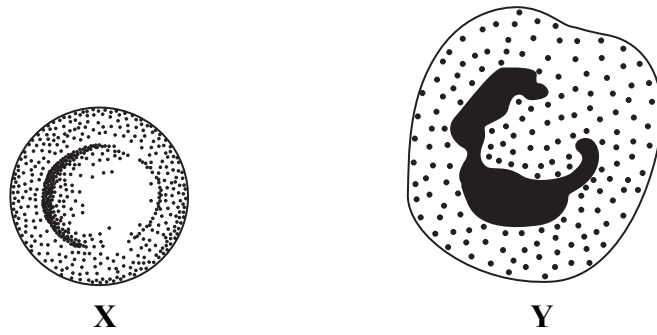


Answer ALL the questions.

1. (a) The diagram below shows two types of blood cell found in humans.



(i) Complete the table below to show two structural differences between these two types of blood cell.

Difference	Cell X	Cell Y
1		
2		

(2)

(ii) State the function of each type of cell.

Function of cell X

.....

Function of cell Y

.....

(2)



Leave blank

(b) (i) In the space below draw and label a ciliated epithelium cell from the lining of the trachea.

(3)

(ii) Explain how a ciliated epithelium cell in the trachea helps to protect the body.

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

(3)

(c) Blood cell Y and the ciliated epithelium cell both have a nucleus and cytoplasm, which is surrounded by a cell membrane. State the role of the nucleus and the role of the cell membrane.

(i) Cell membrane

.....
.....

(2)

(ii) Nucleus

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

(3)

(Total 15 marks)

Q1

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2. (a) Many processes in the human body involve hormones and are controlled through negative feedback mechanisms.

(i) Explain what a hormone is.

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

(2)

(ii) Explain what is meant by the term **negative feedback mechanism**.

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

(2)

(b) The table below shows some human hormones. Complete the table by filling in the spaces.

Name of hormone	Hormone released by	Effect of hormone
ADH		Increases water content of blood
		Development of secondary sexual characteristics of males
	Adrenal glands	Increases heart rate and breathing rate
Insulin	Pancreas	
FSH	Pituitary gland	
Oestrogen		Increases thickness of uterine lining

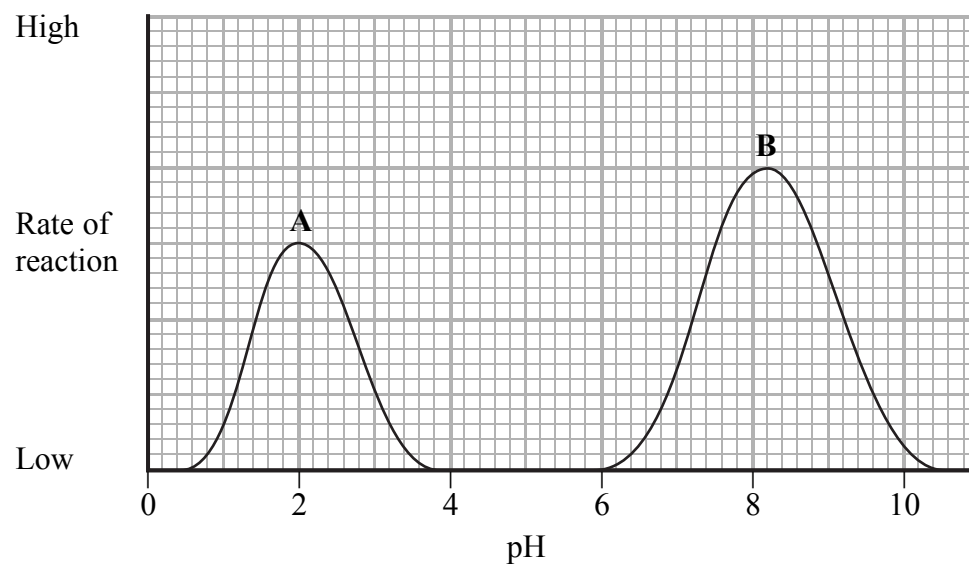
(7)

(Total 11 marks)

Q2



3. (a) The graph below shows the activity of two enzymes (**A** and **B**) that digest protein and are found in the alimentary canal.



