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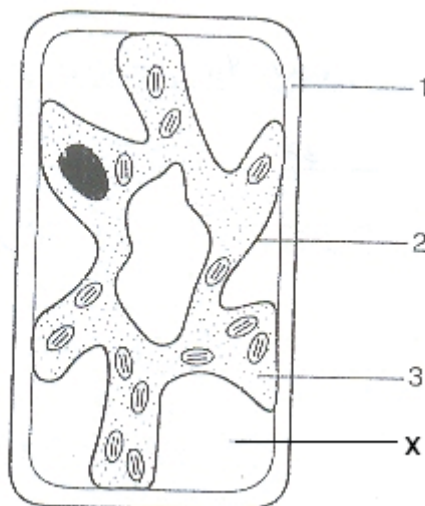
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Paper 1

Answer ALL questions in the Multiple Choice Marking Sheet provided.

The diagram below shows a plant cell that has been placed in 20% salt solution for 10 minutes

Use this information to answer questions 1, 2 and 3.



- 1 Which structure shows that the cell is a plant cell and not an animal cell?
 - A 1 only
 - B 2 only
 - C 1 and 2 only
 - D 1 and 3 only
- 2 What substance can be found in region X?
 - A Air
 - B Water
 - C 10% salt solution
 - D 20% salt solution
- 3 Which structure controls substances into and out of the cell?
 - A 1 only
 - B 2 only
 - C 3 only
 - D 1 and 2 only
- 4 Which of the following term is used to describe a group of cells of similar structure and perform a specific function?
 - A cell
 - B clone
 - C organ
 - D tissue

- 5 An actively growing cell is supplied with radioactive amino acids.

Which cell component would first show an increase in radioactivity?

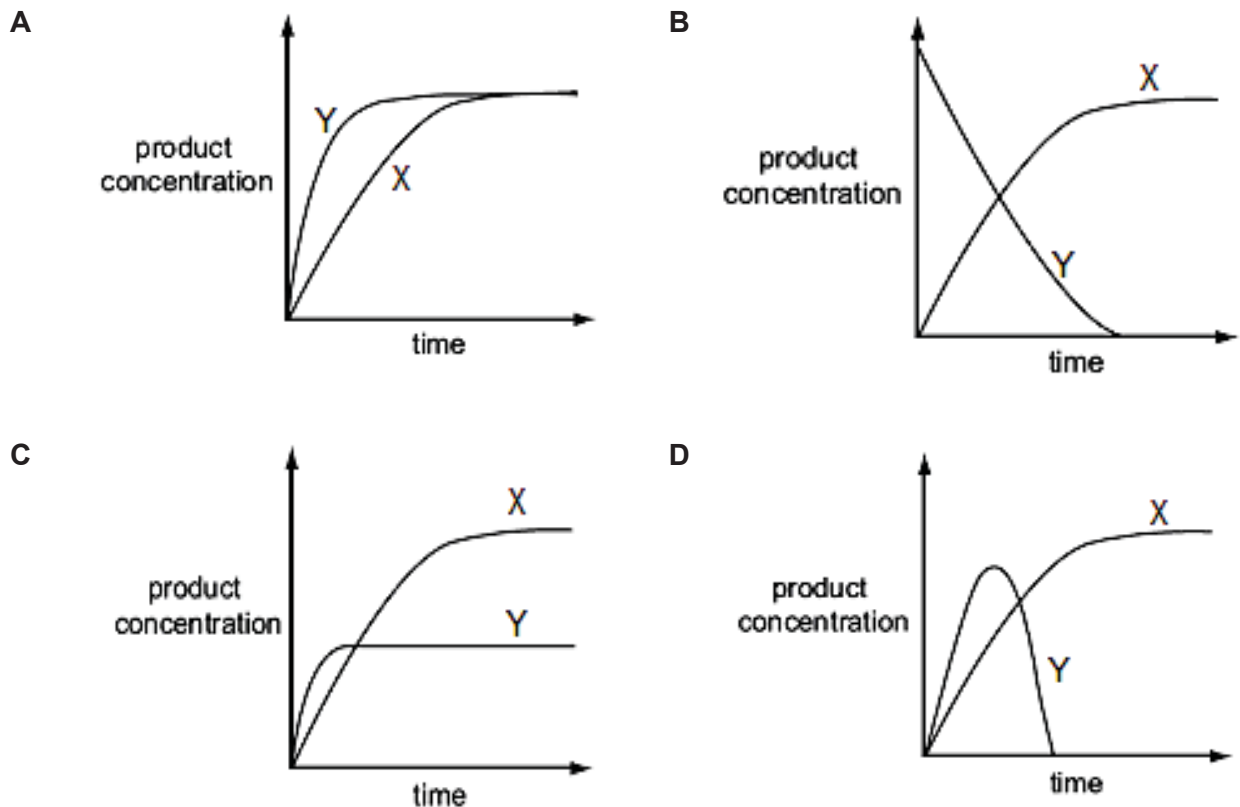
- A golgi body
- B mitochondrion
- C nucleus
- D rough endoplasmic reticulum

- 6 Which combination of chemical elements **must** be present in protein molecules?

	Phosphorus	Nitrogen	Oxygen
A	X	X	X
B	X	√	√
C	√	X	√
D	√	√	√

- 7 Two enzymatic experiments were carried out on pancreatic lipase. The first, experiment X, was carried out at a constant temperature of 37 °C. During the second experiment, Y, the temperature was increased from 37 °C to 80 °C.

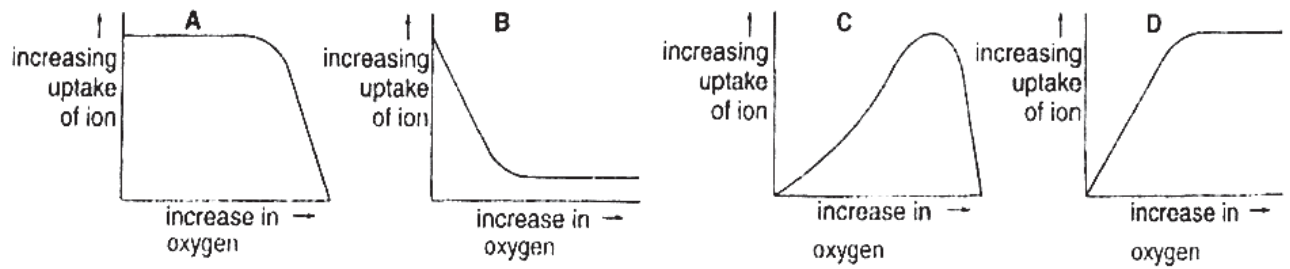
Which graph shows the results?



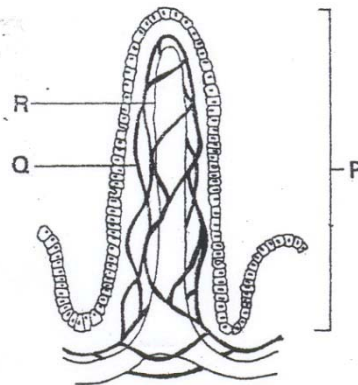
- 8 Which chemical test shows the presence of an enzyme in a biological washing powder?

- A Benedict's test
- B Biuret's test
- C Ethanol emulsion test
- D Iodine test

- 9 Which of the following represents the rate of ion uptake by a living cell in response to increasing oxygen concentration?



The diagram below which illustrates the structure of a certain part in a human alimentary canal. Use this information to answer Questions 10 and 11.



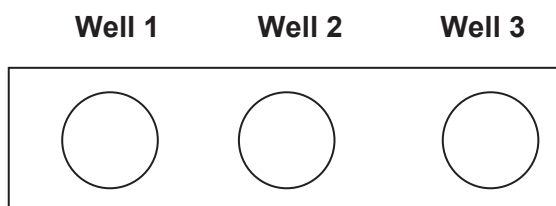
- 10 Identify structure P.

- A Duodenum
- B Ileum
- C Microvilli
- D Villi

- 11 Which of the following food substances are absorbed by structures Q and R?

	Q	R
A	Amino acids and fatty acids	Glucose and glycerol
B	Amino acids and glucose	Fatty acids and glycerol
C	Fatty acids and glycerol	Glucose and amino acids
D	Fatty acids and glucose	Glucose and amino acids

- 12 Digestive juices were collected from three regions of the alimentary canal. Drops of these juices were added to wells made in an agar of starch as shown below.



