Anglo-Chinese School

(Barker Road)

PRELIMINARY EXAMINATION 2017

SECONDARY FOUR EXPRESS

BIOLOGY PAPER 1

5158/1

TIME: 1 HOUR

INSTRUCTIONS TO CANDIDATES:

Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name 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.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.

Additional Materials provided by the School:

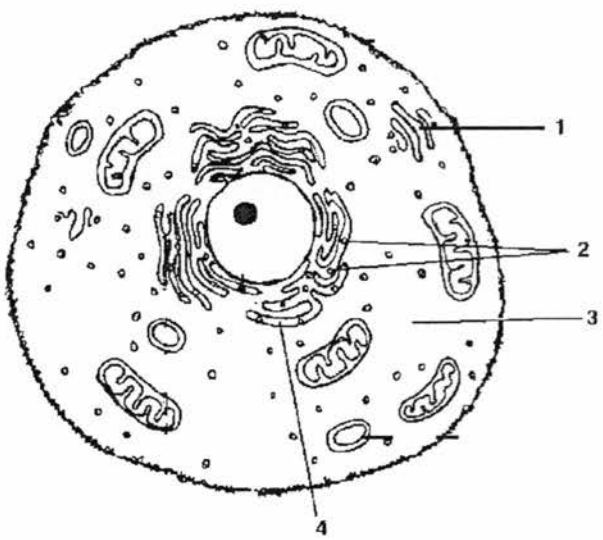
Answer Sheet

This question paper consists of **25** *printed pages.*

Paper 1 (40 marks)

Answer all questions

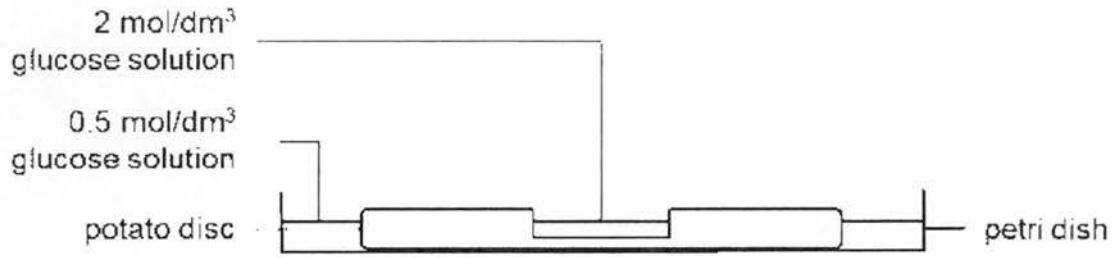
1 The diagram shows a typical animal cell with cell components are involved in the synthesis and secretions of an enzyme.



Which of the following identifies correctly the route taken by an amino acid molecule as it passes through these cell components?

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

Refer to the experimental setup below to answer questions 2 and 3.



2 The student conducting this experiment left the set-up for one hour.

Which correctly shows how the levels of solution in the well and the petri dish changed after an hour?

	well	petri dish
A	higher	higher
B	higher	lower
C	lower	higher
D	lower	lower

3 The student forgot about the set-up and left it standing overnight.

Which correctly describes the texture of the potato disc after 12 hours?

A The bottom half of the potato would be flaccid while the top half would be turgid.
B The bottom half of the potato would be turgid while the top half would be flaccid.
C It would have uniform turgidity.
D It cannot be inferred from the given data.

4 Which of the following situations **does not** involve diffusion?

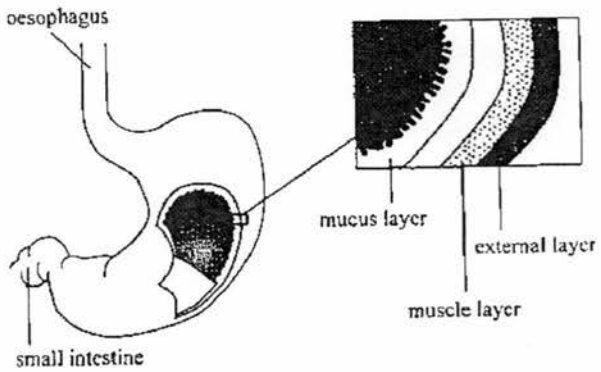
A Production of lipase
B Supply of oxygen to the cells
C Supply of glucose to the cells
D Removal of metabolic waste products

5 The table below shows the chemical elements present in four substances.

Which substance, **A**, **B**, **C** or **D** could be cellulose?

	carbon	hydrogen	nitrogen	oxygen
A	✓	✓	✓	×
B	✓	✓	×	✓
C	✓	✓	✓	✓
D	✓	×	✓	✓

6 The diagram below shows the different layers of tissues in the human stomach.

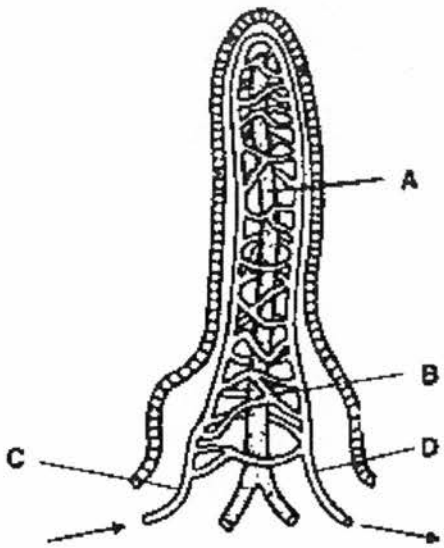


A certain disease results in a reduction in the innermost layer of mucus in the stomach. What is a likely consequence of this disease?

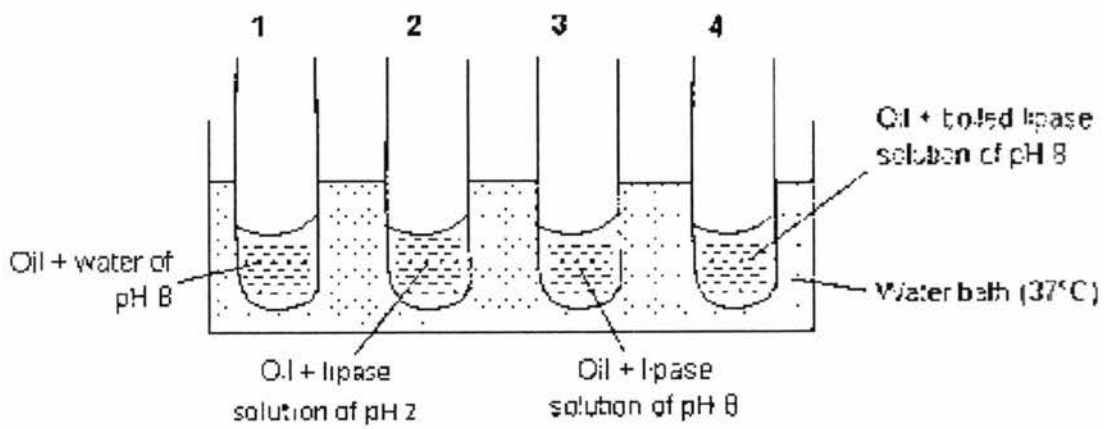
A Destruction of the stomach wall by acid.
B Greater production of gastric juice.
C Rapid emptying of the stomach contents into the small intestine.
D Reduced enzymatic action

7 The diagram shows a section through a villus in a small intestine. The arrows show the direction of flow in the vessels.

Which labelled part contains the highest concentration of glucose?



8 Four test tubes, labelled 1, 2, 3 and 4, were set up in an experiment. 1 cm^3 of oil and 1 cm^3 of solution are added to each test tube. The test tubes were incubated for one hour.



Which of the following shows the expected results when the ethanol emulsion test is carried out?

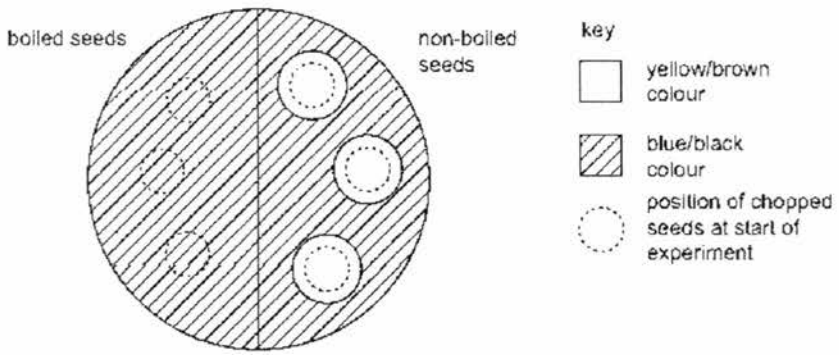
	1	2	3	4
A	cloudy	cloudy	clear	cloudy
B	cloudy	cloudy	cloudy	clear
C	clear	clear	clear	cloudy
D	clear	clear	cloudy	clear

9 A healthy person has decided to modify his diet by increasing his intake of proteins and lowering his intake of carbohydrates. What is a possible consequence of this change?

A Less glucose is present in his urine
B More amino acids is present in his urine
C More proteins is present in his urine
D More urea is present in his urine

10 Six bean seeds were soaked in cold water. Three of them were boiled and cooled. The boiled and the non-boiled seeds were chopped up and then placed on the surface of the agar jelly containing starch.

