福建中學

FUKIEN SECONDARY SCHOOL

S6 Mock Examination (2021-2022)

Biology Paper 1

(2 hours 30 minutes)

Date: 26th January 2022 Name:_____

Time: 8:30a.m. - 11:00a.m. Class: _____ No.: _____

SECTION B (QUESTION-ANSWER BOOK B)

INSTRUCTIONS

1 Write your name, class and class number in the spaces provided on this page.
2 Refer to the general instructions on the cover of the Question Book for Section A.
3 The questions in this Question-Answer Book carry 84 marks. Answer ALL questions.
4 Write your answers to Section B in the spaces provided in this Question-Answer Book.
5 Supplementary answer sheets will be provided on request. Write your name, class, class number and fill in the question number on each sheet. Put them loosely but securely INSIDE this **Question-Answer Book.**
6 Present your answers in paragraphs wherever appropriate.
7 The diagrams in this section are NOT necessarily drawn to scale.

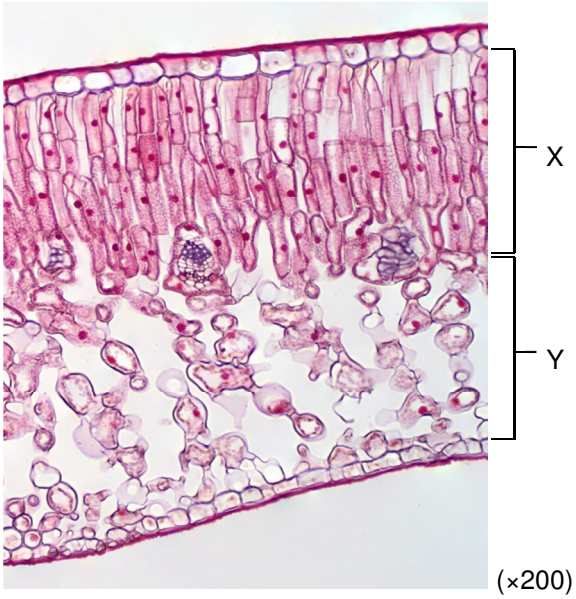
SECTION B

Answer **ALL** questions. Put your answers in the spaces provided.

1 For each of the structures of the human eye listed in column 1, select from column 2 ***one*** phrase that matches it. Put the appropriate letter in the space provided. (3 marks)

Column 1		***Column 2***	
Cornea	_____	A	Changing the thickness of the lens
Ciliary body	_____	B	Containing pigments which reduce reflection of light within the eye
Iris	_____	C	Refracting and focusing light onto the retina
		D	Regulating the amount of light entering the eye
		E	Supplying nutrients and oxygen to the retina and sclera

2 The photomicrograph below shows the transverse section of a dicotyledonous leaf.



a Name tissue X. (1 mark)

_____

b Explain how the leaf is adapted for gas exchange with reference to ***one*** feature of tissue Y observable in the photomicrograph. (2 marks)

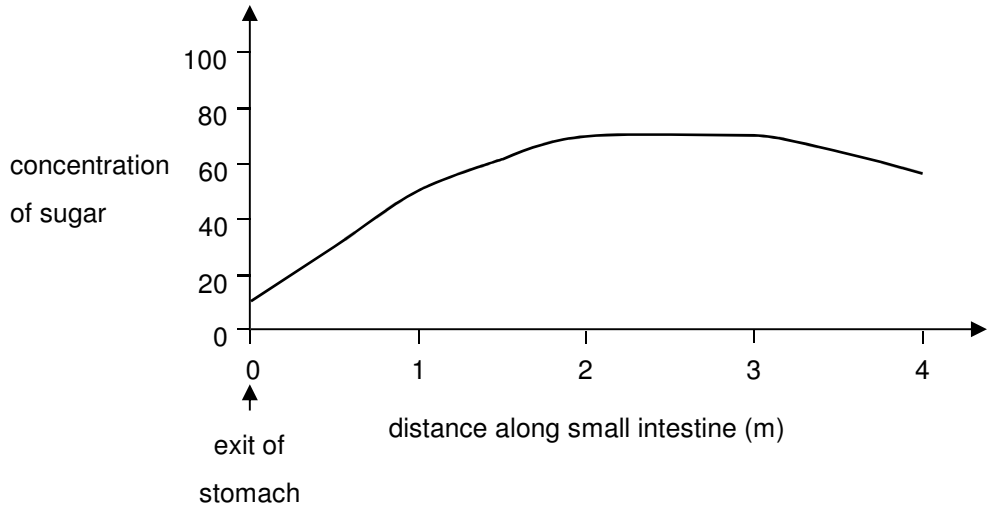
_____

_____

_____

_____

3 In an investigation, a healthy woman was asked to fast overnight and then eat a meal rich in starch. The concentration of sugar along her small intestine was measured two and a half hours after taking the meal. The graph below shows the results.