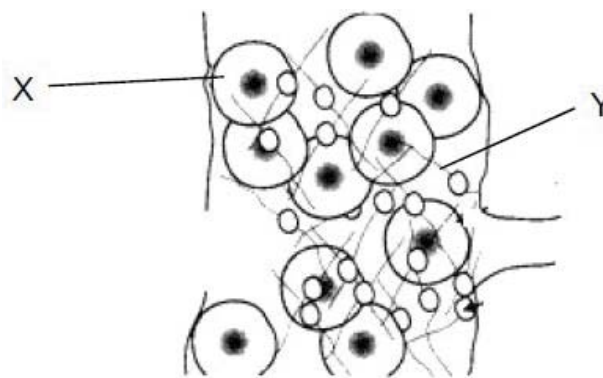
After an hour, the wells were rinsed with distilled water and flooded with iodine solution. The results are shown below:

well	1	2	3
colour of iodine solution	blue-black	brown	brown

Which of the following correctly identifies the regions of the alimentary canal from which the three digestive juices were obtained?

	well 1	well 2	well 3
A	mouth cavity	small intestine	stomach
B	mouth cavity	stomach	small intestine
C	small intestine	mouth cavity	stomach
D	stomach	mouth cavity	small intestine

- 13 The diagram below shows a blood clot on a hand after it suffers a cut.



What are structures **X** and **Y**?

	X	Y
A	Red blood cell	Fibrin
B	Red blood cell	Fibrinogen
C	White blood cell	Fibrin
D	White blood cell	Fibrinogen

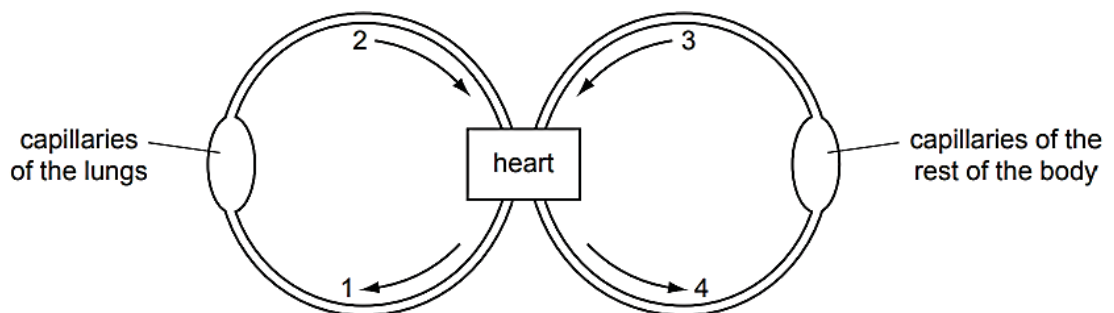
- 14** A person's blood group is determined by antigens present on the red blood cells. Most people have antibodies in their blood plasma even if they have never received a blood transfusion. It is these antibodies in the plasma of the person who receives the blood which makes some blood transfusions unsafe.

The table shows the antigens and antibodies in the blood of people with different blood groups.

blood group	antigens on red blood cells	antibodies in plasma
A	A	antibodies to B
B	B	antibodies to A
AB	A and B	no antibodies to A and B
O	neither A nor B	antibodies to A and B

Which are the blood groups of people who can safely receive blood from a person who has blood group A?

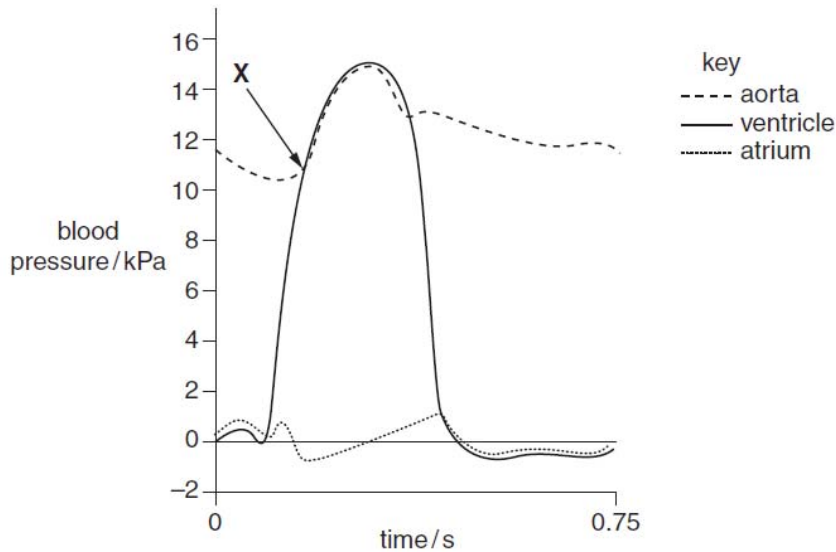
- A** AB only
 - B** A and O
 - C** B and O
 - D** A and AB
- 15** The diagram shows a double circulatory system.



Which two vessels carry blood at the highest pressure?

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

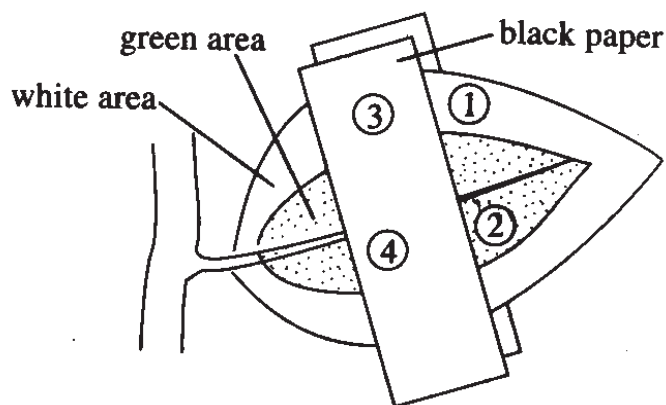
- 16 The graph shows changes in blood pressure during one cardiac cycle.



What is happening to the ventricle and aortic semilunar valve at **X**?

	ventricle	aortic semilunar valve
A	contracting	closing
B	contracting	opening
C	relaxing	closing
D	relaxing	opening

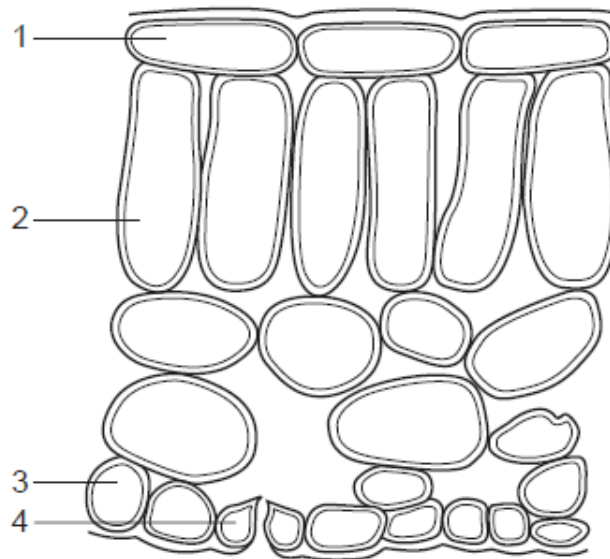
- 17 The diagram shows a destarched variegated leaf partly covered by black paper. The plant was placed in bright light for several hours. Four discs were then cut from the leaf in the position shown and were tested for starch.



Which discs contained starch?

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

The diagram below shows cells in a section through a leaf of a typical green plant. Use this information to answer questions **18** and **19**.



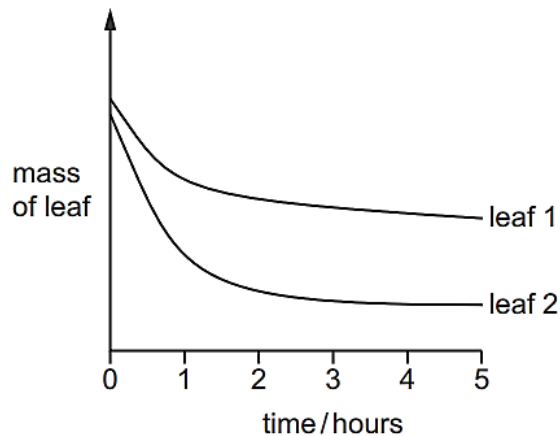
18 Which cells contain chloroplasts?

