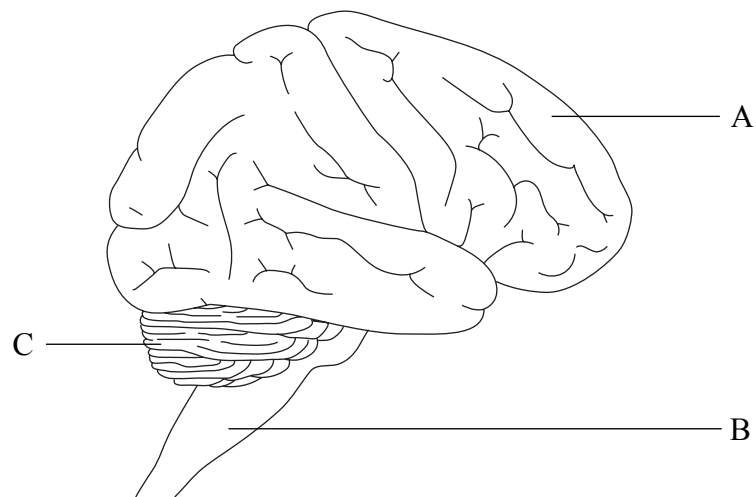


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Answer ALL questions in the spaces provided.

1. The diagram below shows a human brain seen from the side.



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

B

C

(2)

(b) Give **two** functions of the part labelled **A**.

1

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2

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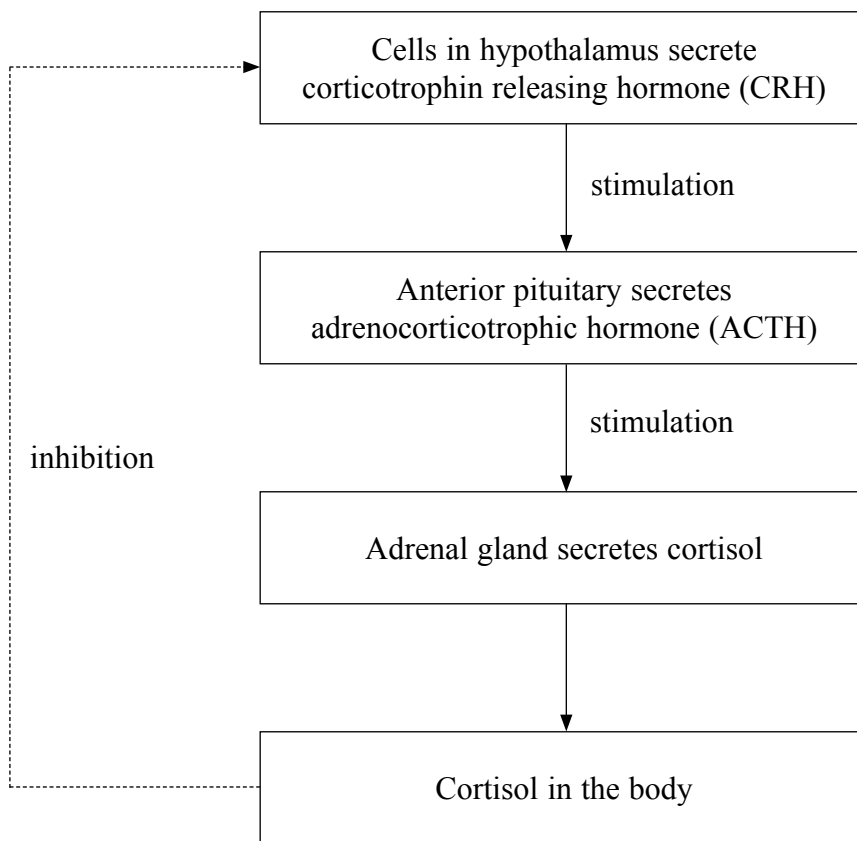
(2)

(Total 4 marks)

Q1



2. Cortisol is a hormone secreted by the adrenal gland and has many functions in the body. The diagram below shows how the secretion of cortisol is controlled.



(a) Using the information in the diagram, explain how the control of cortisol secretion illustrates the principle of negative feedback.