a What is the main kind of sugar found at the exit of the stomach? (1 mark)

_____

b Explain why the concentration of sugar changes in the small intestine

i between 0 m and 2 m. (3 marks)

_____

_____

_____

_____

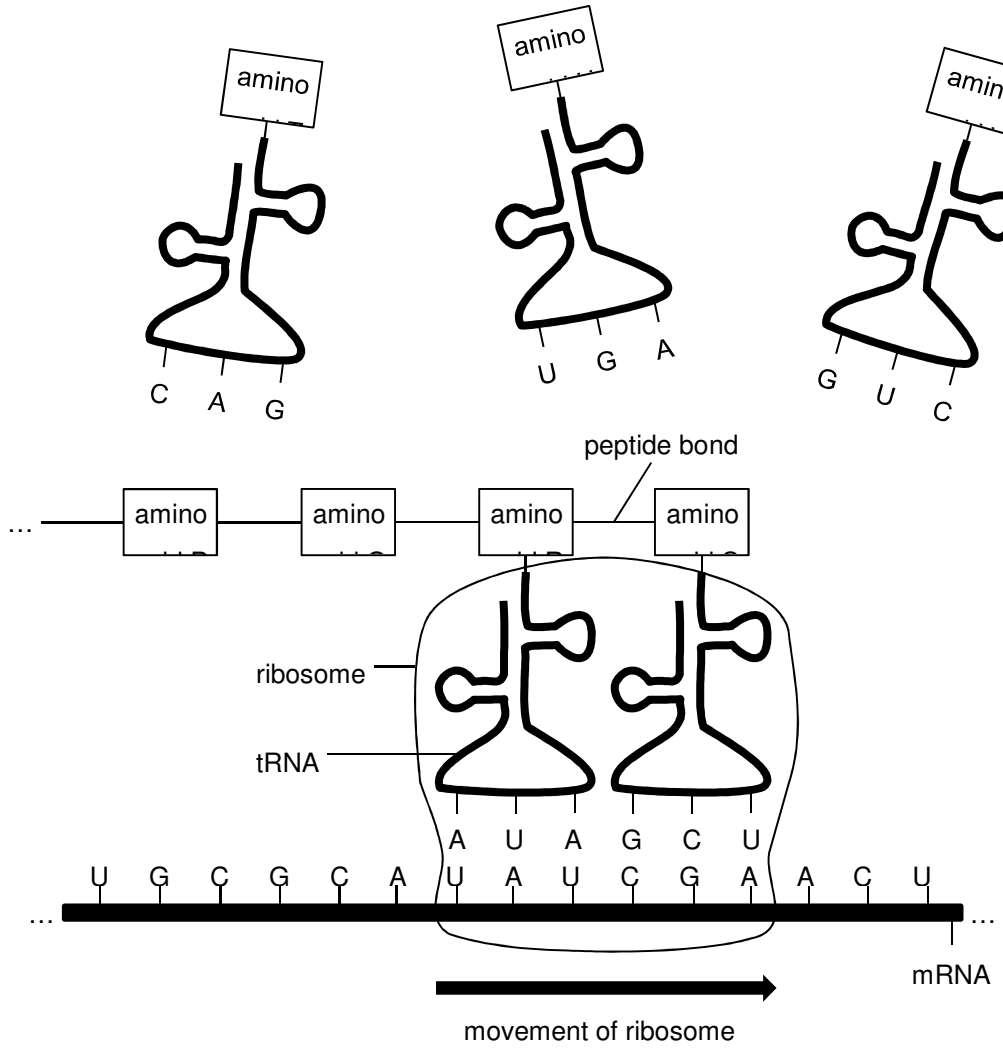
ii between 3 m and 4 m. (2 marks)

_____

_____

_____

4 The diagram below shows a process in the synthesis of a polypeptide in a human cell.



a Where does this process take place in the human cell? (1 mark)

_____

b Which amino acid will be added to the polypeptide chain next? (1 mark)

