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Class:	Register No:	Name:
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CRESCENT GIRLS' SCHOOL
SECONDARY FOUR
PRELIMINARY EXAMINATION

BIOLOGY

Paper 1 Multiple Choice

Additional Materials: Multiple Choice Answer Sheet

5158

1 September 2014

1 hour

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Write your name, class and index number on the Answer Sheet in the spaces provided.

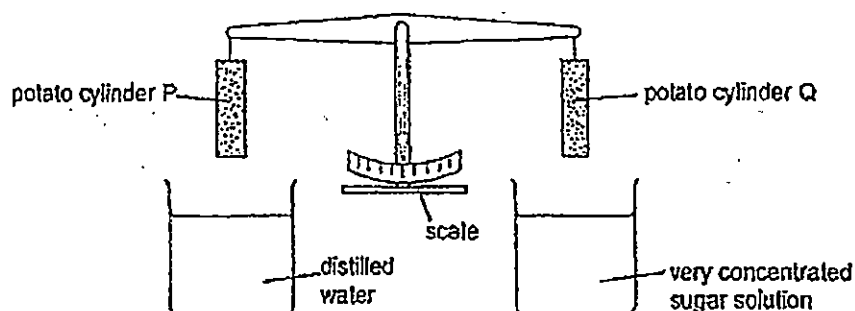
There are forty questions on this paper. Answer all questions. For each question there are four possible answers A, B, C and D.

Choose the one you consider correct and record your choice in soft pencil on the separate Answer Sheet.

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.

This paper consists of 16 printed pages, including the cover page.

- 1 A student investigated osmosis in potatoes. He set up the apparatus shown.



At the beginning, the potato cylinders were exactly balanced on the scale. He immersed the cylinders into the liquids for 4 hours, after which the cylinders were lifted out of the liquids. Cylinder P was then heavier than cylinder Q.

Which statement explains what happened?

- A Water molecules moved into both cylinders.
- B Water molecules moved out of both cylinders.
- C Water molecules moved into the cylinder in the distilled water and out of the cylinder in the sugar solution.
- D Water molecules moved out of the cylinder in the distilled water and into the cylinder in the sugar solution.

- 2 Which kind of molecule could be an enzyme?

- A fat
- B glucose
- C protein
- D starch

- 3 Small molecules are used as the basic units in the synthesis of large food molecules.

Which statement is correct?

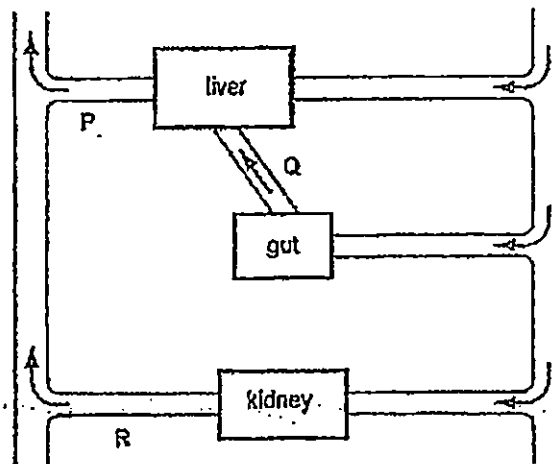
- A Amino acid is a basic unit of DNA.
- B Fatty acid is a basic unit of glycogen.
- C Glycerol is a basic unit of oils.
- D Simple sugar is a basic unit of protein.

- 4 The table shows the conditions in four test-tubes containing equal quantities of starch and salivary amylase.

In which test-tube is the starch broken down the fastest?

	pH	Temperature / °C
A	2	27.0
B	2	37.0
C	7	27.0
D	7	37.0

- 5 The diagram represents some human organs and the associated blood vessels.



Which row represents the levels of alcohol found in blood vessels P, Q and R immediately after taking an alcoholic drink?

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

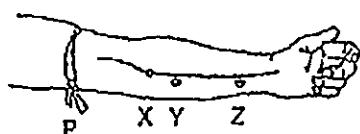
- 6 Which statement explains double circulation of the blood?

- A Atria and ventricles contract alternately.
- B Blood flows through atria and ventricles.
- C Blood flows through the arteries and veins.
- D Blood flows twice through the heart.

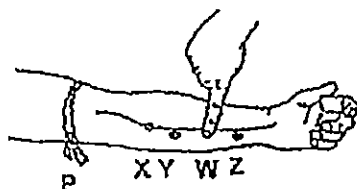
- 7 The diagram shows how to demonstrate the flow of blood in the veins of the lower arm.



Bandage arm at P to slow return of blood to the heart.



Veins become visible, and valves show as swelling at X, Y and Z.



Press one finger down at W.

Use another finger to stroke the vein as far as position X and then remove this finger.

Vein 'disappears' between W and Y.

Some possible reasons why the vein 'disappears' are listed.

1. The bandage at P prevents backflow.
2. The finger pressed at W prevents more blood entering.
3. The valve at Y prevents backflow.
4. The valve at Z prevents more blood entering.

Which are the correct reasons?

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

- 8 Aphids feed on the contents of phloem tubes.

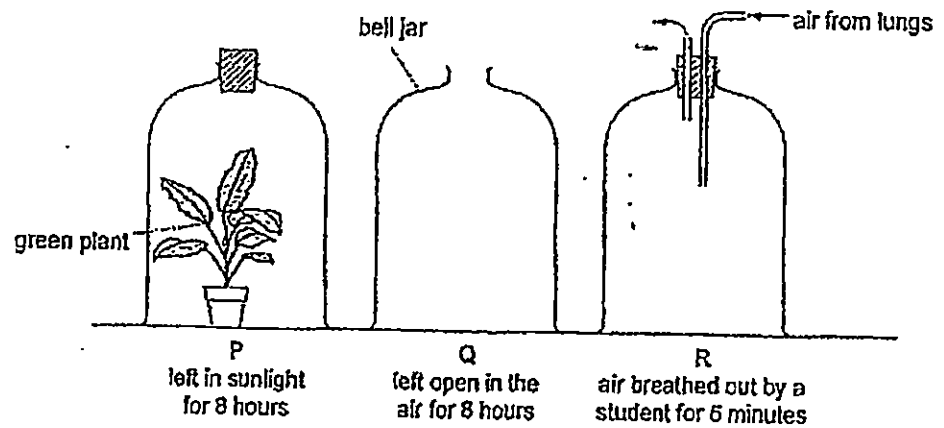
What type of food would be lacking in their diet?

- A amino acid
- B fat
- C sucrose
- D water

9 Which method could increase the rate of water uptake by a shoot?

- A covering the shoot with a black plastic bag
- B covering the shoot with a clear plastic bag
- C removing the leaves from the shoot
- D shining a bright light onto the shoot

10 In an experiment, three glass bell jars were set up.



At the end of the experiment, which bell jar has the most oxygen and which has the least?

