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**BEATTY SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2020**

SUBJECT : BIOLOGY	LEVEL : SEC 4 EXPRESS
PAPER : 6093 / 1	DURATION : 1 HOUR
SETTER : MDM SITI ZUBAIDAH	DATE : 28 AUGUST 2020

CLASS :	NAME :	REG NO :
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.....

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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

Write your name, class and register number on the OTAS 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**.

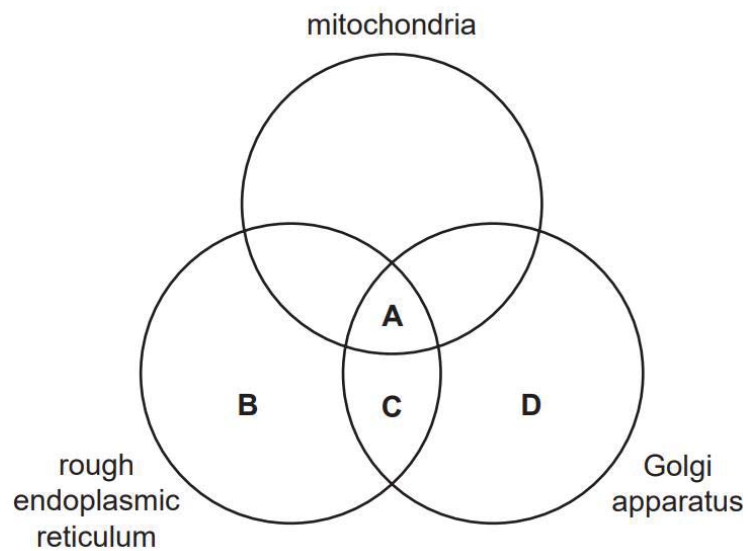
Choose the **one** you consider correct and record your choice in **soft 2B pencil** on the OTAS sheet.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

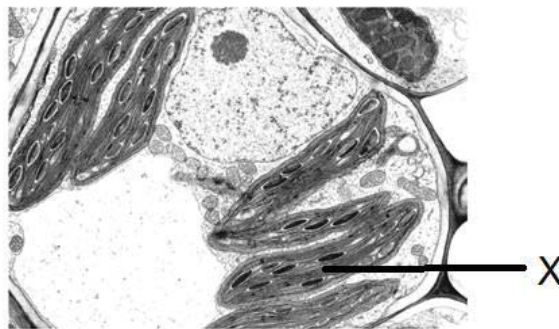
Any rough working should be done in this booklet.

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

- 1 Which organelle(s) is/are required to manufacture enzyme catalase in liver cells?



- 2 The diagram shows a photomicrograph of a cell.



What is the function of X?

- A** absorbs light energy and convert it into chemical energy
- B** site of respiration to release energy
- C** stores genetic material
- D** synthesises lipids and steroids

- 3 When potato strips were immersed in 0.35 mol dm^{-3} sucrose solution, there was no change in mass.

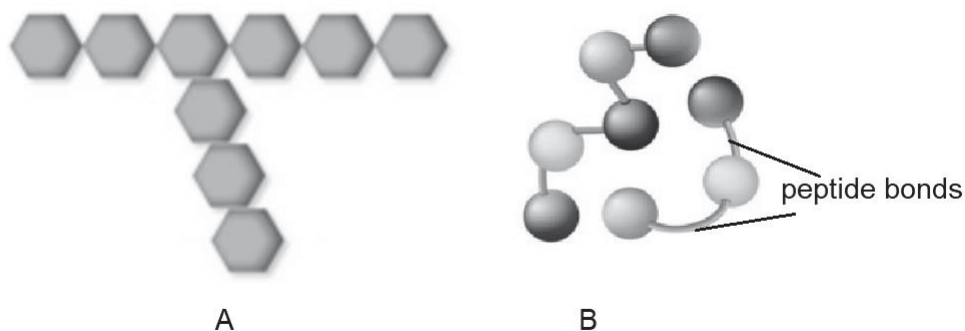
What would happen if they were placed in 0.1 mol dm^{-3} sucrose solution instead?

	movement of substances	change in mass
A	sucrose enters cells by diffusion	increase
B	sucrose leaves cells by diffusion	decrease
C	water enters cells by osmosis	increase
D	water leaves cells by osmosis	decrease

- 4 Which pair of factors is inversely proportional to the rate of diffusion?

- A** concentration gradient and surface area to volume ratio
- B** diffusion distance and size of diffusing molecule
- C** size of diffusing molecule and concentration gradient
- D** surface area to volume ratio and diffusion distance

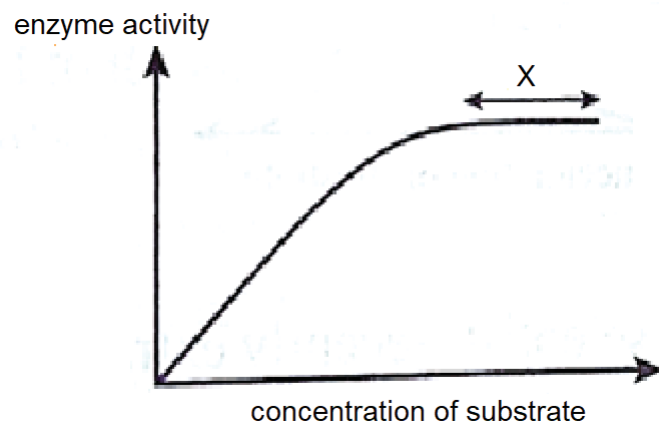
- 5 A sample of food, containing these molecules A and B, was tested using the various food tests.



Which row shows the correct results for the food tests carried out?

	Benedict's test	ethanol emulsion test	biuret test
A	brick-red ppt formed	remain clear	violet
B	brick-red ppt formed	cloudy white emulsion seen	remains blue
C	remains blue	remains clear	violet
D	remains blue	cloudy white emulsion seen	remains blue

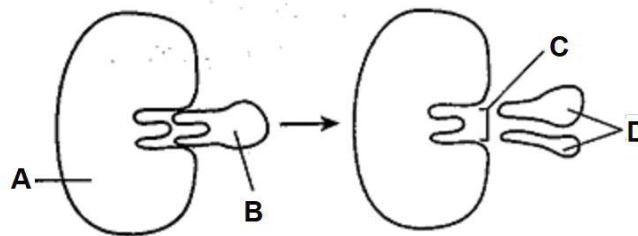
- 6 The graph below shows the effect of substrate concentration on enzyme activity.



What is the possible reason to explain the enzyme activity at X?

- A All enzymes have been denatured.
 - B All enzymes' active sites are saturated.
 - C Concentration of substrate is a limiting factor.
 - D Kinetic energy of enzymes and substrate molecules are decreasing.
- 7 The diagram below shows the lock-and-key model of enzyme action.

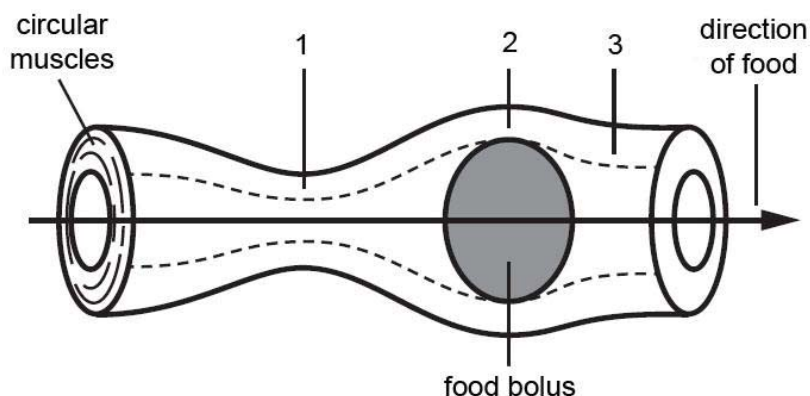
Which of the following represents the 'key'?



- 8 Which row correctly shows the blood composition in the hepatic portal vein?

	amino acid	urea	lipids
A	high	low	low
B	high	high	low
C	low	high	high
D	low	low	high

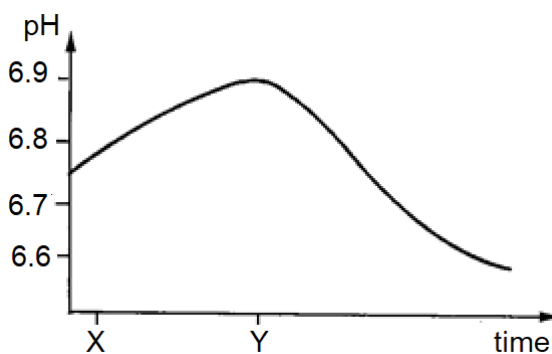
- 9 The diagram below shows the movement of food along the oesophagus.



Which row correctly describes the states of circular muscles at points 1, 2 and 3?