_____

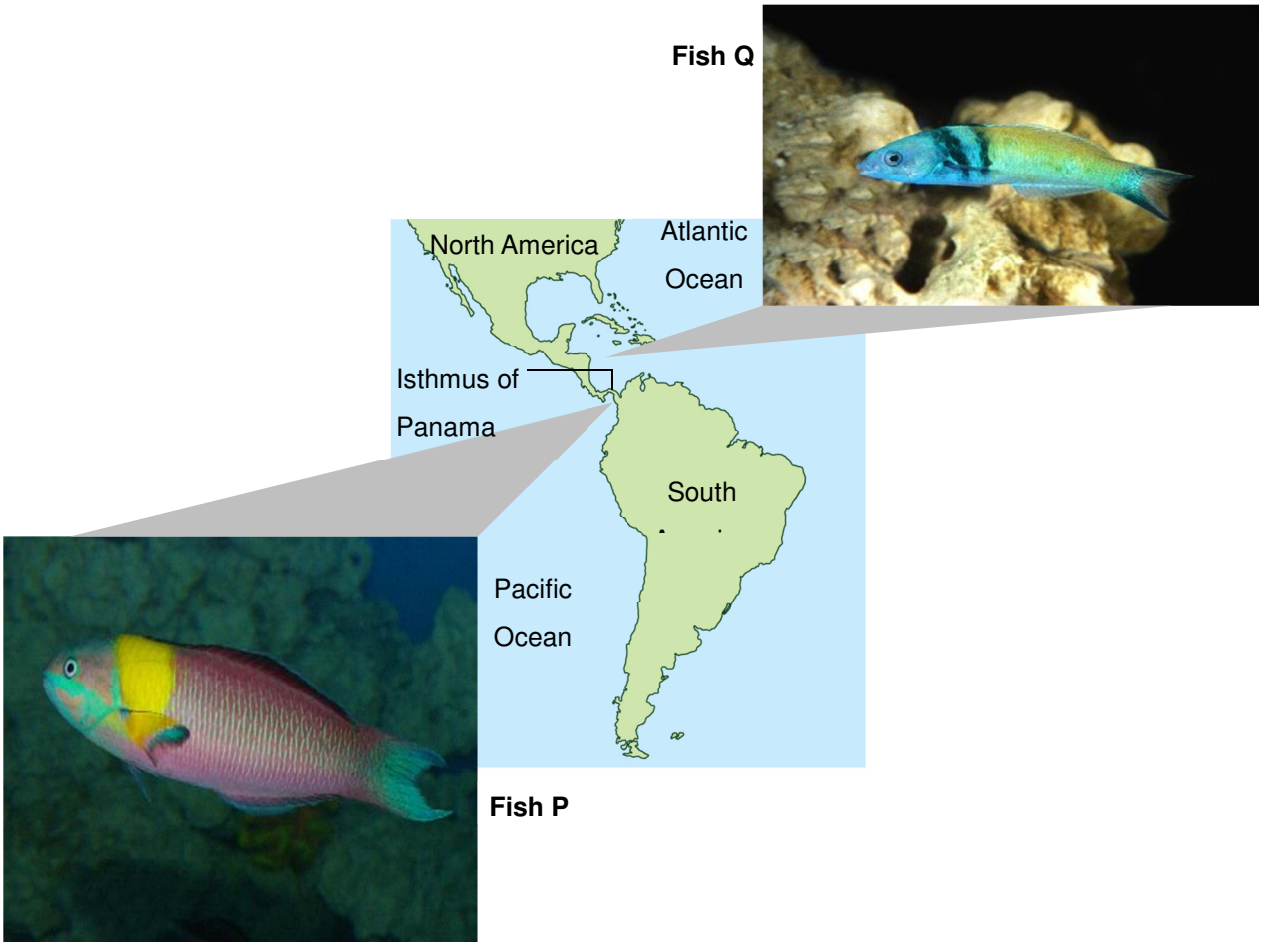
c The table below shows the codons and the amino acids they code for. The amino acids are represented by their short forms.

