Name		Index Number		Class	

ST. ANTHONY'S CANOSSIAN SECONDARY SCHOOL
Preliminary Examination 2020
Secondary 4 Express

BIOLOGY **6093 / 01**

Paper 1 Multiple Choice 21 September 2020

Setter: DR YAP ANN TECK 1 hour

Candidates are to answer on the Answer Sheet.
Additional Materials: Multiple Choice Answer Sheet

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 Answer Sheet in the spaces provided unless this has been done for you.

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 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.
The use of an approved scientific calculator is expected, where appropriate.
The number of marks is given in brackets [ ] at the end of each question or part question.

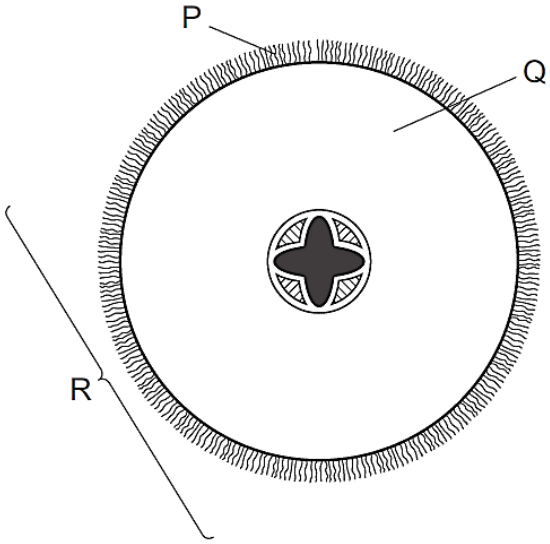
40

Parent's signature:

1 Which pair of statements best explains why plant cells are more angular in shape than animal cells?

	plant cells	animal cells
A	cell wall present	cell wall absent
B	chloroplast present	chloroplast absent
C	one or more large vacuoles	small or no vacuoles
D	thin layer of cytoplasm	dense cytoplasm throughout cell

2 The diagram shows a section through a root.



What are the levels of organisation of the labelled structures?

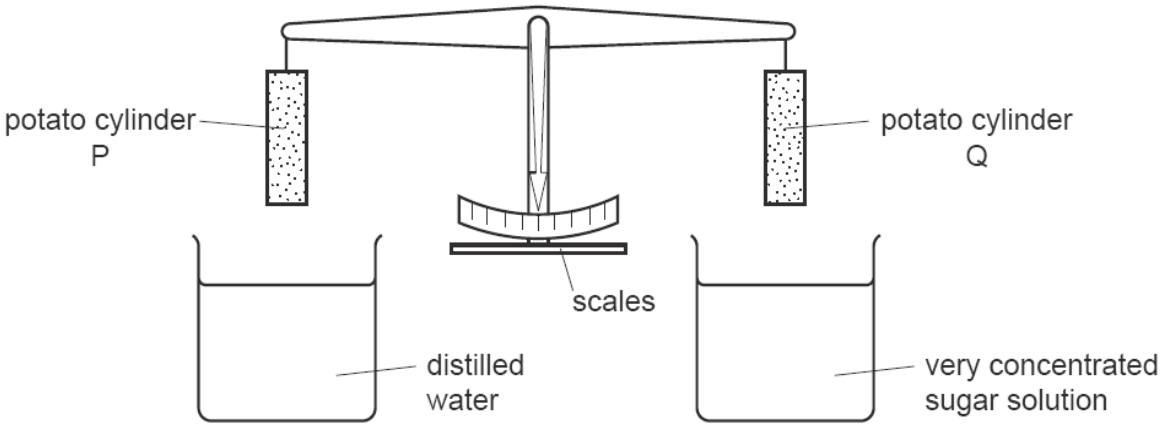
	cell	organ	tissue
A	P	Q	R
B	P	R	Q
C	Q	R	P
D	R	Q	P

3 A plant is growing in a fertile, well-watered soil. It is absorbing nitrate ions by active transport and water by osmosis.

How do the concentrations of nitrate ions and water in the plant's roots compare to the concentrations in the soil?

	concentration of nitrate ions in the roots	concentration of water in the roots
A	higher	higher
B	higher	lower
C	lower	higher
D	lower	lower

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



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

Which statement explains what happened?

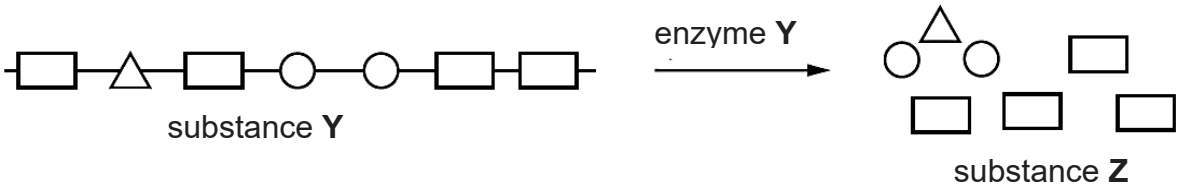
A Water moved into both cylinders.

B Water moved out of both cylinders.

C Water moved into the cylinder in the distilled water and out of the cylinder in the sugar solution.

D Water moved out of the cylinder in the distilled water and into the cylinder in the sugar solution.

5 The diagram shows a large food molecule changing into smaller molecules.



What are the identities of substance **X**, enzyme **Y** and substance **Z**?

	substance **X**	enzyme **Y**	substance **Z**
A	cellulose	cellulase	glucose
B	lipid	lipase	fatty acids and glycerols
C	polypeptide	protease	amino acids
D	starch	amylase	maltose

6 Six test-tubes were set up at different pH values. They each contained the same quantity of starch and amylase in water. The table shows the time taken for the reaction to be completed in each test-tube.

pH	1	3	5	7	9	11
time to be completed / s	95	64	42	5	35	66

At which pH does the amylase work best?

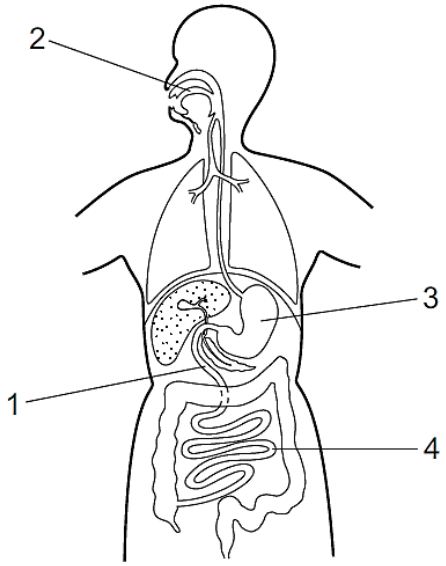
A pH 1

B pH 5

C pH 7

D pH 11

7 The diagram shows the alimentary canal and some associated organs.



Which row shows where amylase is released?

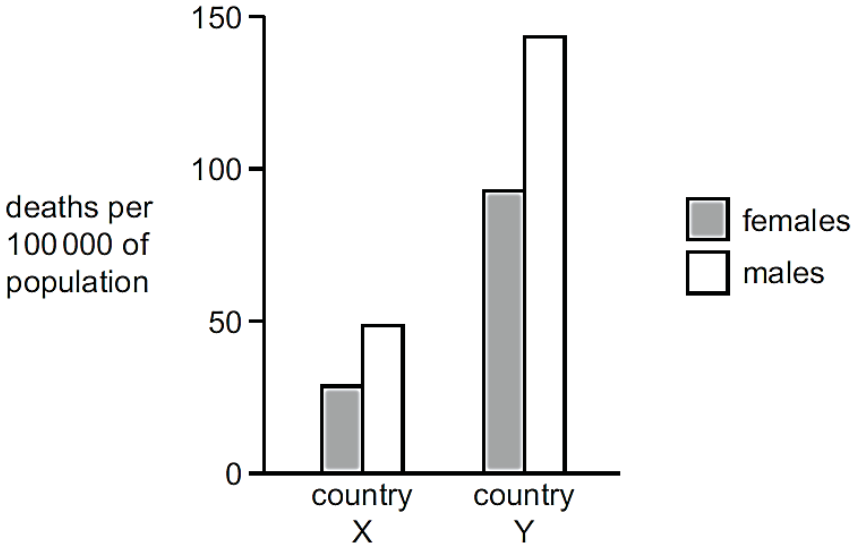
	1	2	3	4
A	✓	✓	×	×
B	✓	×	✓	×
C	×	✓	✓	×
D	×	✓	×	✓

key

✓= yes

×= no

8 The graph shows the death rates from liver disease in two different countries.



What could explain the difference between the two countries?