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

19 Which cell does not have uniform thickness of its cell wall?

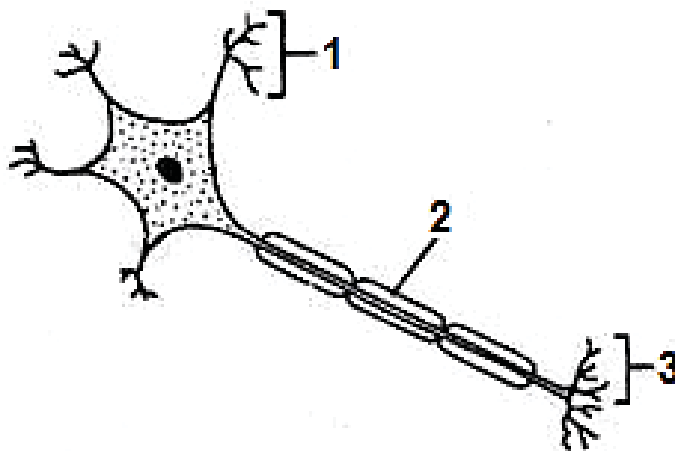
- A** 1
- B** 2
- C** 3
- D** 4

- 20** The diagram shows the results of an experiment using leaves with the same surface area from two different species. Each leaf was left on a balance in daylight in a closed room and their mass recorded at 1 hour intervals.



What could explain these results?

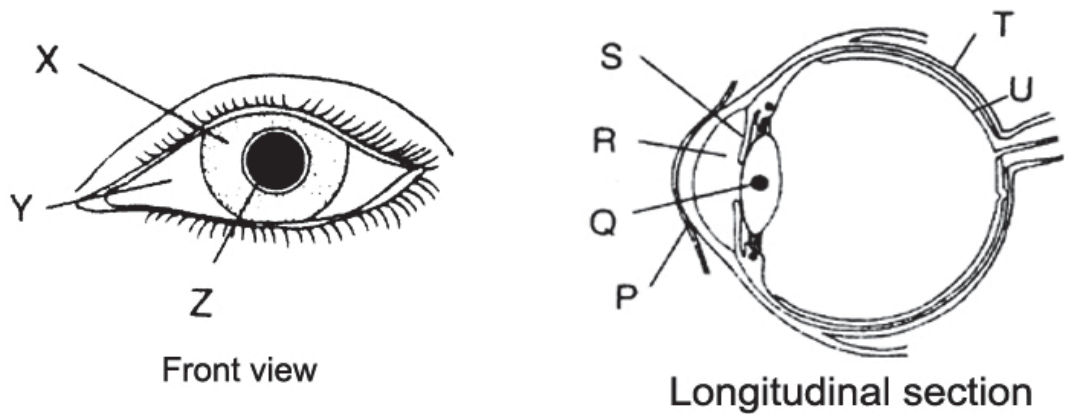
- A** Leaf 1 has a thicker cuticle than leaf 2.
 - B** Leaf 1 is thinner than leaf 2.
 - C** Leaf 2 has stomata protected by hairs and leaf 1 does not.
 - D** Leaf 2 has sunken stomata and leaf 1 does not.
- 21** The diagram below shows a motor neurone.



What are the functions of parts **1**, **2** and **3**?

	1	2	3
A	receives impulses	allow impulses to transmit efficiently	transmits impulses
B	receives impulses	secretes neurotransmitter	transmits impulses
C	transmits impulses	allow impulses to transmit efficiently	receives impulses
D	transmits impulses	secretes neurotransmitter	receives impulses

22 The diagrams below show the front view and longitudinal section of the eye.



What structures shown in the front view are similar to the longitudinal section?

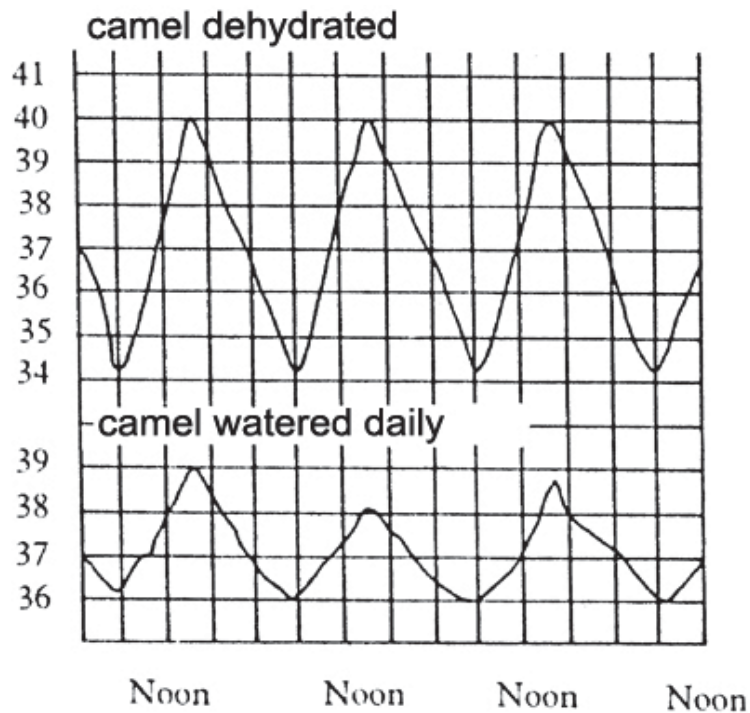
	X	Y	Z
A	S	T	R
B	P	Q	S
C	R	S	U
D	Q	R	T

23 The *tri-germinal nerve* in humans connects the brain with the teeth and with the skin of the face. When the dentist injects a local anaesthetic that targets this nerve, a person cannot feel pain or smile properly.

Which of the following conclusions can be **directly** drawn from the observations above?

- A The *tri-germinal nerve* contains only sensory neurones.
- B The *tri-germinal nerve* contains only motor neurones.
- C The *tri-germinal nerve* contains both sensory and motor neurones.
- D The *tri-germinal nerve* contains sensory, relay and motor neurones

The graphs below show the daily variation in body temperatures of camels with and without a daily supply of water. Use this information to answer questions **24** and **25**.



24 What is the time of the day that camels experienced the highest body temperature?

- A** 0900 hours
- B** 1200 hours
- C** 1500 hours
- D** 1800 hours

25 Which one of the following statements is supported by the graph?

- A** The daily variation in body temperature is about 6 °C in dehydrated camels.
- B** The daily variation in body temperature in dehydrated camels is lesser.
- C** The minimum body temperature of a camel is lower if water is given daily.
- D** Dehydrated camels have higher average body temperature than those watered daily.

26 Which word equation represents anaerobic respiration in muscles?

- A glucose $\rightarrow$ lactic acid + energy
- B glucose $\rightarrow$ ethanol + carbon dioxide + energy
- C glucose + oxygen $\rightarrow$ carbon dioxide + water + energy
- D glucose + oxygen $\rightarrow$ lactic acid + water + energy

27 Which of the following chemicals accelerates the deposition of fatty substances on the inner walls of arteries?

- A alcohol
- B carbon monoxide
- C tar
- D nicotine

28 Which of the following correctly shows the concentration of protein, urea and glucose in g/100 ml of the blood in the renal vein?

	protein	urea	glucose
A	7	0	0
B	7	0.05	0
C	7	0	0.1
D	0	0	0.1

29 A particular group of begonias, called the rex begonias (*Begonia rex cultorum*), propagate themselves through leaf cuttings. Unlike other plants that use specific stem portions for reproduction, the rex begonia uses its leaf veins to create new plantlets.

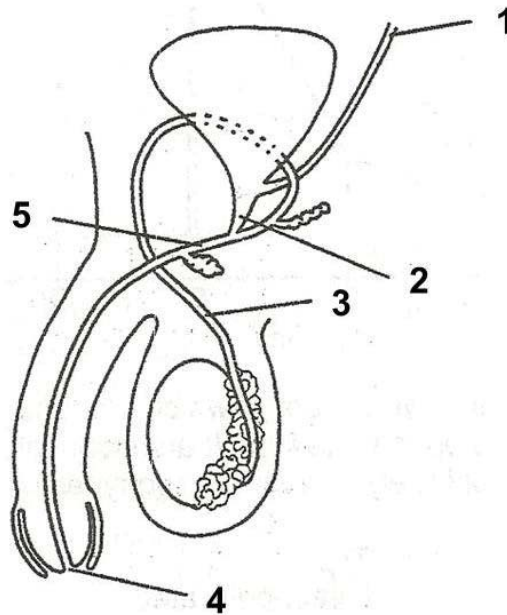
Which of the following describes the reproductive process and the genotypes of the new plantlets?