UUU Phe	UCU Ser	UAU Tyr	UGU Cys
UUC Phe	UCC Ser	UAC Tyr	UGC Cys
UUA Leu	UCA Ser	UAA (Stop)	UGA (Stop)
UUG Leu	UCG Ser	UAG (Stop)	UGG Trp
CUU Leu	CCU Pro	CAU His	CGU Arg
CUC Leu	CCC Pro	CAC His	CGC Arg
CUA Leu	CCA Pro	CAA Gln	CGA Arg
CUG Leu	CCG Pro	CAG Gln	CGG Arg
AUU Ile	ACU Thr	AAU Asn	AGU Ser
AUC Ile	ACC Thr	AAC Asn	AGC Ser
AUA Ile	ACA Thr	AAA Lys	AGA Arg
AUG Met (Start)	ACG Thr	AAG Lys	AGG Arg
GUU Val	GCU Ala	GAU Asp	GGU Gly
GUC Val	GCC Ala	GAC Asp	GGC Gly
GUA Val	GCA Ala	GAA Glu	GGA Gly
GUG Val	GCG Ala	GAG Glu	GGG Gly

Using the information from the table above, state what amino acids P and V are.

(2 marks)

5 The diagram below shows the locations where two fish species (P and Q) are found in Central America at present.



Scientists believe that the two fish species evolved from a common ancestor after the formation of the Isthmus of Panama, a narrow strip of land that connects North America and South America, around 2.8 million years ago.

a Suggest how the two fish species might have evolved from the common ancestor.

(4 marks)

b The photographs below show two other fish species (R and S) which are also found in Central America.

Fish R

Fish S

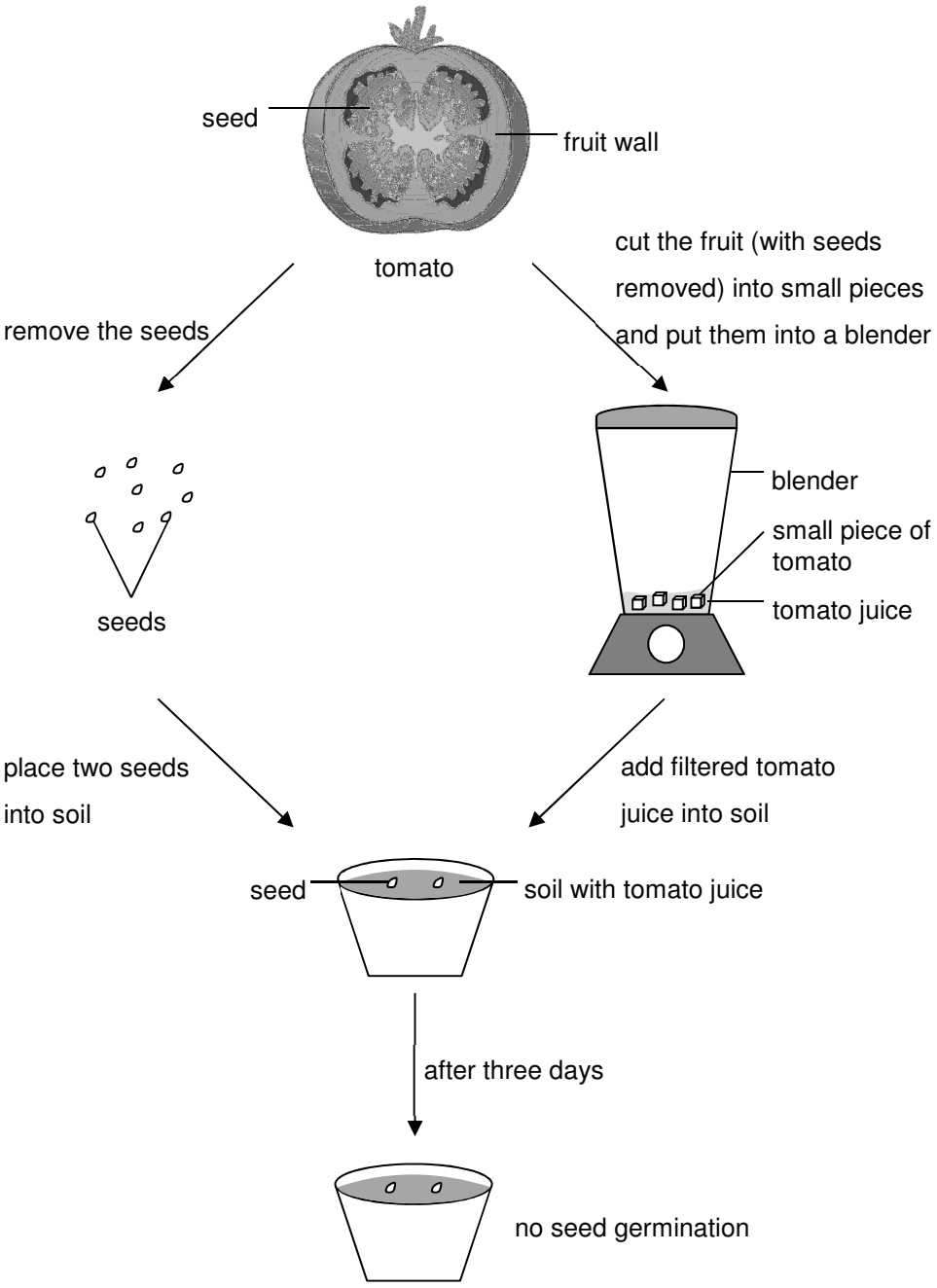
Based on the features shown in the photographs, complete the following dichotomous key so that it can be used to identify fish P, Q, R and S. (3 marks)