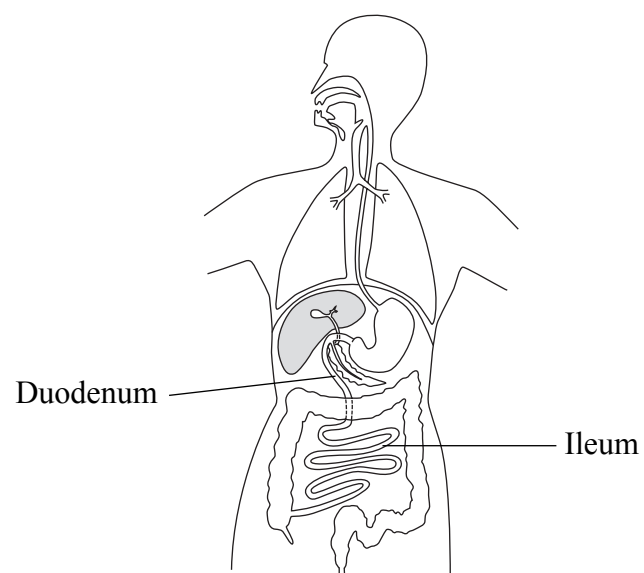
- (i) From the graph, determine the optimum pH for the activity of enzyme **B**.

..... (1)

- (ii) Name the end products of the digestion of proteins.

..... (1)

- (b) The diagram below shows the alimentary canal.



- (i) On the diagram, use a label line and the letter **Z** to show where enzyme **A** is found.

(1)



Leave
blank

(ii) Enzyme **B** is found in the duodenum.

State how its optimum pH is achieved in the duodenum.

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

(2)

(c) Villi are found in the ileum.

(i) State the function of these villi.

.....

(1)

(ii) Describe how the structure of a villus makes it suitable for this function.

.....
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.....

(3)

(d) Explain how food is moved along the alimentary canal.

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

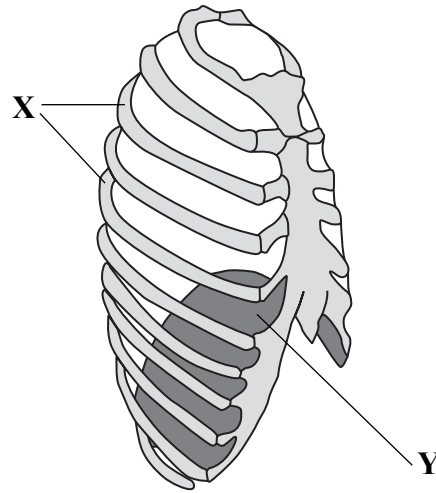
(3)

(Total 12 marks)

Q3



4. The diagram below shows a side view of some of the structures of the thorax.



(a) (i) Describe how structures **X** and **Y** move to bring about inhalation.

X

.....

Y

.....

(2)

(ii) How are the movements of structures **X** and **Y** brought about?

.....

.....

(1)

(iii) Explain how these changes in position of structures **X** and **Y** cause air to be moved into the alveoli of the lungs.

.....

.....

.....

.....

.....

.....

(3)



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blank

(b) At the top of a very high mountain the pressure of the air is lower than at sea level. There is also less oxygen present in each dm^3 of air.

Suggest and explain the changes that are likely to occur in the breathing mechanism to ensure adequate uptake of oxygen into the blood.

