



Rugby  
School

## Sixth Form Entrance Examination

**Specimen paper**

**BIOLOGY**

***Time allowed: 1 hour***

This paper is divided into two sections

<b>Section A:</b>	Multiple choice : 30 marks
<b>Section B:</b>	Structured questions : 30 marks
<b>Equipment Required:</b>	Pen, pencil, ruler and calculator

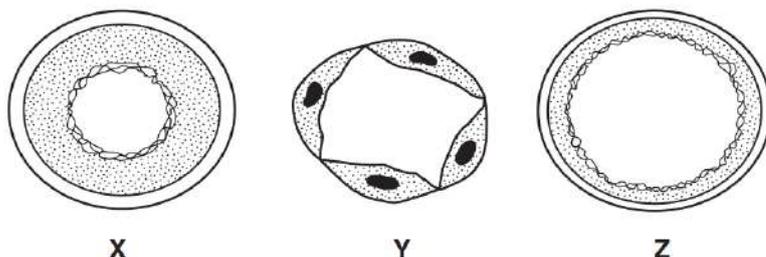
## SECTION A

Use the attached 'Multiple Choice Answer Sheet' at the back of this booklet to give your answer to the following 20 multiple questions. You may detach the sheet but remember to write your name and school in the space provided.

Indicate your answer by circling your chosen letter using a dark (HB) pencil. Ensure you have only one clear answer for each question.

**Q1**

The diagram shows cross-sections of three types of blood vessel (not drawn to the same scale).

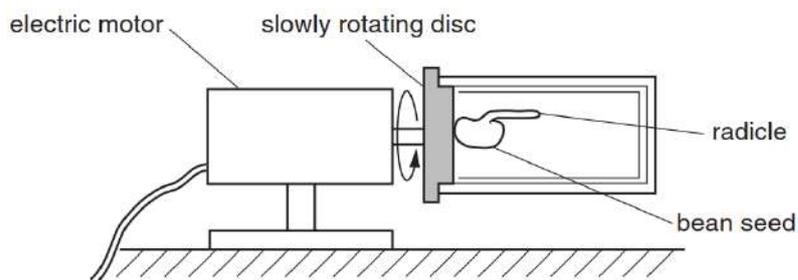


What is the identity of the three vessels?

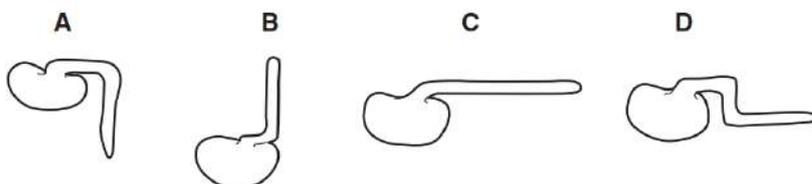
	artery	capillary	vein
<b>A</b>	X	Y	Z
<b>B</b>	Y	X	Z
<b>C</b>	X	Z	Y
<b>D</b>	Y	Z	X

**Q2**

The diagram shows a germinated bean seed with a horizontal radicle. This is placed on a slowly rotating disc and is left for three days.



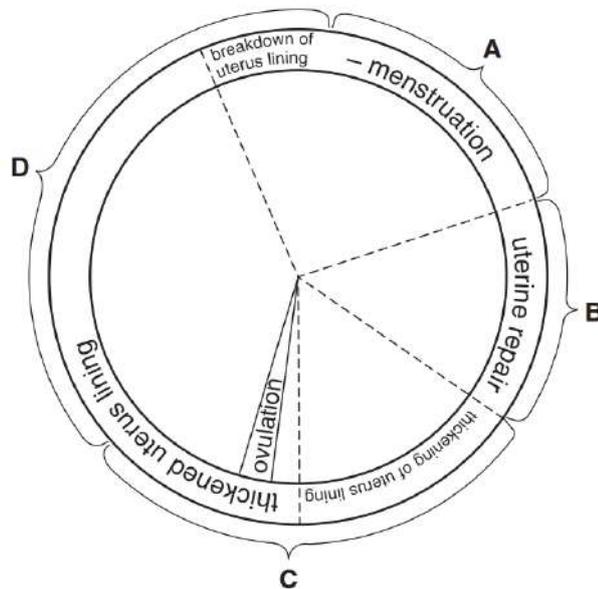
Which diagram shows the appearance of the radicle after three days?