	Reproduction process	Genotype of the plantlets
A	Asexual	Different
B	Asexual	Identical
C	Sexual	Different
D	Sexual	Identical

30 Which of the following occurs during mitosis?

	Homologous chromosome pair up along equator	Chromosome number remains the same
A	X	✓
B	✓	X
C	X	X
D	✓	✓

The diagram below shows the male reproductive organ, use this information to answer questions 31 and 32.



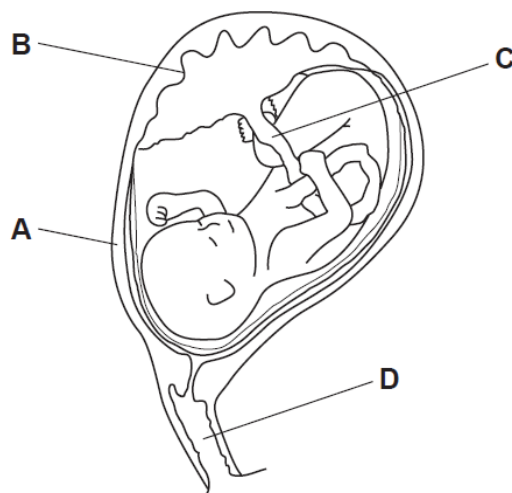
31 Which labelled structure carries both sperms and urine at different times?

- A 1
- B 2
- C 3
- D 5

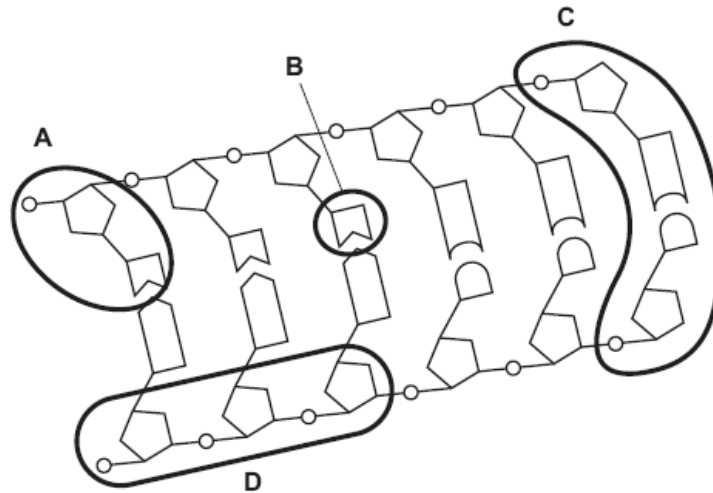
32 Identify the ureter.

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

33 The diagram shows a developing fetus.
Where does gaseous exchange between the fetus and its mother occur?

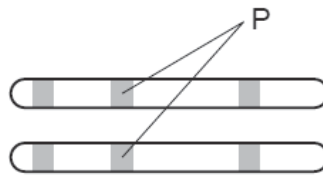


- 34 The diagram shows part of a DNA molecule.



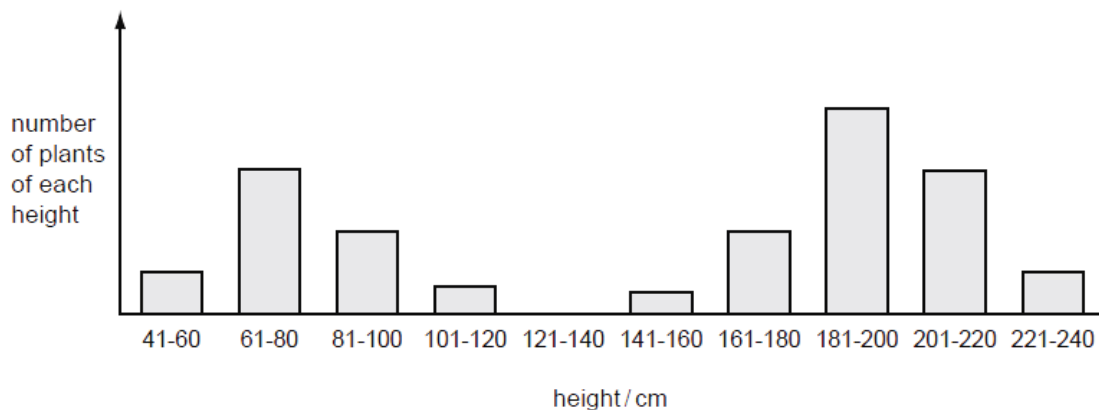
Which part of the DNA molecule shows a nucleotide?

- 35 The diagram shows a pair of chromosomes from the same cell.



What do the lines labelled P point to?

- A Alleles of the same gene which are always the same.
 - B Alleles of the same gene which might be different.
 - C Different genes which will give rise to different phenotype.
 - D Different genes which will give rise to the same phenotype.
- 36 The heights of 500 pea plants of the same age were measured to the nearest 20 cm. The results are shown in the chart below.



What does the variation in height of these pea plants show?

- A Continuous variation only.
- B Discontinuous variation only.
- C Both continuous and discontinuous variation.
- D Neither continuous or discontinuous variation.

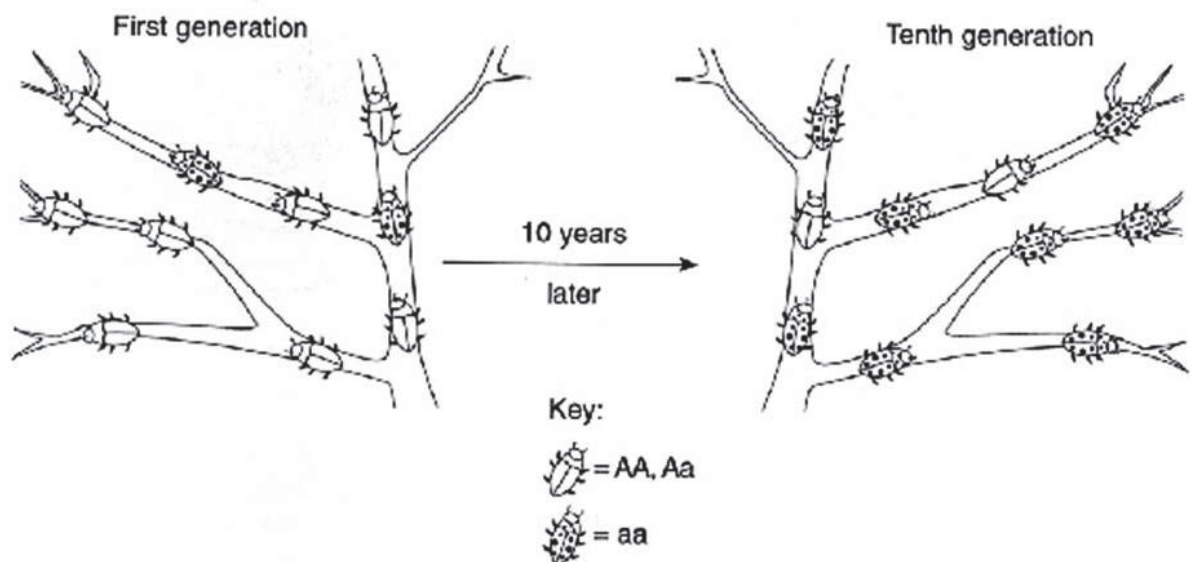
- 37 In a certain species of flowering plant, the genotype $C^R C^R$ has red flowers and the genotype $C^W C^W$ has white flowers. Heterozygotes, $C^R C^W$, have pink flowers. If two parents with pink flowers are crossed and 100 seeds obtained, what will be the numbers of red and white flowering offspring?

	White flower offspring	Red flower offspring
A	0	25
B	25	25
C	50	50
D	25	75

- 38 Which statement is **always** true of dominant alleles?

- A They are only carried on the X chromosome.
- B They cannot undergo mutation.
- C They give the same phenotype in both heterozygotes and homozygotes.
- D They have a higher chance of survival.