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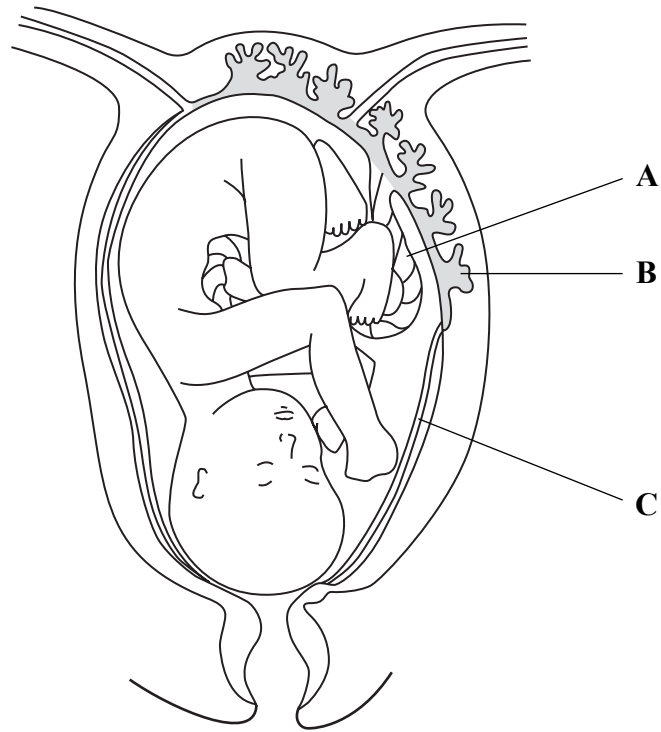
(4)

Q4

(Total 10 marks)



5. The diagram below shows a fetus in the uterus just before birth.



(a) (i) Name the parts labelled **A**, **B** and **C**.

A

B

C

(3)

(ii) Describe the function of part **C** during pregnancy.

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

(2)



Leave
blank

(iii) Part **A** contains an artery and a vein. State which of these blood vessels contains the highest oxygen concentration and explain your answer.

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

(2)