**Q3**

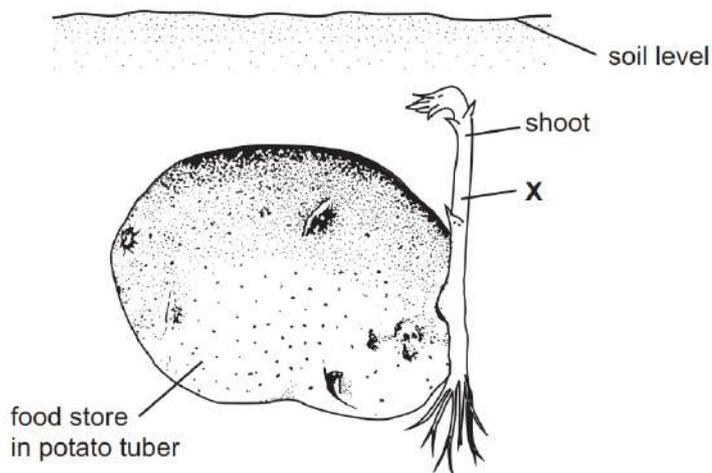
The diagram shows stages of a menstrual cycle.

During which stage is a woman most fertile?



**Q4**

The diagram shows a shoot growing from a potato tuber.



What is being transported in the phloem cells at X?

- A starch downwards
- B starch upwards
- C sugars downwards
- D sugars upwards

**Q5**

From which organ is most carbon dioxide excreted?

- A kidney
- B liver
- C lung
- D skin

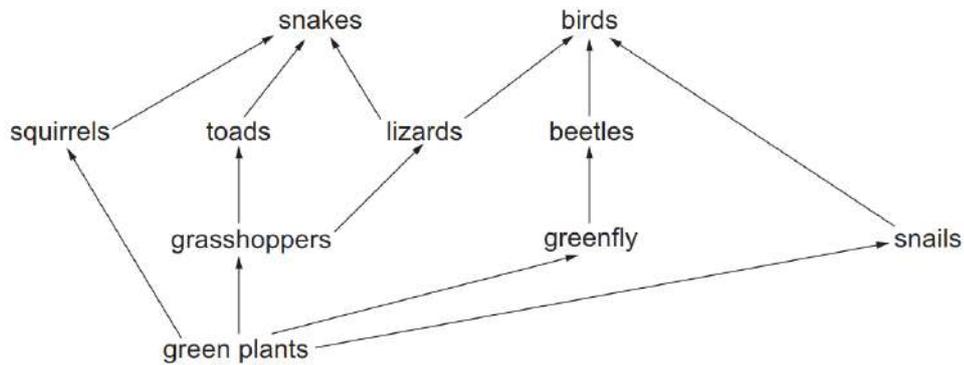
**Q6**

Which substance normally passes from a fetus to its mother through the placenta?

- A alcohol
- B glucose
- C oxygen
- D urea

**Q7**

The diagram shows a food web.



Which organisms will increase in number, if the number of snakes increases?

- A birds
- B grasshoppers
- C lizards
- D squirrels

**Q8**

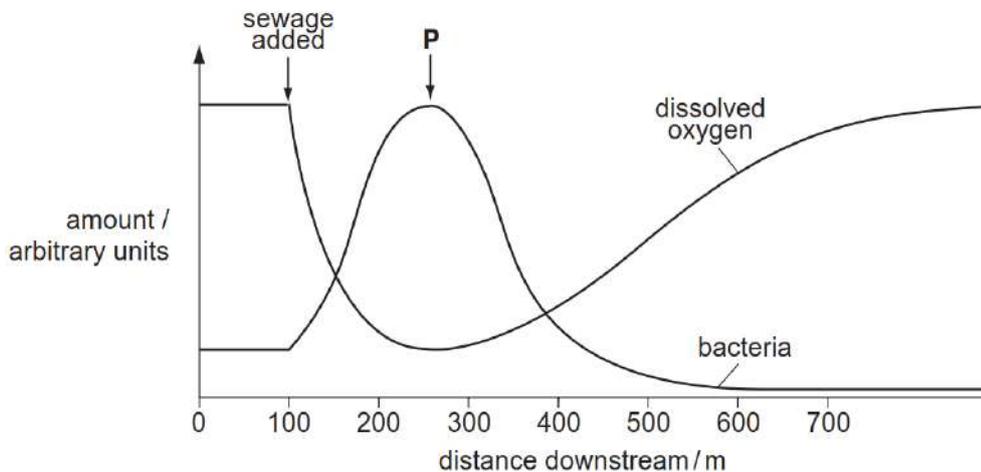
The activity of decomposers returns substances to the atmosphere.

