/egg [1]
- fertilization + ref. zygote/embryo [1]
- oestrogen [1]
- progesterone [1]
- any two functions of oestrogen (e.g. development of sex organs / secondary sexual characteristics / thickening of uterus lining / stimulates production of LH / inhibits follicle stimulating hormones) [2]
- any two function of progesterone (maintains uterus lining / inhibits FSH / inhibits LH AW) [2]
[max 5]

10 Either (b)
- prevent mixing of maternal and fetal blood [1]
- allow exchange AW of substances between maternal and fetal blood [1]
- dissolved [1]
- named nutrient [1]
- named gas [1]
- named excretory product [1] I: nitrogenous waste
- antibodies/hormones [1]
[max 5]

[Total: 10]

10 Or (a)
(gene)
- a section of DNA/chromosome [1]
- controls production of a protein/or a characteristic or e.g. [1]
A: feature/phenotype
- can be copied [1]
- passed on/(unit of) inheritance [1]
[max 3 for gene]
(allele)
- a form of a gene/ref. upper + lower case letters, or e.g./pair of phenotypic examples [1] A: sort/type
- on homologous AW chromosomes/at same locus AW [1]
A: a pair of
- the idea of dominance/recessiveness/codominance/can have different effects [1]
[max 4 for (a)]

10 Or (b)
- are inherited/ref. reproduction [1]
- ref. mutation/change in gene [1]
- producing variation/differences/changes in appearance or in behaviour or in phenotype [1]
- advantageous/useful/better adaptation [1]
- survival [1]
- change in environment [1]
- long period of time [1]
- change in phenotype [1]

- ref; competition [1]
- ref. natural selection [1]

[max 6]

N.B. Accept and apply scheme as appropriate to specific examples.

[Total: 10]

END OF ANSWERS