A fewer males in country X

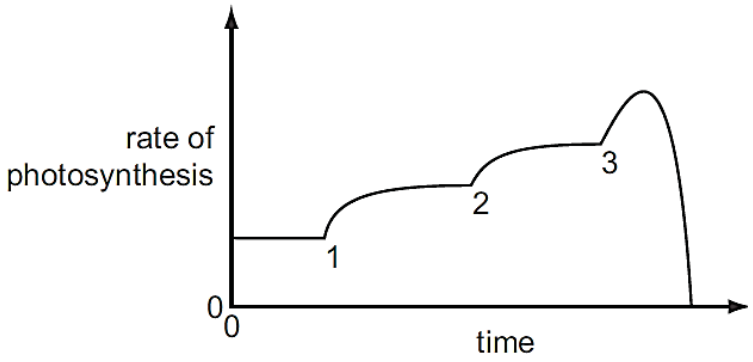
B less consumption of fatty foods in country Y

C less drinking of alcohol in country X

D more infectious disease in country Y

9 Temperature, light intensity and carbon dioxide concentration are three limiting factors in photosynthesis.

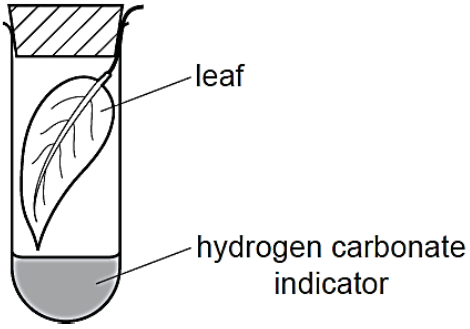
In an experiment, each factor is increased in turn. The graph shows the results.



Which numbered points represent when each factor was increased?

	carbon dioxide concentration	light intensity	temperature
A	1	2	3
B	2	3	1
C	3	1	2
D	3	2	1

10 A freshly picked leaf is placed in a sealed test-tube with some hydrogen carbonate indicator solution. The tube is kept in the light during the day. The indicator changes colour as shown.

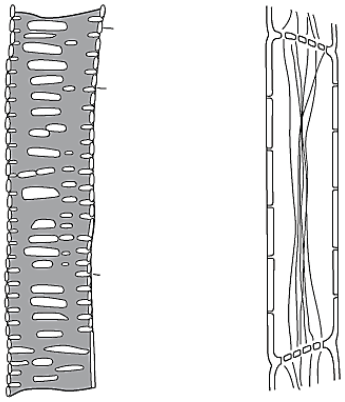


colour	amount of carbon dioxide compared to average atmospheric concentration
purple	less than normal
red	normal
yellow	more than normal

Which colour will the hydrogen carbonate indicator be at midday and at midnight?

	at midday	at midnight
A	purple	yellow
B	red	purple
C	yellow	purple
D	yellow	red

11 The diagram shows two plant cells, X and Y, drawn to different scales.



X Y

Samples of the contents of X and Y were tested.

What results are expected?

	X		Y	
	Benedict's reagent	iodine	Benedict's reagent	iodine
A	+	+	+	+
B	+	-	+	-
C	-	+	-	+
D	-	-	-	-

key

– = negative result

+ = positive result

12 In an experiment to compare water loss, four similar leaves are treated with petroleum jelly (Vaseline) and left on a table for one hour.

leaf 1 upper surface only covered

leaf 2 lower surface only covered

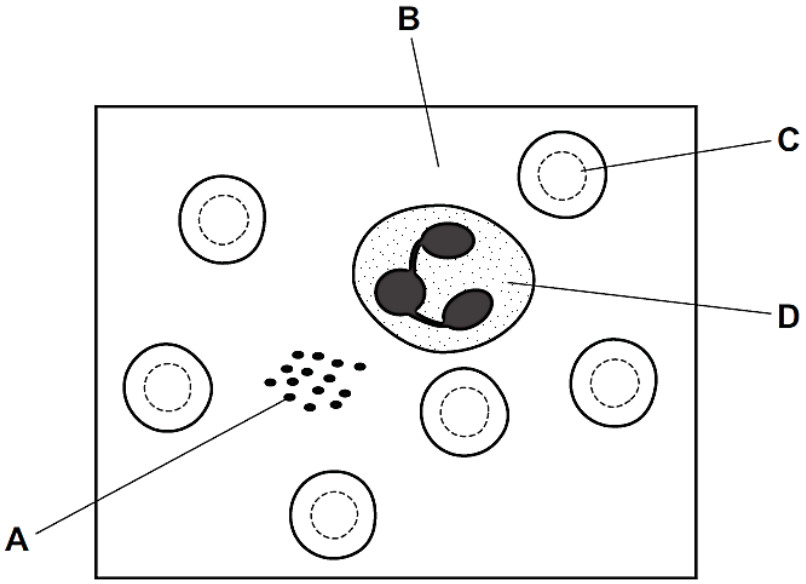
leaf 3 both surfaces covered

leaf 4 neither surface covered

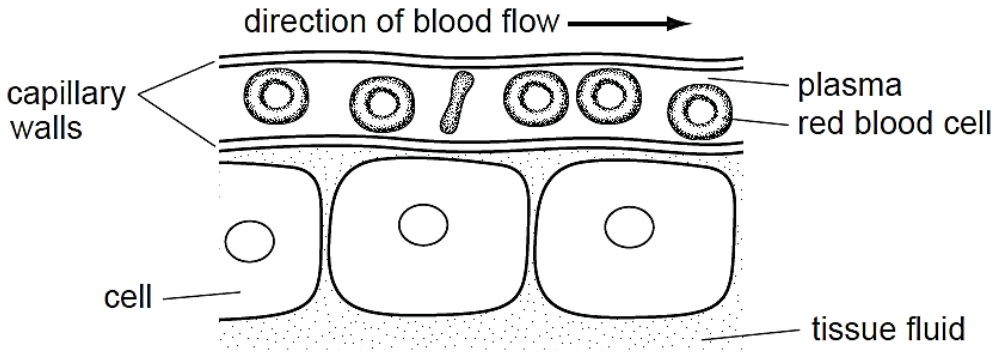
Which shows the water loss from the leaves?

	water loss most → least			
A	1	4	3	2
B	1	2	4	3
C	4	3	1	2
D	4	1	2	3

13 The diagram shows human blood as seen through a light microscope.
A person's blood is unable to clot.
Which component of the blood is **not** functioning properly?



14 The diagram shows a blood capillary close to some tissue cells bathed in tissue fluid. Exchange of nutrients takes place here.

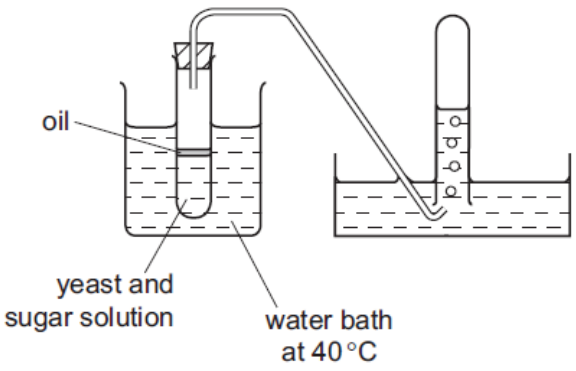


Which row shows the type of nutrient in the plasma and in the tissue fluid and the method of transfer between the two?

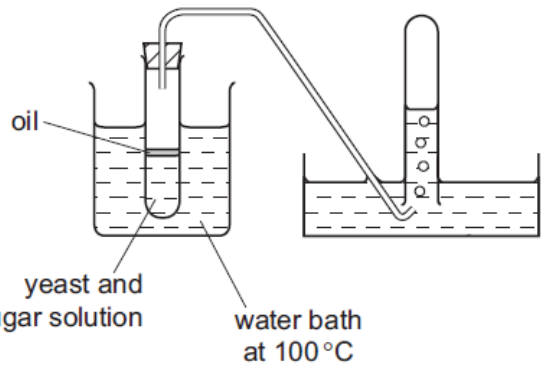
	plasma	tissue fluid	method of transfer
A	amino acid	amino acid	diffusion
B	amino acid	protein	osmosis
C	protein	amino acid	digestion
D	protein	protein	active uptake

15 Which apparatus can be used to investigate the production of carbon dioxide by anaerobic respiration of yeast?

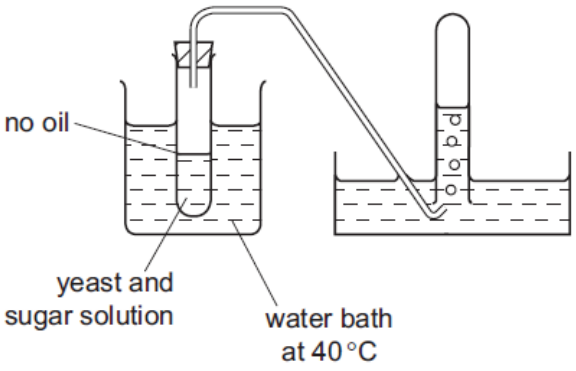
A



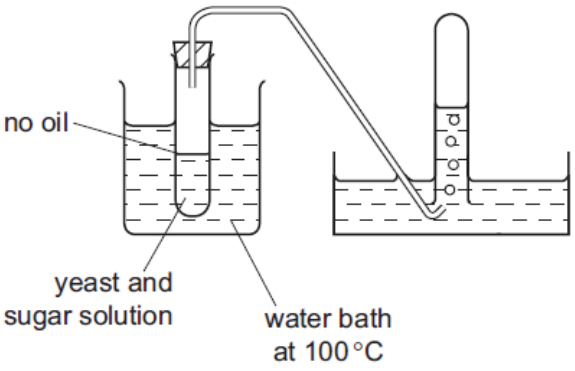
B



C



D



16 The table shows the death rates from lung cancer amongst smokers and non-smokers.

average number of cigarettes smoked per day	deaths from lung cancer per year per 100 000 people
0	10
1-14	78
15-25	127
26 or more	251

What can be concluded from the data?

A People who get lung cancer are likely to be smokers of 26 or more cigarettes per day.

B People who do not smoke will not get lung cancer.