Which products of decomposition enter the atmosphere?

- A carbon dioxide and nitrogen
- B carbon dioxide and water
- C oxygen and nitrogen
- D oxygen and water

### Q9

The graph shows how oxygen concentration and numbers of bacteria change when sewage is added to a river.



What describes the oxygen concentration and the numbers of bacteria between the point at which sewage is added and point P?

- A Oxygen concentration and numbers of bacteria stay the same.
- B Oxygen concentration decreases and numbers of bacteria increase.
- C Oxygen concentration increases and numbers of bacteria decrease.
- D Oxygen concentration remains the same and numbers of bacteria increase.

### Q10

Which word equation represents anaerobic respiration in human muscle?

- A glucose  $\rightarrow$  carbon dioxide + ethanol (alcohol)
- B glucose  $\rightarrow$  carbon dioxide + lactic acid
- C glucose  $\rightarrow$  ethanol (alcohol)
- D glucose  $\rightarrow$  lactic acid

### Q11

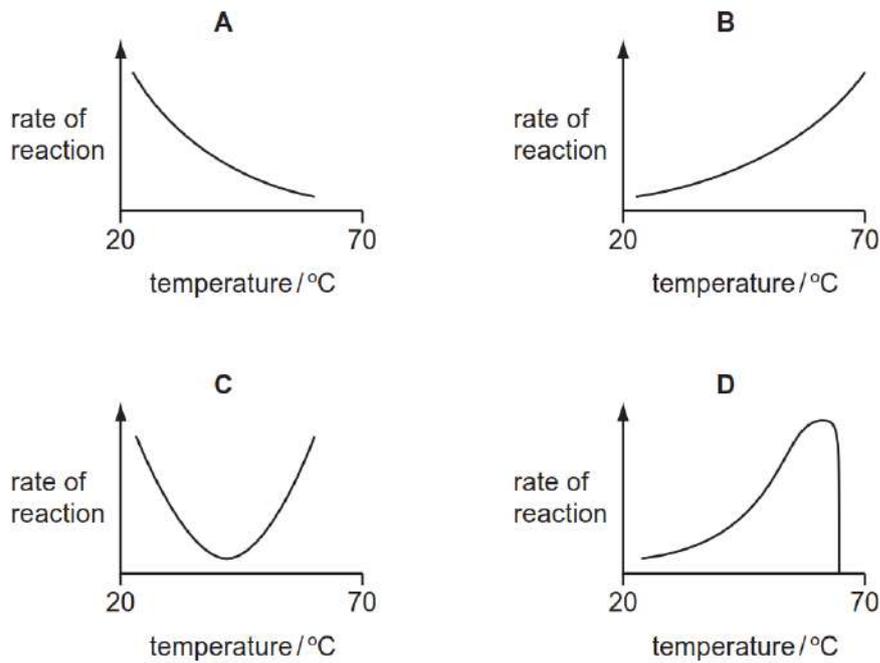
Starch is digested by amylase in the mouth, but it is not digested in the stomach.

What is the reason for this?

- A All starch digestion is completed in the mouth.
- B The pH in the stomach is not suitable for the amylase to work.
- C The starch does not stay in the stomach long enough to be digested.
- D The temperature in the stomach is not suitable for the amylase to work.

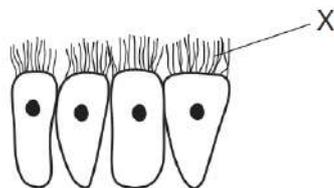
**Q12**

Which graph shows the effect of temperature on the activity of a human digestive enzyme?



**Q13**

The diagram shows some cells from the lining of the trachea (windpipe) in the respiratory tract.



What is the function of the structures labelled X?