After two days, all the chopped seeds were removed and the jelly was tested with iodine solution. The diagram shows the result of the experiment.



What is the explanation for the results with the non-boiled seeds?

A They absorb iodine.
B They absorb starch.
C They contain acid.
D They contain amylase.

11 The following table shows the results of blood transfusions between four individuals, P, Q, R and S.

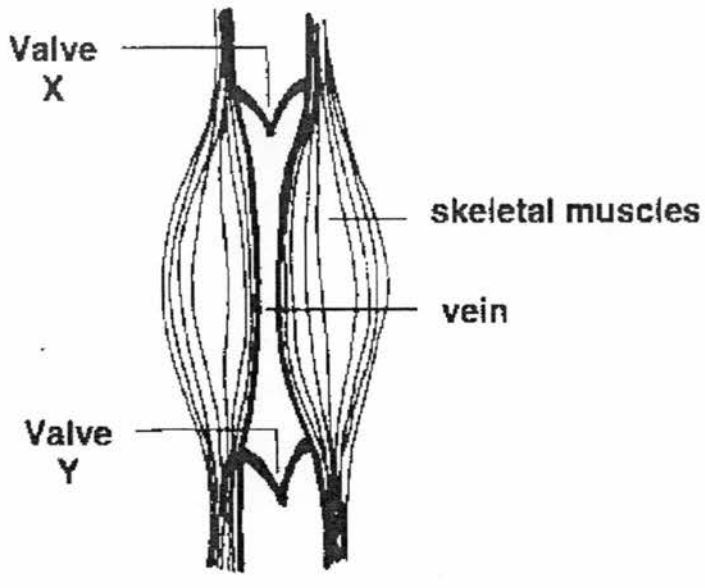
		Recipients			
		P	Q	R	S
Donors	P		✓	✓	✓
	Q	X		✓	✓
	R	X	X		X
	S	X	✓	✓	

✓	Successful transfusion
X	Unsuccessful transfusion

Which row correctly states the blood group of individuals **P**, **Q**, **R**, and **S**?

	P	Q	R	S
A	AB	A or B	O	A or B
B	AB	A	O	B
C	O	A or B	AB	A or B
D	O	B	AB	A

12 The diagram below illustrates a small portion of a vein and its neighbouring skeletal muscles.



Which of the following combinations shows the state of the muscle with the corresponding situations of valves **X** and **Y**?

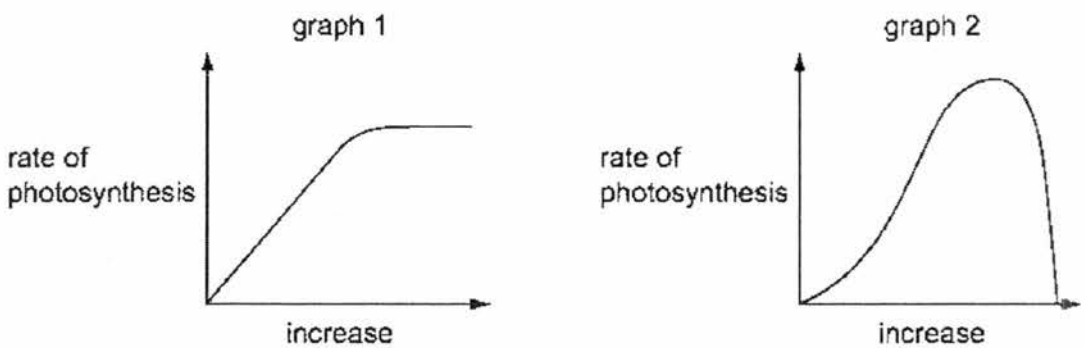
	skeletal muscle	valve **X**	valve **Y**
A	contraction	opened	closed
B	contraction	closed	opened
C	relaxation	opened	opened
D	relaxation	closed	opened

13 The following diagram illustrates a simple potometer which measures water uptake in plants.

Which combination of conditions would result in the fastest uptake of water?

A High temperature and bright light
B Moving air and low temperature
C Bright light and humid air
D High humidity and high temperature

14 The graphs show how two different conditions affect the rate of photosynthesis.

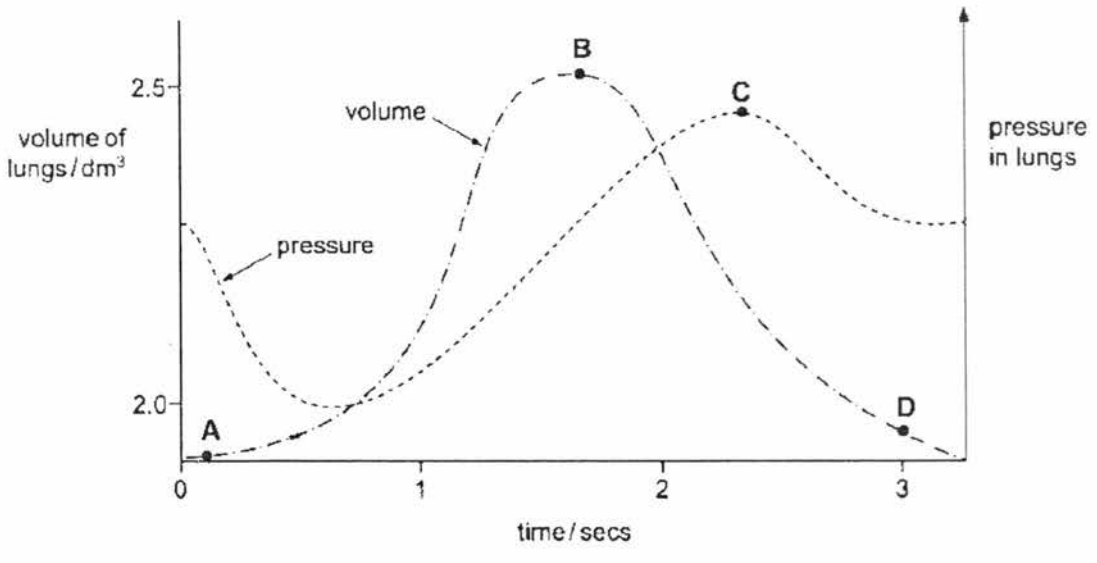


Which conditions are being altered in graphs 1 and 2?

	graph 1	graph 2
A	CO_2 concentration	light intensity
B	CO_2 concentration	temperature
C	temperature	CO_2 concentration
D	temperature	light intensity

15 The graph shows how the pressure and volume inside the lungs change during one complete breath.

At which point are the muscles of the diaphragm starting to contract?



16 In the human respiratory system, which features maintain the carbon dioxide gradient between the alveoli and the outside air?

1. blood being continually pumped to the alveoli
2. breathing in and out
3. moist alveolar surfaces
4. thin alveolar walls

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

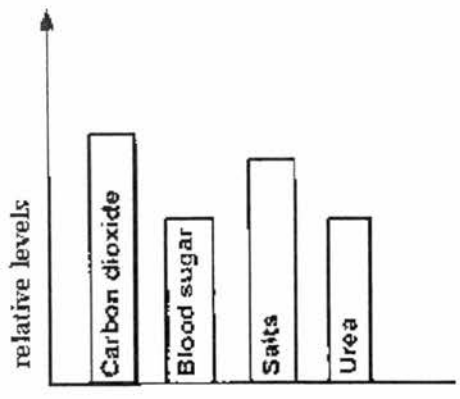
17 Reactions **X** and **Y** take place within the human body.

reaction	equation
X	$Hb + O_2 \leftrightarrow HbO_2$
Y	$CO_2 + H_2O \leftrightarrow H2CO_3$

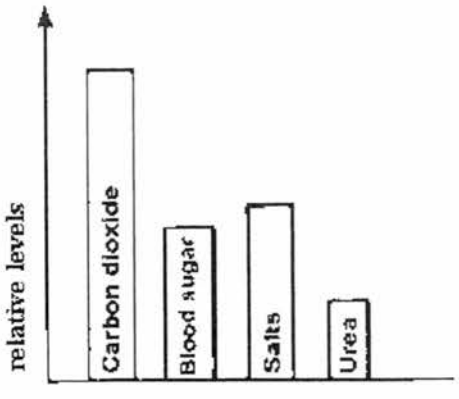
Which row correctly matches X and Y to the site where each occurs, and whether an enzyme is needed?

	reaction **X**		reaction **Y**	
	enzyme needed	location	enzyme needed	location
A	yes	alveoli	no	red blood cell
B	no	plasma	no	alveoli
C	no	red blood cell	yes	red blood cell
D	yes	red blood cell	yes	plasma

18 The bar charts show the relative levels of some substances in the blood before and after passing through a certain organ in the human body.



components in blood before passing through organ



components in blood after passing through organ

Which organ has the blood passed through?

A kidney
B liver
C lungs
D small intestine

19 Three fluid samples are drawn at different parts of a nephron and the components of fluids analysed. The results are shown in the table below:

component	fluid **X** (g/L)	fluid **Y** (g/L)	fluid **Z** (g/L)
glucose	0.0	0.9	0.0
sodium ions	5.0	3.5	4.2
urea	20.0	0.3	0.3

Which correctly matches the fluids to parts of the nephron they were extracted from?

	fluid **X**	fluid **Y**	fluid **Z**
A	glomerulus	collecting duct	proximal convoluted tubule
B	collecting duct	glomerulus	proximal convoluted tubule
C	glomerulus	proximal convoluted tubule	collecting duct
D	proximal convoluted tubule	collecting duct	glomerulus

Use the following information to answer questions 20 and 21.