C People who smoke have a higher chance of getting lung cancer.

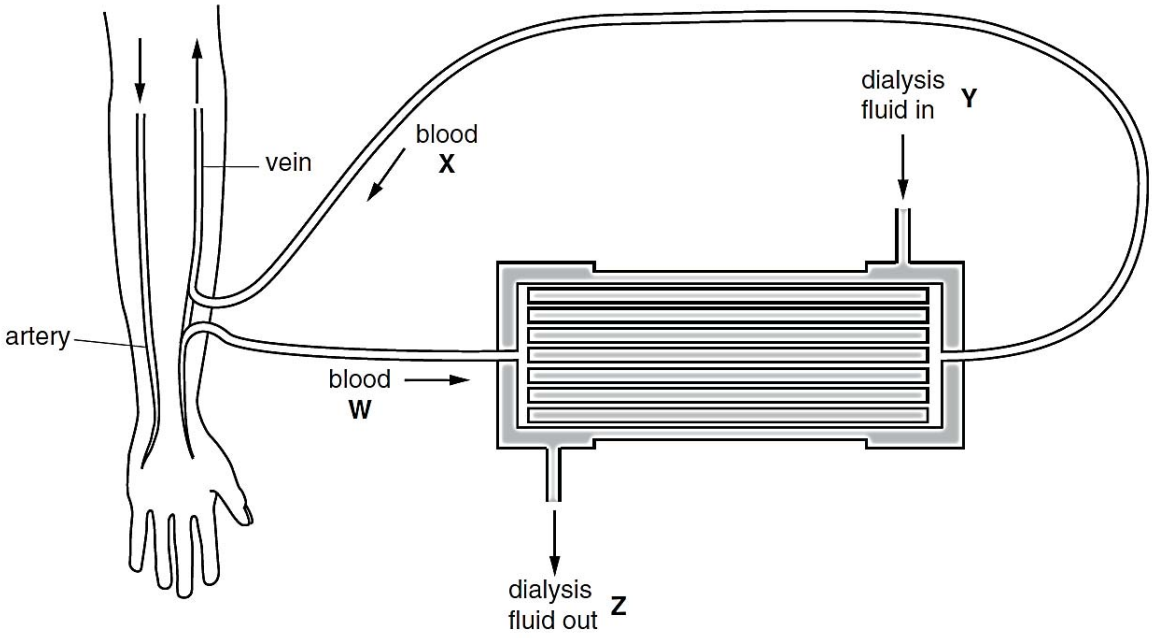
D Smoking causes lung cancer.

17 A person drinks a large amount of water.

How does this affect the water potentials of the liquids in the renal arteries, the renal veins and the ureters?

	water potential in renal arteries	water potential in renal veins	water potential in ureters
A	higher	higher	higher
B	higher	little change	higher
C	lower	lower	little change
D	lower	lower	lower

18 The diagram shows the flow of blood and dialysis fluid through a kidney machine.



Where would the concentration of urea be highest?

A **W** and **X**

B **X** and **Y**

C **Y** and **Z**

D **Z** and **W**

19 Which of these correct statements describes control by negative feedback?

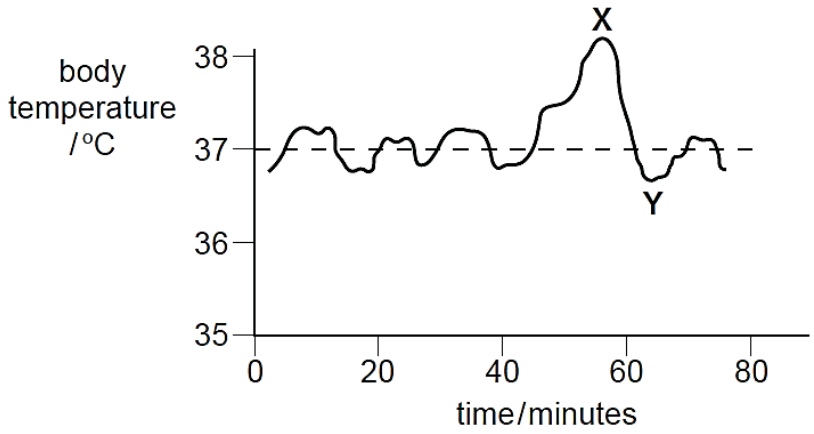
A An injury to body tissue activates platelets in the blood and these activated platelets release chemicals which activate more platelets.

B During the menstrual cycle, luteinising hormone stimulates the release of oestrogen which in turn stimulates the release of more luteinising hormone.

C The onset of contractions during childbirth causes the release of a hormone which stimulates further contractions.

D When blood pressure is high, nerve impulses from the brain cause the blood vessels to dilate and blood pressure is reduced.

20 The graph shows changes in a person's body temperature plotted against time.



What causes the change in temperature between **X** and **Y**?

A increased air temperature

B increased evaporation of sweat

C reduced blood flow through surface capillaries

D shivering

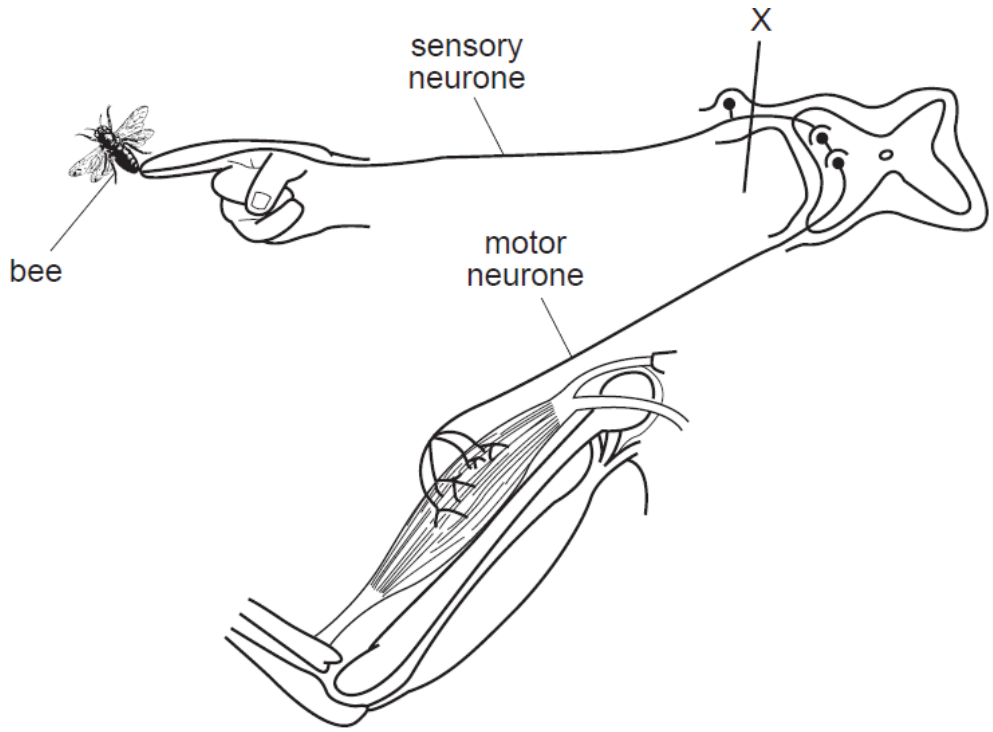
21 Three directions in which nerve impulses can travel in the nervous system are listed.

1. away from the central nervous system
2. towards the central nervous system
3. within the central nervous system

In which direction do impulses in sensory and relay (intermediate) neurones travel?

	sensory neurone	relay neurone
A	1	2
B	1	3
C	2	1
D	2	3

22 The diagram shows part of a person's nervous system that has been cut at X.

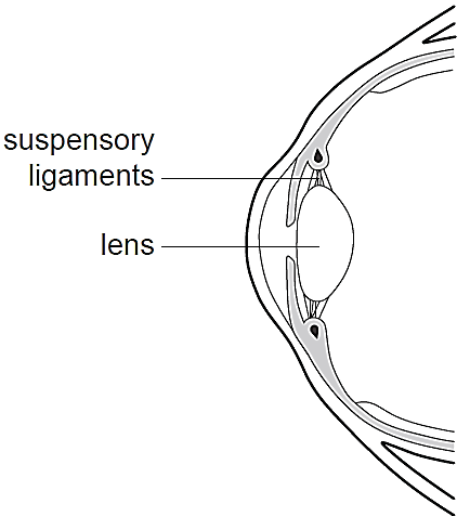


A bee stings the finger, as shown.