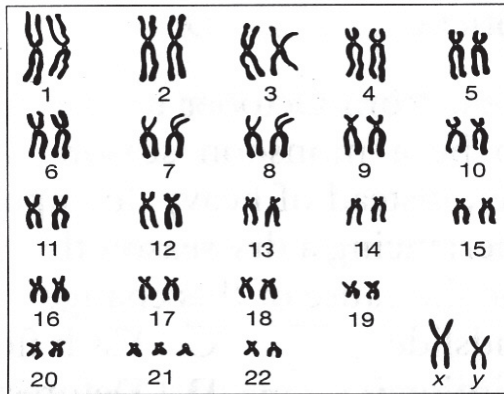
- 39 The diagram below illustrates the change that occurs in the frequency of phenotypes in an insect population over 10 generations.



Which of the following statement correctly explains the change in this population over time?

- A There was a change in environment that cause allele **a** to be selected against.
- B There was a change in environment that cause allele **a** to be selected for.
- C There was a mutation to allele **a**.
- D There was an increase in the population of this insect.

- 40 The diagram below shows a human karyotype.



Which of the following can be inferred from the karyotype above?

- A This individual is a female.
- B This individual has Down's Syndrome.
- C This individual has sickle cell anaemia.
- D This individual loses the ability to reproduce.

End of Paper 1

Name

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Class



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4EX

BIOLOGY**6093/02**

Paper 2 Theory [80 Marks]

PRELIMINARY EXAMINATION**September 2019**

Additional Materials:
 Approved calculator

1 hour 45 minutes**INSTRUCTIONS TO CANDIDATES****Do not start reading the questions until you are told to do so.**

Write your name, class, and 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 paper clips, highlighters, glue or correction fluid.

This paper consists of **Section A** and **Section B**.Answer **all** questions.

Write your answers in the spaces provided on the Question Paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [] at the end of each question or part question.

Candidates are reminded that **all** quantitative answers should include appropriate units.

Candidates are advised to show all their working in a clear and orderly manner.

The use of an approved scientific calculator is expected, where appropriate.

FOR EXAMINER'S USE		
Paper		Marks
Paper 1 (MCQ)		/ 40
Paper 2		
A		/ 50
B	7	/ 10
	8	/ 10
	9	/ 10
Total		/ 120

This question paper consists of **18** printed pages.

Setter: Mrs Marie Huang

Vetter: Mr Ng Tze How

[Turn Over

Section A [50 marks]

Answer **all** questions in this section.
Write your answers in the spaces provided.

- 1 Figure 1.1 shows the structures found within a mammalian liver cell.

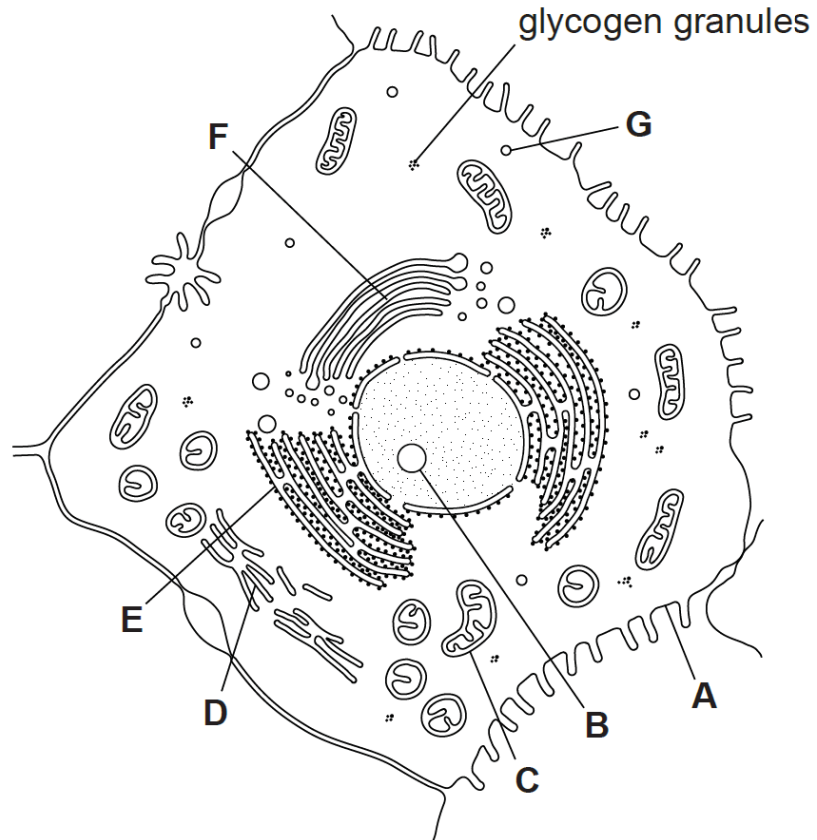


Figure 1.1

- (a) Complete the table by naming the structures and stating one function of each. The first structure (A) has been completed for you.

	name of organelle	function
A	Cell surface membrane	Controls movement of substances into and out of cell
C		
E		
F		

- (b) As shown in Figure 1.1, liver cells contain many storage granules of glycogen. Figure 1.2 shows a simplified diagram of the structure of glycogen.



Figure 1.2

- (i) Describe one feature of the structure of the glycogen molecule that makes it suitable as a storage molecule.

.....
[1]

- (ii) Explain the importance of glycogen in the regulation of a mammal's internal environment.

.....

[4]

[Total = 8]

- 2 Large trees produce sun leaves on the outside of the canopy and shade leaves inside the canopy. Figure 2.1 shows the rate of carbon dioxide uptake or production of a sun leaf and a shade leaf when exposed to increasing light intensity.

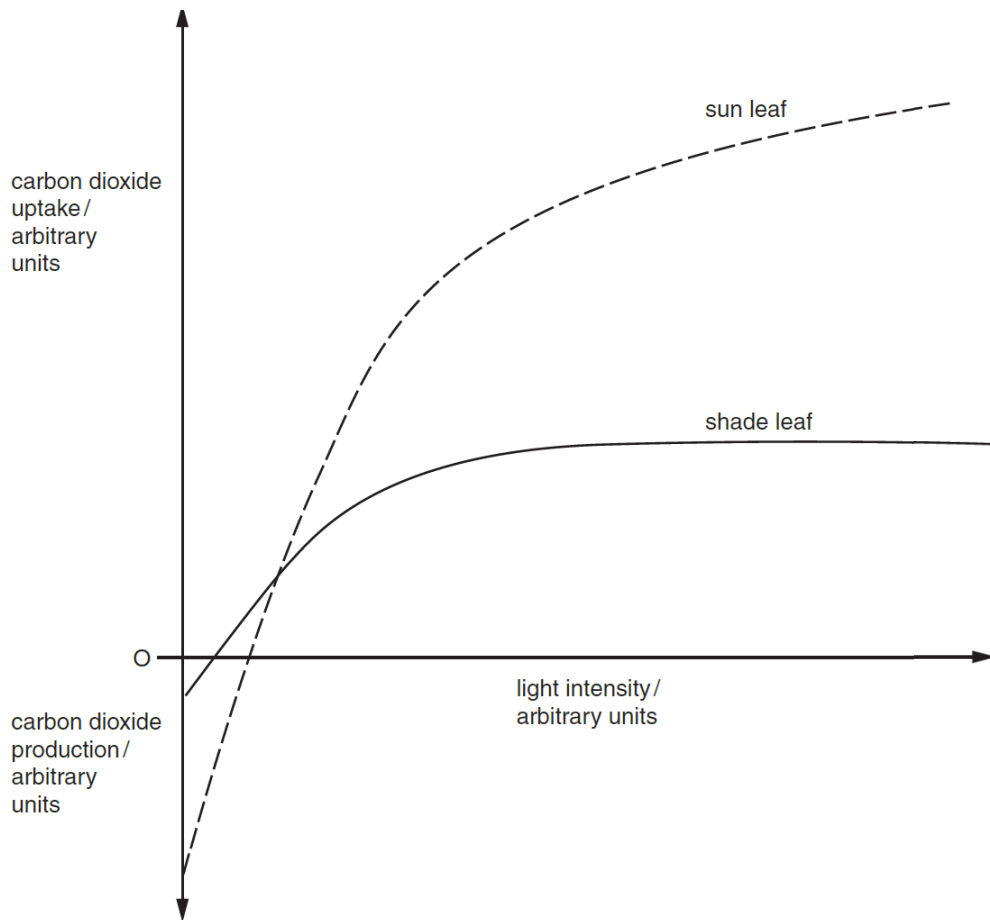


Figure 2.1

- (a) State the word equation of the process that results in carbon dioxide uptake in a plant.