(b) Describe the structure of part **B** and explain how this helps in the transfer of materials from the mother to the fetus.

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

(4)

(c) The level of progesterone remains high throughout pregnancy. Explain what would happen if the supply of this hormone decreases markedly before the end of pregnancy.

.....
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(3)

(Total 14 marks)

Q5

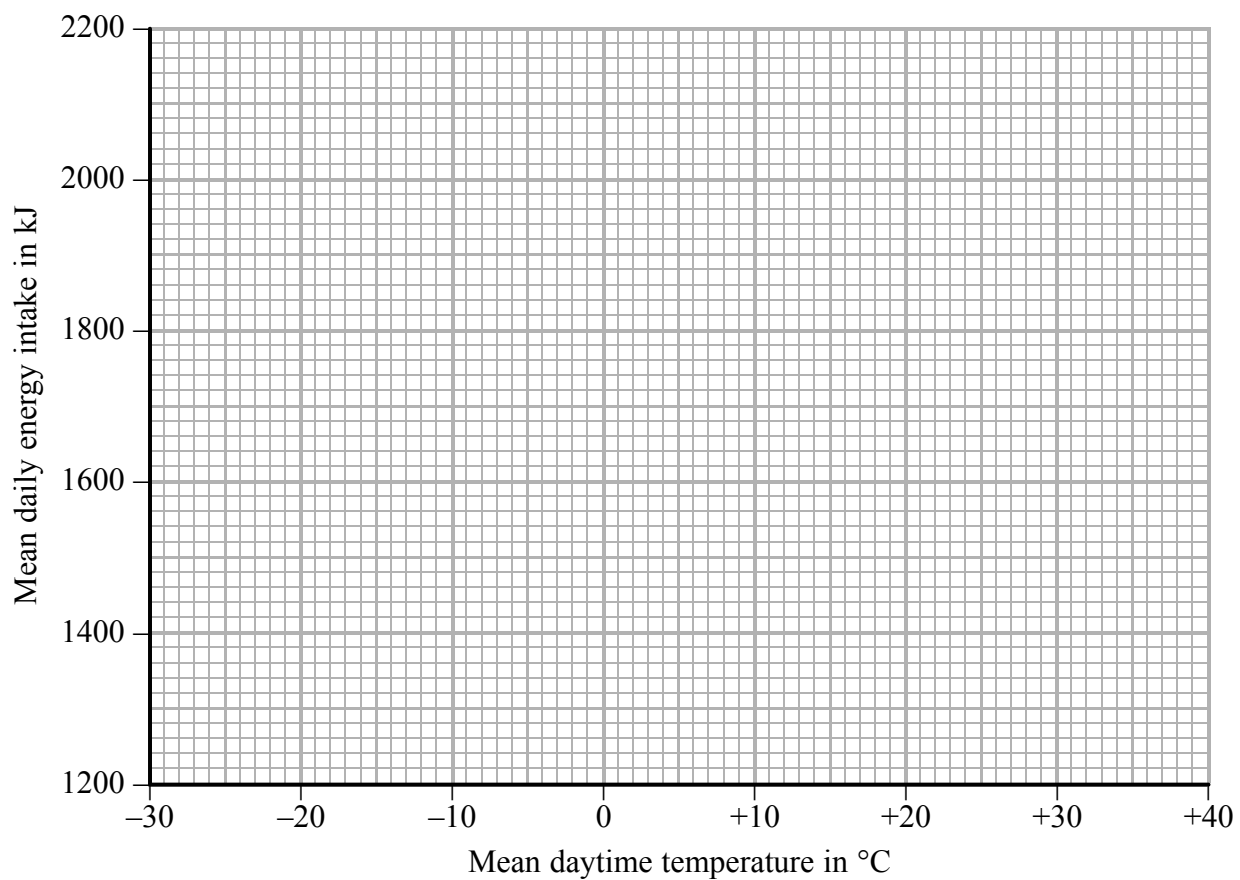
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6. The table below shows the mean energy intake per day needed by soldiers stationed in different regions of the world.