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(3)



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(b) Name **one** hormone, other than ACTH, released by the anterior pituitary gland.

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(1)

(c) State **three** ways in which hormonal control differs from nervous control.

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(3)

Q2

(Total 7 marks)



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3. (a) When an action potential arrives at a synaptic knob, acetylcholine is released. Describe how acetylcholine is released into the synaptic cleft.

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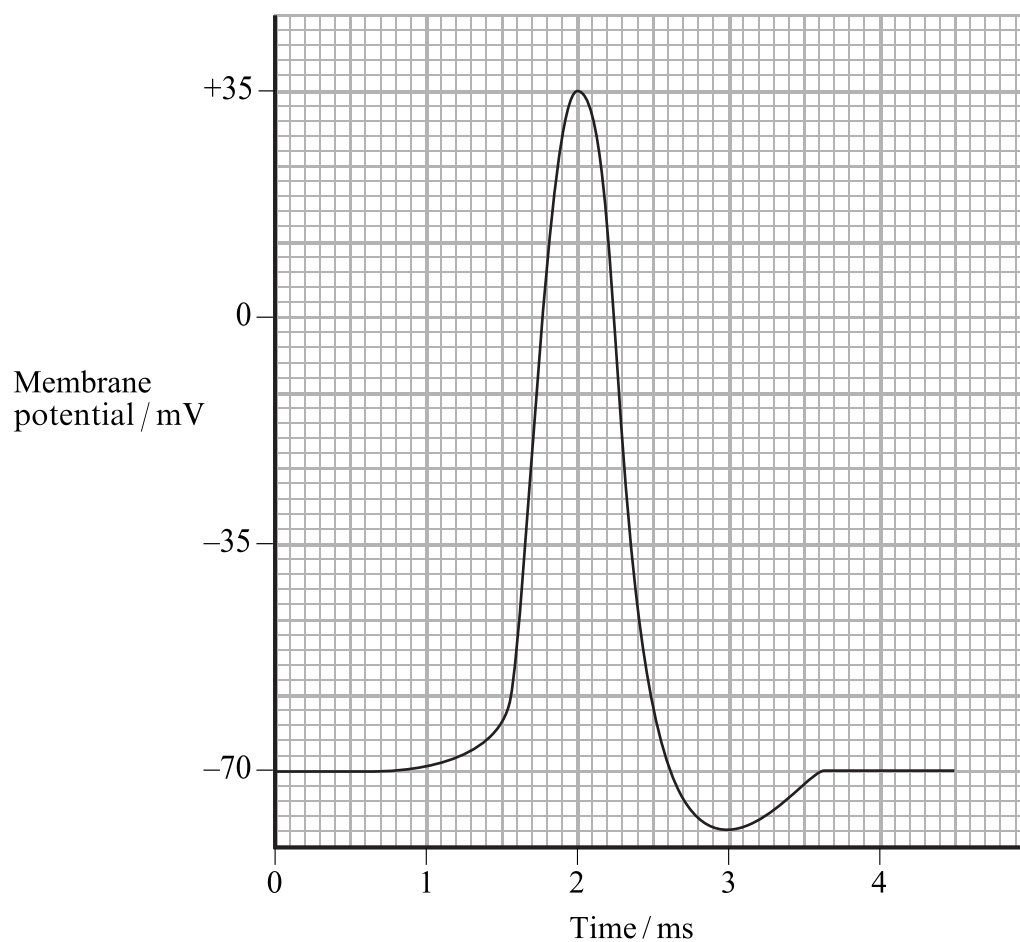
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(3)

- (b) The graph below shows a recording of an action potential produced after the binding of acetylcholine to receptors on a post-synaptic membrane.



- (i) Use the graph to state the time at which the sodium channels open to allow an increased flow of sodium ions into the neurone.

..... ms
(1)



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(ii) Use the graph to state the time at which the hyperpolarisation is at its greatest.

..... ms
(1)

(iii) Calculate the number of action potentials that could occur in one second if the stimulus is maintained. Show your working.