.....[1]

- (b) With reference to Figure 2.1, describe two ways in which the sun and shade leaf differ in their response to increasing light intensity.

1

.....

2

.....
[2]

- (c) Explain why the carbon dioxide uptake levels off in the shade leaf as light intensity increases.

.....
.....[1]

- (d) The rate of photosynthesis can be calculated based on the biomass of the tree. The tree is able to produce different types of carbohydrates that eventually become a part of its biomass.

Explain, by using two named molecules, how different types of carbohydrates can be produced after the process of photosynthesis.

.....
.....
.....
.....[2]

- (e) Explain why the biomass of a tree may decrease when the leaves of the tree wilt.

.....
.....
.....
.....[2]

[Total = 8]

- 3** In mammalian kidneys, the nephron is closely associated with homeostasis and negative feedback.

(a) Define homeostasis.

.....
.....[1]

(b) Control systems often work by using negative feedback. These systems require a receptor and an effector. In the process of osmoregulation, identify the receptor and effector.

Receptor

Effector

[2]

(c) Describe how osmoregulation occurs in the body to achieve homeostasis when a person takes in large amounts of concentrated sodium chloride solution.

.....
.....
.....
.....
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.....
.....
.....[4]

[Total = 7]

- 4 Figure 4.1 describes the process of producing herbicide-resistant crop plants by using transgenic bacteria (*E. coli*) which carry the desired gene into the root cells of the plant.

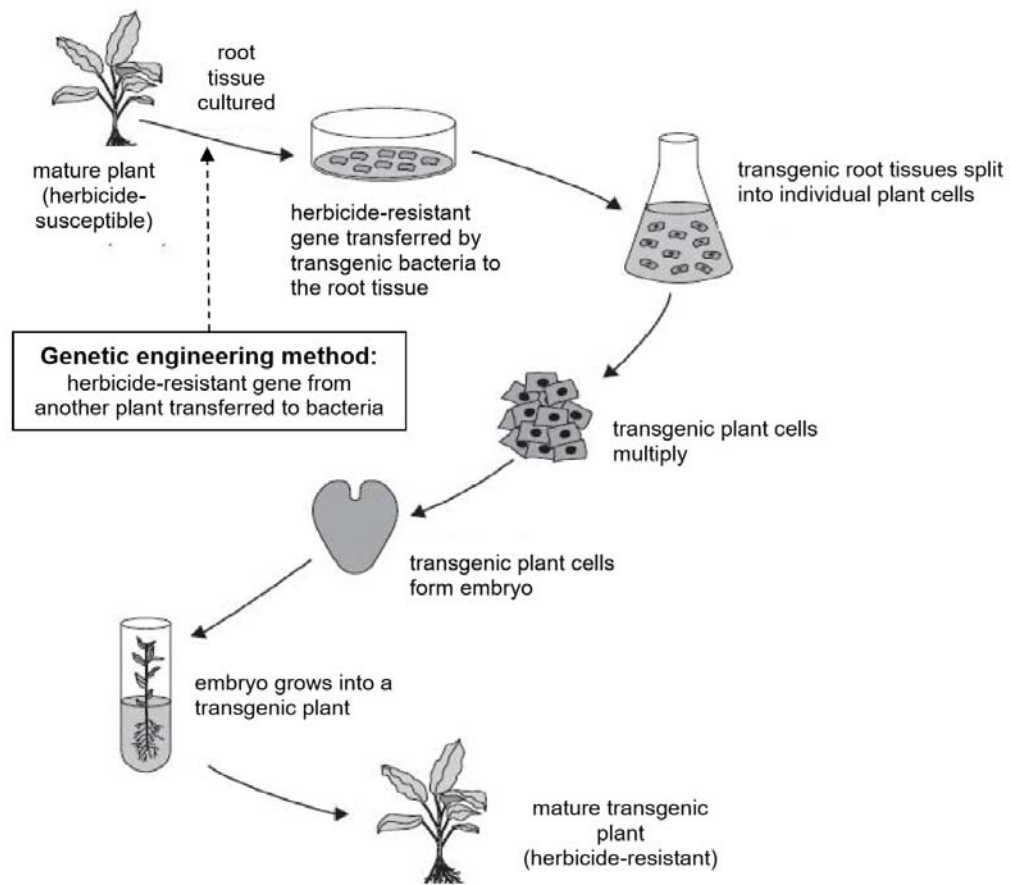


Figure 4.1

- (a) Describe how genetic engineering techniques can be used to produce the transgenic bacteria, which carry the herbicide-resistant gene.

[4]

- (b) Many people are opposed to the growing of herbicide-resistant crops produced in this way. Suggest one reason for their concern.

.....
[1]

- (c) Figure 4.2 shows a Venn diagram on sexual and asexual reproduction in plants.

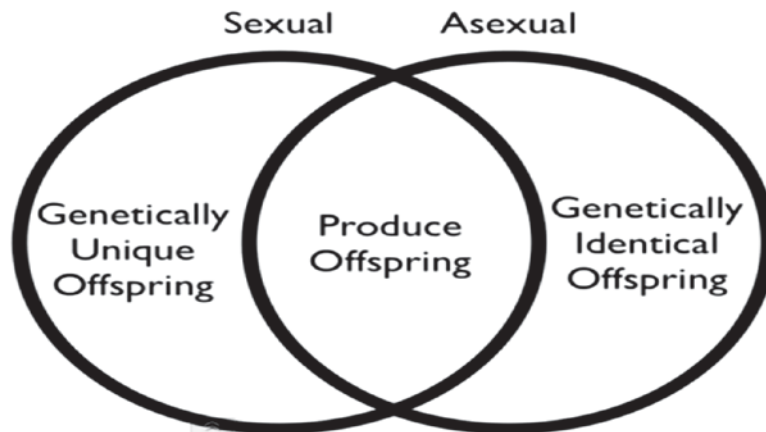


Figure 4.2

With reference to Figure 4.2, explain what causes the difference in the type of offspring produced.

.....

[2]

- (d) In Figure 4.2, mark in appropriate region(s) of the Venn diagram,

- (i) X to represent self-pollination
- (ii) Y to represent cross-pollination

[1]

[Total = 8]

5 Figure 5 shows part of a DNA molecule.

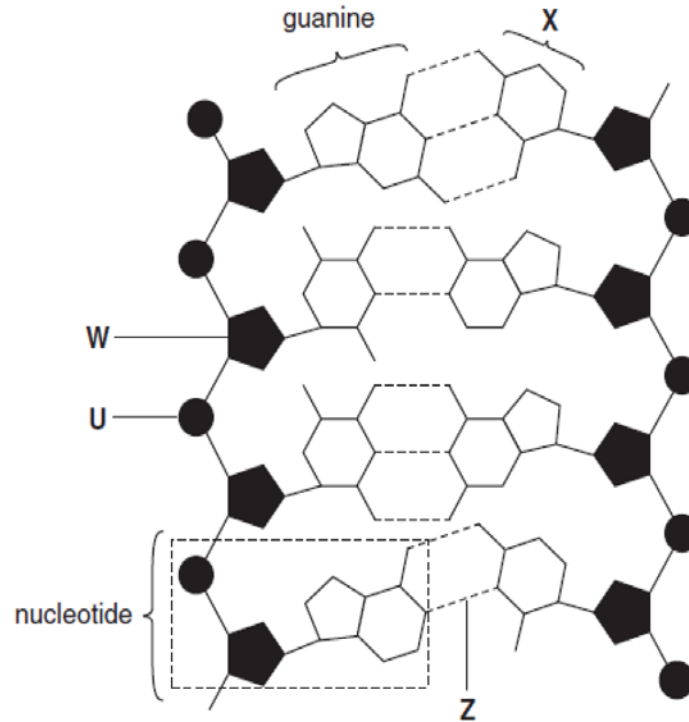


Figure 5

(a) Identify **U**, **W** and **X**.