A group of research scientists conducted an experiment to test the reaction time of 10 volunteers. Each volunteer was blindfolded and touched on the left foot by an object. They were instructed to press a button as soon as they felt the touch. Each person did the test 30 times, and an average reaction time was calculated. The results are shown in the table.

individual	average reaction time /s
1	0.8
2	0.5
3	0.3
4	0.4
5	0.5
6	0.6
7	0.8
8	0.7
9	0.7
10	0.5

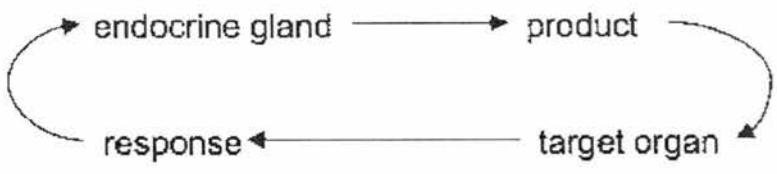
20 Which is the stimulus in this experiment?

A pressing the button
B feeling the touch
C the skin receptors on the toe
D the touch on the toe

21 Which correctly describes the response above?

	type of action	reason
A	not a reflex	touch was not painful
B	not a reflex	response was voluntary
C	reflex	presence of stimulus
D	reflex	response was quick and immediate

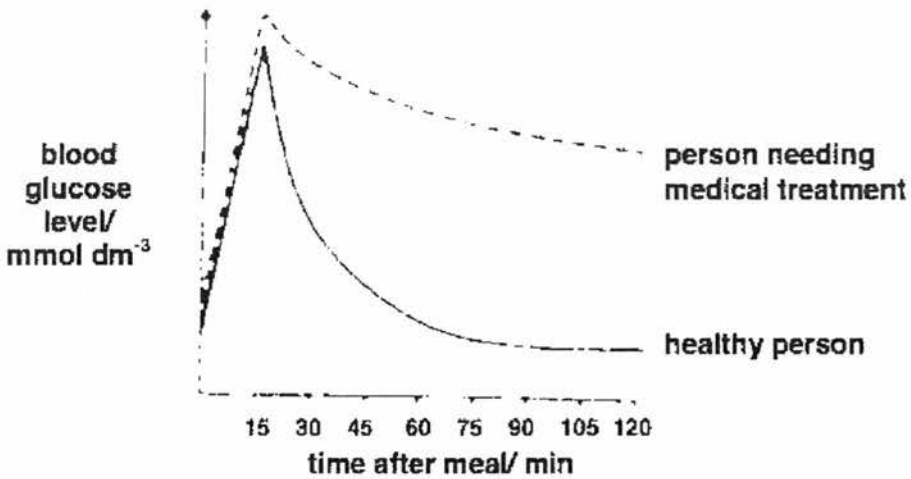
22 The diagram below shows the relationship between two organs and the changes/responses they bring about in the body.



If the response of the target organ is controlled by negative feedback, then the product of the endocrine gland

A inhibits the target organ with no effect on response.
B stimulates the target organ with no effect on response.
C stimulates the target organ while the response inhibits secretion of the product.
D inhibits the target organ while the response stimulates secretion of the product.

23 The graph shows changes in the blood glucose levels of two people after eating identical meals.



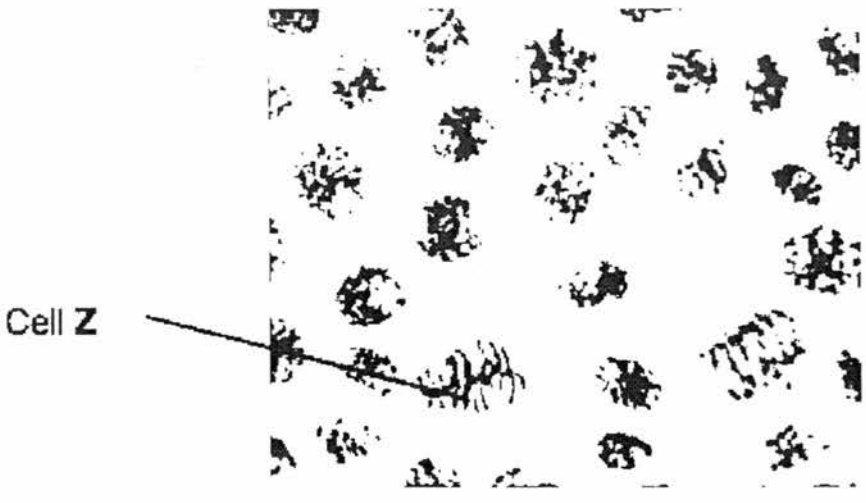
What should be the correct medical treatment for the person needing medical treatment?

A blood transfusion
B dialysis by a kidney machine
C increase intake of proteins
D insulin injections

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

	increase in	decrease in
A	diameter of the pupil in the eye	speed of peristalsis
B	rate of conversion of glycogen to glucose	diameter of the pupil in the eye
C	rate of urine formation	rate of conversion of glycogen to glucose
D	speed of peristalsis	rate of urine formation

25 The photomicrograph shows the cells in an onion root tip undergoing cell division.



Which statement correctly describes what is occurring in cell Z?

A Chromosomes are lining up at the equator
B DNA is replicating
C Homologous chromosomes are pairing up
D Sister chromatids are separating

26 How does mitosis contribute in each of the following processes stated below?

Key:
✓ = contributes to process

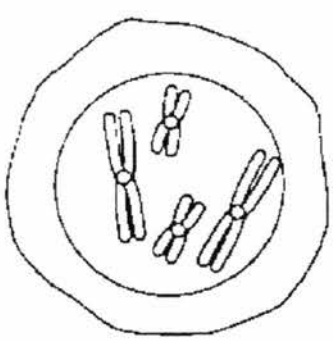
× = does not contribute to process

	genetic variation	increase in cell number	replacement of damaged cells
A	×	✓	✓
B	✓	×	×
C	✓	✓	×
D	×	×	✓

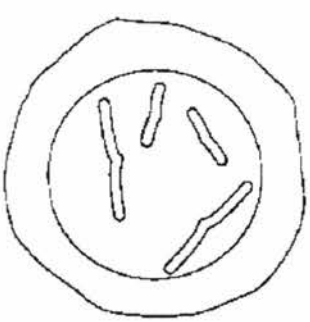
27 A cell containing two sets of chromosomes divides by meiosis.

Which diagram shows prophase II?

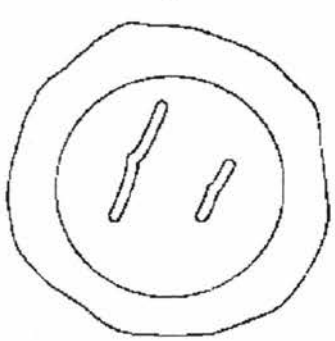
A



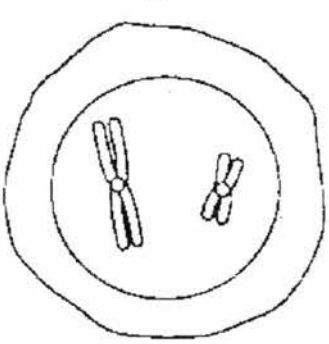
B



C



D

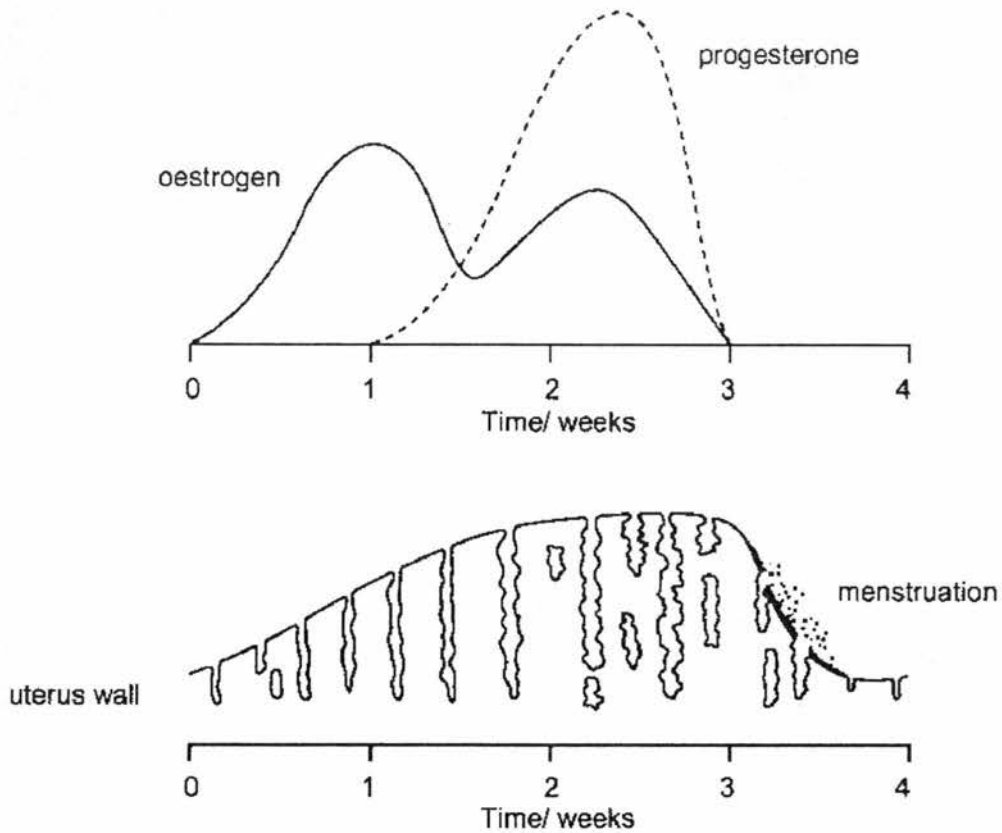


28 A student carried out an experiment to study the wind-pollinated flowers growing in the area. The flowers were divided into four different groups. In each group, selected structures were removed, as shown in the table below.