Answer action potentials per second.
(2)

(c) When a transmitter substance called gamma-aminobutyric acid (GABA) is released at a synapse, it causes chloride ion (Cl^-) channels and potassium ion (K^+) channels to open in the post-synaptic membrane. This results in chloride ions moving into the post-synaptic neurone and potassium ions moving out.

Explain why an action potential is less likely to develop when GABA is released at the same time as acetylcholine.

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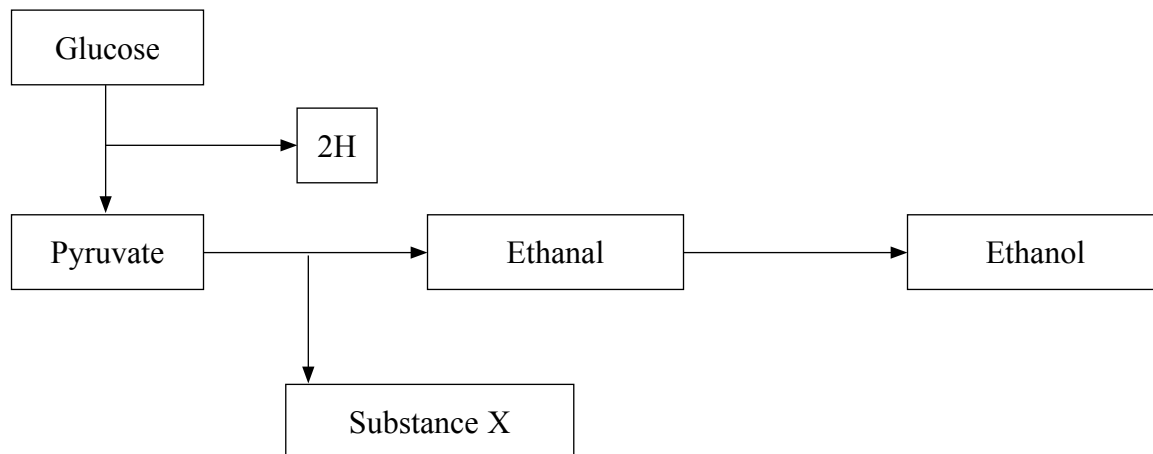
(2)

Q3

(Total 9 marks)



4. (a) The diagram below shows an outline of anaerobic respiration in a yeast cell.



(i) Name substance X.

..... (1)

(ii) Explain why it is necessary for the cell to convert ethanal to ethanol.

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..... (2)