What are the effects of this sting on the person?

	pain felt	arm moved
A	no	no
B	no	yes
C	yes	no
D	yes	yes

23 The diagram shows a section through part of the human eye.

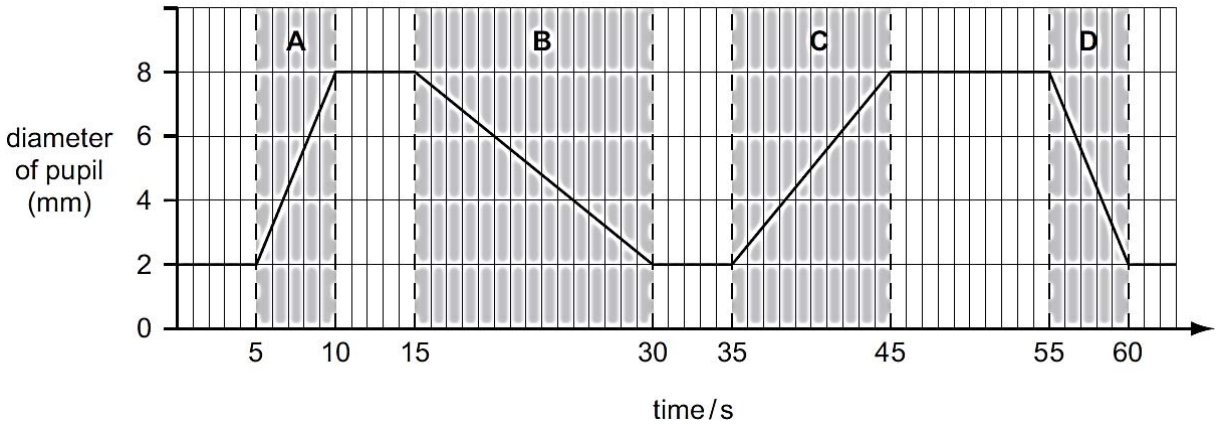


When a person looks at an object which is close to their eye, which of the following takes place?

	suspensory ligaments	lens
A	slacken	becomes more convex
B	slacken	becomes less convex
C	tighten	becomes more convex
D	tighten	becomes less convex

24 The diameter of a person's pupil is measured as the light intensity is varied.

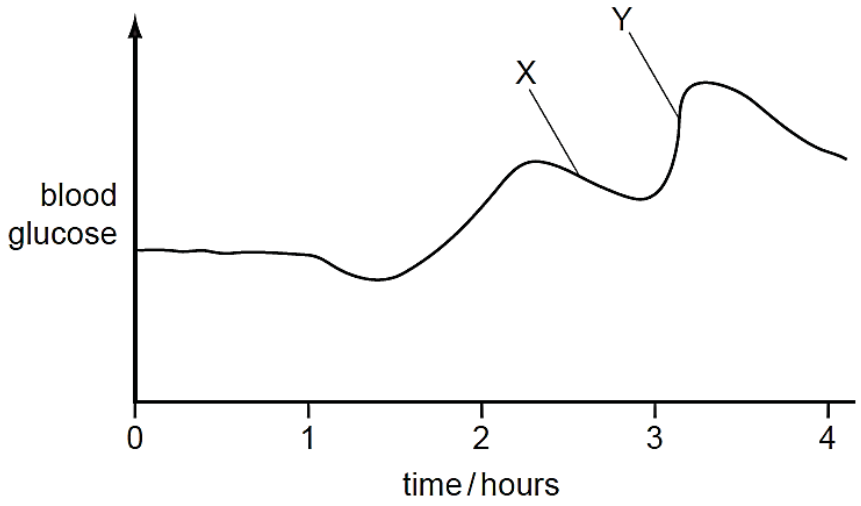
During which time period does the light intensity increase fastest?



25 When a person is frightened which responses will occur?

A	adrenaline released	heart beat increases	eye pupils dilate
B	adrenaline released	blood glucose increases	urine production increases
C	insulin released	breathing rate increases	peristalsis stops
D	insulin released	eye pupils dilate	saliva secretion stops

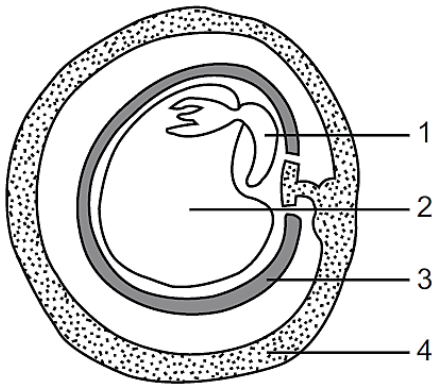
26 The graph shows changes in a person's blood glucose concentration over four hours.



What might cause the changes at X and Y?

	X	Y
A	decreased insulin	decreased adrenaline
B	decreased insulin	increased adrenaline
C	increased adrenaline	increased insulin
D	increased insulin	increased adrenaline

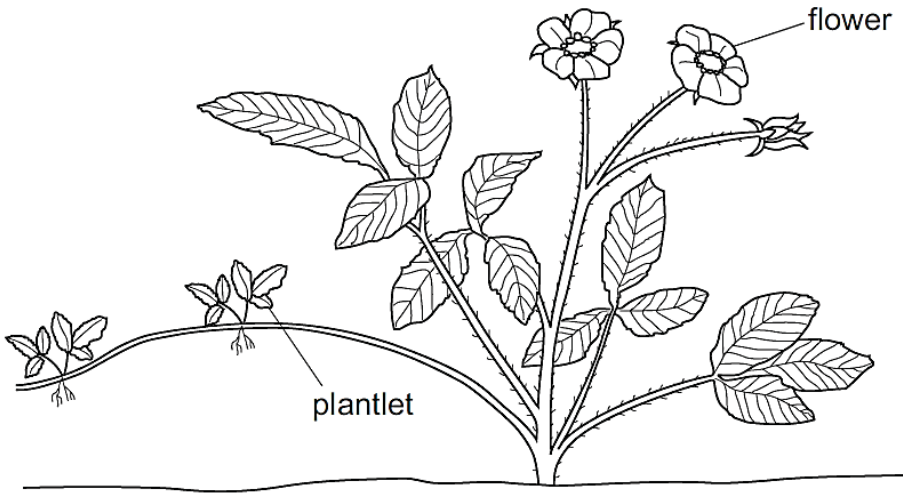
27 The diagram shows a section through a fruit containing a seed.



What are the labelled parts?

	1	2	3	4
A	cotyledon	radicle	pericarp	testa
B	cotyledon	radicle	testa	pericarp
C	radicle	cotyledon	pericarp	testa
D	radicle	cotyledon	testa	pericarp

28 The diagram shows a plant that is producing small plantlets.



Which statement about the plantlets is correct?

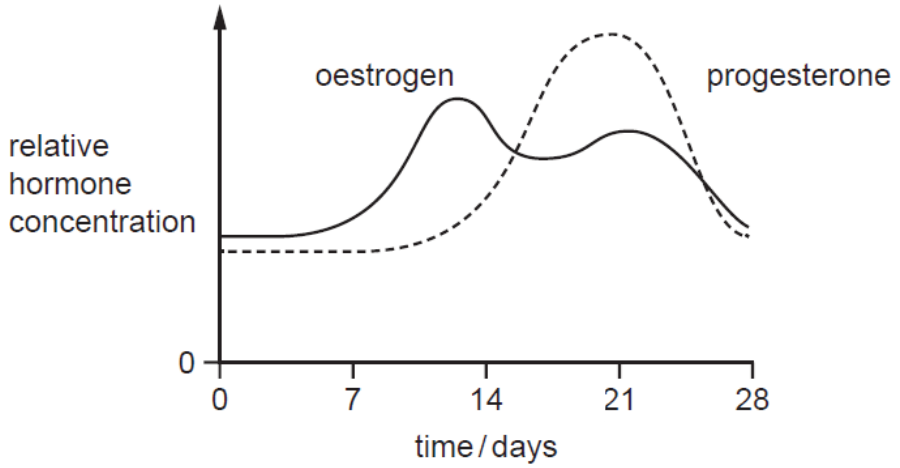
A They are genetically different from the parent plant.

B They are genetically identical to the parent plant.

C They are produced as a result of the fusion of nuclei.

D They are produced by fertilising the flowers.

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



Assuming ovulation occurs on day 14, what is occurring at the time of ovulation?

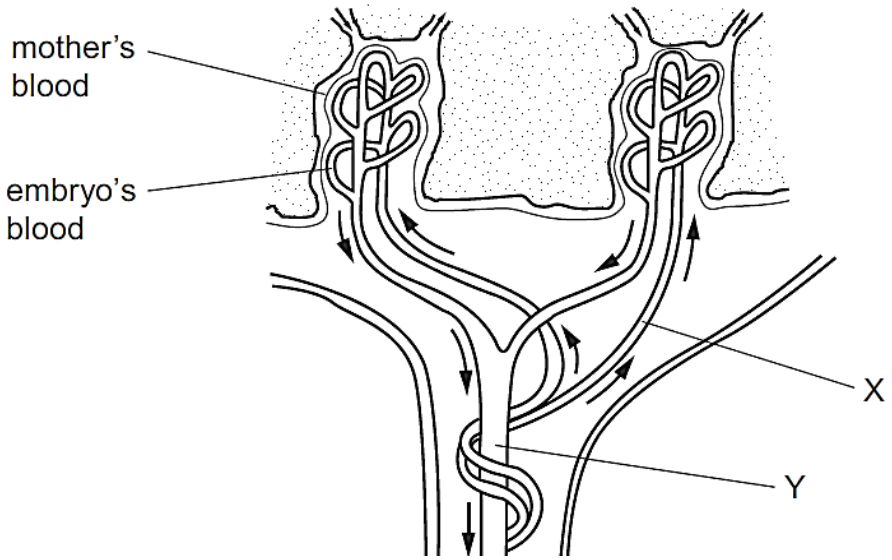
A a fall in the levels of oestrogen and progesterone

B a fall in the level of progesterone only

C a rise in the level of oestrogen

D a rise in the level of progesterone and fall in the level of oestrogen

30 The diagram shows how the blood of a human embryo flows close to the mother's blood in the placenta.



Which substances are present at X in higher concentrations than at Y?