U

W

X [2]

(b) Describe two features of a polypeptide molecule that are different from those found in a DNA molecule.

.....

 [2]

(c) Explain the significance of the order of nitrogenous bases in the DNA molecule.

.....

 [2]

[Turn Over

- (d) Bone marrow contains stem cells that divide by mitosis to form blood cells. Each time the cell divides, it forms a replacement stem cell and a cell that develops into a blood cell.

Figure 6.2 shows changes in the mass of DNA in a human stem cell from the bone marrow during three cell cycles.

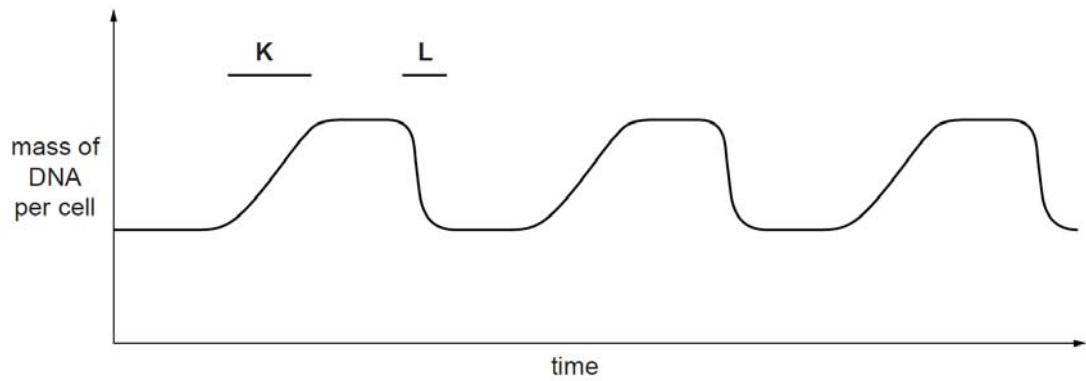


Figure 5.2

With reference to Figure 5.2, state

- (i) what happens to bring about the changes in the mass of DNA per cell at **K** and at **L**.

[2]
- (ii) the number of blood cells are formed from the stem cell in the time shown
[1]
- (iii) what happens to the number of chromosomes in the stem cell
[1]

[Total = 10]

- 6 Figure 6.1 shows the inheritance of an abnormal condition that affects the seeing and distinguishing objects under low light intensities.

This disorder is caused by a mutation in the PDE6B gene that is responsible for producing proteins found in specialised photoreceptor cells on the retina.

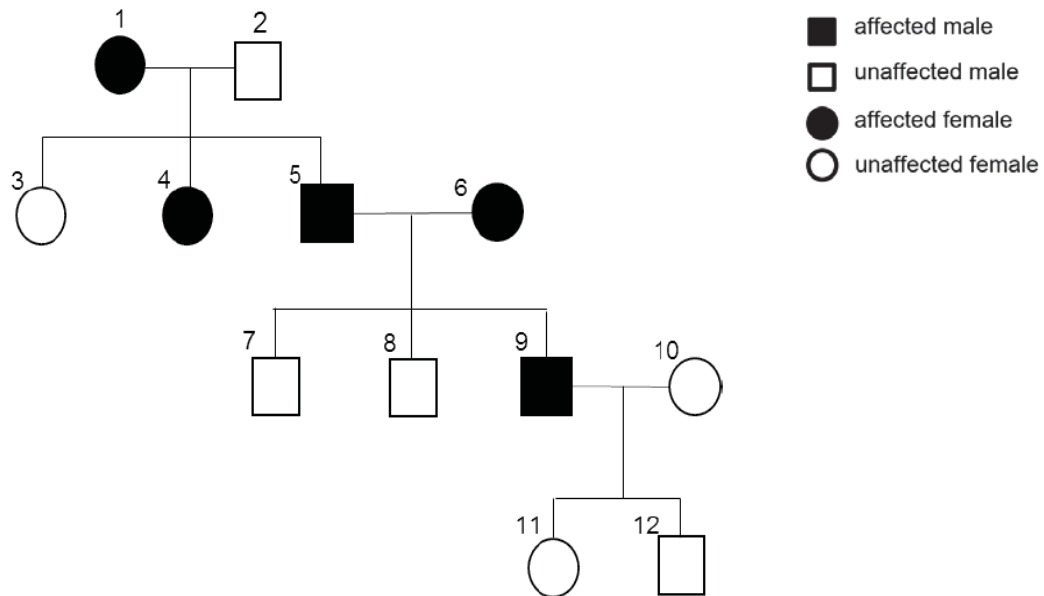


Figure 6.1

- (a) Explain, with reference to Figure 6.1, if the abnormal condition is controlled by a dominant or recessive allele.

.....

.....

.....

.....

.....

.....

.....[3]

- (b) Individual 11 married an unaffected male. Explain the chance of them having an affected child.

.....

.....

.....

.....[2]

- (c) (i) State the form of mutation that causes this disease.

.....[1]

- (ii) Suggest how a person is unable to see clearly under low light intensity due to this disorder.

.....

.....

.....

.....

.....

.....[3]

[Total = 9]

---End of Section A ---

Section B [30 marks]

Answer all **three** questions in this section.

- 7 Catalase is an enzyme found in many tissues. Catalase breaks down hydrogen peroxide, forming water and oxygen.

Figure 7.1 shows the apparatus used by a student to investigate the effect of pH on the activity of catalase. The gas syringe was used to measure the volume of oxygen produced at each pH.

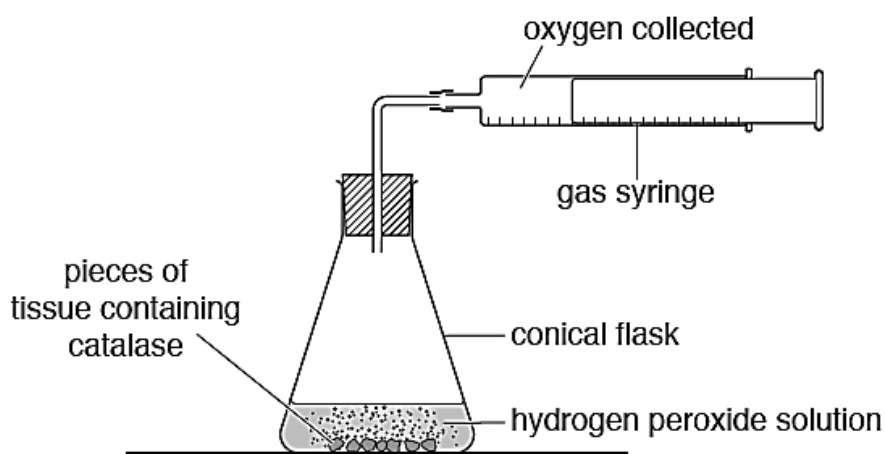


Figure 7.1

The student carried out the experiment at a pH of 7.0 and measured the volume of oxygen produced during a period of five minutes.

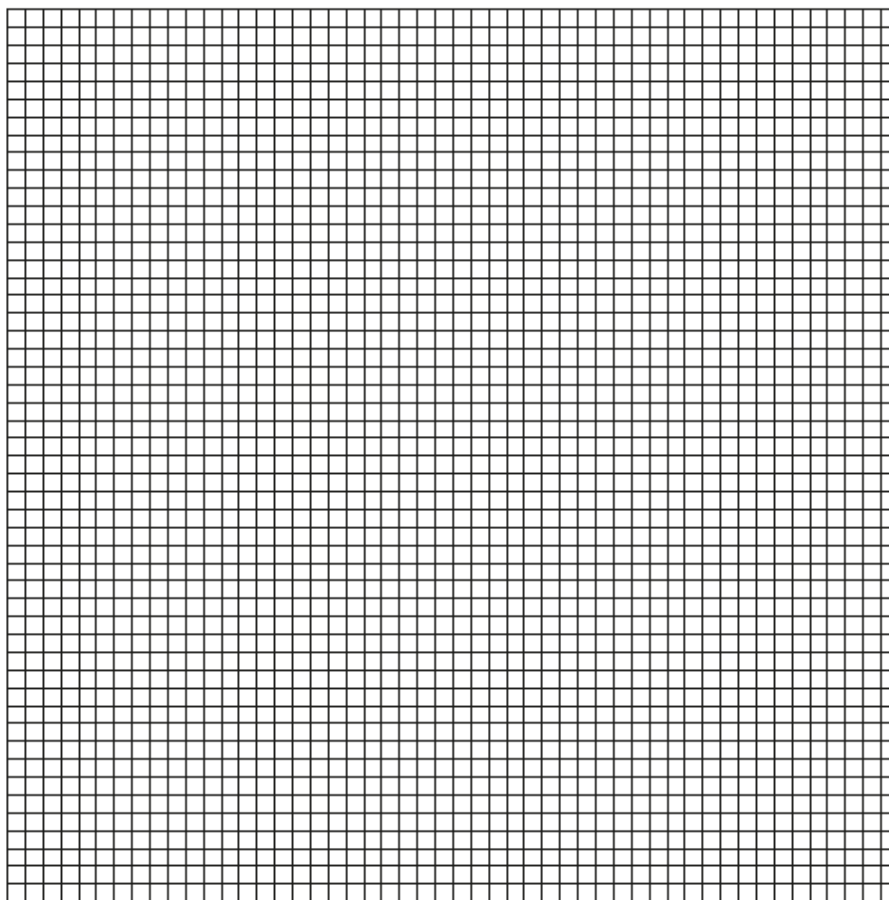
He then mixed fresh samples of tissue containing catalase, and hydrogen peroxide solution at pH values of 5.0, 6.0, 8.0 and 9.0 and measured the volume of oxygen produced during five minutes for each pH.