	Most oxygen	Least oxygen
A	P	Q
B	P	R
C	Q	P
D	R	P

11 Why does anaerobic respiration by yeast release less energy than aerobic respiration?

- A Energy is lost in oxygen.
- B Energy is lost in carbon dioxide.
- C Energy remains trapped in ethanol.
- D Energy remains trapped in lactic acid.

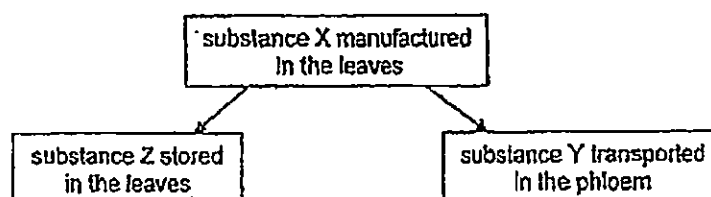
- 12 In which organ is urea formed and through which tube does it leave the body?

	organ	tube
A	kidney	ureter
B	kidney	urethra
C	liver	ureter
D	liver	urethra

- 13 Which process is used during dialysis?

- A active transport
- B passive diffusion
- C translocation
- D ultrafiltration

- 14 The diagram shows some stages occurring in the leaves.



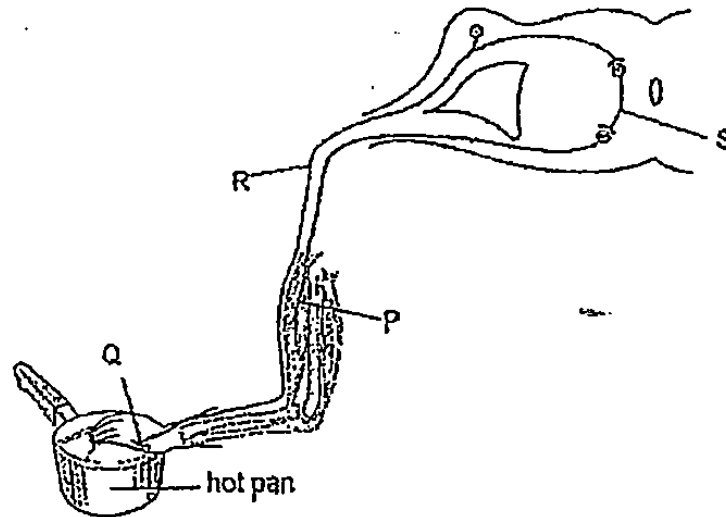
What are substances X, Y and Z?

	X	Y	Z
A	glucose	sucrose	glucose
B	glucose	sucrose	starch
C	starch	glucose	glucose
D	starch	glucose	starch

- 15 What are the two active enzymes involved in the blood clotting process?

- A fibrinogen and prothrombin
- B fibrinogen and thrombin
- C thrombokinase and prothrombin
- D thrombokinase and thrombin

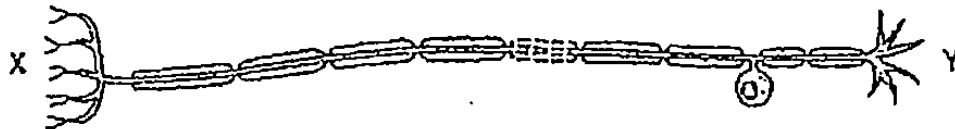
- 16 The diagram shows the structures involved in a reflex action.



What is the correct sequence showing a reflex action?

- A $P \rightarrow Q \rightarrow R \rightarrow S$
- B $P \rightarrow S \rightarrow R \rightarrow Q$
- C $Q \rightarrow R \rightarrow S \rightarrow P$
- D $Q \rightarrow S \rightarrow P \rightarrow R$

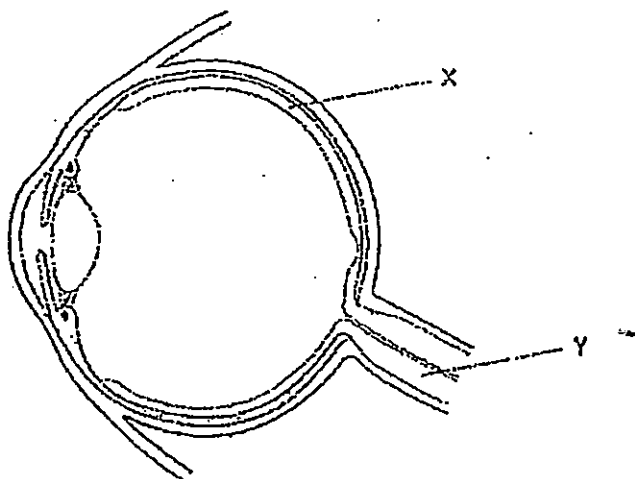
- 17 The diagram shows a neurone.



Which structures could be found at X and Y?

	X	Y
A	brain	intestine
B	brain	leg
C	eye	hand
D	skin	spinal cord

- 18 The diagram shows a section through an eye.



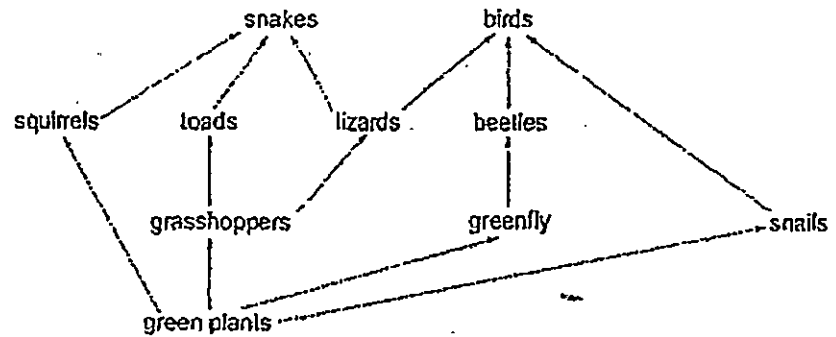
What are structures X and Y?

- A organs in an organ system
 - B organs in a tissue
 - C organ systems in an organ
 - D tissues in an organ
- 19 Which part of the eyeball produces the greatest degree of refraction of light?
- A aqueous humour
 - B cornea
 - C lens
 - D vitreous humour
- 20 When a person is frightened, adrenaline is released by the adrenal glands,

What are the effects of the adrenaline?