After a period of time, which group would produce the most number of seeds?

	Anther	Receptacle	Stigma
A	Removed	Removed	No change
B	No change	Removed	No change
C	No change	No change	Removed
D	Removed	No change	No change

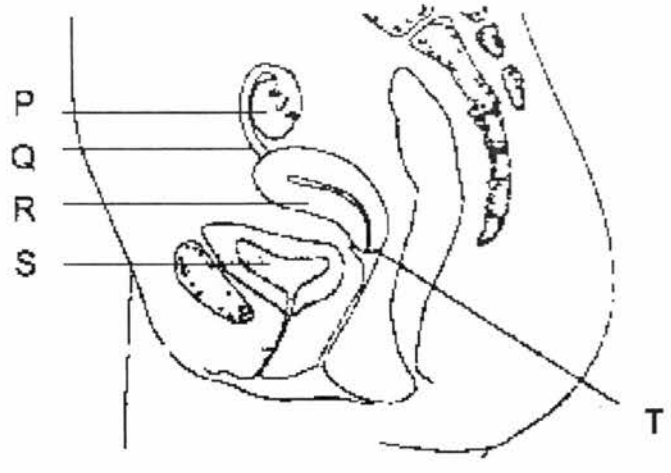
29 The diagram shows the changes which take place during a woman's menstrual cycle.



What is occurring at the time of ovulation?

A a fall in 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 The diagram below shows a female reproductive system.



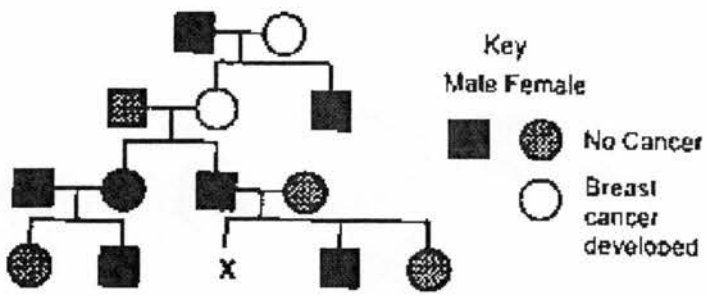
Which correctly shows the regions where the following events occur?

	implantation	fertilization	meiosis
A	R	Q	P
B	R	P	Q
C	S	Q	R
D	T	R	P

31 Which statement about discontinuous variation is true?

A It is determined by a pair of alleles.
B It can be affected by the environment.
C There are many intermediate phenotypes present for a certain trait.
D Blood group and gender are examples of discontinuous variation.

32 The diagram below shows the inheritance of a form of breast cancer. The presence of just one allele is enough for the cancer to express itself



What is the probability that the woman X develops breast cancer?

A 0.00
B 0.25
C 0.75
D 1.00

33 What is the number of chromosomes in a gamete that causes Down's Syndrome?

A 21
B 22
C 23
D 24

34 Which characteristics of a population would most likely indicate the lowest potential for evolutionary change in that population?

A asexual reproduction and few mutations
B asexual reproduction and many mutations
C sexual reproduction and few mutations
D sexual reproduction and many mutations

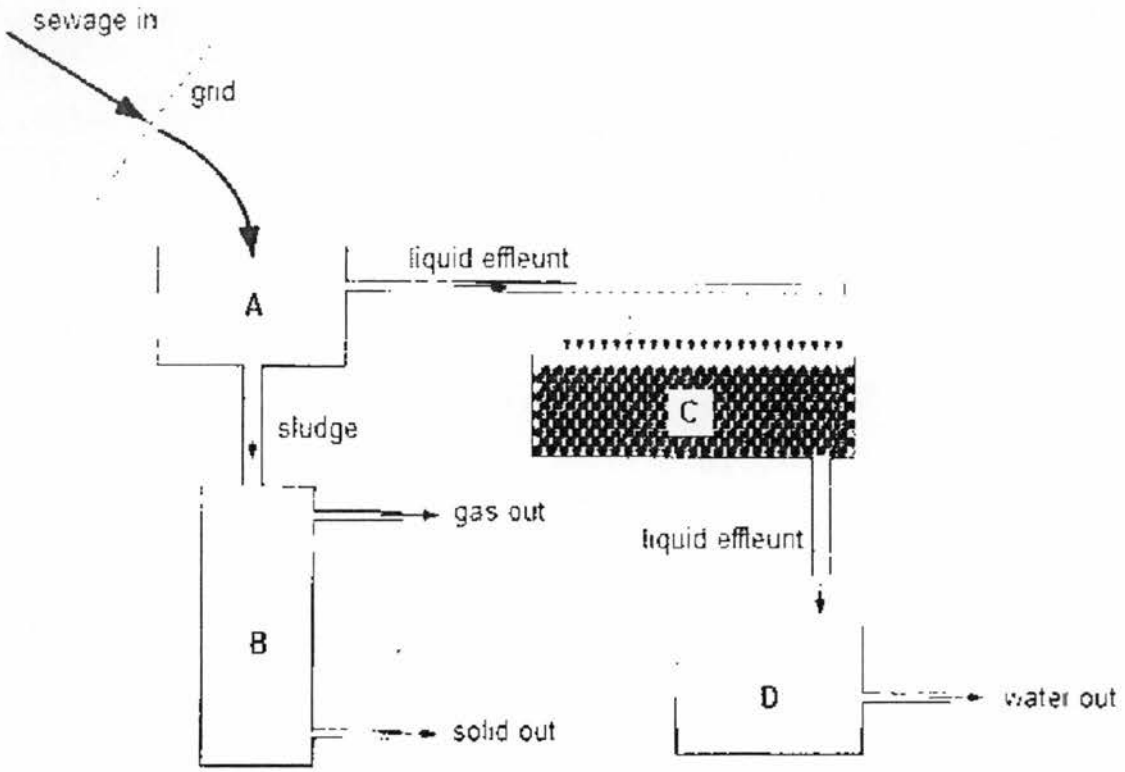
35 The table below shows the percentage of nucleotides found in an octopus and a starfish.

Source of DNA	Adenine (%)	Cytosine (%)	Guanine (%)	Thymine (%)
Octopus	28	22	22	28
Starfish	28	22	22	28

Which of the following best explains why these two animals differ greatly in their physical characteristics?

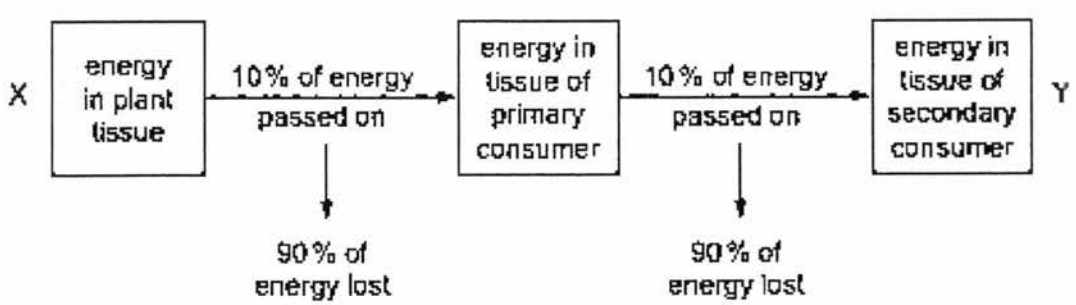
A Amino acids used to produce proteins are different in both animals.
B Deoxyribose is used in DNA of the octopus but ribose is used in the DNA of starfish.
C The sequence of DNA are different in both animals and thus code for different proteins in their bodies.
D The two animals follow different base pairing rules in their DNA strands.

36 The diagram shows a sewage treatment process.



Which labelled stage is likely to involve anaerobic bacteria?

37 The diagram shows how energy flows through a food chain.



By which processes is energy lost between X and Y?