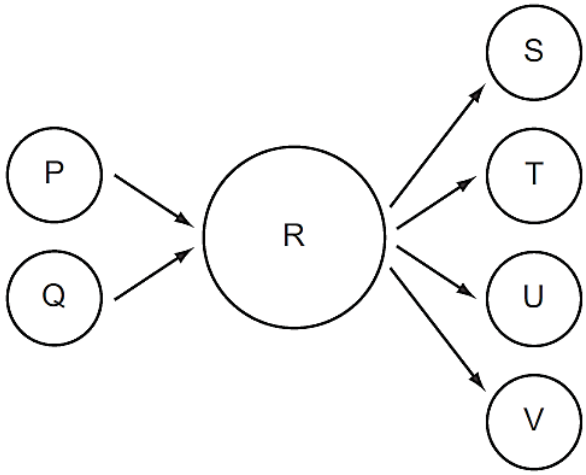
A carbon dioxide and glucose

B carbon dioxide and urea

C glucose and oxygen

D glucose and urea

31 The diagram represents gametes P and Q fusing to give cell R. Cell R then produces gametes S, T, U and V.



Which statement about the numbers of chromosomes in the cells and gametes is correct?

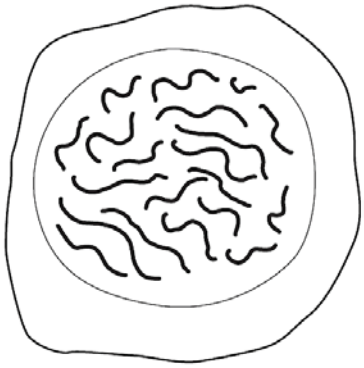
A The numbers of chromosomes in P and Q are different.

B The numbers of chromosomes in P and S are the same.

C The number of chromosomes in S is one quarter of the number of chromosomes in R.

D The number of chromosomes in T is half the number of chromosomes in Q.

32 The diagram shows a cell of an organism formed by reduction division. The nucleus contains 20 chromosomes.



What is the diploid number for this organism?

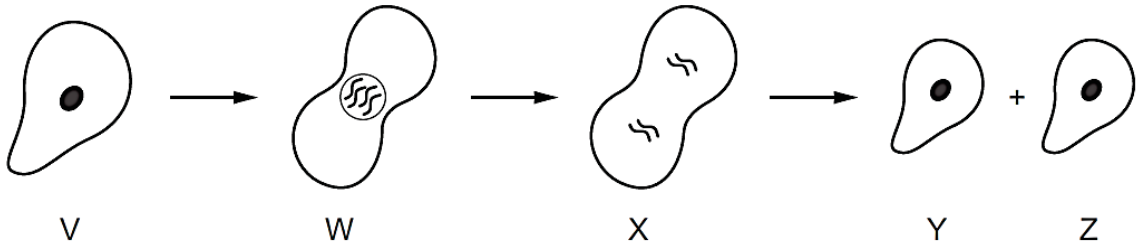
A 10

B 20

C 40

D 46

33 The diagram shows some stages during the asexual reproduction of a single-celled organism.



Which row correctly shows the relative amounts of DNA in each of the cells V, W, X, Y and Z?

	V	W	X	Y	Z
A	1	1	1	2	2
B	1	1	2	1	1
C	1	2	2	1	1
D	2	1	1	2	2

34 Which statement about chromosomes is correct?

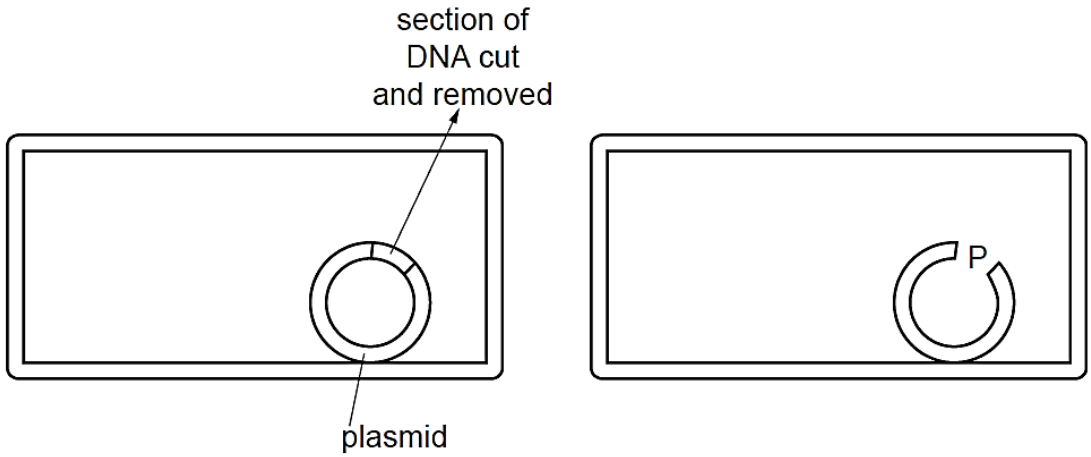
A Chromosomes are long DNA molecules called genes which are divided into sections.

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.

35 The diagram shows a bacterium whose plasmid is being used during genetic engineering to produce human insulin.



What is inserted at P so that the bacterium can produce human insulin, and which enzyme is used to catalyse the insertion?

A a section of human DNA, using DNA ligase

B a section of human DNA, using restriction enzymes

C a section of human mRNA, using DNA ligase

D a section of human mRNA, using restriction enzymes

36 Which statements about genetically engineered plants show potential benefits?

1 The increased yield from genetically engineered plants allows a smaller area of land to be farmed.

2 Genetically engineered plants may have improved nutritional value.

3 Some plants can be genetically modified to give resistance to diseases.

4 Cross-pollination with weeds could produce new varieties of weeds.

5 The use of genetically engineered crops may explain the increase in allergies in children.

6 There is more research needed on the long term effects of genetically engineered crops on the environment.

A 1, 2 and 3

B 1, 5 and 6

C 2, 3 and 4

D 4, 5 and 6

37 Two heterozygotes are crossed. Some of the offspring show the recessive characteristic.

What is the probability that the offspring that show the recessive characteristic are homozygous?

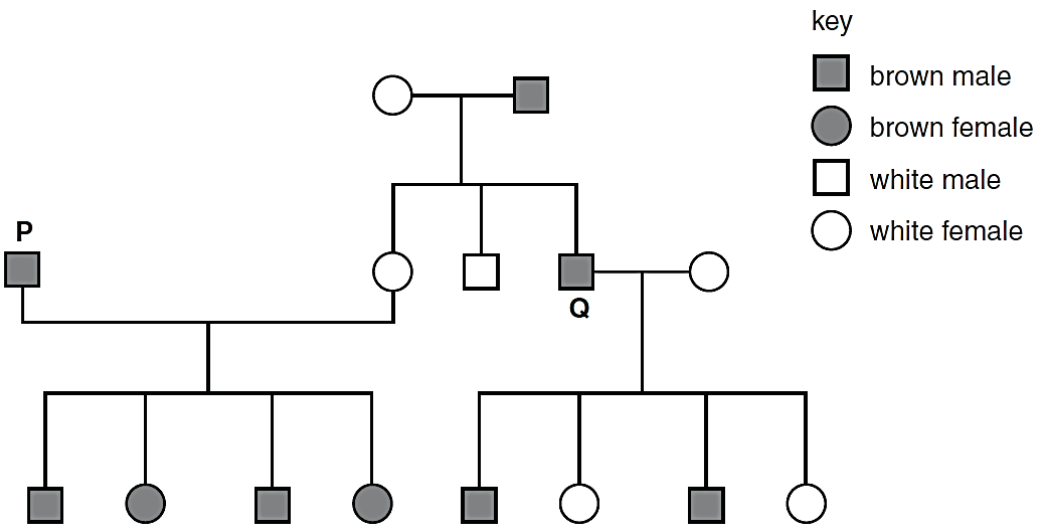
A 0.00

B 0.25

C 0.50

D 1.00

38 The chart shows the inheritance of coat colour in mice. The allele for brown coat, **B**, is dominant to the allele for white coat, **b**.

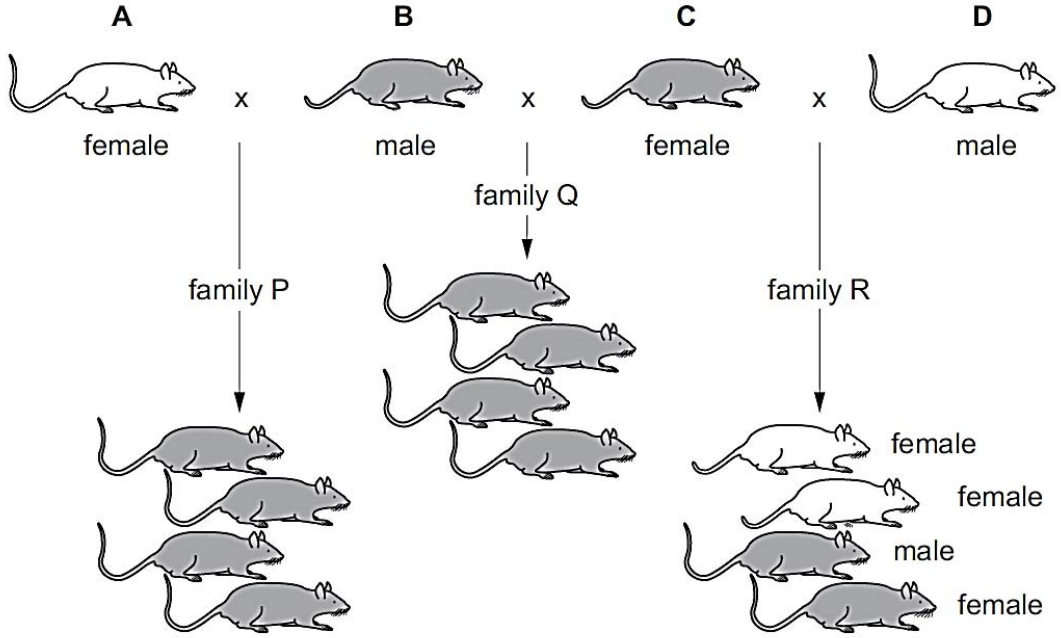


What are the most likely genotypes of the individuals **P** and **Q**?