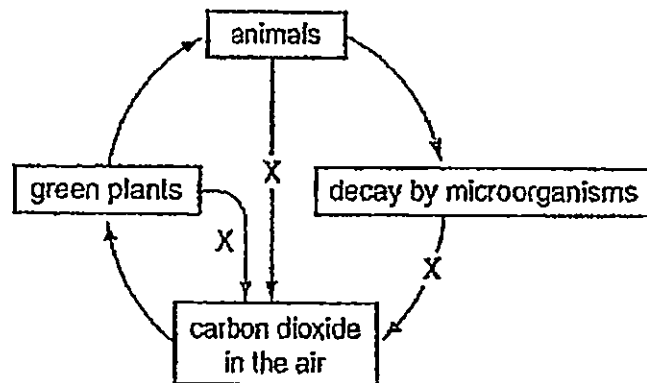
	breathing rate	heart beat rate
A	decreased	decreased
B	decreased	increased
C	increased	decreased
D	increased	increased

- 21 The diagram shows a food web.



Which organism population will increase when the population of snakes increases?

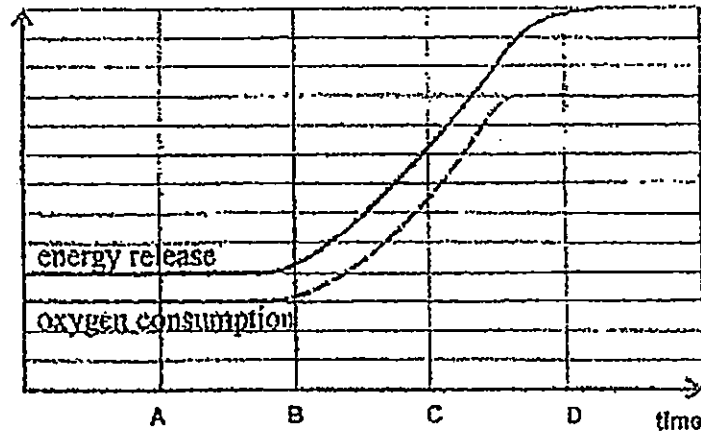
- A birds
 - B grasshoppers
 - C lizards
 - D squirrels
- 22 The diagram shows part of the carbon cycle.



What does X represent?

- A death
- B digestion
- C photosynthesis
- D respiration

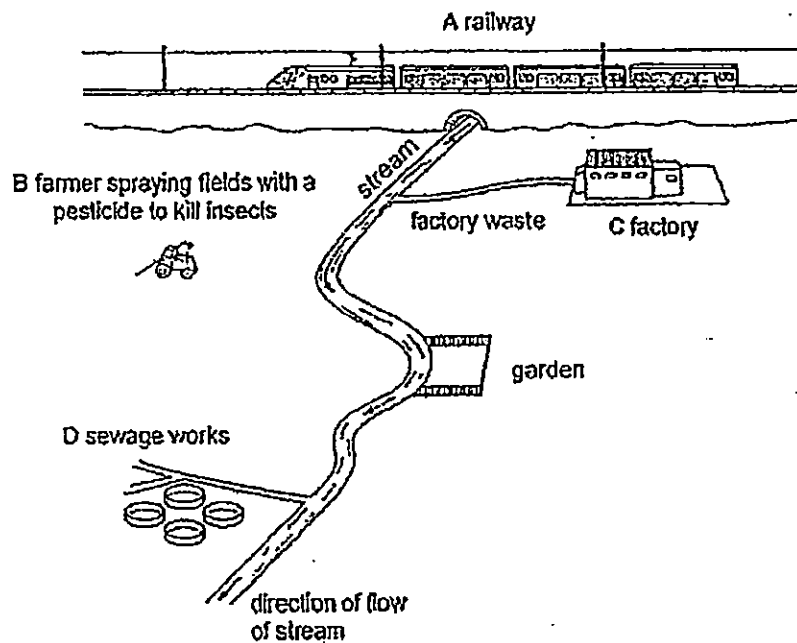
- 23 The graph shows the oxygen consumption and energy released during a period of exercise.



At which point in time is an oxygen debt incurred?

- 24 A gardener planted some water plants in the stream at the bottom of the garden shown on the diagram. At first, the plants grew well but after a while, they died.

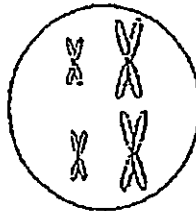
Which source of pollution is most likely to have caused the death of the plants?



- 25 The zygote produced by sexual reproduction in mice (*mus musculus*) contains 40 chromosomes. How many chromosomes are there in cells produced by the first division of meiosis in mice?

A 10
B 20
C 40
D 80

- 26 The diagram represents the nucleus of a cell $2n=4$ in late prophase of meiosis.

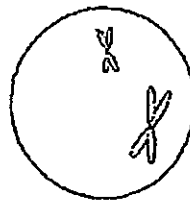


Which diagram represents a cell of the same species in anaphase II of meiosis?

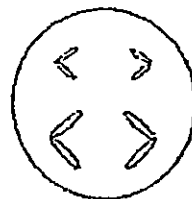
A



B



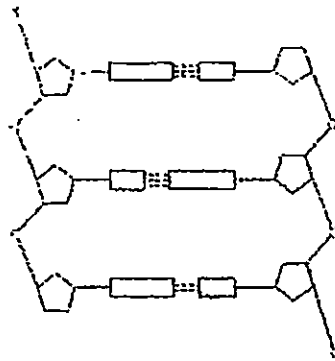
C



D



- 27 The diagram shows the structure of a small section of DNA.

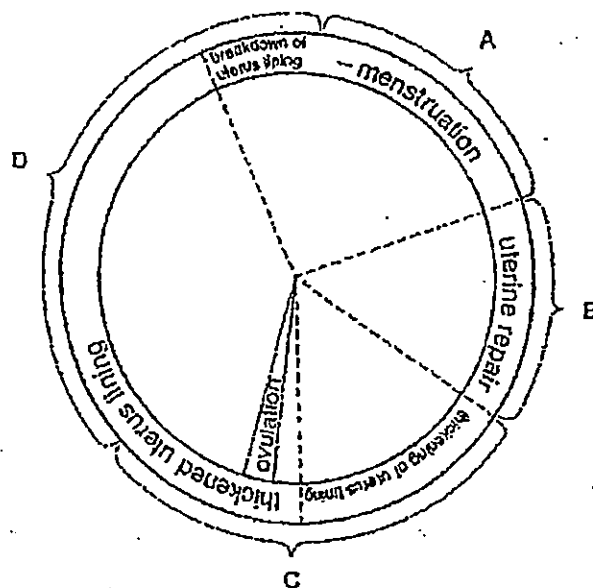


What is represented by the shapes in the diagram?