	1	2	3
A	contracted	relaxed	relaxed
B	relaxed	contracted	contracted
C	contracted	relaxed	contracted
D	relaxed	contracted	relaxed

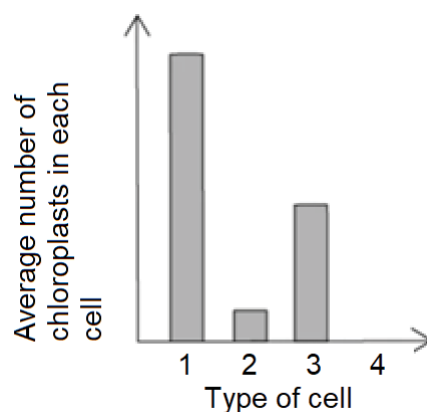
- 10 The graph shows the changes in pH of water in a fresh water lake on a summer day.



Which is a possible reason for the rise in pH between time X and Y?

- A** Decreased levels of carbon dioxide due to photosynthesis.
- B** Decreased levels of oxygen due to respiration.
- C** Increased levels of carbon dioxide due to respiration.
- D** Increased levels of mineral nutrients in the water.

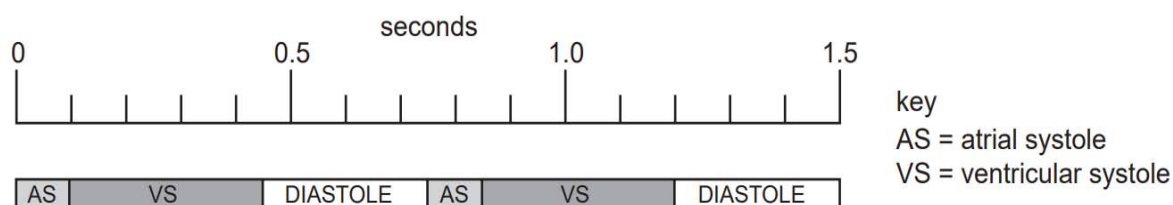
- 11 The average number of chloroplasts found in four different types of cell from the leaf of a plant is shown below.



Which correctly identifies the types of cell?

	1	2	3	4
A	spongy mesophyll cell	guard cell	epidermal cell	palisade mesophyll cell
B	epidermal cell	palisade mesophyll cell	spongy mesophyll cell	guard cell
C	guard cell	spongy mesophyll cell	palisade mesophyll cell	epidermal cell
D	palisade mesophyll cell	guard cell	spongy mesophyll cell	epidermal cell

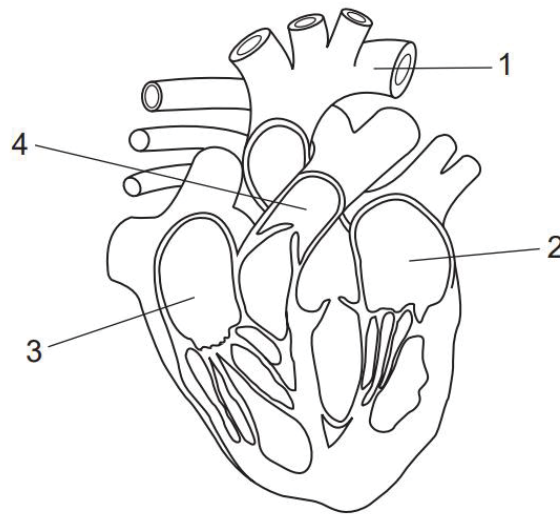
- 12 The diagram shows two cardiac cycles of a person, with the sequence of events set against time.



What is the heart rate of the person?

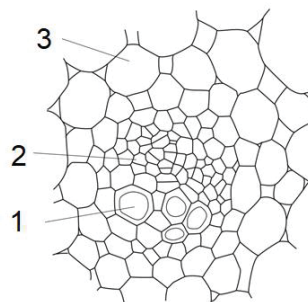
- A** 60 beats per minute
- B** 72 beats per minute
- C** 80 beats per minute
- D** 100 beats per minute

- 13** The diagram shows the structures of the heart.



Which statement is true?

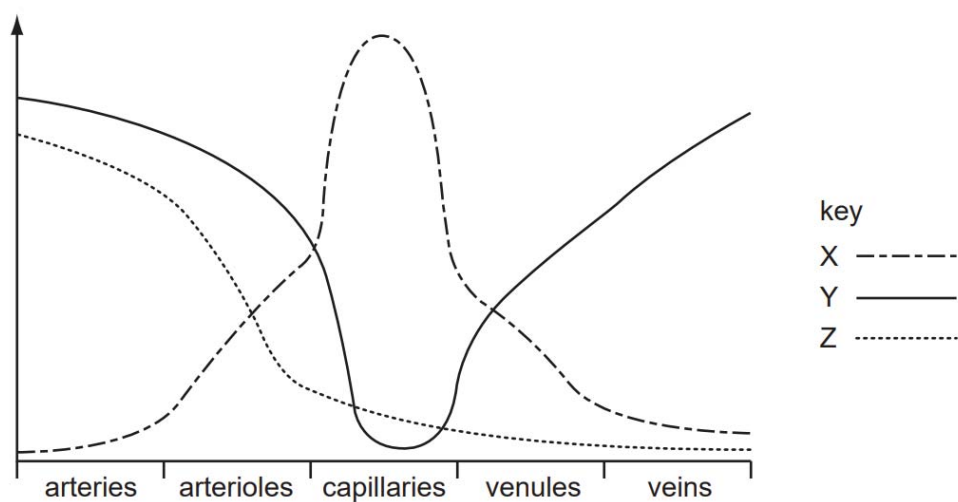
- A** Blood pressure at 3 is greater than at 4.
 - B** Blood pressure at 4 is greater than at 2.
 - C** Oxygen content is greater in 3 than at 4.
 - D** Oxygen content is greater at 2 than at 1.
- 14** The diagram shows a vascular bundle in plant. Radioactive labelled carbon is supplied to the plant in the form of carbon dioxide.



In which parts will radioactive carbon be detected?

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

15 The graph represents data on blood vessels and blood flow.



Which correctly represents X, Y and Z?

	X	Y	Z
A	cross-sectional area of vessels	blood velocity	blood pressure
B	blood velocity	cross-sectional area of vessels	blood pressure
C	cross-sectional area of vessels	blood pressure	blood velocity
D	blood pressure	blood velocity	cross-sectional area of vessels

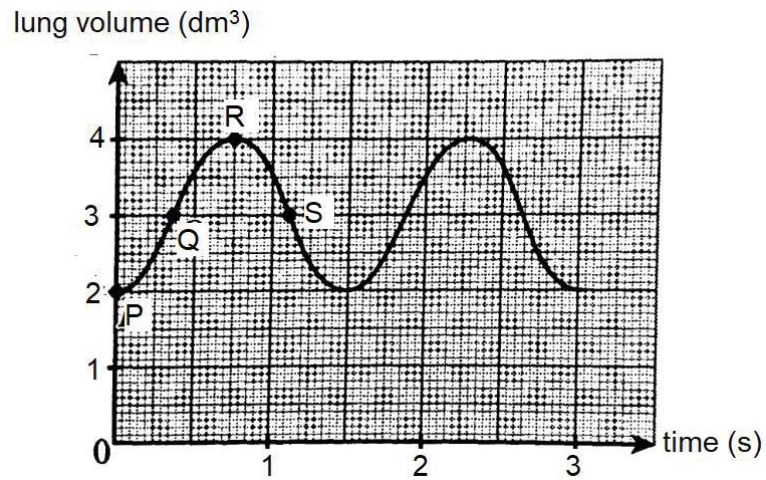
16 Three features are stated below.

- 1 no cell wall
- 2 no nucleus
- 3 no cytoplasm

Which features apply to both sieve tube elements and xylem vessels?

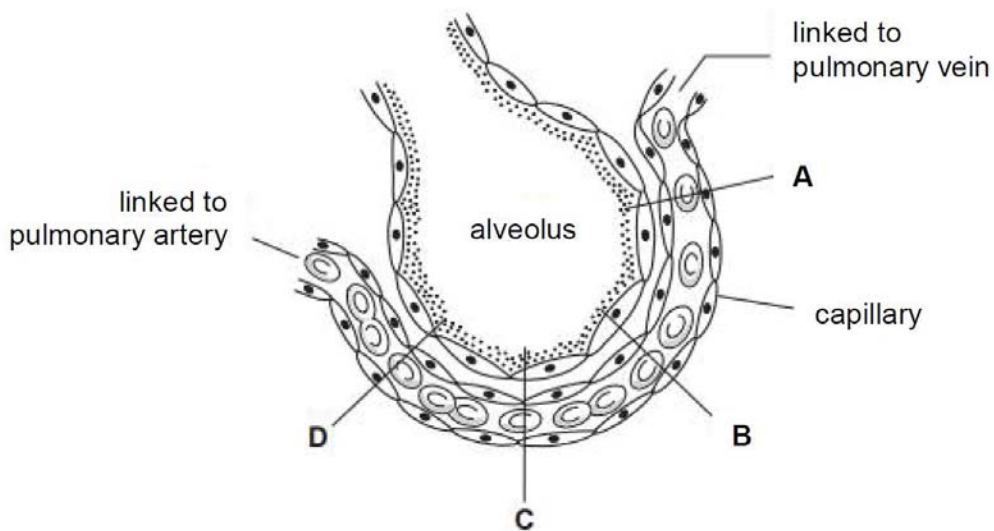
- A** 1 only
B 2 only
C 1 and 2
D 2 and 3

- 17 The graph below tracks changes in the lung volume of a person during physical activity.