1	a	Without a vertical black stripe through the eye ……...	
1	b	With a vertical black stripe through the eye ……	

2	a		……... Fish P
2	b		……... Fish Q

3	a	Body with horizontal stripes ……..……..	
3	b	Body with vertical stripes ……..……..	

6 Andy wanted to grow tomato plants at home. He wondered if using tomato juice can promote the growth of tomato plants from seeds. The diagram below shows how he used tomato juice to grow tomatoes. To his surprise, no seed germinated after three days.



Andy hypothesized that the fruit wall of tomato contains certain substances that inhibit seed germination. He then carried out an experiment at the school to test his hypothesis. The main steps involved are shown below.

Step 1	Seeds were collected from four tomatoes.
Step 2	The seeds were washed thoroughly with distilled water and then blotted dry.
Step 3	The tomatoes were cut into small pieces, put into a mortar and ground using a pestle. Extract of tomato fruit wall was obtained after filtering the ground materials using a filter paper.
Step 4	10 tomato seeds were selected randomly and placed on cotton wool soaked with extract of tomato fruit wall.
Step 5	The seeds were provided with the conditions necessary for germination.
Step 6	The percentage of seeds germinated after three days was calculated.

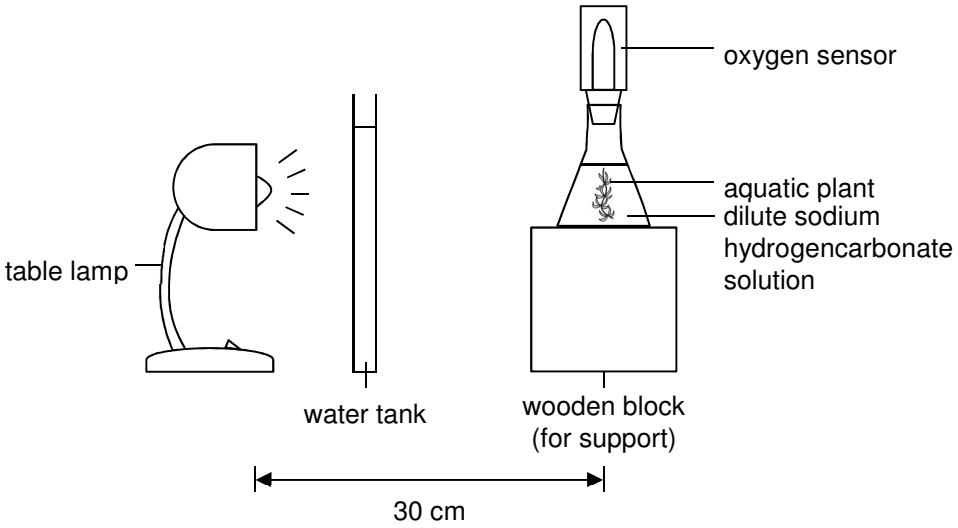
a Explain why it is important to wash the seeds thoroughly (Step 2) before placing them on cotton wool. (1 mark)

b Describe ***two*** conditions that should be provided to the seeds in Step 5 and their significance to seed germination. (2 marks)

c Andy forgot to include a control. If you were Andy, how would you set up a suitable control for this experiment? Explain your answer. (3 marks)

d Suggest ***one*** possible advantage of delaying seed germination by the fruit wall to tomato plants. (1 mark)

7 Jason carried out an investigation to study the effect of carbon dioxide concentration on the rate of photosynthesis of an aquatic plant. The set-up he used is shown in the diagram below.