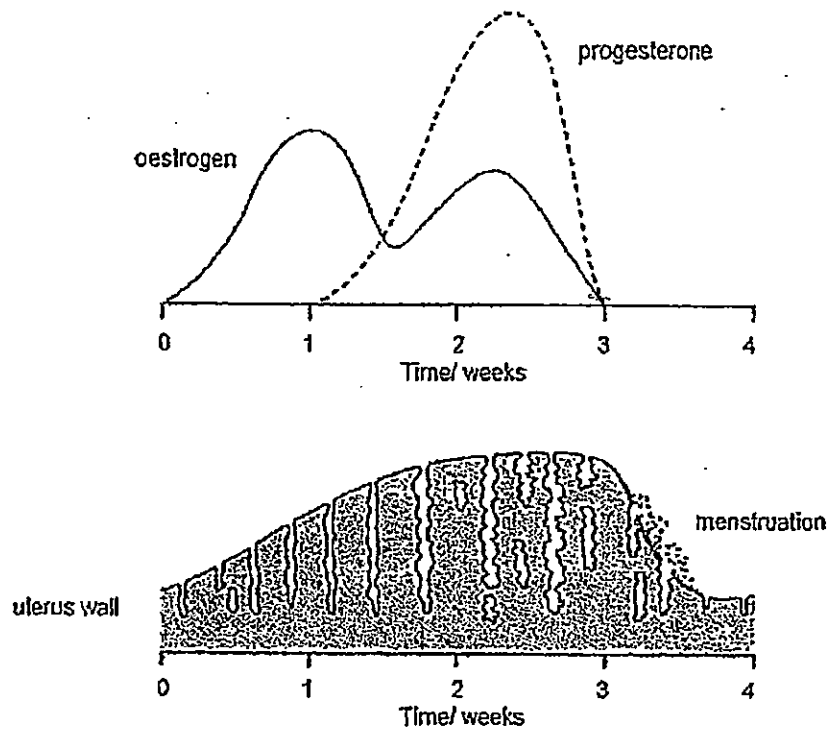
			
A	base	phosphate	deoxyribose
B	base	ribose	phosphate
C	deoxyribose	phosphate	base
D	phosphate	deoxyribose	base

- 28 The diagram shows stages of a menstrual cycle.

Which is the most fertile stage?



29 The diagram shows the changes which take place during a woman's menstrual cycle.



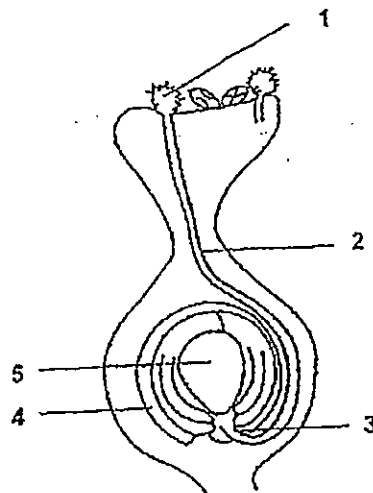
What is occurring at the time of ovulation?

- A a fall in the levels of oestrogen and progesterone
- B a fall in the level of oestrogen and a rise in progesterone
- C a rise in the levels of oestrogen and progesterone
- D a rise in the level of oestrogen only

30 AIDS is not transmitted _____.

- A during sexual intercourse with an infected person
- B from an infected mother to foetus during birth
- C through the sharing of infected needles
- D through mosquitoes which bit an infected person previously

- 31 The diagram shows a cross-section through the carpel of a flower just before fertilisation.



Which parts would develop further after fertilisation?

- A 1 & 5
 B 4 & 5
 C 1, 2 & 3
 D 2, 4 & 5
- 32 The chart provides information about the flowers of three different plants.

Flower characteristic	Flowers		
	Plant A	Plant B	Plant C
Petal colour	white	purple	bright, yellow
Aroma	none	rotting meat, strong	sweet, strong
Petal size	0.3 cm	10.0 cm	4.0 cm
Nectar size	none	medium amount	large amount

Which inference is valid concerning the method of pollination for plants A, B and C?

- A All three plants are wind pollinated.
 B All three plants are insect pollinated.
 C Plant A is wind pollinated, but plants B and C are insect pollinated.
 D Plants A and B are insect pollinated, but plant C is wind pollinated.

- 33 In humans, which types of variation are shown by blood group and height?

	blood group	height
A	continuous	continuous
B	continuous	discontinuous
C	discontinuous	continuous
D	discontinuous	discontinuous

- 34 A family has three daughters. The mother is pregnant for the fourth time. What is the chance of the fourth child being a son?

- A 25%
- B 50%
- C 75%
- D 100%

- 35 What is a mutation?

- A a change in a gene or chromosome
- B a condition caused by a recessive allele
- C a process used in genetic engineering
- D a type of discontinuous variation

- 36 Which is genetically identical?

- A brothers and sisters in the same family
- B cuttings taken from the same plant
- C mammals in the same litter
- D seeds produced by the same tree

- 37 A person has the blood group O with genotype $i^O i^O$. What determines this blood group?

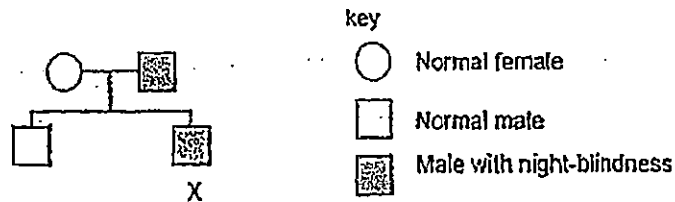
- A different alleles on different chromosomes
- B different alleles on the same chromosomes
- C the same alleles on different chromosomes
- D the same alleles on the same chromosomes

- 38 Why does a young boy lose more heat than a man in identical condition?

- A The boy is more active.
- B The boy sweats less than a man.
- C The boy eats more carbohydrates.
- D The boy has a larger surface area to mass ratio.

- 39 Night-blindness is an inherited condition, caused by a dominant allele.

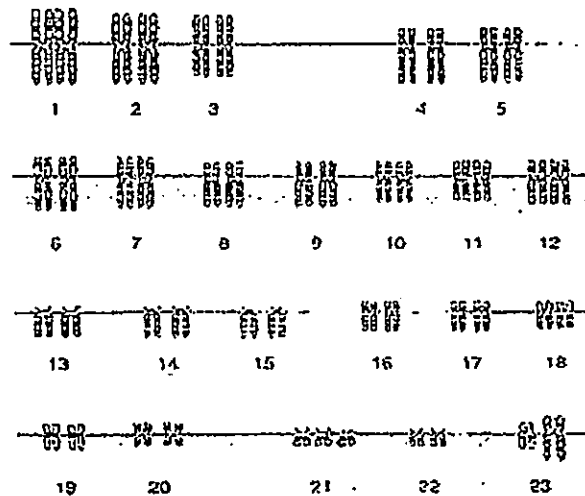
The chart shows how this condition was passed on in a family.



Person X marries someone with normal sight.

What is the chance that their first child will have night-blindness?

- A 0%
 - B 50%
 - C 75%
 - D 100%
- 40 The diagram shows chromosomes from a human cell.



This person is _____.