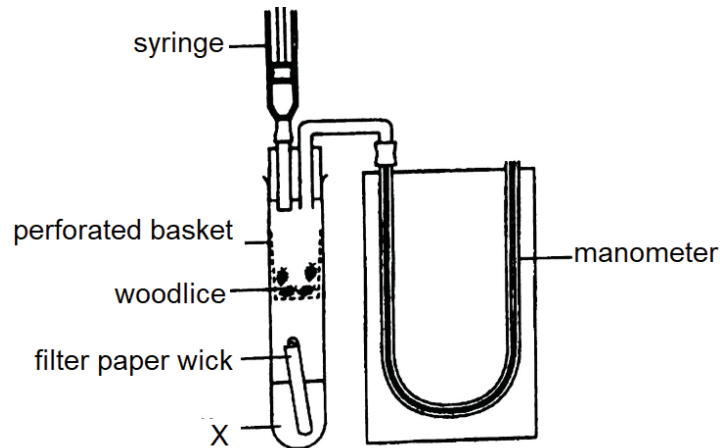
Which region of the graph shows the person exhaling?

- A $P \rightarrow Q$
 - B $Q \rightarrow R$
 - C $R \rightarrow S$
 - D $P \rightarrow R$
- 18 The diagram shows an alveolus and its surrounding capillary.



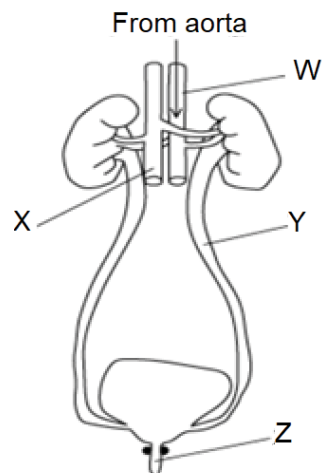
At which point is the rate of carbon dioxide diffusion highest?

- 19 The diagram shows a respirometer used to measure oxygen uptake by woodlice.



What is X?

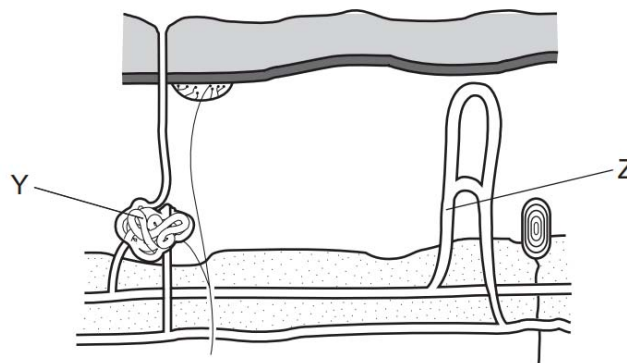
- A buffer solution to control the pH
 - B limewater to indicate the presence of carbon dioxide
 - C potassium hydroxide solution to absorb carbon dioxide
 - D water to control the humidity
- 20 The diagram shows the structure of human urinary system.



Which correctly matches the structures to the labels?

	renal vein	urethra	ureter
A	W	Y	Z
B	W	Z	Y
C	X	Y	Z
D	X	Z	Y

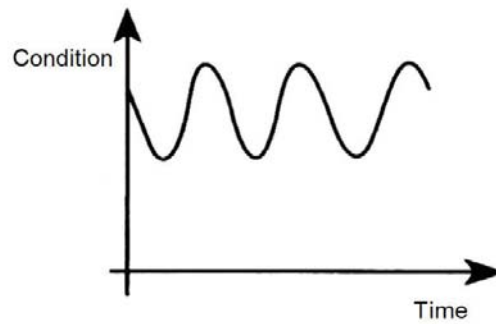
- 21** Which does **not** show excretion in humans?
- A** Exhaling carbon dioxide through the lungs.
 - B** Removing of excess water through skin.
 - C** Removing undigested waste through the anus.
 - D** Removing urea through the formation of urine.
- 22** An increase in insulin results in
- A** an increase in blood sugar level.
 - B** an increase in the conversion of glycogen to glucose.
 - C** an increase in permeability of cells to glucose.
 - D** a decrease in glucose metabolism.
- 23** The diagram shows the internal structures of skin.



What happens to Y and Z when body temperature rises?

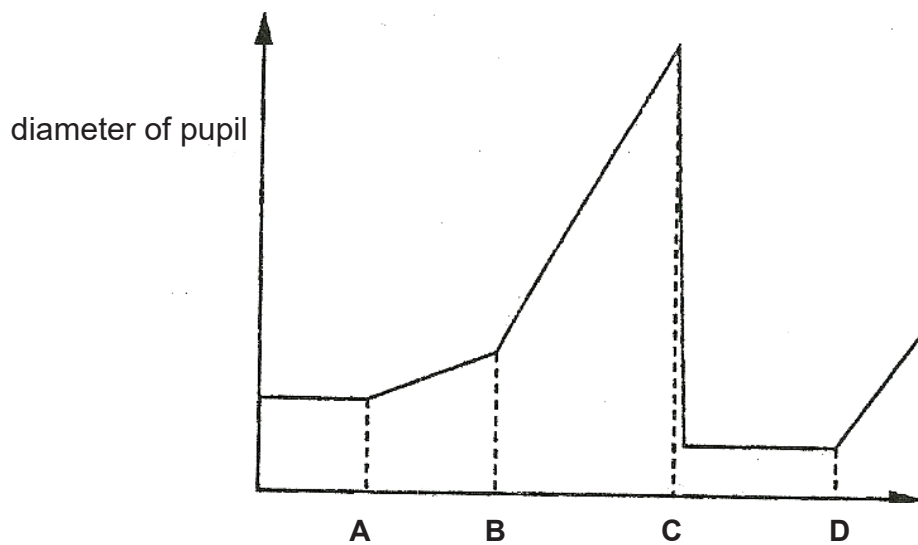
	Y	Z
A	active	dilate
B	active	constrict
C	less active	dilate
D	less active	constrict

- 24 Which condition is **not** represented by the graph below?



- A glucose level in blood
 - B production of milk in mammary glands
 - C temperature of blood
 - D water potential in blood
- 25 The graph shows the changes in the diameter of the pupils of a man's eyes in response to sunlight over time.

At which time does he put on his sunglasses?



- 26** Myopia or short-sightedness is a condition where distant objects appear blurred while near objects are clear.

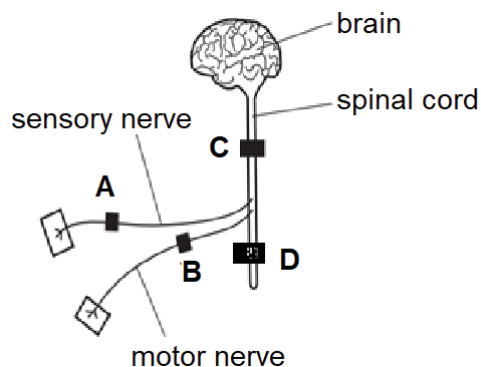
Below are some statements on the causes of myopia.

- 1 The lens are not able to change its curvature.
- 2 The ciliary muscles are not able to contract sufficiently.
- 3 The lens have become cloudy.
- 4 The circular muscles are not able to relax sufficiently.

Which statement(s) is/are true?