Mean daytime temperature in °C	Mean daily energy intake in kJ
+ 35	1300
+ 15	1500
+ 5	1640
- 5	1800
- 20	2000
- 30	2100

(a) (i) Plot the daily energy intake at different temperatures as a line graph on the axes provided. Join the points with straight lines.



(3)

(ii) What is the mean daily energy intake for soldiers stationed in a region where the local mean daytime temperature is 0 °C?

.....

(1)



Leave blank

(iii) A group of soldiers moves from a region where the mean daytime temperature is +15 °C to a region where it is +35 °C.

By how much would the soldiers' mean daily energy intake change, assuming their activities are the same in both regions?

.....
.....

(2)

(b) (i) Describe the relationship between the mean daytime temperature and the soldiers' mean daily energy intake.

.....
.....

(1)

(ii) Suggest an explanation for the relationship between the mean daily energy intake and the mean daytime temperature.

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

(3)

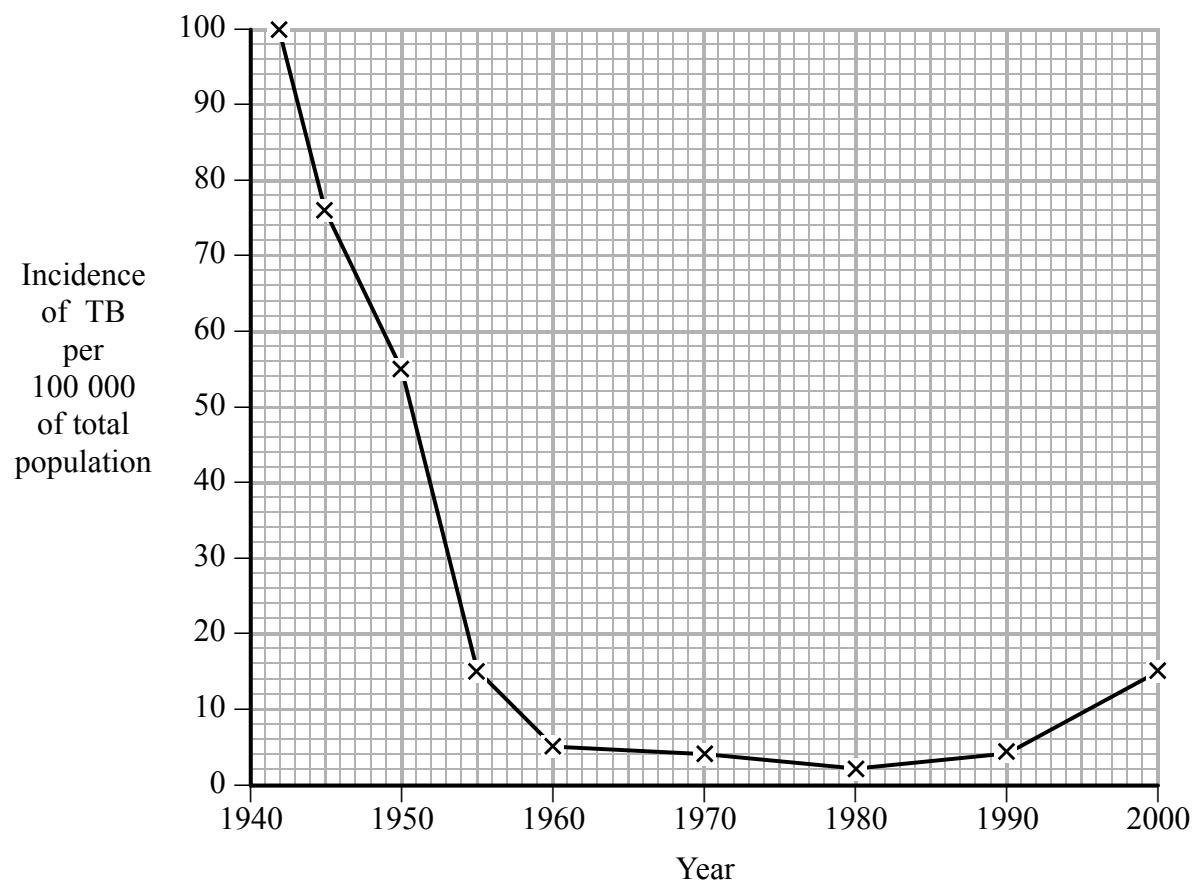
Q6

(Total 10 marks)



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7. The graph below shows the incidence of pulmonary tuberculosis (TB) in London during the period 1942 to 2000.



(a) (i) Which microorganism causes TB?

..... (1)

(ii) When was the incidence of TB in London at its lowest?

..... (1)

(iii) During which 5-year period was the decrease in the number of cases of TB in London greatest?

..... (1)



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blank

(iv) Suggest **two** measures that might have brought about this decrease in the incidence of TB.

1

.....

2

.....

(2)

(b) (i) Describe the trend in the number of cases of TB in London after 1990.

.....

.....

(1)

(ii) Suggest **two** reasons for this trend.

1

.....

2

.....

(2)

Q7

(Total 8 marks)



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8. (a) The passage below is about the eye. Complete the passage by writing the most suitable word or words in each space.