- A a normal female
- B a normal male
- C a female with Down's syndrome
- D a male with Down's syndrome

.....The End

Class:	Register No:	Name:
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CRESCENT GIRLS' SCHOOL
SECONDARY FOUR
PRELIMINARY EXAMINATION

BIOLOGY
Paper 2

No additional materials are required

5158/02

25 August 2014

1 hour 45 minutes

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number in the spaces provided above.
Write in dark blue or black pen on both sides of the paper.
You may use a pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A
Answer all questions.
Write your answers in the spaces provided on the Question Paper.

Section B
Answer three questions.
Write your answers in the spaces provided on the Question Paper.

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.

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

This paper consists of 18 printed pages, including the cover page.

SECTION A (50 marks)

Answer all questions.

Write your answers in the spaces provided.

- 1 Fig. 1 shows a single-celled organism called *Euglena*.

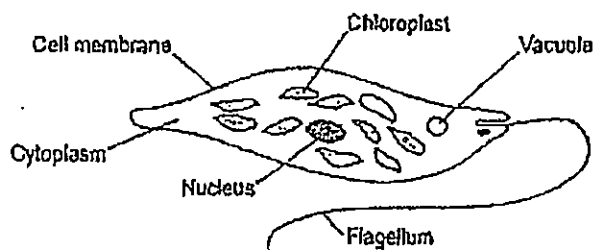


Fig. 1

- (a) In the 19th century, scientists could not decide whether *Euglena* should be described as a plant or an animal.

Use your knowledge of plant and animal cells to answer these questions.

- (i) Suggest two reasons why some scientists thought *Euglena* was a plant cell and not an animal cell. [2]

1

2

- (ii) Suggest one reason why some scientists thought *Euglena* was an animal cell and not a plant cell. [1]

.....

- (b) The *Euglena* in Fig. 1 lives in fresh water. Explain what happens to the *Euglena* if it is put into salt water. [3]

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[Total: 8]

- 2 A patient has a disease which damages his pancreas. His doctor prescribes a course of treatment for him. He was advised to take one capsule of medicine (shown in Fig. 2 below) with each meal. Each capsule contains hundreds of small, dry beads. The beads are made of enzymes. The pancreas normally produces these enzymes. The outer coating of the capsule is made of lipid.

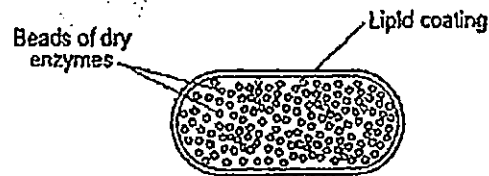


Fig. 2

- (a) One of the enzymes in the beads is lipase.
Name two other enzymes made in the pancreas of a healthy person. [2]
-
- (b) Explain how the lipid coating on the capsule makes sure that the enzymes are not released until the capsule reaches the small intestine. [2]
-
-
-
- (c) Suggest why the lipase in the beads does not digest the lipid coating around the capsule. [1]
-
-
- (d) State another medical condition that this patient is likely to have and suggest 2 ways to treat it. [3]
-
-
-
-

[Total: 8]

- 3 Fig. 3.1 below shows a developing human fetus and part of the mother's reproductive system.

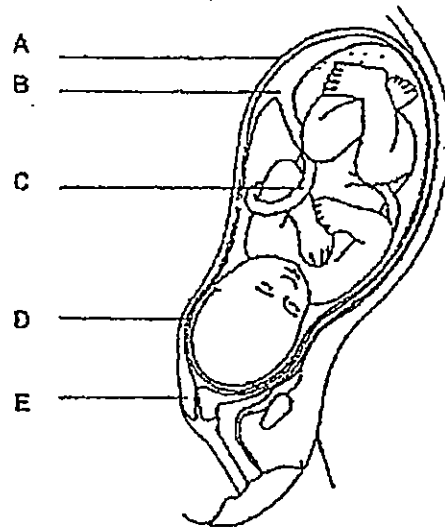


Fig. 3.1

- (a) State two functions of the fluid enclosed by structure D. [2]

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- (b) Name the structure B. Suggest two fetal organs which functions have been taken over by B during pregnancy. [3]

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- (c) State the role played by structure A during the birth of the fetus. [1]

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- (d) One of the structures (A – E) secretes a hormone. State the structure and name the hormone that it produces. [1]

.....

- (e) Fig. 3.2 shows the cross section of structure C.

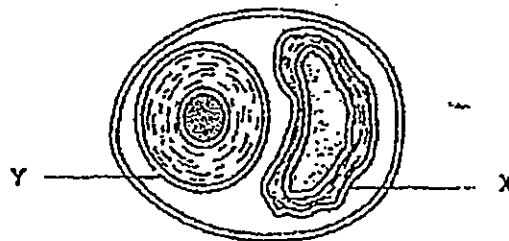


Fig. 3.2

- (i) X and Y are blood vessels. State which one (X or Y) is an artery. Give one reason for your answer. [1]

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- (ii) State two differences in the composition of the blood in X and in Y. [2]

Blood in X	Blood in Y

[Total: 10]

- 4 Fig. 4 is a diagram representing a stage of mitosis in an animal cell.

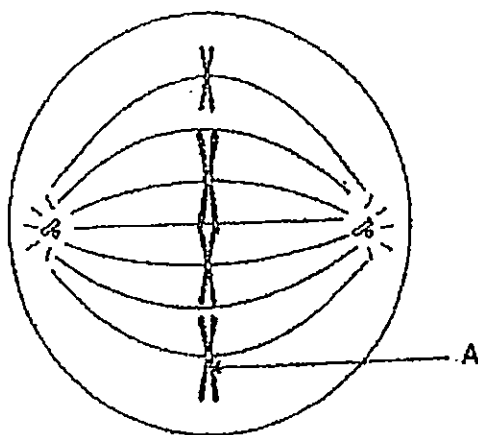


Fig. 4

- (a)(i) Name this stage of mitosis.

[1]

- (ii) Structure A is a chromosome. Describe what happens to A in the stage immediately following that shown in Fig. 4.

[2]

- (b) The table shows the mean mass of DNA in the nuclei of different cells in cattle.

Cell	Mean mass of DNA / arbitrary units
Sperm cell	3.42
Red blood cell	0.00
Liver cell	7.05

- (i) Explain why there is a difference in DNA content between sperm and liver cells. [2]

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- (ii) Explain why there is no DNA in the red blood cell. [1]

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- (iii) The amount of DNA in cells from the liver tissue was analysed. Explain why some cells were found to have 7 units of DNA while others had 14 units of DNA. [2]

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[Total: 8]

- 5 Fig. 5 shows two different species of butterfly.