- A absorbing oxygen
- B killing micro-organisms
- C moving mucus
- D trapping bacteria

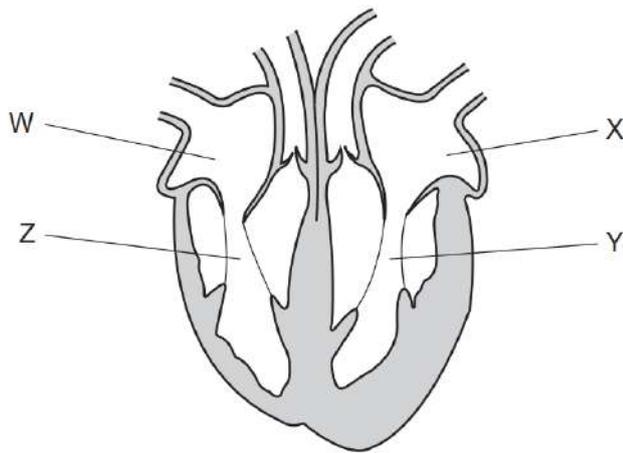
**Q14**

Which cell type contains the **most** chloroplasts?

- A palisade mesophyll
- B phloem
- C spongy mesophyll
- D xylem

**Q15**

The diagram shows the human heart.

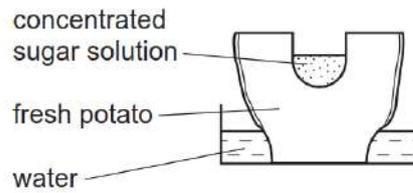


Which two chambers contract at the same time?

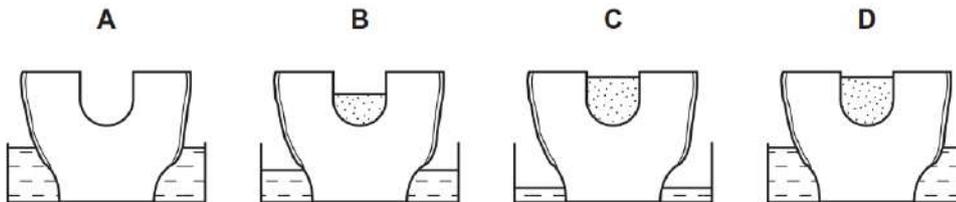
- A** W and X      **B** W and Z      **C** X and Z      **D** X and Y

**Q16**

The diagram shows an experiment using a potato.



Which shows the result of the experiment after 24 hours?



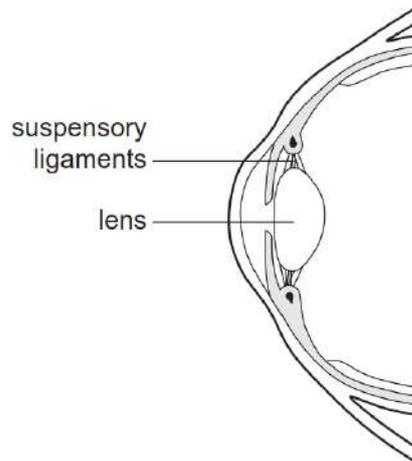
**Q17**

Which set of conditions will best enable seeds to germinate quickly?

	water	oxygen	temperature (°C)
<b>A</b>	absent	present	20
<b>B</b>	present	absent	20
<b>C</b>	present	present	20
<b>D</b>	present	present	0

**Q18**

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



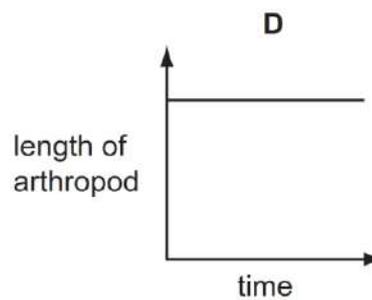
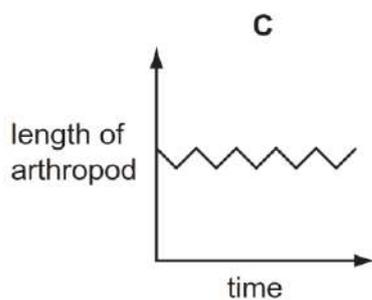
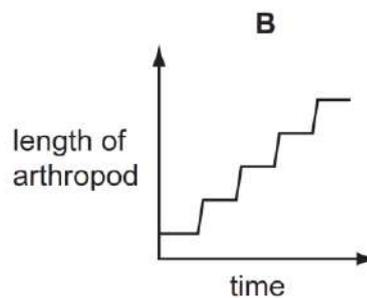
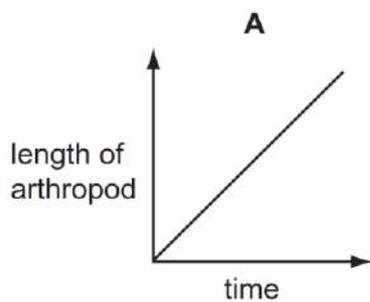
When a person looks at an object which is close to their eye, which of the following takes place?