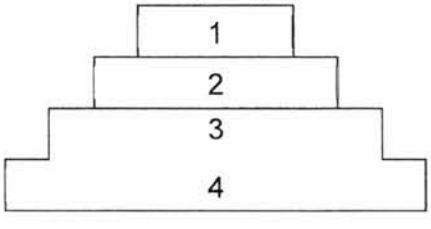
A excretion and respiration
B growth and excretion
C growth and photosynthesis
D photosynthesis and respiration

38 Which group(s) of organisms is/are not necessary for a carbon cycle to continue?

I. Carnivores
II. Decomposers
III. Herbivores
IV. Producers

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

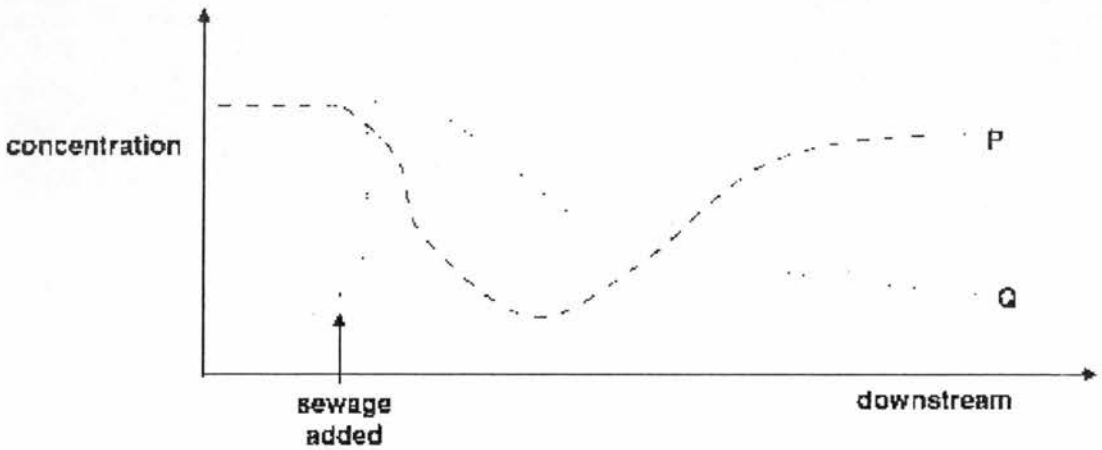
39 The following diagram shows an ecological pyramid of energy.



Which statement is always true?

A Level 1 is occupied by a photosynthesising organism.
B Energy flow is upwards from level 4 to 1.
C Numbers in level 4 exceed those in level 3.
D Cumulative toxins become more concentrated from level 1 down to level 4.

40 The graph below shows the changes in the concentration of two substances, **P** and **Q** in the river.



Identify **P** and **Q**.

	P	Q
A	carbon dioxide	nitrogen compound
B	nitrogen compound	carbon dioxide
C	nitrogen compound	oxygen
D	oxygen	nitrogen compound

End of paper

INDEX NO.	

Anglo-Chinese School

(Barker Road)

PRELIMINARY EXAMINATION 2017

SECONDARY FOUR EXPRESS

BIOLOGY PAPER 2

5158/2

TIME: 1 Hour 45 Minutes

READ THESE INSTRUCTIONS FIRST

Write your index number on all the work you hand in.
Write in dark blue or black pen.
You may use a soft 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 answer in the spaces provided on the question paper.

Section B
Answer **all** questions including questions 8, 9 and 10 **Either** or 10 **Or**.

	Marks
Section A	
Section B	
8	
9	
10	
TOTAL	

INFORMATION FOR CANDIDATES

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

*This question paper consists of **19** printed pages.*

Section A (50 marks)

Answer all questions

Write all answers in the spaces provided.

1 **Fig. 1.1** shows the changes in blood pressure during the cardiac cycle.

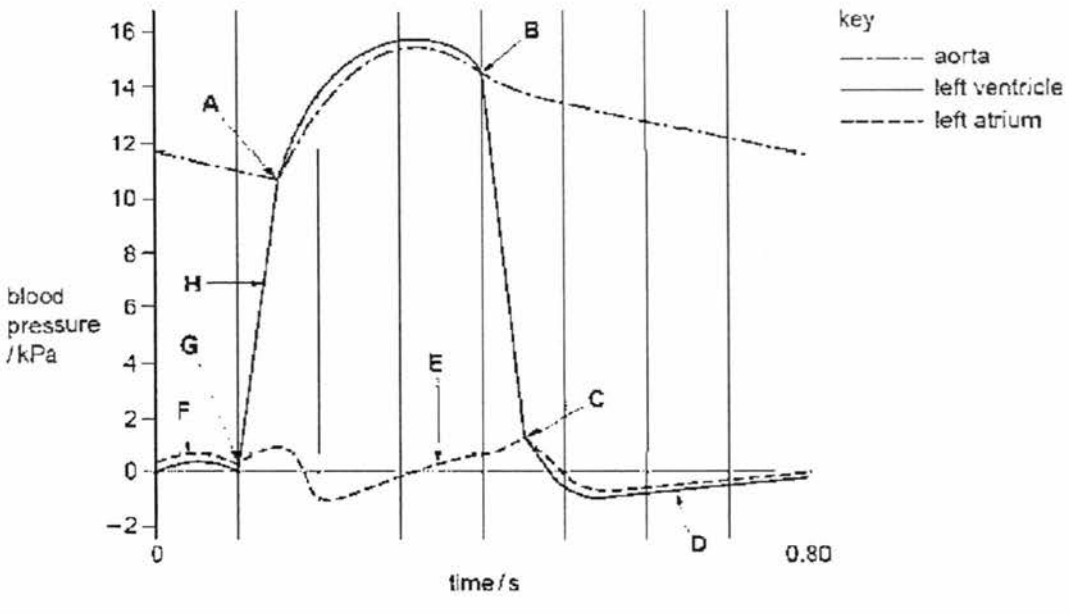


Fig. 1.1

(a) State the duration of ventricular systole.

.....

[1]

(b) Using points **A – H**, identify when

(i) the biscuspid valve is closed,

.....

(ii) the semi-lunar valve is open, and

.....

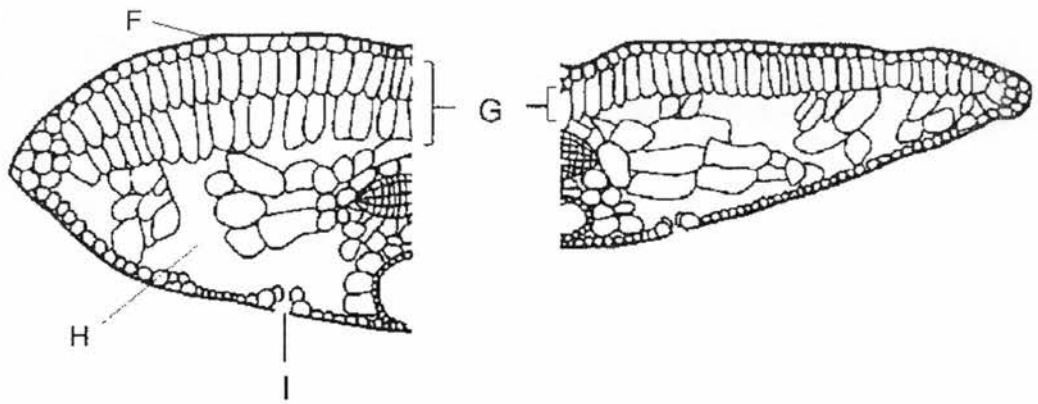
(ii) the ventricle has the least volume of blood.

.....

[3]

[Total: 4 marks]

2 Two different plants of the same tropical species were sampled in Bukit Timah Nature Reserve. One plant was grown in strong sunlight and the other was grown in the shade. The top most leaf of each plant was detached, sectioned and viewed under the light microscope. Drawings to the same scale were then made as seen in **Fig 2.1**.



Sun-developed leaf Shade-developed leaf

Fig. 2.1

(a) (i) Name structures **F**, **G**, **H** and **I**.

F: _____ **H**: _____

G: _____ **I**: _____ [2]

(ii) Explain the importance of structure **I**.

_____

_____ [1]

(b) (i) State one visible difference between the sun-developed leaf and shade-developed leaf.

_____

_____ [1]

(ii) Suggest how the difference stated above is an adaption for the shade-developed plant.

_____

_____

_____ [1]

[Total: 5 marks]

3 **Fig. 3.1** and **Fig. 3.2** show the sectional views of the structures in the eye.

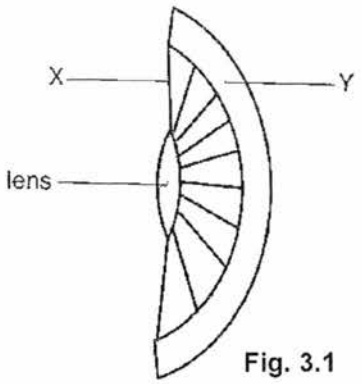


Fig. 3.1

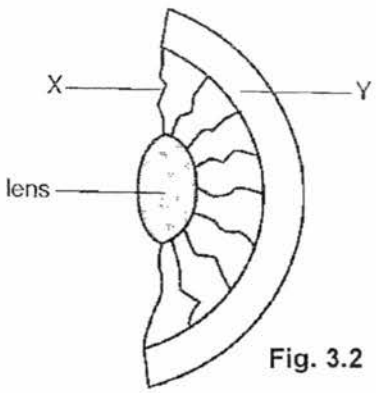


Fig. 3.2

(a) Name structures **X** and **Y**.

X: _____

Y: _____ [2]

(b) A man was reading a book when he heard a helicopter fly by, causing him to look up into the sky to look at it.

(i) State which figure shows the state of the man's eye when he was reading his book and after he looked up at the helicopter.

when reading his book: : _____

after he looked up at the helicopter: : _____ [1]

(ii) Describe the changes in the eye that allows him to focus on the helicopter.