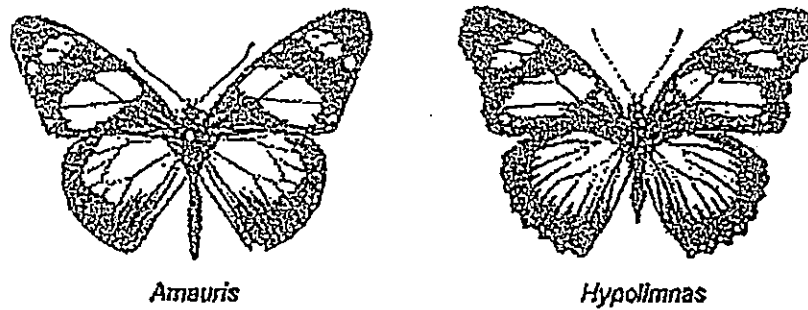


Fig. 5

Both species can be eaten by most birds.

Amauris has an unpleasant taste which birds do not like, so birds have learned not to prey on it.

Hypolimnas does not have an unpleasant taste but most birds also do not prey on it.

- (a) With reference to Fig. 5, suggest why most birds do not prey on *Hypolimnas*. [2]

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- (b) Suggest an explanation, in terms of natural selection, for the markings on the wings of *Hypolimnas*. [3]

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[Total: 5]

- 6 Fig. 6 shows the annual energy flow through 1 m^2 of a habitat. The unit, in each case, is $\text{kJ per m}^2 \text{ per year}$.

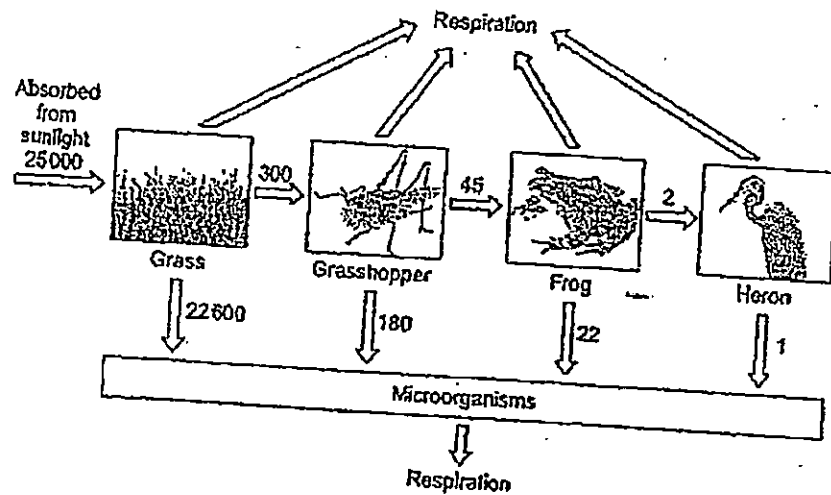


Fig. 6

- (a) Calculate the percentage of the energy absorbed by the grass from sunlight that is transferred to the frog. Show clearly how you work out your answer. [1]
- (b) All of the energy the grass absorbs from the sun is eventually lost to the surroundings. State the form in which this energy is lost. [1]
- (c) Explain how microorganisms help to recycle materials in this habitat. [3]

[Total: 5]

- 7 Students investigated the effect of changing the carbon dioxide concentration on the rate of photosynthesis in pieces of leaf.

Fig. 7.1 shows the type of leaf used by the students.



Fig. 7.1

The students:

- cut pieces of leaf from the green region
- put the pieces into test tubes
- added different concentrations of carbon dioxide to each tube
- shone lights with either high or low light intensity on the tubes
- recorded the concentration of oxygen in the tubes after 5 hours

Fig. 7.2 shows how each experiment was set up.

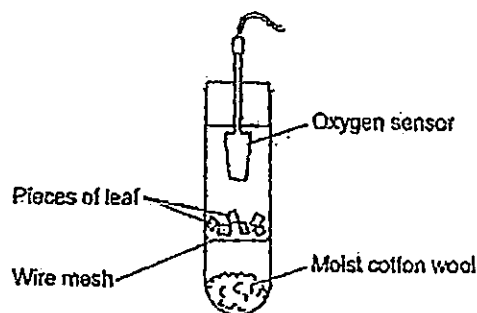
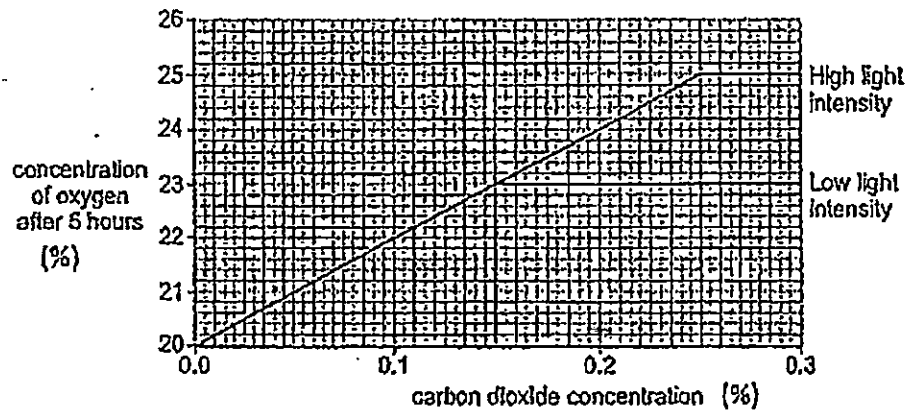


Fig. 7.2

The graph shows the results of the investigation.



- (a)(i) With reference to the graph, describe the effect of increasing carbon dioxide concentration on the rate of photosynthesis at low light intensity. [2]

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- (ii) Based on the concept of limiting factors, explain the effect that you have described in (i). [2]

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- (b) Explain the effect on oxygen concentration over the five-hour period if a white region of the leaf had been used, instead of a green region. [2]

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- (c) Some people keep indoor plants which have variegated leaves (leaves with green and white regions).

If plants with variegated leaves are kept in dim light conditions, the white areas of the leaves start to turn green. Suggest why this is an advantage to the plant. [2]

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[Total: 8]

SECTION B (30 marks)

Answer three questions.

Question 10 is in the form of an Either/Or question.

Only one part should be answered.

Write your answers in the spaces provided.

- 8 The seeds of a certain plant species have either red or orange seed coats. This trait is controlled by a pair of alleles. A red seed is germinated and developed into a mature plant. This plant is then self-pollinated and 200 seeds were produced. The colour and mass of the seeds were recorded in Table 8.1 and 8.2.