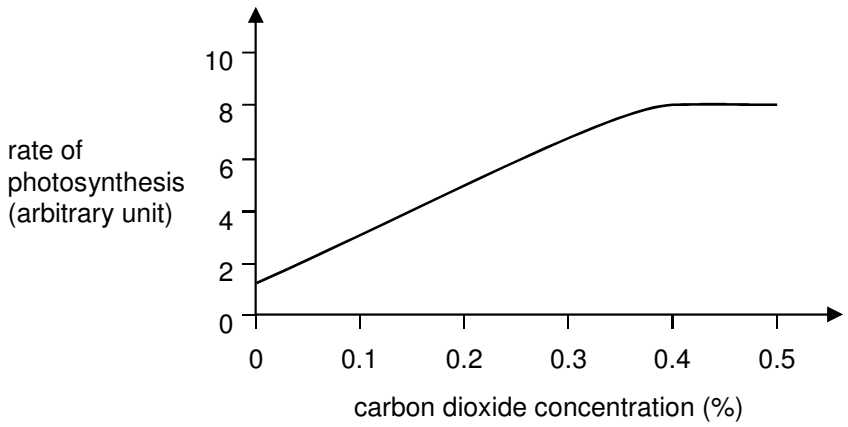


a Explain why placing a water tank between the table lamp and the conical flask is important for making the investigation a fair test. (2 marks)

b Describe how the independent variable of this investigation was manipulated. (1 mark)

c Each time Jason had manipulated the independent variable, he waited for five minutes before starting to record the readings of the oxygen sensor. Explain why. (1 mark)

d The graph below shows the results obtained by Jason.

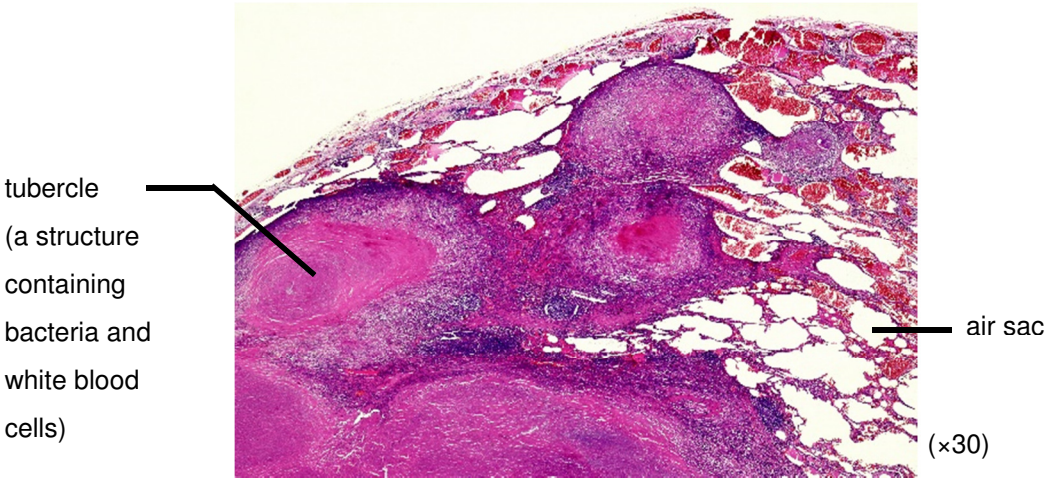


Based on your knowledge on the reactions of photosynthesis, describe and explain the change in the rate of photosynthesis when carbon dioxide concentration increased from 0% to 0.5%. (4 marks)

8 Tuberculosis (TB) is an infectious disease caused by the bacterium Mycobacterium tuberculosis. It is transmitted by air and usually affects the lungs.

a The bacterium M. tuberculosis can cause TB only if it reaches the air sacs of the lungs. Describe how the defence mechanism of our body prevents this from occurring. (2 marks)

The photomicrograph below shows a section of the lung of a person suffering from TB.



b With reference to the photomicrograph, explain why TB patients usually experience shortness of breath. (2 marks)

c Another common symptom of TB is coughing up blood. Explain why TB patients usually have blood in their sputum. (1 mark)

d Treating TB is becoming more and more challenging as M. tuberculosis has developed resistance to an increasing number of antibiotics. For patients with active TB, multiple antibiotics are often prescribed for at least six months.

i Explain why multiple antibiotics are used in the treatment. (1 mark)

ii What reminders should be given to patients who are undergoing the antibiotic treatment of TB so that the antibiotics currently in use can remain effective in treating TB for a longer time? Give ***two*** examples. (2 marks)

e Suggest ***one*** measure that individual citizen and the government can take to help prevent the spread of TB respectively.

i Individual citizen (1 mark)

ii Government (1 mark)

9 An ecological study was carried out to study the distribution and abundance of two plant species (X and Y) found in a woodland of city P. The table below shows the results.