_____

_____

_____

_____ [3]

(c) The lens is made up of living cells packed full of special proteins. In some people, part of the lens may become cloudy due to various reasons. This condition is known as cataract.

People who are diabetic are at higher risk of developing cataracts. In these people, the concentration of glucose in the aqueous humour and lens are abnormally high. The cells in the lens convert excess glucose into sorbitol, which is the compound that increases absorption of water into the lens. The lens swells and becomes cloudy.

(i) Describe a test for protein.

[2]

(ii) Briefly explain how being diabetic leads to the swelling of the lens.

[3]

(iii) A person with cataract can have his lens replaced with an artificial lens made of a special material.

Suggest two properties the material would need to have for the lens to be functional.

1:

2: [2]

[Total: 13 marks]

4 **Fig. 4.1** shows the flower of *Hypericum perforatum*, also commonly known as St John's wort, a plant commonly found along the coasts of Snowdonia in Wales.

Fig. 4.1

(a) With reference to **Fig. 4.1**, suggest and explain how pollination occurs in the flower of *Hypericum perforatum*.

.....

.....

.....

.....

.....

..... [2]

In a seprate investigation, the number of pollen grains released into the atmosphere by another flower, *Hypericum calycinum* was sampled at hourly intervals over three consecutive days.

The wind speed was recorded at the times of sampling. The results of the investigation are shown in **Fig. 4.2**.

Based on the results, experimenters concluded that *Hypericum calycinum* was not pollinated by the wind.

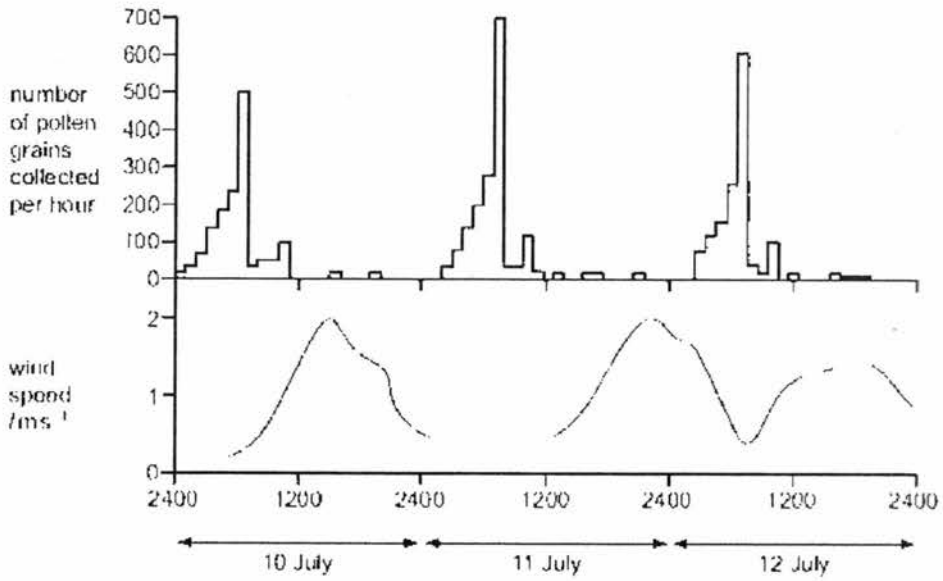


Fig. 4.2

(b) Explain if the information presented in **Fig. 4.2** supports the experimenter's conclusion.

[3]

(c) **Fig. 4.3** shows the transverse section of a part of *Hypericum calycinum*.

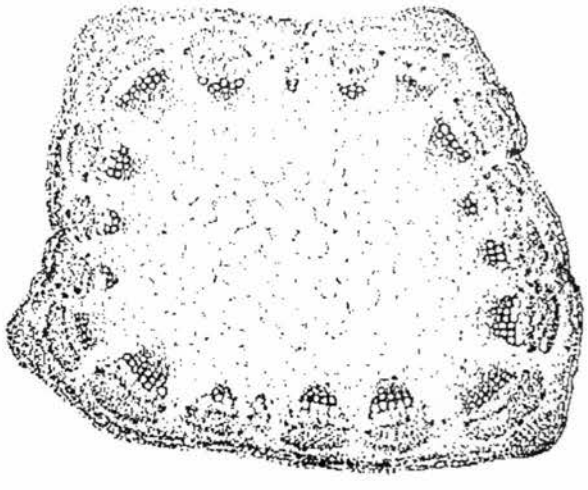


Fig. 4.3

Label the phloem and xylem on **Fig. 4.3** [2]

[Total: 7 marks]

5 The seeds of a certain plant species have either red or orange seed coats. This trait is controlled by a pair of alleles. The allele for red seed coats is dominant over the allele for orange seed coats.

A red seed is germinated and developed into a mature plant. This plant is then self-pollinated and 300 seeds were produced. The colour of the seeds were recorded in **Table 5.1**.

Table 5.1

colour of seed	red	orange	white
number of seeds	223	76	1

Let **R** represent the allele for red seat coats and **r** represent the allele for orange seed coats.

(a) (i) Deduce the genotype of the original red seed.

.....

[1]

(ii) Explain your answer.

.....

.....

.....

[2]

(b) By drawing a genetic diagram for the cross above, state the expected phenotypic ratio of red to orange seeds.

[3]

(c) Explain why the actual phenotypic ratio differs from the expected phenotypic ratio.

.....

..... [1]

(d) Suggest a possible reason for the presence of a single white seed.

..... [1]

(e) The mass of the seeds were also recorded in **Table 5.2**.

Table 5.2

mass of seeds/g	0.4	0.5	0.6	0.7	0.8	0.9	1.0
number of seeds	28	27	66	78	54	36	11

(i) Calculate the percentage of seeds that are at least 0.8 g.

[1]

(ii) Suggest one environmental factor that may result in the increase in mass of the seed.

..... [1]

[Total: 10 marks]

6 Besides nutrients, other atmospheric elements may enter the ecosystem. Radioactive caesium-137 was released into the atmosphere by atomic bomb tests in 1961. The radioactive substance was deposited in the soil and on the plants. **Fig. 6.1** shows the amount of radioactivity found in the tissues of lichens (an alga and fungus growing together), caribou (a member of the deer family) and the Inuit people in the Anaktuvuk Pass of Alaska.

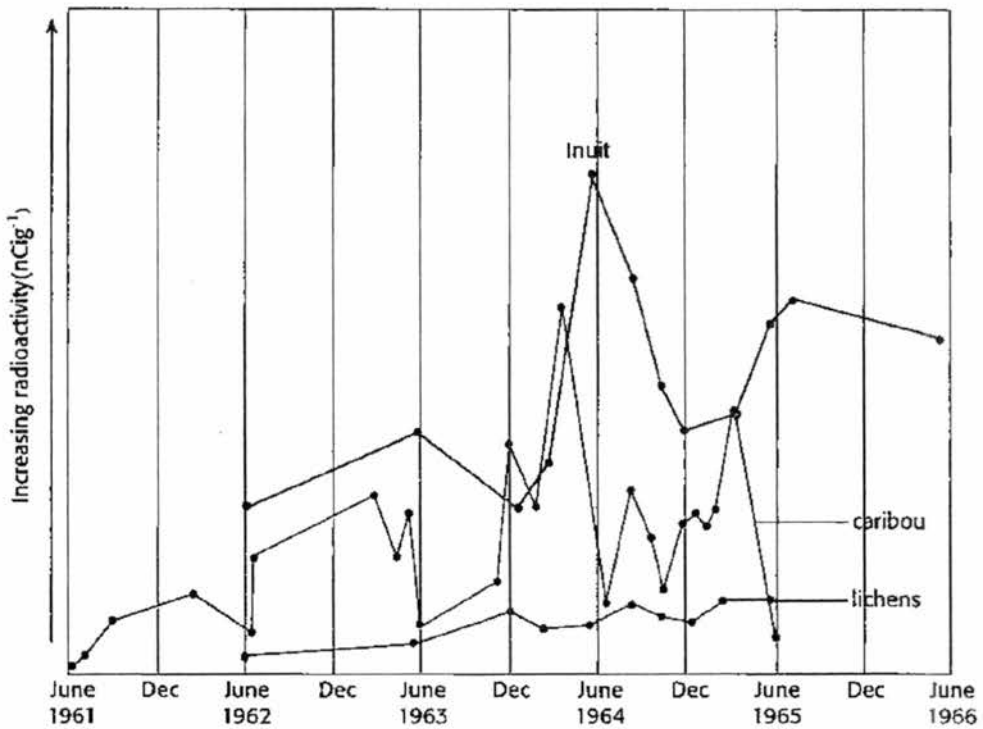


Fig. 6.1

(a) The three organisms form a food chain.

(i) Deduce the food chain that includes these three organisms

_____ [1]

(ii) Explain your answer.

_____

_____

_____

_____ [3]

(b) Draw and label the pyramid of biomass for the food chain in a(i).

[2]

[Total: 6 marks]

7 The owner of a fishing company in Yukon, Canada is licensed to catch Arctic cod in the Arctic Ocean. The model of his fishing operations is shown in **Fig. 7.1**.