Table 8.1

Colour of seed	Red	Orange	White
Number of seeds	148	51	1

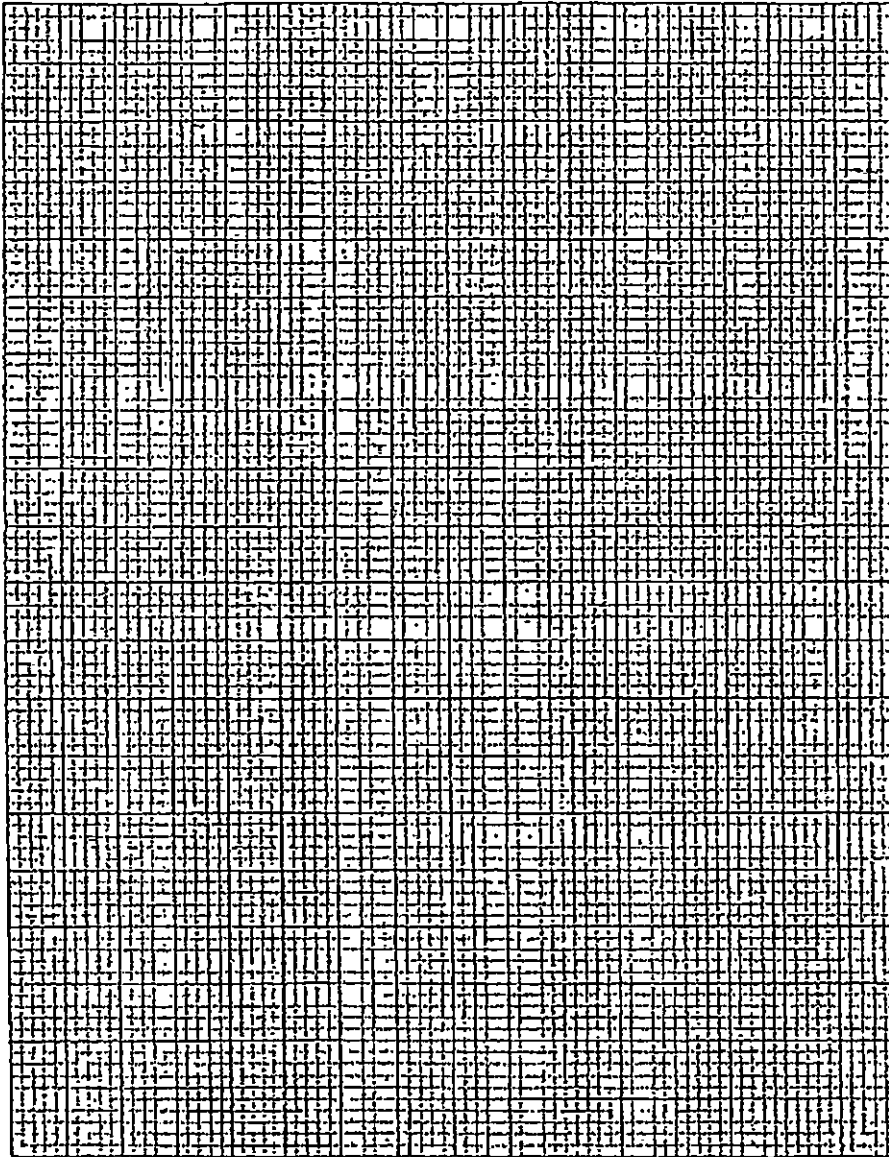
Table 8.2

Mass of seeds / g	0.4	0.6	0.8	1.0	1.2	1.4
Number of seeds	18	27	49	60	26	20

- (a) State the dominant allele for the colour of seed coat. [1]
-
- (b) With the help of a genetic diagram, show how self-pollination of the original red seed plant can produce orange seeds. [3]

- (c) Suggest a possible reason for the presence of the single white seed. [1]

- (d)(i) Plot a graph of the number of seeds against the mass of seeds. [3]



- (ii) Calculate the percentage of seeds which have mass of at least 1.2 g. [1]

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- (e) The mass of seeds can be affected by both environmental and genetic factors. Suggest one environmental factor that may result in the difference in the mass of the seed. [1]

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[Total: 10]

9

- (a) Explain why a plant species in which self-pollination occurs can become adapted to new surrounding better than one that reproduces asexually, but less well adapted than a species that is always cross-pollinated. [4]

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- (b) Describe how sperms and pollen grains are specialised for their respective roles in the life cycles of mammal and flowering plants. [6]

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[Total: 10]

10 Either

(a) Explain why more urine is produced on a cold rainy day.

[3]

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(b) Explain how bacteria can be genetically modified to produce human insulin.

[4]

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(c) Explain how eutrophication can lead to the death of fish in the river.

[3]

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[Total: 10]

10 Or

- (a) Explain the importance of the structure of each of the following in relation to their functions: [4]

- (i) the exchange surface of the alveoli
(ii) the lining of the trachea

- (b) People who have regularly smoked cigarettes for many years may become short of breath when they exercise. They may also have a persistent cough. Explain how smoking cigarettes could have contributed to these two effects. [6]

[Total: 10]

..... End of Paper

MCQ:

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
C	C	C	D	B	D	C	B	D	B

11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
C	D	B	B	D	C	D	D	B	D

21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
B	D	D	C	B	C	D	C	B	D

31.	32.	33.	34.	35.	36.	37.	38.	39.	40.
B	C	C	B	A	B	C	D	B	D

Crescent girls

19

Biology Prelim 2014 Paper 2

Marking scheme

Section A

question	answers	extra information	mark
1ai	(has) chloroplast(s)	(A) chlorophyll	1
	vacuole		1
ail	any one from: - no cell wall - can move / has flagellum	R. counter arguments that are listed in 1a(ii)	1
b	water molecules leave / move out through partially permeable membrane + by osmosis because water potential inside the cell is greater than that of solution outside Euglena shrinks in size	1 1 1 1 Any 3 accept explanations in terms of concentration (of salt) is greater outside than inside	Max 3

2a	trypsin	(A) protease (R) pepsin	1
	amylase	do not allow sucrase / maltase / lactase	1
b	no lipase produced / found In stomach / mouth / before small intestine OR accept lipase only produced / found (1) in small intestine (1)	 if no other mark is awarded, lipid is not broken down in the stomach or lipid is digested in small intestine, gains 1 mark	1 1
c	enzymes only work in solution / when dissolved or because enzyme / lipase / it is dry	allow enzymes only work in presence of water or enzymes do not work/ inactive when dry Ignore other physical conditions	1
d	Diabetes / high blood glucose/ Insulin injection Diet low in carbohydrates/ sugars		1 1 1