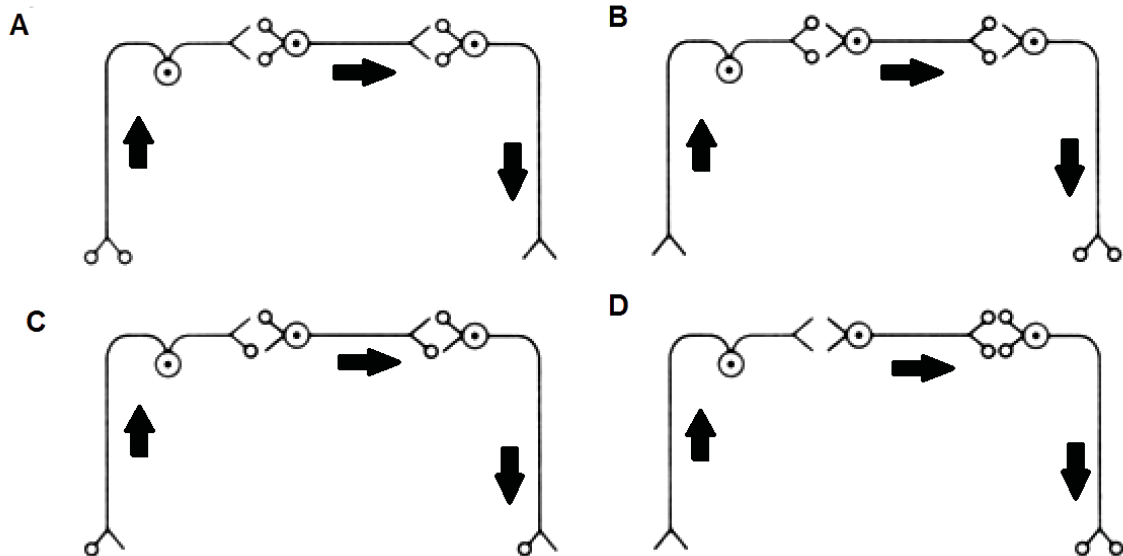
- A** 1 only
B 1 and 2
C 3 and 4
D 1, 2 and 4
- 27** Local anaesthetic drug can be applied at **A, B, C** or **D**.

At which part can the drug be applied to allow the person to move his hand unconsciously but unable to feel the pain from a pin prick?



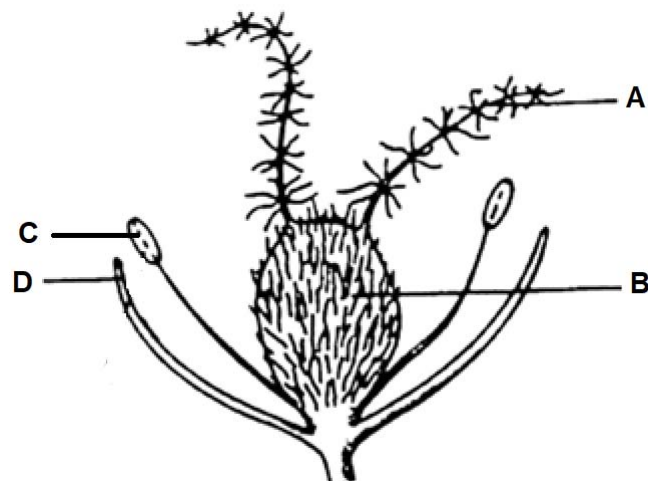
- 28 Which diagram most correctly represents the arrangement of the three types of neurons found in a reflex arc?

Legend:  = cell body of neurone  = axon endings  = direction of nerve impulses



- 29 The diagram shows a longitudinal section of a flower.

In which part will pollen grains be produced?

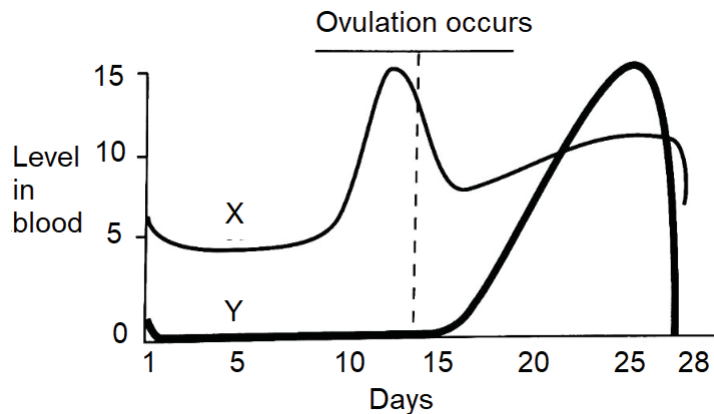


- 30** An experiment was set-up using four groups of insect-pollinated flowers in a field. In each group, different parts of the flowers were removed, as shown in the table below, and insects were allowed to visit all the flowers freely.

Which group of flowers would produce the most seeds?

group of flowers	anthers	stigma	petals
A	left	removed	left
B	left	removed	removed
C	removed	left	left
D	removed	left	removed

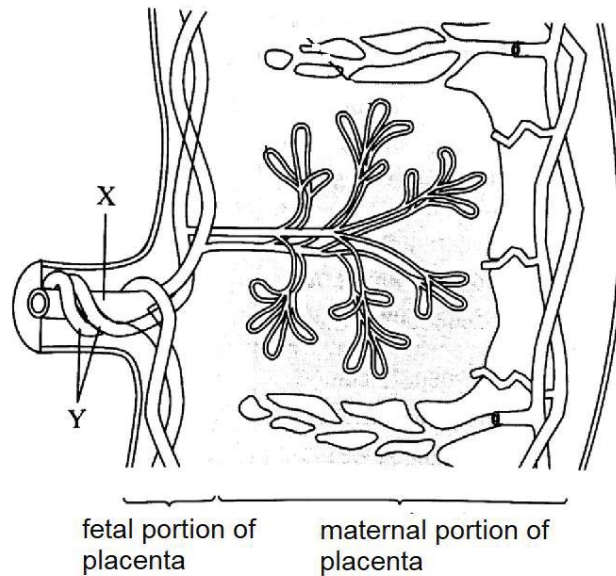
- 31** The graph shows the changes in hormones during a menstrual cycle.



What are hormones X and Y?

	X	Y
A	progesterone released from pituitary gland	oestrogen released from pituitary gland
B	progesterone released from ovary	oestrogen released from pituitary gland
C	oestrogen released from pituitary gland	progesterone released from ovary
D	oestrogen released from ovary	progesterone released from ovary

32 The diagram shows the structure of a human placenta.



Which row correctly describes vessel X in relation to vessel Y?

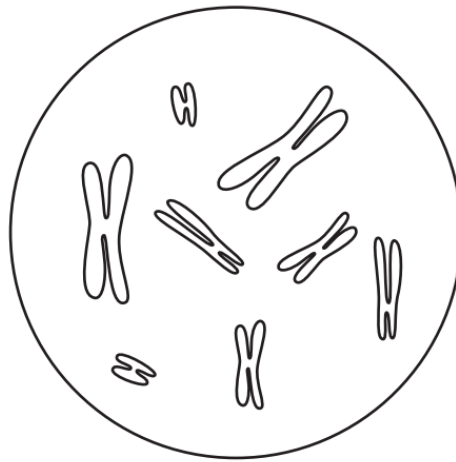
	relative concentration of glucose	relative concentration of urea	relative concentration of carbon dioxide
A	lower than Y	lower than Y	higher than Y
B	higher than Y	higher than Y	lower than Y
C	higher than Y	lower than Y	lower than Y
D	lower than Y	higher than Y	higher than Y

33 Two polynucleotide strands make up a DNA molecule.

Which of these statements is true?

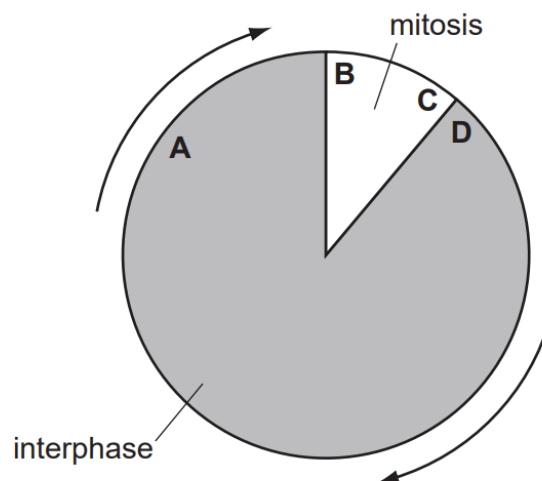
- A** Cytosine makes up 50% of bases in a molecule of DNA.
- B** The percentage of cytosine is the same as guanine in each polynucleotide strand.
- C** The percentage of cytosine is the same as guanine in each DNA molecule.
- D** The percentage of cytosine is the same in all polynucleotide strands.

- 34** The diagram shows a cell nucleus in early prophase 1 of meiosis.



Which describes the chromosomes in the daughter cell formed at the end of meiosis?

- A** 4 chromosomes each with one molecule of DNA
 - B** 4 chromosomes each with two molecules of DNA
 - C** 8 chromosomes each with one molecule of DNA
 - D** 8 chromosomes each with two molecules of DNA
- 35** The diagram shows the cell cycle.
- When radioactive nucleotides are supplied to the cell, at which stage will the nucleotides be incorporated into the chromosomes?



- 36** A length of double-stranded DNA molecule contains 120 nucleotides and codes for polypeptide X.

What is the maximum number of amino acids found in polypeptide X?

- A** 20
- B** 40
- C** 60
- D** 360

- 37** Which of these is a result of chromosomal mutation?