Distance from the edge of woodland (m)	**Abundance** (percentage cover)	
	Species X	**Species Y**
0	85	0
5	63	0
10	40	8
15	18	21
20	5	34
25	2	42
30	0	50

a i Describe how the data above were collected. (4 marks)

ii The photographs below show the appearance of species X and Y.

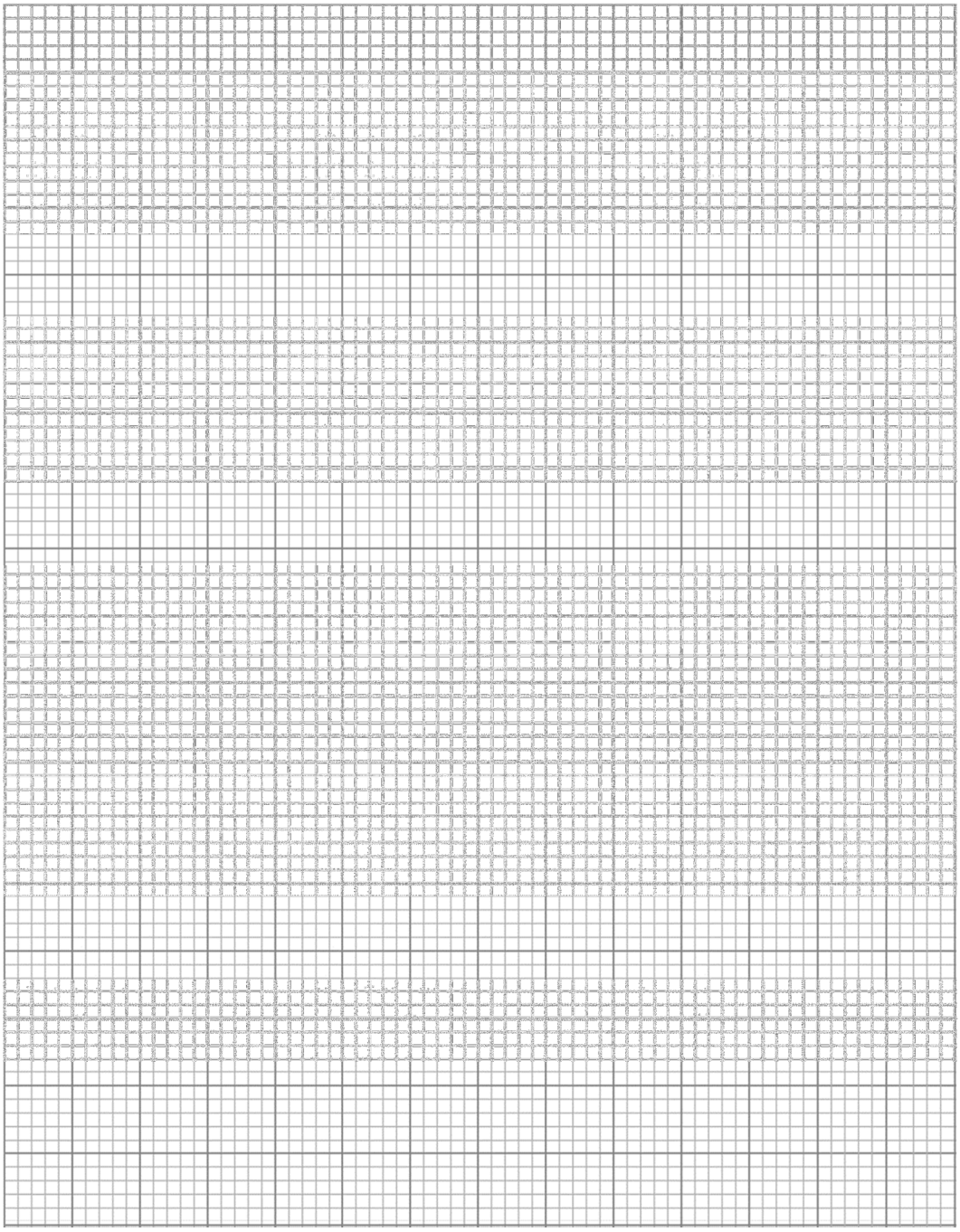
species X

species Y

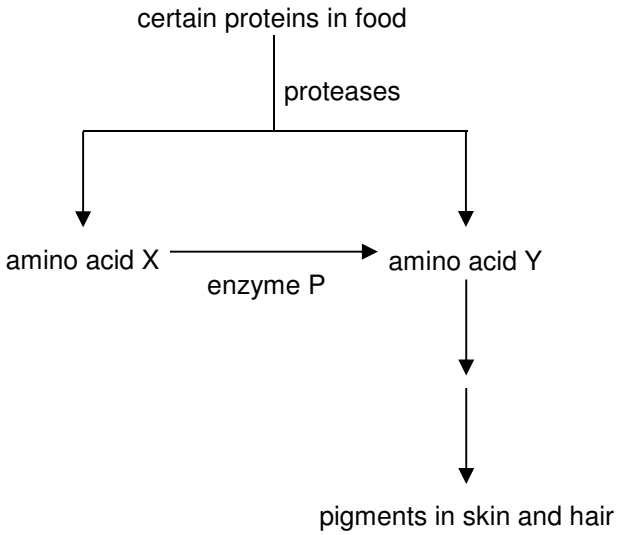
With reference to the photographs above, explain why the abundance of the two species is measured in percentage cover, instead of the number of individual plants, in this study. (1 mark)

b Using the graph paper on the next page (p.41), plot a graph to show the results of this study. (5 marks)

c City P is undergoing rapid urbanization and large areas of the woodlands will be destroyed to create lands for building houses and infrastructure. Deduce, with reasons, which plant species (X or Y) would be more abundant in the city in the future. (2 marks)



10 The diagram below shows part of the metabolic pathways involving two amino acids, X and Y, in the human body. Amino acid Y is important for the synthesis of pigments in the skin and hair.



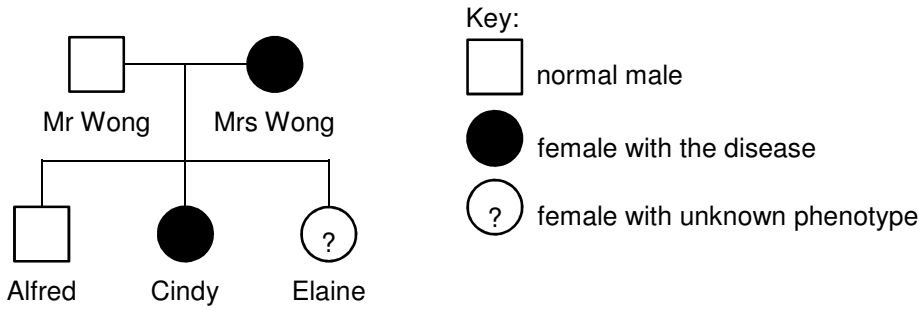
People suffering from a certain genetic disease cannot produce functional enzyme P. It is known that the inheritance of this disease is controlled by a pair of alleles. The disease can be diagnosed by measuring the levels of amino acids X and Y in blood. The table below shows the normal range of the ratio between the two amino acids and the typical range in patients with this genetic disease.

	Normal range	**Typical range in patients with the genetic disease**
Ratio of amino acid X to amino acid Y in blood	0.5–2.0	>2.6

a Explain the difference in the ratio of amino acid X to amino acid Y in blood between patients with the genetic disease and healthy people. (4 marks)

b Explain why most patients with the genetic disease have lighter skin tone and hair colour than healthy people. (2 marks)

c The pedigree below shows the inheritance of the genetic disease in a family. It is known that the disease is caused by a recessive allele.



i Deduce the genotype of Mr Wong. Explain your deduction. (4 marks)
(Marks will ***not*** be awarded for genetic diagrams.)

ii Mrs Wong has just given birth to Elaine. The couple thinks that the probability of Elaine being normal is 50% as one out of two of their children is normal. Do you agree with them? Explain your answer. (2 marks)

You are required to present your answer to the following question in essay form. Criteria for marking will include relevant content, logical presentation and clarity of expression.

11 Water is essential for the survival of all living forms on earth. Describe how water is transported in humans and in terrestrial plants. Illustrate, with examples, the role of water as a transport medium for materials in humans and in terrestrial plants. (12 marks)

– END OF PAPER –