	suspensory ligaments	lens
<b>A</b>	slacken	becomes fatter
<b>B</b>	slacken	becomes thinner
<b>C</b>	tighten	becomes fatter
<b>D</b>	tighten	becomes thinner

**Q19**

In arthropods, growth occurs only after the exoskeleton is shed and before the new one hardens.

Which graph shows a typical growth curve for an arthropod?



**Q20**

In the life cycle of a mammal, what describes the eggs or sperms and the cells of the embryo?

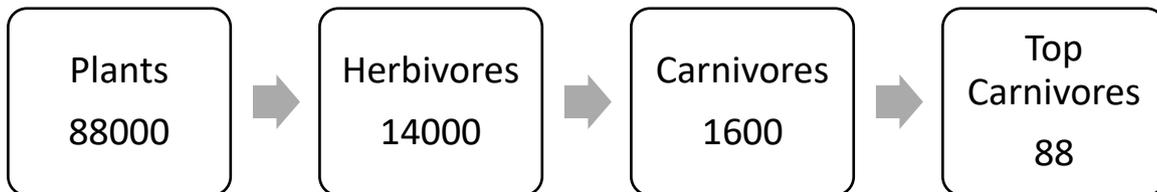
	eggs or sperms	cells of the embryo
<b>A</b>	diploid	diploid
<b>B</b>	diploid	haploid
<b>C</b>	haploid	diploid
<b>D</b>	haploid	haploid

**The END of Section A**

## Section B

Q1

The diagram shows a food chain in a pond. The figures show the amounts of energy in each type of organism, in kilojoules per m<sup>2</sup> of pond per year



(a) Calculate the percentage of the energy in plants that is passed to the top carnivores. Show your working

.....%

[1]

(b) In the space below, draw a labelled pyramid of biomass for this food chain.

[2]

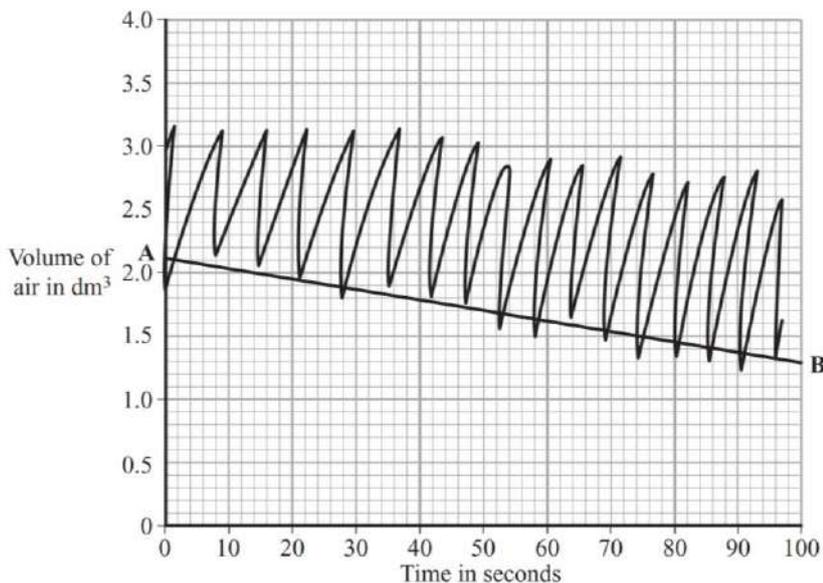
(c) If humans ate organisms from this food chain, it would be more efficient to eat plant than to eat herbivories. Why is this?

.....  
.....  
.....