	P	**Q**
A	BB	BB
B	BB	Bb
C	Bb	BB
D	Bb	Bb

39 The diagram shows the inheritance of coat colour in mice.

Which mouse is heterozygous for coat colour?



40 Some fruit flies have orange eyes and others have red eyes.

If two orange-eyed fruit flies are crossed, their offspring always have orange eyes.

If two red-eyed fruit flies are crossed, their offspring sometimes include both orange-eyed and red-eyed flies.

What can be concluded from these observations?

A Crossing an orange-eyed fly with a red-eyed fly will produce a 1 : 1 ratio in the offspring.

B The allele for orange eyes is dominant.

C The allele for red eyes is dominant.

D We could determine which allele is dominant only by doing a cross that produces a 3 : 1 ratio.

END OF PAPER 1

Name		Index Number		Class	

ST. ANTHONY'S CANOSSIAN SECONDARY SCHOOL
Preliminary Examination 2020
Secondary 4 Express

BIOLOGY **6093 / 02**

Paper 2 Biology 15 September 2020

Setter: DR YAP ANN TECK 1 hour 45 minutes

Candidates are to answer on the Question Paper.
No Additional Materials are required.

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.
You may use an HB pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, glue or correction fluid.

Section A:
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section B:
Write your answers in the spaces provided on the Question Paper.
Answer **all** questions.
Questions assessing CLT will be removed from Section B of Paper 2.
Candidates will answer all questions in **Section B** with **no question option** in the last question.

The use of an approved scientific calculator is expected, where appropriate.
You are advised to spend no longer than one hour on Section A and no longer than 45 minutes on Section B.

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

For Examiner's Use	
MCQs	/40
Section A	/50
Section B	/30
Total	/120

Section A [50 marks]

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

1 When a strip of filter paper is soaked in cobalt chloride solution, it is pink when damp and turns blue when dry.

Fig. 1.1 shows strips of dry cobalt chloride paper on the upper and lower surfaces of a leaf, pressed between dry glass slides.

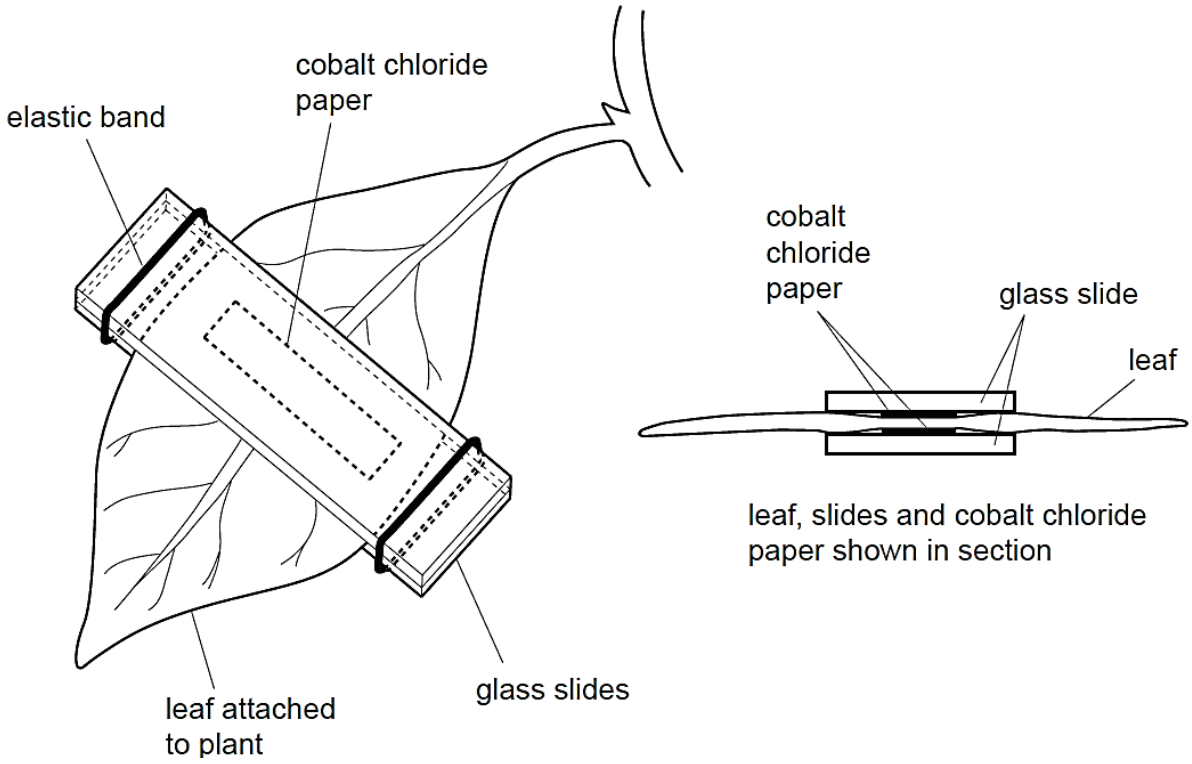


Fig. 1.1

A student used this method to investigate the time taken for strips of cobalt chloride paper to turn from blue to pink. The experiment was performed five times. The results are shown in Table 1.1.

Table 1.1

experiment number	time (in minutes) taken for paper to change from blue to pink	
	upper surface	lower surface
1	10	3
2	13	4
3	4	3
4	11	4
5	12	3

(a) (i) State the most likely conclusion that could be drawn from the results of experiments 1, 2, 4 and 5.

.....

..... [1]

(ii) Suggest an explanation for the results of these experiments

for the upper surface of the leaf,

.....

.....

.....

for the lower surface of the leaf.

.....

.....

..... [4]

(b) Suggest **two** possible reasons for the result obtained for the strip attached to the upper surface of the leaf in experiment 3.

1. .....

2. ..... [2]

(c) Suggest how the student could improve the reliability of this experiment.

.....

..... [1]

(d) Suggest how the student could show that the concentration of water vapour coming out of a leaf is greater than its concentration in the atmosphere.

.....

..... [2]

[Total: 10]

2 Fig. 2.1 is a graph that shows the percentage of males and females in different age groups that smoke cigarettes every day.

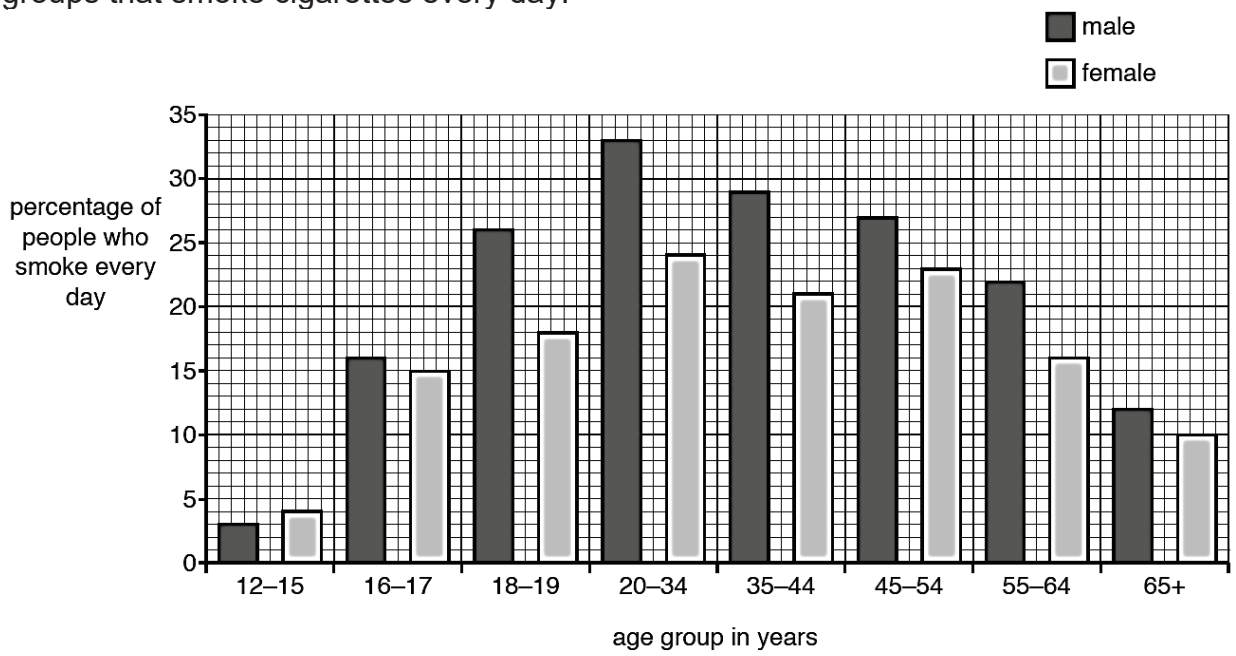


Fig. 2.1

Use Fig. 2.1 to answer these questions.