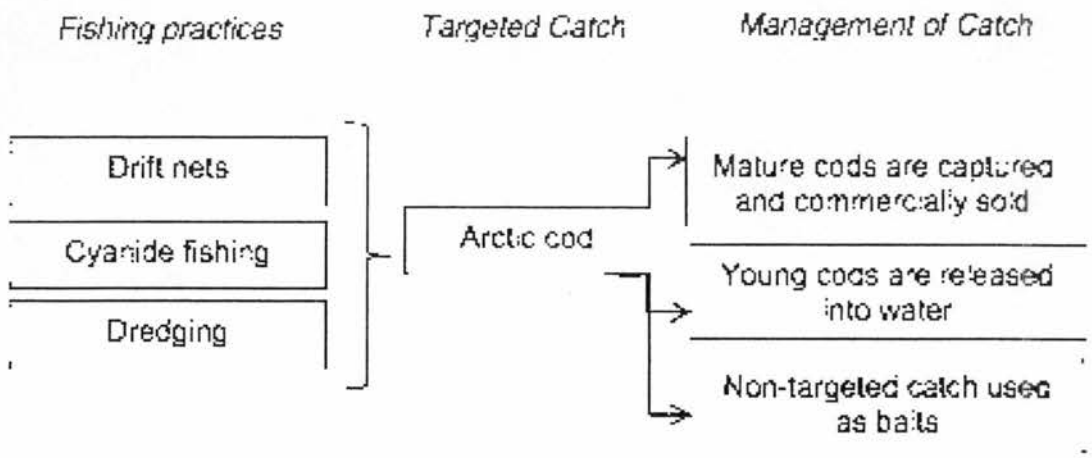


Fig. 7.1

Using information from **Fig. 7.1**, discuss the consequences of

(i) the fishing practices, and

[3]

(ii) the management of catch of the fishing company.

[2]

[Total: 5 marks]

Section B (30 marks)

Answer all questions

Write all answers in the spaces provided.

8 In cold weather, some warm blooded animals crowd together in groups.
Some students used test-tubes containing hot water to represent such animals in an investigation of the loss of heat from animals' bodies.

As shown in **Fig. 8.1**, test-tube **A**, represented one animal on its own.

Another test-tube **B**, represented an animal surrounded by seven similar animals in group.

Test-tube **C** represented one of the outer animals in the group.

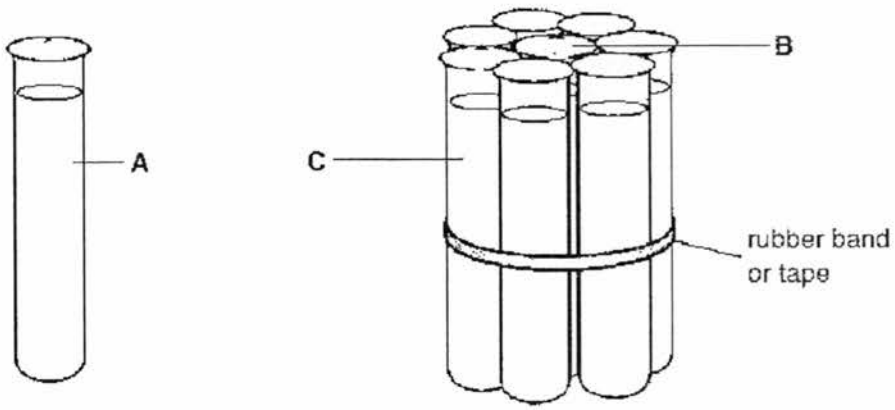


Fig. 8.1

All nine test-tubes were filled with water at 40 °C.

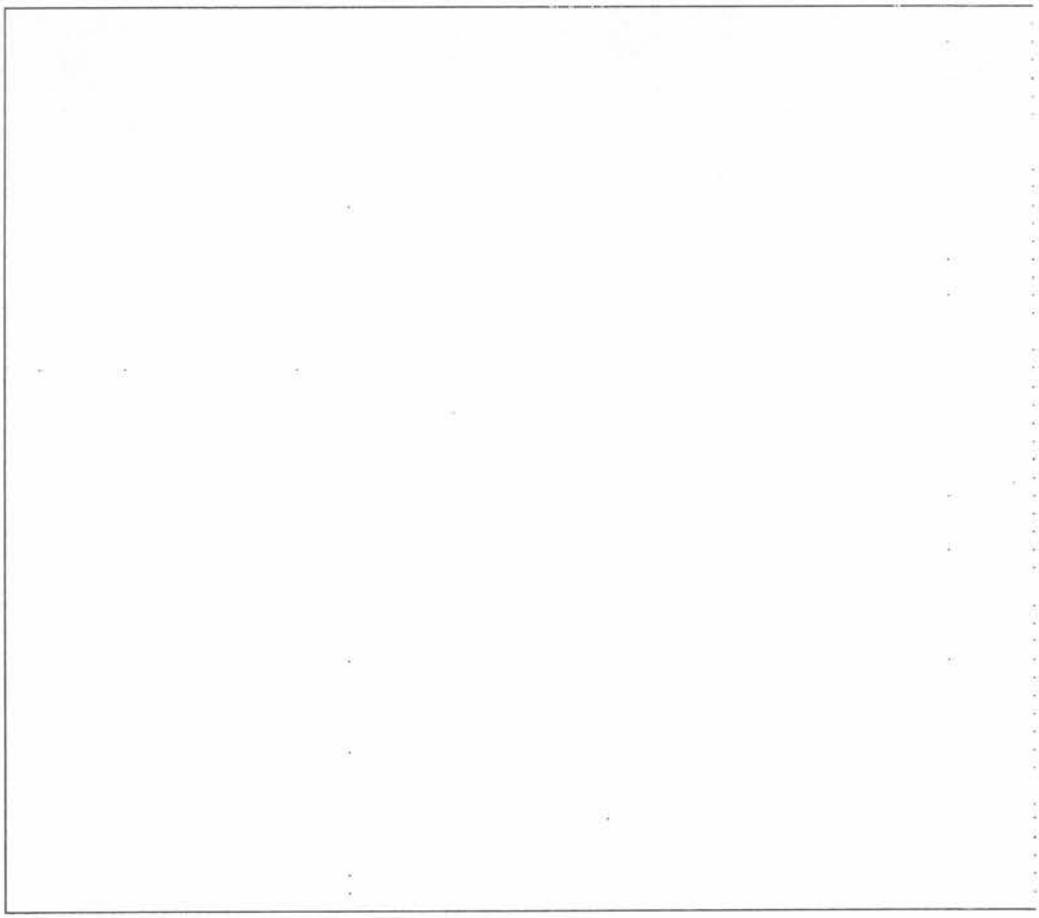
The temperature of water in test-tubes **A**, **B** and **C** was measured when the tubes were filled, and then every two minutes for a total of ten minutes.

The results are shown in **Table 8.2**.

Table 8.2

time/min	temperature / °C		
	tube A	tube B	tube C
0	70	69	68
2	61	68	65
4	53	68	63
6	47	67	62
8	41	67	61
10	36	67	60

(a) Plot the results for the three test-tubes A, B and C on the same axes.



[4]

(b) Describe and compare the trend shown in the graph.

[2]

(c) With reference to the experimental results, suggest why animals crowd together in a group in cold weather.

[4]

(d) Suggest modifications to the procedure to make the results more accurate.

[2]

[Total: 12 marks]

9 Using **3 named examples**, describe how cells are specialised for their respective roles.

[8]

[Total 8 marks]

10 Either

(a) Distinguish between aerobic and anaerobic respiration.

[3]

(b) Differentiate between respiration and breathing.

[2]

(c) 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.

[5]

[Total: 10 marks]

10 OR

(a) Describe what is meant by a transgenic organism.

[2]

(b) Children with very short stature can often be treated with human growth hormone (a protein molecule).With reference to the principle of genetic engineering, outline how human growth hormone may be synthesized on a large scale.

[5]

(c) Farmers growing soya beans have a problem because weeds compete with their crops. A genetically engineered variety of soya bean may solve their problem. A bacterial gene, which can boost photosynthesis, has been inserted into the plant. The new soya bean plants can also withstand glyphosate, a herbicide that disrupts photosynthesis and kills plants.

Discuss the ecological implications of the new variety of soya beans in the field.