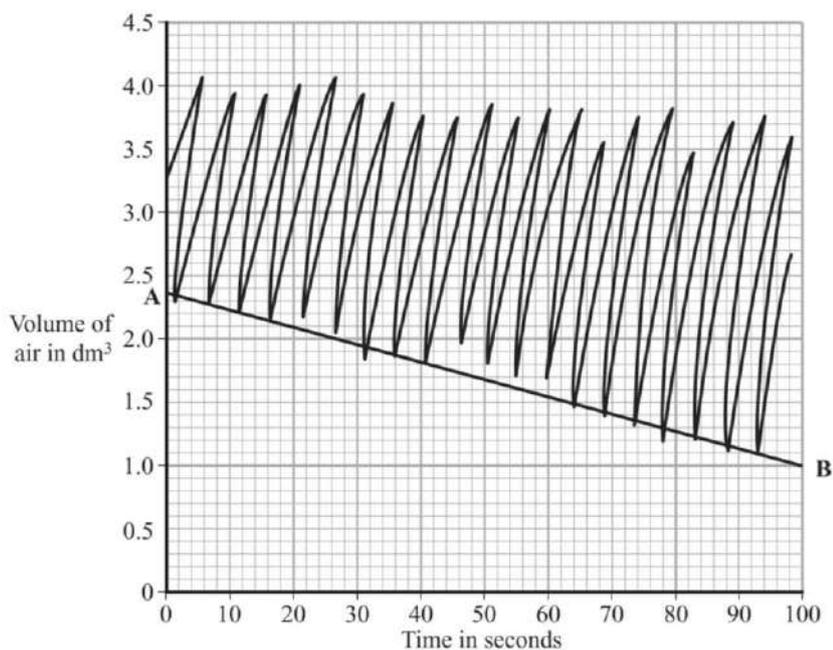
[1]

**Q2** A student's breathing was monitored before and after vigorous exercise. The student breathed in and out through a special apparatus. The graphs show the changes in the volume of air inside the apparatus. Each time the student breathed in, the line on the graph dropped. Each time the student breathed out, the line went up.

**Before Exercise**



**After Exercise**



(a) How many times did the student breathe in per minute

Before exercise; .....

After exercise; .....

(b) ON each graph, the line **A-B** shows how much oxygen was used. The rate of oxygen use before exercise was  $0.5 \text{ dm}^3$  per minute?

Calculate the rate of oxygen use after exercise.

Rate of oxygen use after exercise = ..... $\text{dm}^3$  per minute

**[1]**

(c) The breathing rate and amount of oxygen used were still higher after exercise, even though the student sat down to rest.

Why were they still higher?

.....

.....

.....

.....

.....

.....

.....

.....

.....

**[4]**

(d) Apart from the temperature, state one other factor which must be kept constant throughout the experiment.

.....

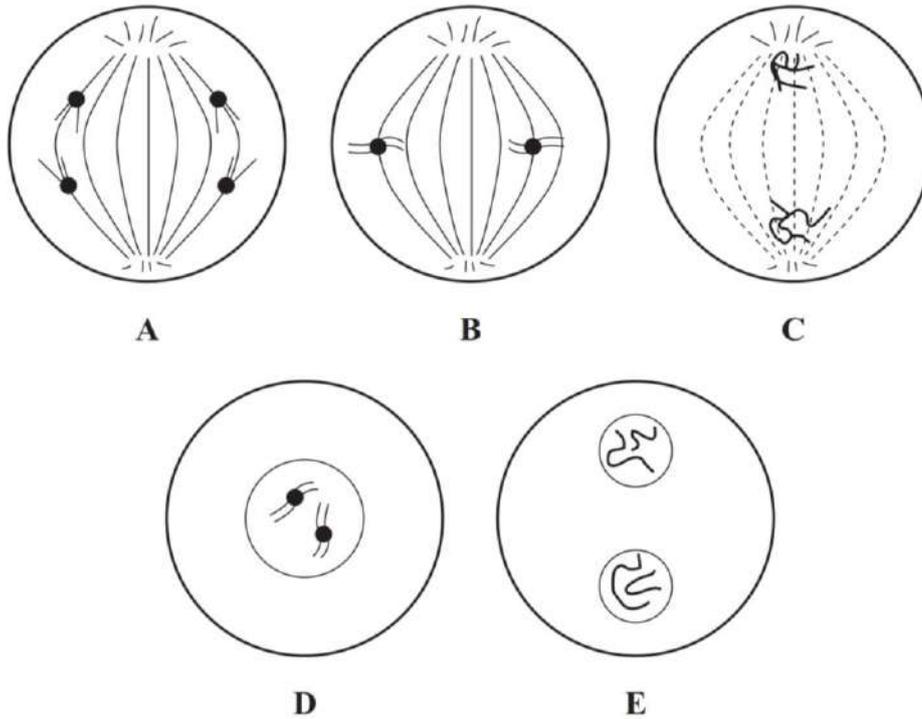
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.....