(a) **(i)** State the age group **and** gender that is most likely to smoke cigarettes every day.

.....

[1]

(ii) State the percentage of 55–64 year old females who smoke cigarettes every day.

.....

[1]

(b) Table 2.1 shows the components of cigarette smoke.

Complete Table 2.1 to show the effects of the components of cigarette smoke on the body.

Table 2.1

component in cigarette	smoke effect on the body
carbon monoxide	
tar	
nicotine	

[3]

(c) Smoking is one of the risk factors that contributes to coronary heart disease.
Fig. 2.2 shows an external view of the heart of a person who has coronary heart disease.

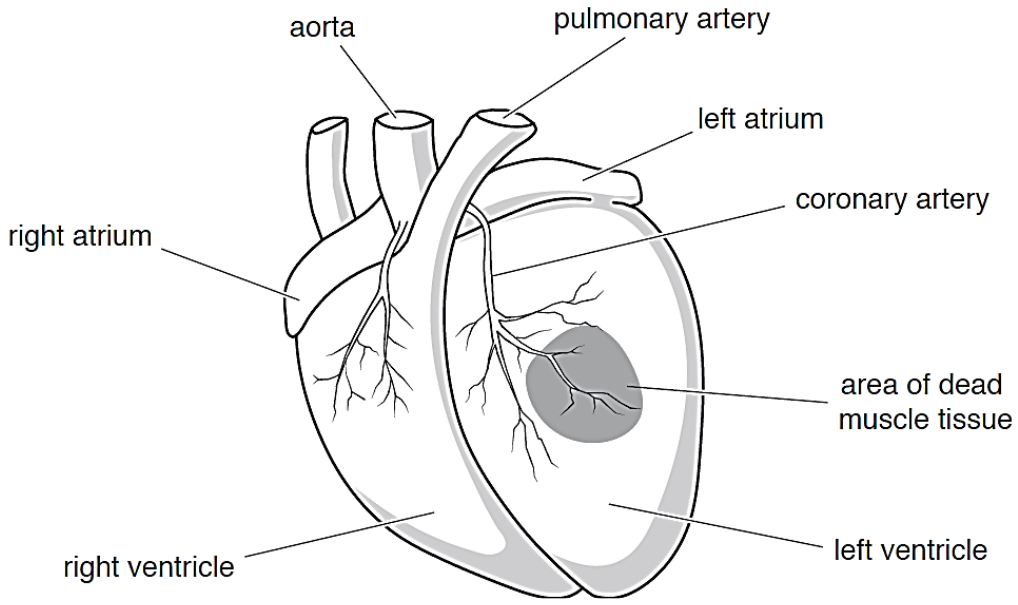


Fig. 2.2

(i) Fig. 2.2 shows an area of dead muscle tissue.

Describe what is meant by the term *coronary heart disease* and suggest why the heart muscle tissue has died.

.....

.....

.....

..... [3]

(ii) One factor that increases the risk of developing coronary heart disease is smoking.

State **two other** factors that increase the risk of a person developing coronary heart disease.

1 .....

2 ..... [2]

[Total: 10]

3 Human kidneys process 1200 cm^3 of blood every minute. Approximately 125 cm^3 of fluid is filtered from this blood into the renal capsules, resulting in 1500 cm^3 of urine being produced each day.

(a) (i) Calculate the volume of filtrate, in cm^3, produced by the kidneys in a day. Show your working.

volume = ... cm^3 [1]

(ii) Calculate the percentage of the filtrate that is reabsorbed into the bloodstream. Show your working.

answer = ... % [1]

(b) Table 3.1 shows the composition of fluids in the kidney.

Table 3.1

component	concentration/g 100 cm^{-3}		
	blood plasma entering glomerulus	filtrate in renal capsule	urine in collecting duct
water	90 – 93	97 – 99	96
proteins	7 – 9	0.0	0.0
glucose	0.1	0.1	0.0
urea	0.03	0.03	2.0
other nitrogenous waste products	0.003	0.003	0.24
sodium ions	0.32	0.32	0.30 – 0.35

(i) State why there are **no** proteins in the filtrate in the renal capsule.

.....

..... [1]

(ii) Explain why the concentration of urea is greater in the urine than it is in the filtrate.

.....

.....

.....

.....

..... [2]

(c) Use the concept of control by negative feedback to explain what would happen in each of the following situations.

(i) A person goes outside wearing only short trousers and a short-sleeved shirt on a day when the air temperature is below 10 °C.

.....

.....

.....

.....

..... [2]

(ii) A person drinks an excessive volume of water.

.....

.....

.....

..... [3]

[Total: 10]

4 Fig. 4.1 shows the bones and muscles of a human leg.

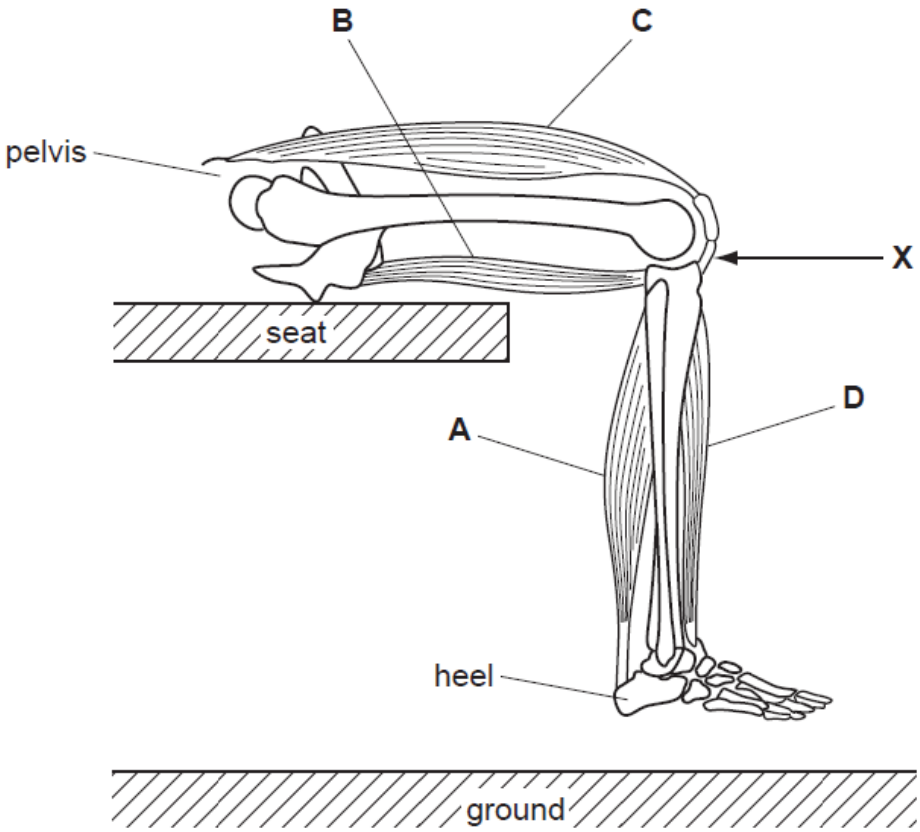


Fig. 4.1

(a) Muscles in the leg work antagonistically.

(i) State which muscle is antagonistic to muscle **A**.

.....[1]

(ii) Explain what is meant by *antagonistic*.

.....

.....

.....[2]

(b) In Fig. 4.1, the person is sitting with the foot clear of the ground. If a sharp tap is given at **X** then the lower leg swings forwards.

This is a reflex action. A reflex action is an involuntary action.

Explain what is meant by the term *involuntary action*.

.....

.....

..... [2]

(c) **(i)** Describe the general features of any reflex action.

.....

.....

..... [2]

(ii) If the spinal cord is cut through near the chest, this reflex action still takes place.

Suggest where in the central nervous system this reflex response is coordinated.

.....

..... [1]

(d) Suggest the advantages of having reflexes.

You may refer to an example to illustrate your answer.

.....

.....