[3]

[Total: 10 marks]

The End

Prelim Answers

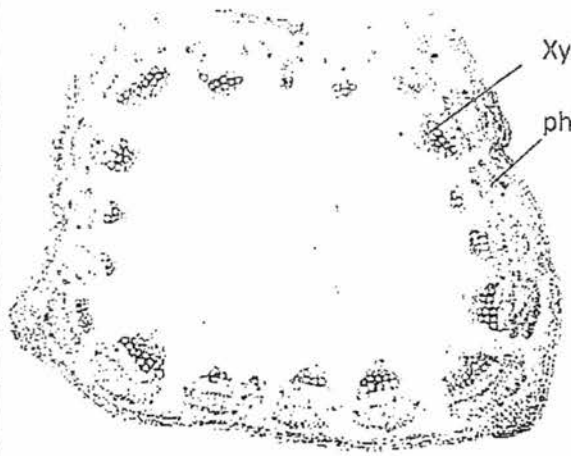
Paper 1 Answers

Question	Answer	Feedback and guidance
1	B	
2	B	
3	D	
4	A	
5	B	
6	A	
7	D	after absorption of glucose from the ileum, blood sugar level increases
8	A	
9	D	excess amino acids are deaminated in the liver to form urea which is passed out of the body as a component of urine.
10	D	
11	C	
12	B	
13	A	
14	B	
15	A	
16	A	
17	C	
18	A	
19	B	
20	D	
21	B	
22	C	
23	D	
24	A	
25	A	
26	A	
27	D	homologous chromosomes have separated during meiosis 1.
28	B	
29	C	
30	A	
31	D	
32	A	
33	D	Down syndrome is a result of a mutation in chromosome number. Organism has one extra chromosome in its nucleus (46+1)
34	A	
35	C	
36	B	
37	A	
38	B	
39	B	
40	D	

Paper 2 Answers

1	(a)		0.3s (units included)	1	Look for intersection
	(b)	(i)	G to C	1	
		(ii)	A to B	1	
		(iii)	B/ C / B-C	1	
2	(a)	(i)	F: upper epidermal cell G: palisade mesophyll layer H: intercellular air space I: Stoma (singular)/ stomata	2	For G, : Other accepted: Palisade layer/palisade mesophyll cells Rejectd: palisade cell
		(ii)	allow gaseous exchange to take place for photosynthesis.	1	Many left out the importance of gaseous exchange to the plant.
	(b)	(i)	The shade leaf is thinner than sun leaf the shade leaf has one layer of palisade mesophyll cells while the sun leaf has two layers of palisade mesophyll cells. Shade leaf has a wider lamina than sun leaf	1 1	
		(ii)	being thinner, it allows light to penetrate through the leaf for maximum absorption of light to take place / palisade cells are compacted to a single layer on the top so that they are closest to the sun and exposed to maximum light for absorption. less reason needed to keep 2nd layer of palisade cells alive to conserve energy for growth. Increase surface area to reach for sunlight. any 1	1 1 1 1	Common incorrect answer: Shade leaf grows where there is less light, hence they do not need as much chloroplast for photosynthesis. Above is incorrect because it does not answer the question of why the shade plant has this adaptation. What is the advantage to the shade plant?
3	(a)		X: suspensory ligament Y: ciliary body/ciliary muscle	1 1	
	(b)	(i)	when reading his book: Fig. 3.2 after he looked up at the helicopter: Fig. 3.1	1	
		(ii)	ciliary muscles relax ,causing the suspensory ligaments to become taut lens become thicker and more convex decreasing focal length	1 1 1	

			causing light rays to refract less to converge on the retina	1	
	(c)	(i)	Add <u>equal amounts</u> of sodium hydroxide and sample solution. Add copper (II) sulphate drop by drop, shaking after every drop Violet colour indicates presence of protein OR Addition of biuret's reagent: ◦ Drop by drop any 2	1 1 1 1	
		(ii)	A -excess glucose is converted to sorbitol in the lens, (picking out information from question) causing the lens to swell as <u>more</u> water moves into the lens B- leading to an <u>increase</u> in the concentration of sorbitol in the lens, C- lowering the water potential of the lens, D- the lens swells due to a higher volume of water present in the lens/cells of the lens Max 3	1 1 1 1	
		(iii)	Any two -clear/transparent - durable/long lasting - will not be rejected by immune system -impermeable to water/water proof - able to refract light - elastic/flexible		
4	(a)		Flower is insect pollinated due to the presence of large petals. Pollen grains may be transferred to a female flower by self- pollination (ie. In the same plant) OR a female flower by insects to another plant (cross pollination)	1 1	
	(b)		No the data collected supports the type of pollination. As wind speed increase from 2400 towards 1200 in 10	1	

			July, the number of pollen grains decreased. Between 2400 and 1200 on 11 July, the pollen grains released was increasing but wind speed was at its minimum. On 12 July, the highest number of pollen grains released nearest 1200 corresponds to the lower wind speed for that day. any 2 or more pollen is released in the morning compared to the night but wind speed is varying in the mornings (not always highest in the morning)	1 1 1 1 1	
	(c)			1	
				1	
5	(a)	(i)	Rr / heterozygous	1	
		(ii)	Orange coat offspring must have genotype rr, hence r allele must have been passed down from the parent. since its red, R allele must be present	1 1	
	(b)	(insert genetic diagram)		3	
	(c)	each fertilization is random and occurs by chance. sample size small		1	
	(d)	mutation		1	
	(e)	(i)	33.7% (3s.f)		
		(ii)	increased availability of water/increased light to the parent plant	1	

			Reject if answer mentions more light/water to seed?		
6	(a)	(i)	lichens→ caribou → inuit	1	
		(ii)	Ref. lichens had the lowest level of radioactivity while the inuit had the highest; The caesium entered the food chain when the caribou fed on the lichens and passed to the Inuit; Ref. to bio amplication ref to bioaccumulation: As the radioactive caesium was non-biodegradable, it was stored and accumulated in the tissues and passed along the food chain through feeding	1 1 1 1	
	(b)		pyramid of biomass	2	
7		(i)	Lead to *disruption of balance of ecosystem; Drift nets trap everything in the water (indiscriminate killing OWTTE) cyanide fishing is poisonous and stuns fish and kills corals; Dredging scrape and destroy the seabed and organisms that live on max 3	1 1 1 1	
		(ii)	Young fish caught is released = give a chance to grow and reproduces; preventing extinction Prevent overfishing; Non-targeted catch used as bait = upset blanace of ecosystem/loss of marine life (any logical answer) any 2	1 1 1	
8	(a)		Axes labelled correctly with units	4	

			Label the lines A, B and C Correct points plotted Smooth best fit graph for all lines		
	(b)		Decrease in temperature for all 3 curves. Ref. to rate of temperature decrease relative to others: (A has greatest decrease/ C is greater than B.	1 1	
	(c)		Animals in groups lose heat slower than an individual animal Bodies trap heat/better insulation Reduced convection and radiation from body surface to surrounding Total surface area expose to cold air is smaller / reduced surface area to volume ratio	1 1 1 1	
	(d)		Use lids to reduce loss of heat due to evaporation of water Take more readings and take average Take shorter readings/shorter interval between readings Reject-use more test-tubes/use animals/alter volume of water/time lag in measuring the temperature any 2		
9	red blood cell- ○ no nucleus (*structure)* ○ to store more hemoglobin to transport <u>more</u> oxygen around the body (*relation to function)* ○ biconcave shape (*structure)* for increased surface area to volume ratio ○ for faster uptake and release of oxygen (*relation to function)* root hair cell- ○ elongated portion (*structure)* for increased surface area to volume ratio ○ for faster uptake of water (*relation to function)* ○ presence of large amounts of mitochondria *(structure)* ○ for active transport of mineral salts into cell (*relation to function)*				

sperm cell-

- presence of flagellum for movement of cell to oviduct ;
- Acrosome for digestion of follicie cells of the ovum
- Large number of mitochondria for release of energy from respiration for movement of sperm

pollen grain-

- 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

max 3 for each cell- must give 3 cells to gain full credit

10 E (a)

	aerobic respiraton	anaerobic respiration
presence of oxygen	yes	no
amount of energy released	large	small
by-product	carbon dioxide	lactic acid
side effect	none	muscle fatigue

3

(b) Respiration is the oxidation of food substance to release energy while Breathing is the contraction and relaxation of muscles to bring about the movement of the ribs

1

Breathing is a physicai process whereas respiration is a chemicai process

1

Occurs in all living cells and breathing causes air to move in and out of the lungs

1

Max 2

(c) Tar & irritants in tobacco smoke

Paralyse cilia lining trachea & bronchi

Mucus & dust cannot be removed / accumulate

Violent coughing to expel mucus & clear air passage

Partition walls of alveoli breakdown & form large

		empty spaces, causing emphysema. Surface area for gaseous exchange is reduced results in breathlessness during exercise max 5		
10 O	(a)	A transgenic organism is one that has been genetically engineered by the <u>insertion of a modified gene from another organism</u>		
	(b)	Human chromosome containing the growth hormone gene is obtained and cut using restriction enzyme to produce sticky ends. Plasmid is obtained from a bacterium and cut using same restriction enzyme to produce complementary sticky ends. DNA ligase is used to join the growth hormone gene and plasmid to form recombinant plasmid. The recombinant plasmid is inserted into bacteria by applying heat/electric shock to open up pores in bacterial membrane and allow bacteria to take in recombinant plasmid. The transgenic bacteria are placed in a fermenter to multiply rapidly, producing hormone in large quantities growth hormone can then be harvested ad purified.	1 1 1 1 1 1	
	(b)	With the introduction of the new variety, Advantages o farmers are able to obtain higher yield since the it has been genetically modified with a gene to boost photosynthesis / rate of photosynthesis is increased o Soya beans will be unaffected by herbicides used to kill the weeds, hence they can continue to grow well; o In addition, soya beans will be able to thrive better in the field since there will be lesser competition for nutrients and water as weeds can be removed easily with herbicides.		

	Disadvantages ○ With the introduction of gene that can resist herbicides, weeds that cross-breed with soya bean plants may inherit the gene and develop immunity to herbicides as well. ○ Formation of superweeds, weeds that are not easily removed in future by the same herbicide. This will create even greater competition for nutrients and space for growth with the soya bean crops. ○ Population of insects that feeds on weeds and help in pollination will be reduced since there will be drastic drop in weed population in the field / useful insects will be killed, links in food web are broken which will upset the ecological balance max 3 max 2 for disadvantage and/or advantage		