The eye sits in a bony cavity in the

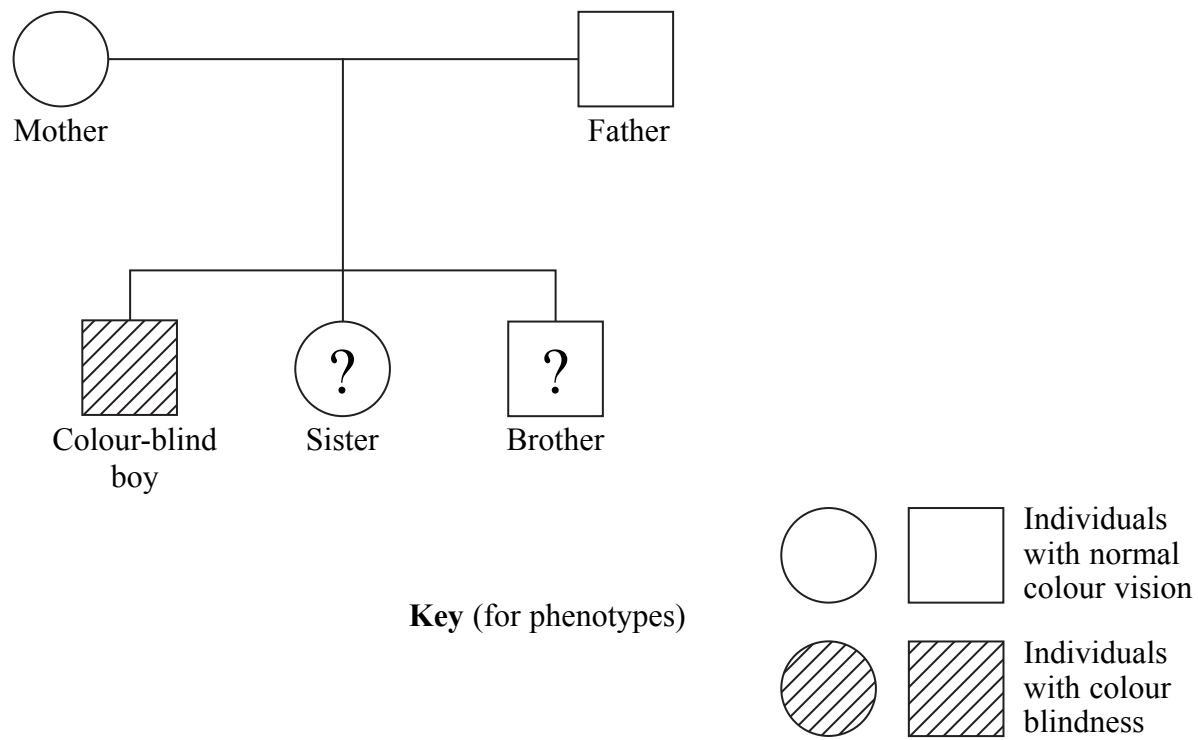
The wall of the eyeball has three layers, the inner of which is called the This is made of light-sensitive cells called rods and cones. The cones are active only in bright light and enable us to see Light rays entering the eye are by the and the lens. This brings the light rays into focus on the fovea. The shape of the lens is altered by the muscles. In very bright light, the action of the muscles helps to make the smaller.

(8)



(b) Red-green colour blindness is a condition caused by a gene carried on the X chromosome.

The genetic diagram below shows the family of a boy who has inherited red-green colour blindness.



(i) From which parent did the colour-blind boy inherit his condition? Give a reason for your choice.

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

(2)

(ii) The boy has a younger sister and a baby brother. What is the probability that each of these children will also show colour blindness?

Sister

Brother

(2)

(Total 12 marks)

Q8



9. The heart is able to adjust the volume of blood it pumps out in response to the demands of the body.

(a) (i) Name the chamber of the heart that pumps blood out to the muscles of the body.

.....
(1)

(ii) Name the main blood vessel that carries blood to the organs of the body.

.....
(1)

(b) The table below shows the energy required, heart rate, stroke volume and cardiac output in relation to increasing amounts of exercise by the body.

Energy required for exercise in kJ per minute	Heart rate in beats per minute	Stroke volume in dm ³	Cardiac output in dm ³ per minute
0.0 (at rest)	60	0.11	6.6
3.5	100	0.12	12.0
5.5	120	0.12	14.4
9.0	160	0.12	19.2
12.5	175	0.12	21.0

(i) By how much does the cardiac output alter when a person changes from rest to exercise that uses 5.5 kJ per minute?

.....
(1)

(ii) By how much does the heart rate alter when a person changes from rest to exercise that uses 5.5 kJ per minute?

.....
(1)

(iii) Suggest what is meant by the term **stroke volume**.

.....
.....
.....
(2)



(iv) Explain which process, heart rate or stroke volume, accounts for most of the increase in cardiac output as the energy demand for exercise increases. Use data from the table to support your answer.

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

(2)

(Total 8 marks)

TOTAL FOR PAPER: 100 MARKS

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Q9



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