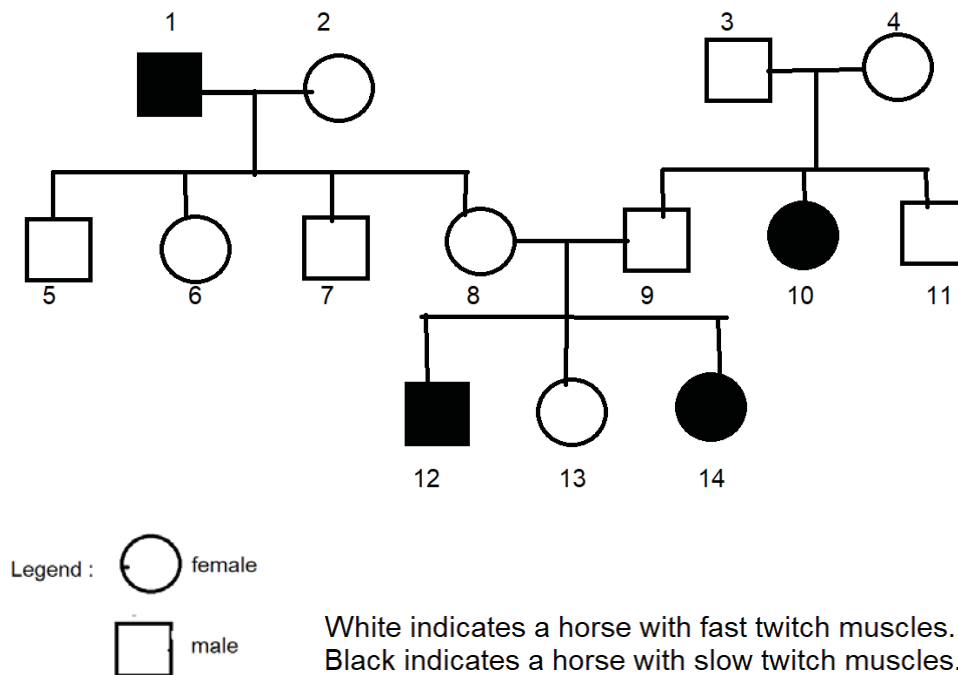
- A** albinism
- B** down's syndrome
- C** emphysema
- D** sickle cell anaemia

- 38** The allele for brown eyes is dominant in humans to the allele for blue eyes. A man with brown eyes is heterozygous while his wife has blue eyes.

What is the probability of getting a son with blue eyes?

- A** 1
- B** $\frac{3}{4}$
- C** $\frac{1}{2}$
- D** $\frac{1}{4}$

- 39** The diagram tracks the inheritance of fast twitch muscles and slow twitch muscles in three generation of horses.



What are the likely genotypes of horses 1, 4 and 8?

	1	4	8
A	homozygous recessive	heterozygous	homozygous dominant
B	homozygous dominant	homozygous dominant	heterozygous
C	heterozygous	heterozygous	homozygous dominant
D	homozygous recessive	heterozygous	heterozygous

- 40** What needs to be inserted into a bacterial cell to produce protein such as insulin?

- A** an enzyme
- B** a molecule of human DNA
- C** a segment of human DNA
- D** a molecule of bacterium DNA



**BEATTY SECONDARY SCHOOL
PRELIMINARY EXAMINATIONS 2020**

SUBJECT : BIOLOGY

LEVEL : 4 EXPRESS

PAPER : 6093/2

DURATION : 1H 45 MIN

SETTER : MDM SITI ZUBAIDAH

DATE : 26 AUGUST 2020

CLASS :	NAME :	REG NO :
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.....
READ THESE INSTRUCTIONS FIRST

Write your name, class and register number on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
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

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

Electronic calculators may be used.

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 the 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	
Section A	
B9	
B10	
B11	
Total	

Section A

Answer **all** the questions.

Write your answers in the spaces provided.

- 1 Fig. 1.1 shows two histograms representing the proportions of four main types of cell organelles in two types of plant cells, P and Q.

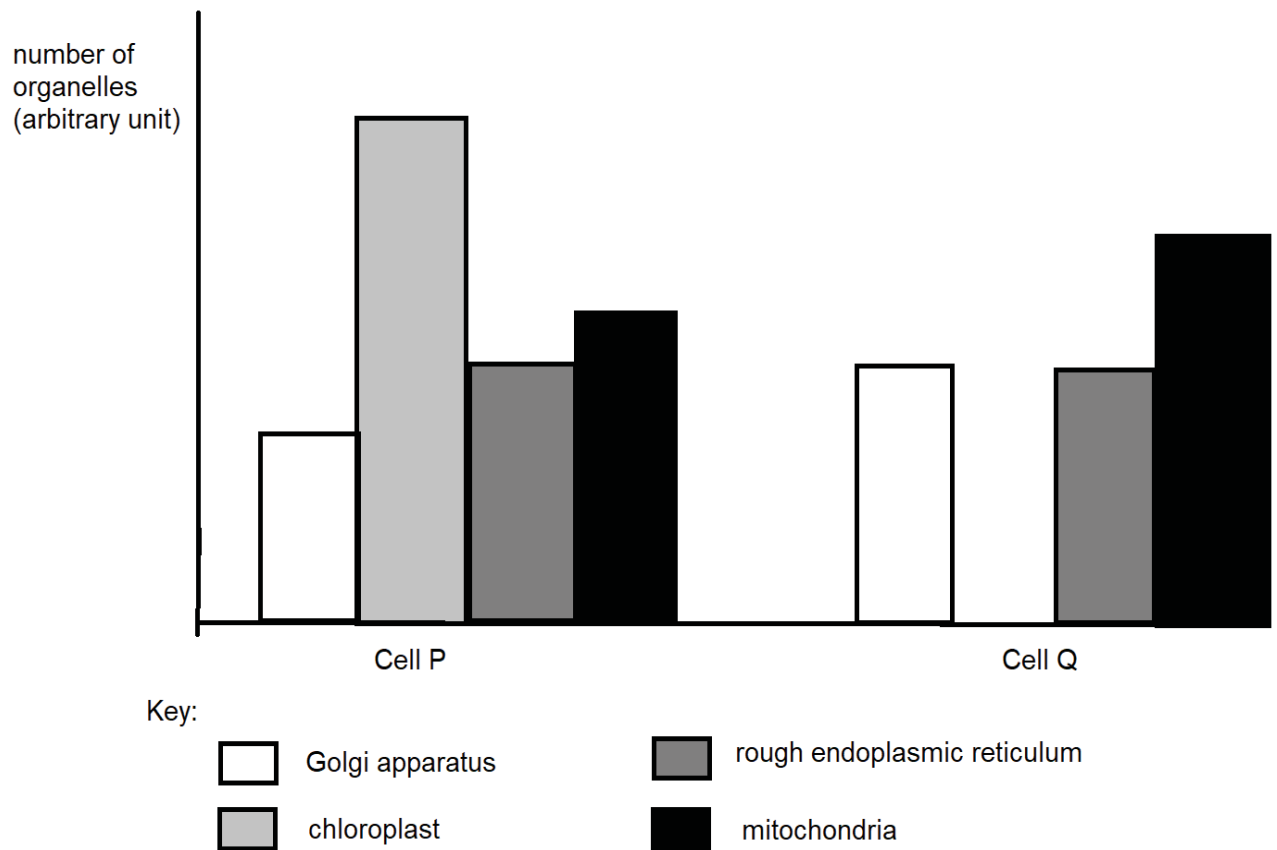


Fig. 1.1

- (a) State the functions of the following organelles.

Golgi apparatus:

.....

Mitochondria:

.....

[2]

- (b) Suggest the identities of cell P and Q, providing reasons for your answer.

.....

.....

.....

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.....

.....

.....

[2]

- (c) Draw a histogram showing the possible proportions of the four cellular organelles in a pancreatic cell. Label the histogram clearly.

[2]

[Total: 6]

2 Fig. 2.1 shows a section through a leaf of a plant living in dry conditions.

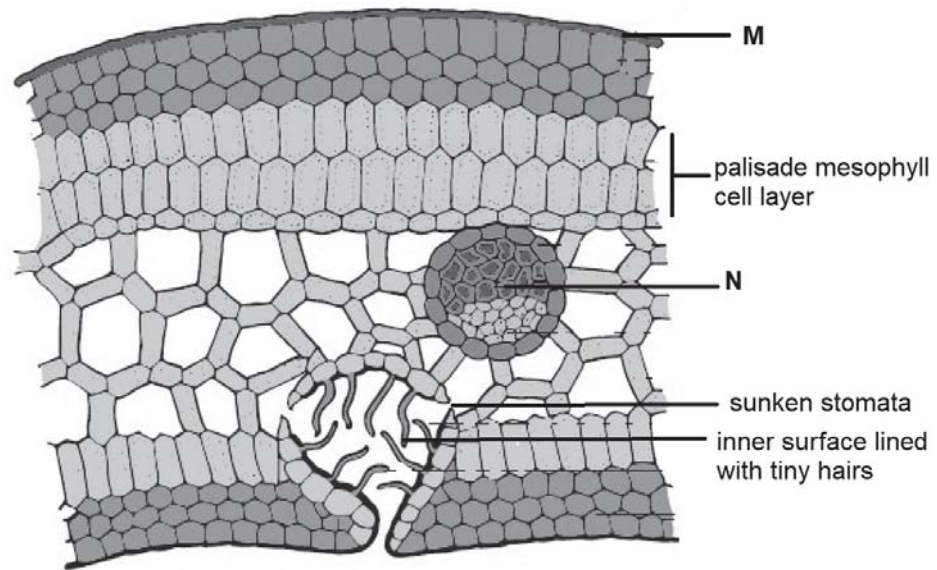


Fig. 2.1

(a) Identify **M** and **N**.