**[1]**

**Q3**

The diagram shows five stages in one type of cell division. The stages are not in the correct order. Cells produced by this type of cell division are genetically identical.



(a) Name the type of cell division shown in the diagram

.....

[1]

(b) What is the correct order of stages A, B, C, D, E?

.....

[1]

(c) Approximately one in every million cells produced by this types of cell division will be genetically different.

(i) What term do scientists use to describe a change in a gene?

.....

**[1]**

(ii) The rate of genetic change can be increased by some environmental factors. Give one environmental factor that would cause an increase in the rate of genetic change.

.....

**[1]**

**Q4**

(a) What is the name given to an enzyme which catalyses the breakdown of a protein?

.....

[1]

(b) What product is formed when protein is broken down by an enzyme?

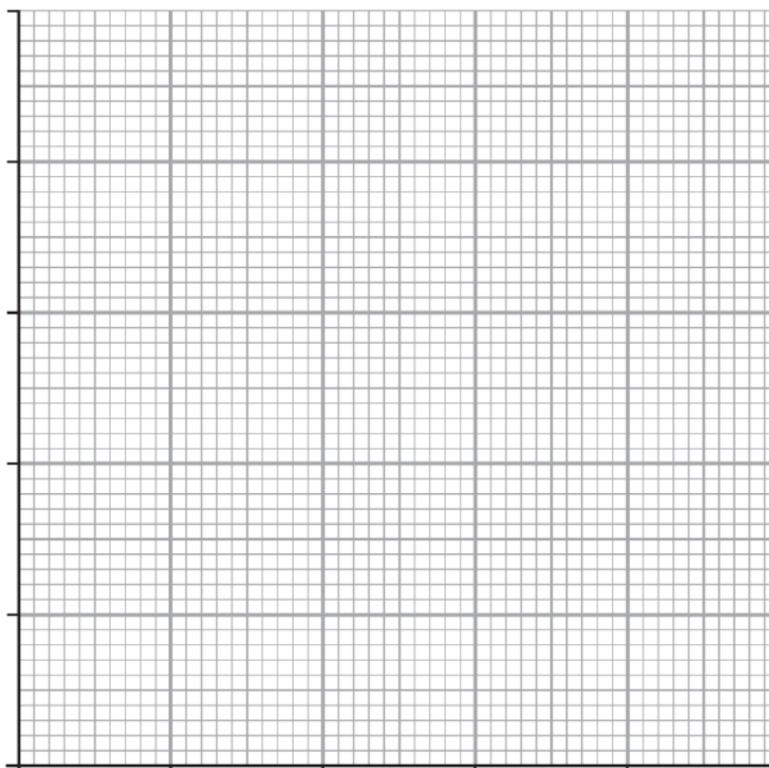
.....

[1]

The table below shows the effect of pH on the activity of an enzyme which catalyses the breakdown of protein

<b>pH</b>	1.0	2.0	3.0	4.0	5.0
<b>Rate of formation of product in mmol per minute</b>	10.5	23.0	10.5	2.5	0.0

(c) Draw a graph of the data in the table



[5]

(d) Calculate how many times greater the enzyme rate is at pH 2.0 than pH 4.0.

.....

[1]

The enzyme is produced by the human digestive system.

(e) Suggest which part of the digestive system produces this enzyme.

.....

[1]



# Multiple Choice Answer Sheet

Please answer all 20 questions by circling the correct answer.

*Take care not to go out of sequence as this will adversely affect your score.*

Question				
1	A	B	C	D
2	A	B	C	D
3	A	B	C	D
4	A	B	C	D
5	A	B	C	D
6	A	B	C	D
7	A	B	C	D
8	A	B	C	D
9	A	B	C	D
10	A	B	C	D
11	A	B	C	D
12	A	B	C	D
13	A	B	C	D
14	A	B	C	D
15	A	B	C	D
16	A	B	C	D
17	A	B	C	D
18	A	B	C	D
19	A	B	C	D
20	A	B	C	D