The results are shown in Table 7.2.

Table 7.2

pH	volume of oxygen produced during five minutes / cm ³
5.0	12
6.0	45
7.0	88
8.0	57
9.0	8

- (a) Using the data in Table 7.2, plot a graph to show the effect of pH on the activity of catalase.



[4]

- (b) Describe and explain the shape of the graph obtained in (a).

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.....[4]

- (c) State two variables, other than temperature, that should be kept constant in this investigation.

1

2

[2]

[Total = 10]

- 8 Blood samples were taken from a 29 year old woman each day for a period of 43 days. The concentrations of oestrogen, progesterone and luteinising hormone (LH) in each sample were measured. The results are shown in Fig. 8.1.

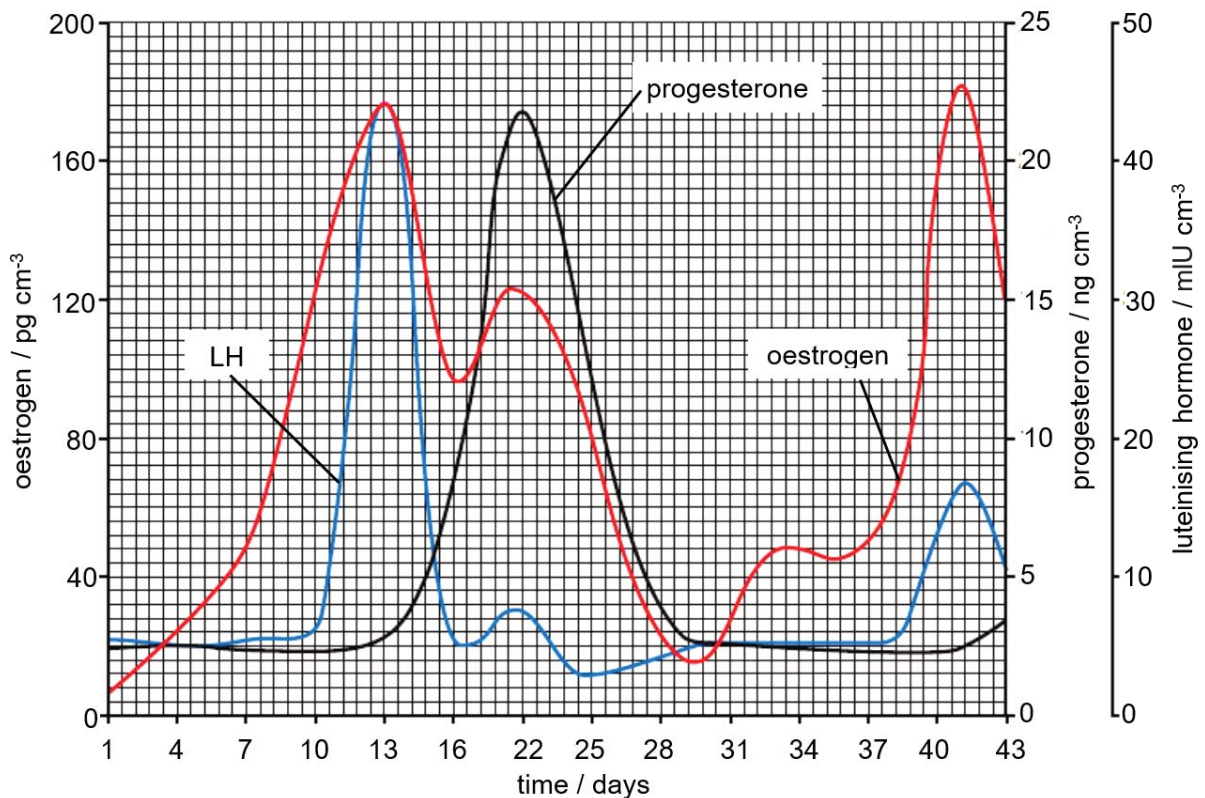


Figure 8.1

- (a) With reference to Figure 8.1, estimate the length of the woman's menstrual cycle and explain your answer.

Length of menstrual cycle [1]

Explanation

.....

 [2]

[Turn Over]

- (b) Describe and explain the changes in oestrogen and progesterone level from day 1 to day 22.

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.....[5]

- (c) Describe and explain how the graph(s) will change if the woman is pregnant.

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.....[2]

[Total = 10]

- 9** The effects of strenuous exercise is shown in Table 9.2.

Table 9.2

	Before exercise	After exercise
Breathing rate/breaths per minute	11	22
Ventilation rate (volume of air taken into lungs per min)/dm ³ per minute	6	90
Heart rate/beats per minute	65	170

- (a)** Explain why the changes shown in Table 9.2 occurs during exercise.

.....[5]

- (b)** Exercise that occurs over a longer period often involves aerobic respiration as well as anaerobic respiration.

Figure 9.2 shows the oxygen consumed by an athlete during and after a 2.4 kilometres race.

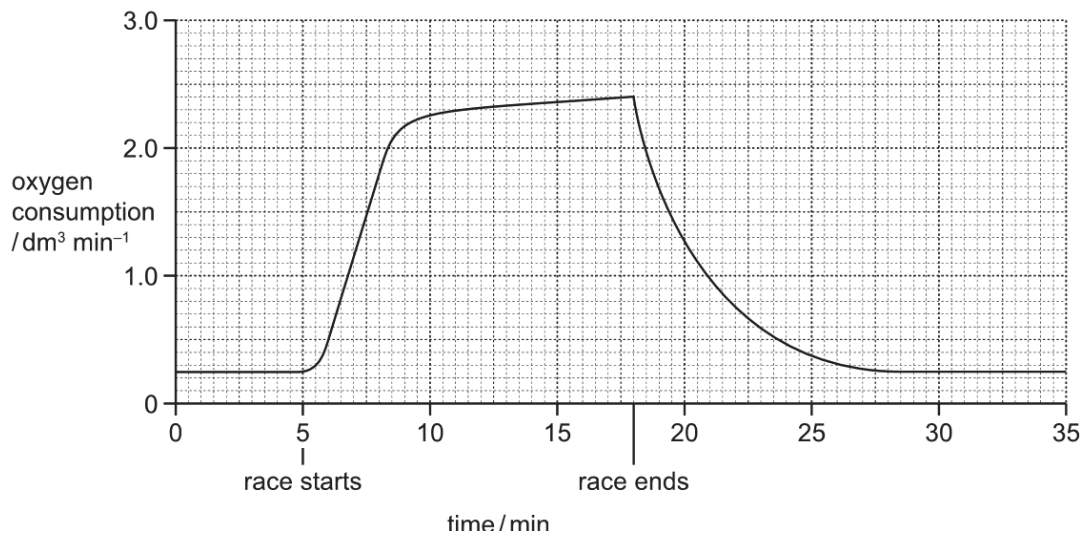


Figure 9.2

Explain why the oxygen consumption does not immediately return to the resting level after the race ends.

.....[5]

[Total = 10]