M:

N:

[1]

(b) The presence of sunken stomata and tiny hairs lining the inner surface help the plant to adapt to the dry conditions.

Suggest and explain how these adaptations work.

.....

.....

.....

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.....

[2]

- (c) Describe the entry of carbon dioxide from the atmosphere into a named cell in the leaf.

.....

.....

.....

..... [2]

[Total: 5]

- 3 Red blood cells are suspended in plasma which has a concentration equivalent to that of 0.9 % sodium chloride (NaCl) solution.

A student investigated what happens to red blood cells when placed into sodium chloride solutions of different concentrations.

A small drop of blood was added to 10 cm³ of each sodium chloride solution. Samples were taken from each mixture and observed under the microscope. The number of red blood cells remaining in each sample was calculated as a percentage of the number in the 0.9 % solution. The results are shown in Fig. 3.1.

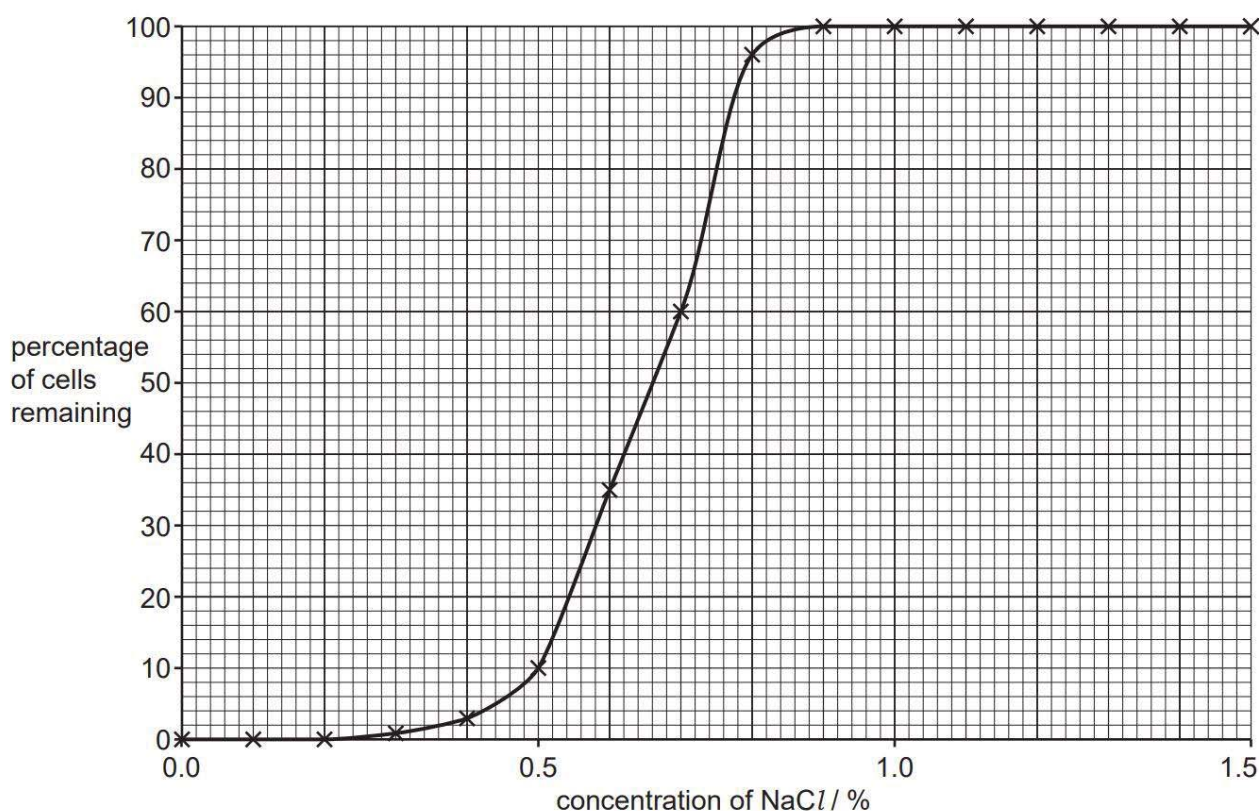


Fig. 3.1

- (a) With reference to Fig. 3.1, describe the student's results.

.....

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.....

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.....

[3]

- (b) Explain the results obtained when the concentration of NaCl is between 0.0 % and 0.2 %.

.....

.....

.....

..... [2]

[Total: 5]

- 4 Fig. 4.1 is a photomicrograph of two homologous chromosomes during a stage in meiosis.



Fig. 4.1

- (a) Describe one way that the homologous chromosomes are

- (i) similar to each other,

.....

- (ii) different from each other.

..... [2]

- (b) Identify which stage the chromosomes are in meiosis.

..... [1]

- (c) Explain the importance of the event that is taking place during this stage.

.....

.....

.....

..... [2]

[Total: 5]

- 5 Fig. 5.1 and Fig. 5.2 show the use of some scientific techniques in the process of reproduction. The animal used in this particular procedure was a sheep.

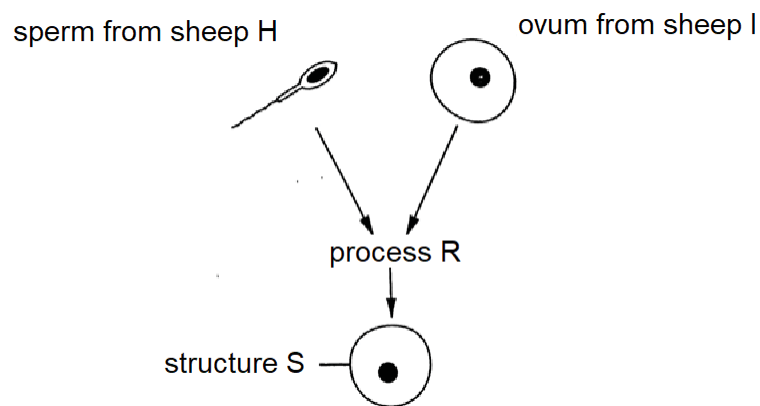


Fig. 5.1

- (a) Define process R.

.....

..... [1]

- (b) The diploid number of a sheep is 54. State the number of chromosomes in

(i) ovum of sheep I

(ii) structure S

[1]

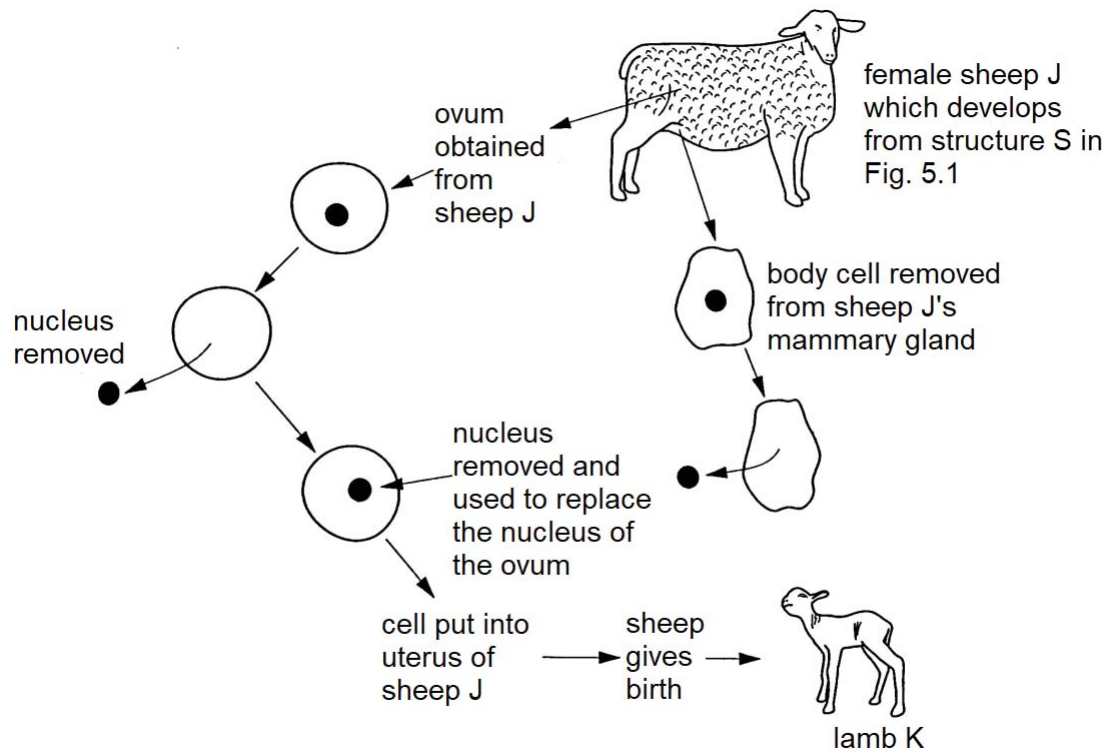


Fig. 5.2

- (c) What type of reproduction is shown in Fig. 5.2? Use the diagram to explain your answer.