..... [2]

[Total: 10]

5 Fig. 5.1 shows a flowering head of wheat, and individual flowers before and after opening.

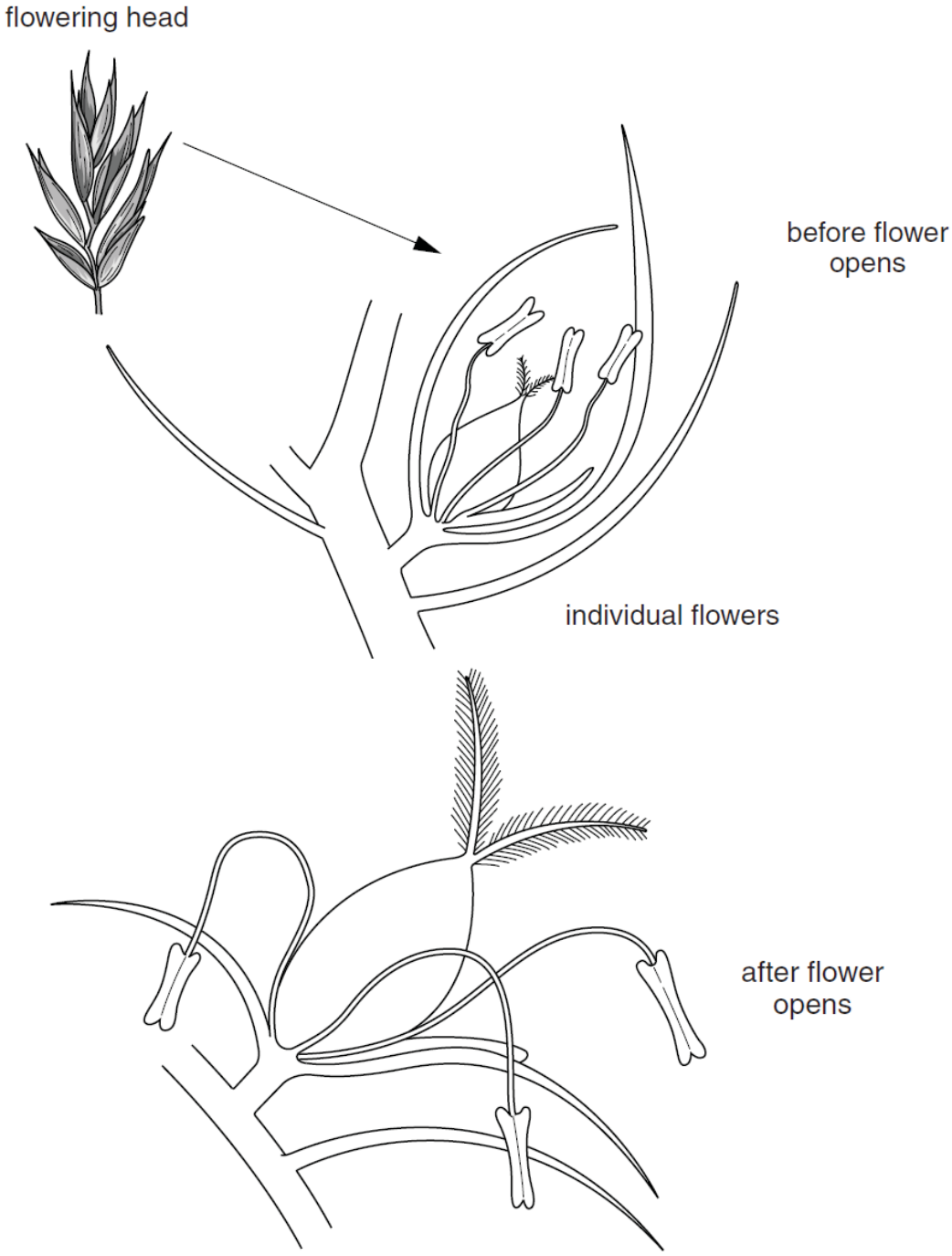


Fig. 5.1

The anthers release most of their pollen before the flower opens. The rest is released after the flower opens.

(a) Name the type of pollination found in the wheat plant before the flower opens.

.....

..... [1]

(b) **(i)** Using the information provided by Fig. 5.1, describe pollination in the wheat plant after the flower opens.

.....

.....

..... [2]

(ii) Wheat pollen is relatively heavy and is released for only a few hours after the flowers open.

Suggest **two** disadvantages of this.

.....

.....

.....

..... [2]

[Total: 5]

6 Fig. 6.1 shows the changes in the uterus during the menstrual cycle.

Fig. 6.1

(a) Identify **R**

.....[1]

(b) State the days when each of the following processes are most likely to occur during the cycle.

(i) fertilization .....

(ii) Implantation .....[2]

(c) Suggest and explain why blood must **not** pass directly from the mother to the fetus during pregnancy, even though it contains substances necessary for foetal development.

.....

.....

.....[2]

[Total: 5]

[Turn over

Section B [30 marks]

Answer **all** questions.
***Note that there is no question option in the last question.**

Write your answers in the spaces provided.

7 Table 7.1 shows the effect of temperature on the clotting time of the blood.

Table 7.1

temperature / °C	10	15	20	25	30	35	40	45
clotting time / s	86	58	48	40	30	24	32	58

(a) Plot a graph of these data using the grid in Fig. 7.1 below.

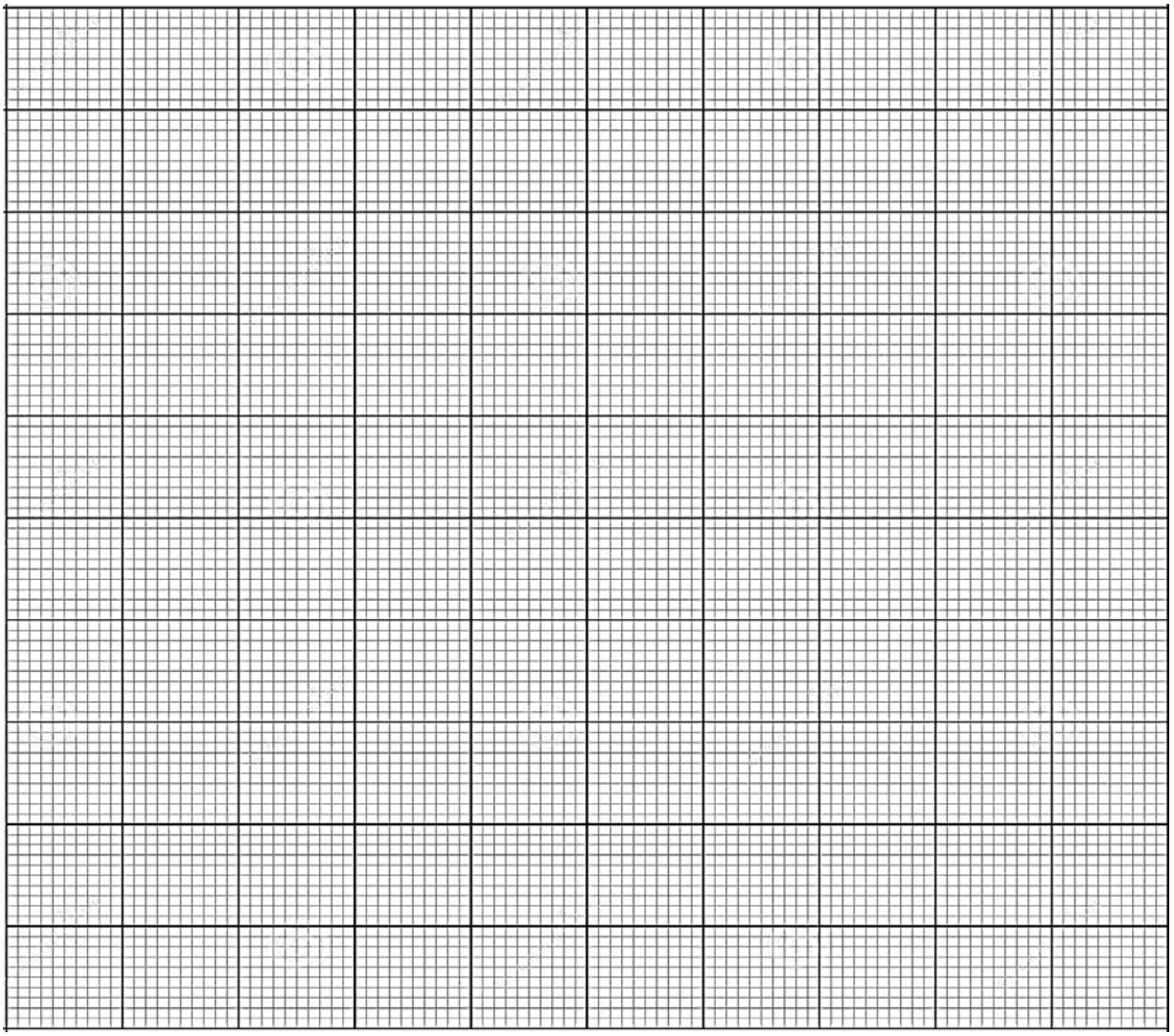


Fig. 7.1 [4]

(b) With reference to Table 7.1 and to the graph drawn in (a), describe the relationships between temperature and blood clotting .

.....

.....

.....

..... [3]

(c) State the role of platelets in protecting the body from disease.

.....

.....

.....

..... [3]

[Total: 10]

8 **(a)** Describe the cause of each of the following:

(i) Down's syndrome,

.....

[2]

(ii) sickle cell anaemia.

.....

[1]

(b) Sickle cell disease is a recessive genetic disorder.

(i) Draw a genetic diagram to show the possible genotypes from two heterozygous parents, using Hb^A for normal haemoglobin allele and Hb^S for sickle cell allele.

[3]

(ii) Calculate the percentage probability that the offspring will be carriers of the sickle cell allele but **not** have sickle cell disease.

.....

[1]

(iii) Explain why the percentage of people with sickle cell disease is higher in countries where malaria is present than in countries where malaria is **not** present.

[3]

[Total: 10]

9 **(a)** Explain the differences between *mitosis* and *meiosis*. Your explanation should include references to where the processes occur and why they occur.

[5]

[Turn over

(b) Describe the large-scale manufacture of a named antibiotic. State reasons for any procedures you mention.

[5]

[Total: 10]

END OF PAPER 2