3a	Supports/ cushions the fetus before birth / Acts as shock absorber/ Protects fetus against physical injury/ Allows fetus some degree of movement/ Lubricates birth canal during childbirth	Any 2 functions	2										
b	Placenta Lungs / Kidneys / Stomach / small intestines	Reject uterine lining / uterus 1 } 1 } Any 2 1 }	1 2										
c	Contracts to push out the baby		1										
d	B + progesterone	(R) placenta 1 mark given only when both are correct	1										
e(i)	Y It has thicker muscle wall / smaller lumen	1 mark given only when both are correct	1										
(ii)	<table border="1"> <thead> <tr> <th>X</th><th>Y</th></tr> </thead> <tbody> <tr> <td>More oxygen</td><td>Less oxygen</td></tr> <tr> <td>Less carbon dioxide</td><td>More carbon dioxide</td></tr> <tr> <td>More glucose</td><td>Less glucose</td></tr> <tr> <td>Less urea</td><td>More urea</td></tr> </tbody> </table>	X	Y	More oxygen	Less oxygen	Less carbon dioxide	More carbon dioxide	More glucose	Less glucose	Less urea	More urea	Reject oxygenated/ deoxygenated blood Any 2	2
X	Y												
More oxygen	Less oxygen												
Less carbon dioxide	More carbon dioxide												
More glucose	Less glucose												
Less urea	More urea												

4a(i)	metaphase		1
(ii)	centromere splits/ divides into two; sister chromatids separates / pull apart by spindle fibres to opposite poles.		1 1
b(i)	sperm produced by <u>meiosis</u> + haploid/ only one set of chromosomes; liver cell produced by <u>mitosis</u> + diploid/ two sets of chromosomes/	Do not award any marks if candidate simply mentions that mass of DNA in liver cell is twice that of the sperm cell	1 1
(ii)	Red blood cell has no nucleus	Accept red blood cell has no chromosome	1

(iii)	cell with 14 units of DNA has replicated its DNA / is at interphase / prophase / metaphase / before cytokinesis;		1
	cell with 7 units of DNA has not undergone DNA replication or has just completed cytokinesis;		1

5a	wing pattern similar to <i>Amauris</i>	allow looks similar to <i>Amauris</i>	1
	birds assume it will have an unpleasant taste		1
b	mutation / variation produced wing pattern similar to <i>Amauris</i>	do not accept breeds with <i>Amauris</i>	1
	(these butterflies not eaten (by birds))	do not accept idea of intentional adaptation	1
	these butterflies breed or their genes are passed to the next generation		1

6a	$45 \times 100 / 25000$ $= 0.18\%$	award mark for correct answer with working	1
b	Heat	Allow heat <u>from</u> respiration	1
c	any three from: (microorganisms) decay / decompose / digest / breakdown dead organic matter (breakdown) releases minerals / nutrients / ions / into soil + plants absorb these for growth (microorganisms / respiration) release carbon dioxide into the air + plants use the carbon dioxide for photosynthesis	accept marking points if candidate uses other terms for microorganisms ignore eat ignore food	3

7ai	Rate of photosynthesis increases when CO ₂ conc. increases from 0 to 0.15 %		1
	Above 0.15% CO ₂ , rate of photosynthesis levels off / becomes constant / reaches a maximum		1
aii	at CO ₂ conc. below 0.15%, CO ₂ concentration is a limiting factor + hence		1

	Increase in CO₂ conc. leads to an increase in the rate of PS at CO₂ conc. above 0.15%, light is a limiting factor + hence further increase in CO₂ conc. does not result in any increase in the rate of PS		1
b	effect: oxygen concentration falls explanation: oxygen is used for respiration no photosynthesis, hence no oxygen is released from the leaves		1 $\frac{1}{2} + \frac{1}{2}$
c	more chlorophyll / chloroplasts allows more photosynthesis / description	for both marks must refer to more at least once	1 1

Section B

8a	Allele for red seed coat	(A) red	1
b	Legend for the alleles Parents' phenotype: Red X Red Parents' genotype: Rr Rr Gametes: R, r R, r Offspring's genotype: RR, Rr, Rr, rr Offspring's phenotype: red, red, red, orange Ratio 3 red : 1 orange		$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
c	mutation		1
d(i)	Axes are labelled with units All points plotted correctly and smooth curve/ best fit curve Suitable scale		1 1 1
(ii)	$\frac{46}{200} \times 100$ $= 23\%$	No mark given if working not shown	1
(iii)	Amount of water available / Amount of nutrients in the soil / Light intensity		1

9(a)	Asexual reproduction does not involve fusion of gametes/ produces genetically identical offspring Self and cross pollination both involve sexual reproduction / fusion of gametes Gametes are produced through meiosis / genetically varied Self-pollination results in offspring with some genetic variation as the gametes come from the same parent Cross-pollination results in offspring with greater genetic variation as gametes come from / traits are inherited from 2 parents The more genetically varied the offspring, the better they are at adapting to changing environmental conditions	1 1 1 1 1 1	Max. 4
(b)	<u>For adaptation of sperm cell</u> • Flagellum for movement of cell to oviduct • Acrosome for digestion of follicle cells of the ovum • Large number of mitochondria for release of energy from respiration for movement of sperm <u>For adaptation of pollen grain</u> • Pollen tube produces enzymes to digest through style • Rough surface for insect pollinated flowers + cling to body of insects • Light/small pollen grains for wind pollinated flowers + to be easily carried by the wind	1 1 1 1 1 1	1 1 1 1 1 1

10 Either (a)	Less sweat produced Water potential of blood increases Less ADH released less water reabsorbed from kidney tubules back to blood capillaries	Max 3 marks	1 1 1 1
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(b)	Insulin gene cut from Human DNA + use of restriction enzyme	$\frac{1}{2} + \frac{1}{2}$	1
	Plasmid is isolated and cut + use of <u>same</u> restriction enzyme	$\frac{1}{2} + \frac{1}{2}$	1
	Insulin gene inserted into cut plasmid + use of DNA ligase	$\frac{1}{2} + \frac{1}{2}$	1
	Plasmid with the inserted insulin gene is introduced into bacteria + treating bacteria with heat / electric shock	$\frac{1}{2} + \frac{1}{2}$	1
(c)	Profuse growth of algae in the water blocks sunlight from reaching the submerged plants	Max 3 marks	1
	Submerged plants fail to photosynthesise and die		1
	Bacteria decompose the dead plants and increase in numbers		1
	Bacteria use up the oxygen in the water causing fish to die due to lack of oxygen		1

10 OR (a)(i)	Inner wall covered with a thin film of moisture + to dissolve oxygen before it diffuses in solution into blood;		1
	- wall is very thin/ only one-cell thick + to enable faster diffusion of oxygen and carbon dioxide during gaseous exchange		1
(ii)	Gland cells in the epithellum secrete mucus + traps dust and germs in inhaled air;		1
	Cilia sweep the mucus towards the pharynx to be swallowed ;		1
(b)	Tar & irritants in tobacco smoke		1
	Paralyse cilia lining trachea & bronchi		1
	Mucus & dust cannot be removed / accumulate		1
	Violent coughing to expel mucus & clear air passage		1
	Partition walls of alveoli breakdown & form large empty spaces, causing emphysema.		1
	Surface area for gaseous exchange is reduced results in breathlessness during exercise		1