.....

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.....

.....

[2]

[Total: 4]

6 Fig. 6.1 shows the blood circulatory systems of two organisms, **P** and **Q**.

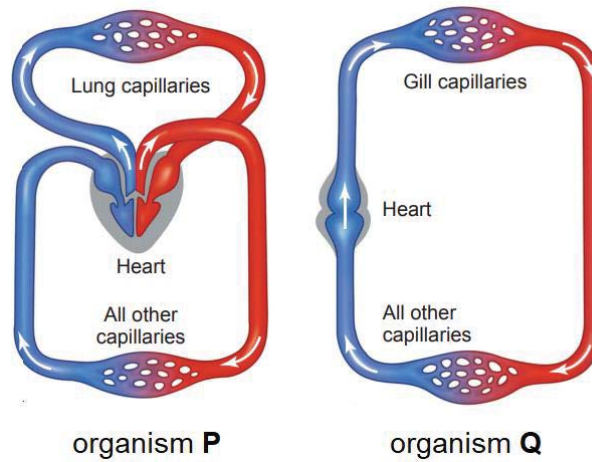


Fig. 6.1

(a) State one similarity between the circulatory systems of organisms **P** and **Q**.

..... [1]

(b) The heart of organism **P** has two ventricles while the heart of organism **Q** has only one ventricle. Explain the advantage of having two ventricles.

..... [2]

Fig. 6.2 shows the changes in blood pressure in organism **P** as blood flows around the body.

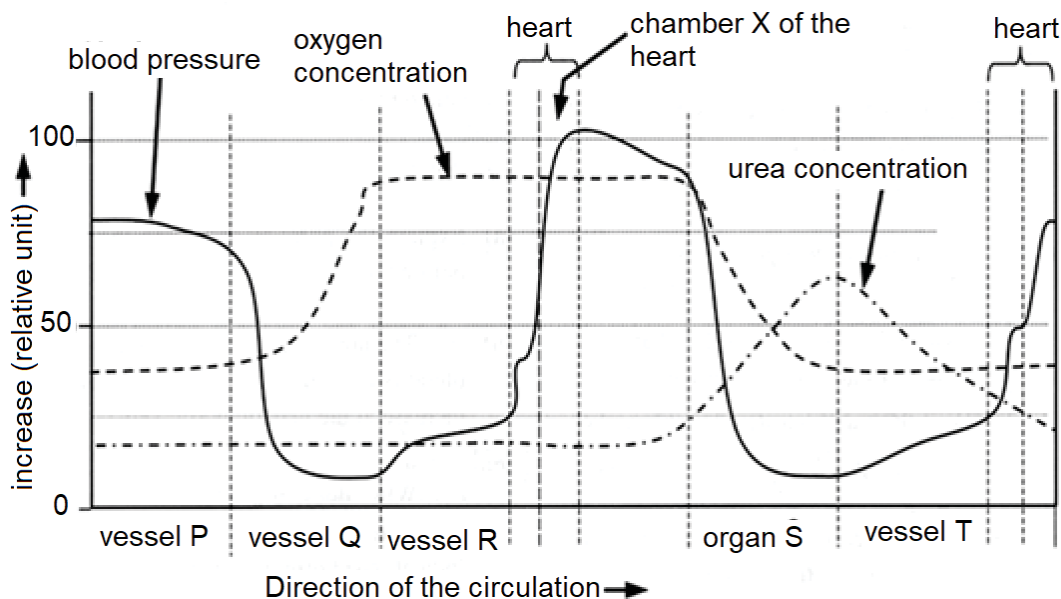


Fig. 6.2

(c) Identify the following. Explain your answer.

(i) chamber X of heart:

explanation:

(ii) vessel Q:

explanation:

(iii) organ S:

explanation:

[6]

[Total: 9]

- 7 Enzyme lactase can be used to digest lactose into its monosaccharides. A deficiency in enzyme lactase can result in a condition known as lactose intolerance. In this condition, lactose passes undigested into the large intestine resulting in diarrhoea.

Some babies are born with congenital lactase deficiency, which is an inherited condition and thus require lactose-free milk from birth.

- (a) State the monosaccharides formed at the end of lactose digestion by enzyme lactase.

..... [1]

- (b) Two parents who can digest lactose, have a child who has congenital lactase deficiency.

Is the allele for this condition dominant or recessive? Justify your answer with labelled genetic diagrams.

- (c) The enzyme lactase can be produced using biotechnology and is normally used to produce lactose-free dairy products. Lactase is normally used immobilised in alginate beads.

Fig. 7.1 shows a comparison between the activity of lactase free in solution and lactase immobilized in alginate beads, over a range of temperatures. Equal concentrations of free lactase and immobilised lactase were used.

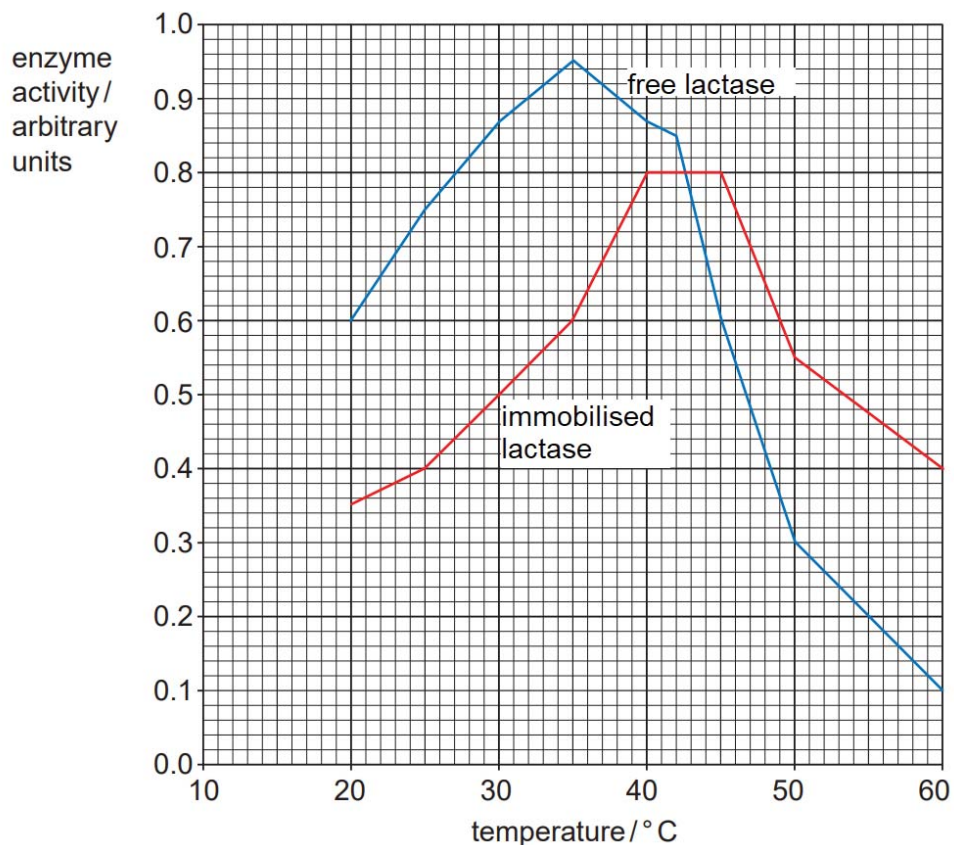


Fig. 7.1

- (i) Compare the activity of free lactase and immobilised lactase at temperatures between 20 °C to 40 °C.

.....

.....

.....

.....

[2]

- (ii) Provide an explanation for the activity of immobilised lactase at temperatures between 20 °C to 40 °C.

.....

.....

.....

..... [2]

[Total: 9]

- 8 Fig. 8.1 is a diagram showing part of a capillary and two alveoli.

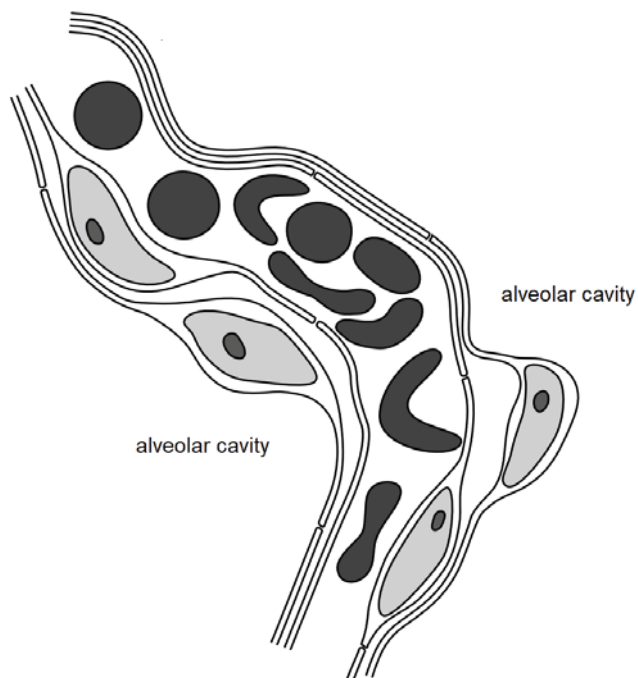


Fig. 8.1

- (a) With reference to Fig. 8.1, describe the adaptation(s) of the

- (i) alveoli,

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..... [2]

- (ii) red blood cell.

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[1]

- (b) Smoking can cause a large-scale destruction of alveolar walls.

- (i) Describe how this happens.

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[2]

- (ii) Outline the effects of smoking on the destruction of a person's health.

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[2]

[Total: 7]

Section B

Answer **all** questions.

Write your answer in the spaces provided.

- 9** Alcohol is a toxin that has to be removed by the body when consumed. The liver is responsible to detoxify the alcohol present in blood.

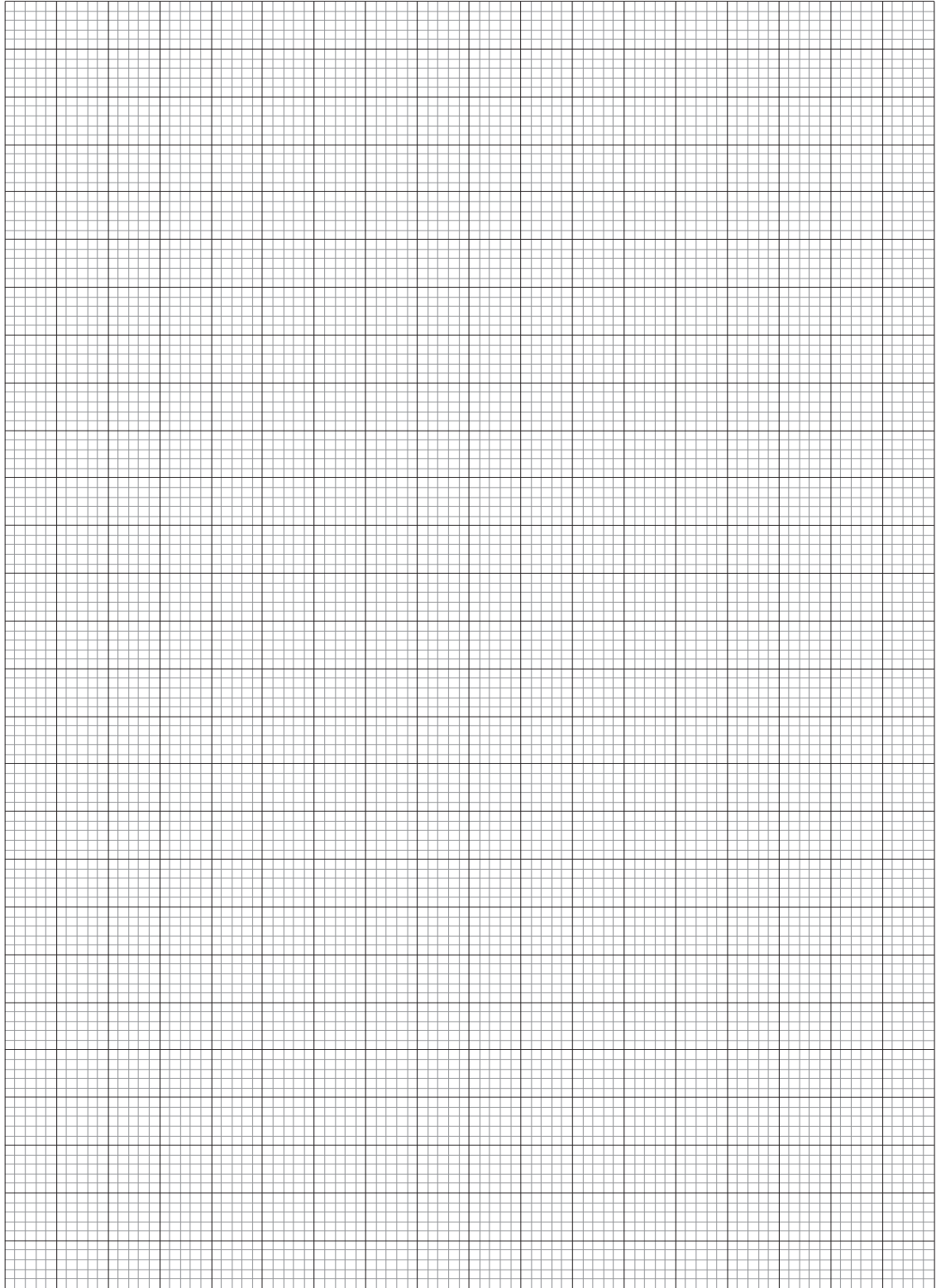
Blood alcohol content (BAC) is a measure of alcohol in the blood as a percentage so a BAC of 0.08 means your blood is 0.08 % alcohol by volume.

The BAC of a man is recorded over time from the time alcohol is consumed in Table 9.1.

Table 9.1

Time (hours)	BAC (%)
0200	0.20
0400	0.17
0600	0.14
0800	0.10
1000	0.08
1200	0.05
1400	0.02
1600	0.00

- (a) Plot a graph of BAC recorded over time on the grid provided using the information in Table 9.1.



[4]

- (b) From the graph, state his BAC value at 0700 hours.

..... [1]

- (c) On another day, he drinks 600 ml of wine, which contains 12 % alcohol. Males have an average volume of 5 l of blood.

- (i) Calculate his BAC value immediately after drinking the wine.

BAC value: [2]

- (ii) A BAC value of more than 0.08 % will cause a person to be highly intoxicated. Justify, with reasons, if he should drink and drive after consuming the wine.

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 [2]

- (d) Drinking alcohol excessively can alter the movement and number of sperms in men. Explain how this will affect the fertility in men who drink excessively.

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 [2]

- (e) State another function of the liver.

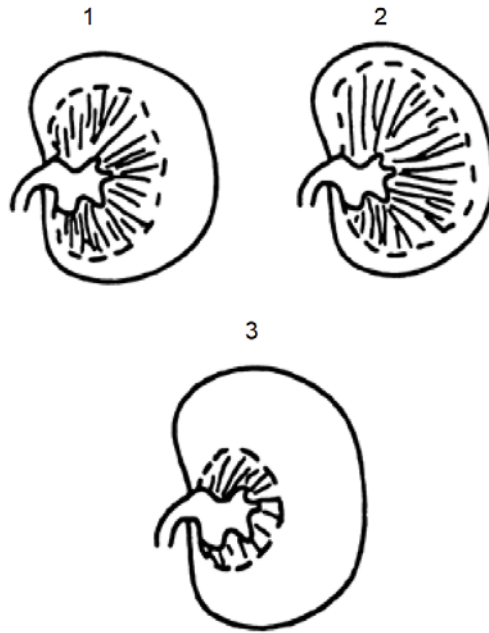
..... [1]

[Total: 12]

- 10** The diagram shows the cortex and medulla regions of three different types of kidneys belonging to three different types of rat species living at different conditions.

The three different species are:

1. brown rat that lives predominantly in the dessert with very little water supply
2. kangaroo rat that lives in areas where there is some water supply
3. coypu rat that lives in areas with abundant water supply



- (a)** Match the kidneys to the different rat species, providing reasons for your answer.

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[4]

(b) Suggest and explain the composition of urine in a kangaroo rat on a hot day.

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[Total : 8]

- 11 (a) Compare the hormonal system and the nervous system.

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[5]

- (b) Insulin is normally injected into the bloodstream in patients suffering from diabetes mellitus. Insulin stimulates the liver cells to convert excess glucose into glycogen thus lowering the glucose level in blood.

Another alternative is by inhaling insulin into the lungs as a spray.

Outline how insulin enters the body from the mouth into the bloodstream, eventually reaching the liver.

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[5]

[Total: 10]