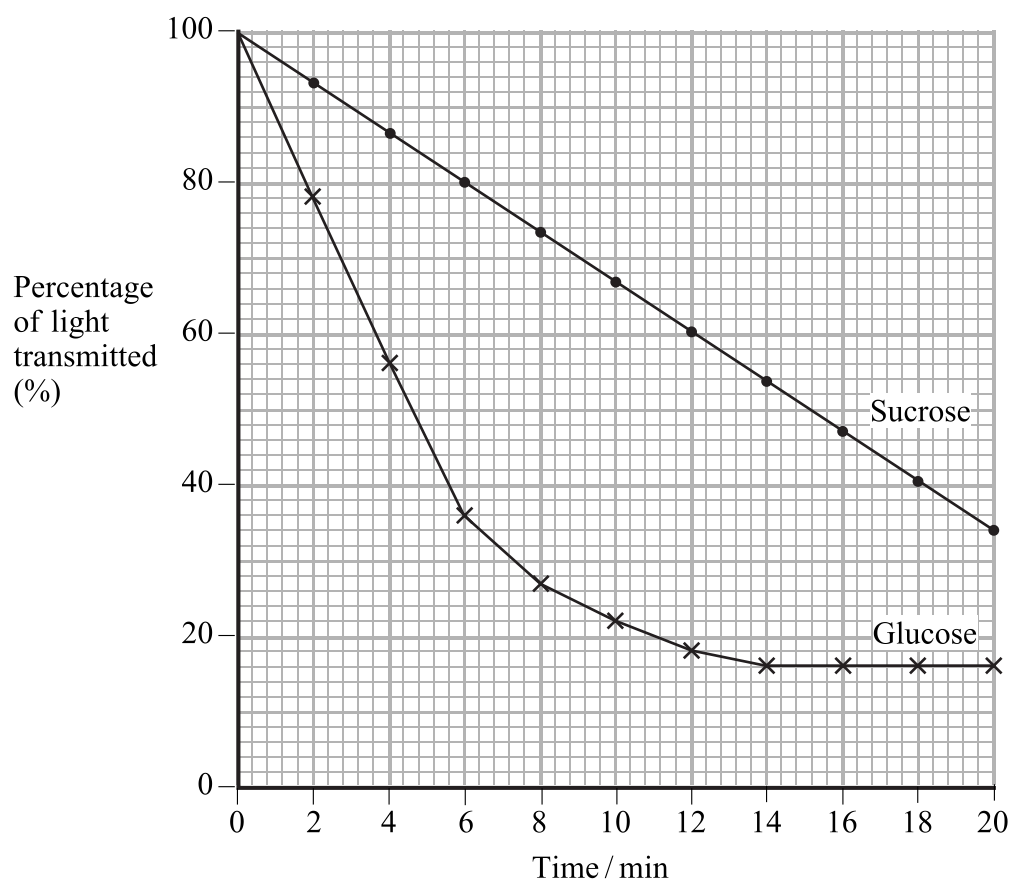


(b) A student carried out an investigation into the effect of glucose and sucrose on the rate of respiration of yeast cells. Triphenyl tetrazolium chloride (TTC) is an artificial hydrogen acceptor, which is colourless in the oxidised form and red when reduced. A colorimeter is an instrument used to measure the percentage of light transmitted through a liquid. In this investigation, when the TTC is fully oxidised 100% of the light is transmitted through the liquid. The darker the red colour of the TTC solution becomes, the lower the percentage of light transmitted.

Yeast cells were suspended in 0.5% glucose solution. The student set up a tube containing 10 cm³ of this suspension and 1 cm³ of TTC solution. The tube was covered and placed in a water bath for 20 minutes. During this time, the percentage of light transmitted through the solution was measured at two-minute intervals.

The experiment was repeated using yeast cells suspended in 0.5% sucrose solution.

The results of the investigation are shown in the graph below.



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(i) Describe the rate of respiration of yeast in the glucose solution during the 20 minutes of this investigation.

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(3)

(ii) State **one** way in which the rate of respiration of yeast in the sucrose solution differs from the rate in the glucose solution.

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(1)

(iii) Explain why the tubes were covered during this investigation.

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(2)



(iv) Explain why the student placed the tubes in a water bath.

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(2)

(Total 11 marks)

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Q4

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N 3 0 7 4 4 A 0 1 1 2 0

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5. Ultrafiltration and reabsorption occur in a mammalian kidney.

(a) Describe and explain the process of **ultrafiltration**.

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(4)



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Option C: Human Health and Fitness

6. The table below refers to white blood cells involved in the immune response. Complete the table by writing the most appropriate word or words in the boxes.

White blood cells	Type of immune response	One role in the immune response
B-lymphocytes		
T-lymphocytes		
Macrophages		

(Total 6 marks)

Q6



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7. The table below gives some information about the features of the left ventricle of the heart of an untrained individual, a runner and a wrestler.

Feature of left ventricle	Untrained individual	Runner	Wrestler
Mass / g	211.0	302.0	330.0
Wall thickness / mm	10.3	11.3	13.7
Volume / cm ³	101.0	160.0	110.0

(a) Compare the features of the left ventricle of a runner and a wrestler with those of an untrained individual.

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(3)

(b) Describe the layers that form the wall of the heart.

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(2)

(Total 5 marks)

Q7



8. An experiment was carried out to investigate the effect of a 10-day training programme on a group of 10 individuals. The heart rate and stroke volume of each individual was measured during exercise, both before and after the training programme. The mean results are shown in the table below.

Measurement	Before training programme	After training programme
Mean heart rate / beats min ⁻¹	152	142
Mean stroke volume / cm ³	85	96

- (a) State **two** factors that need to be considered when choosing the 10 individuals.

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(2)

- (b) Using the data above and the equation given below, calculate the mean increase in the cardiac output (**measured in dm³ min⁻¹**) after completing the training programme. Show your working.

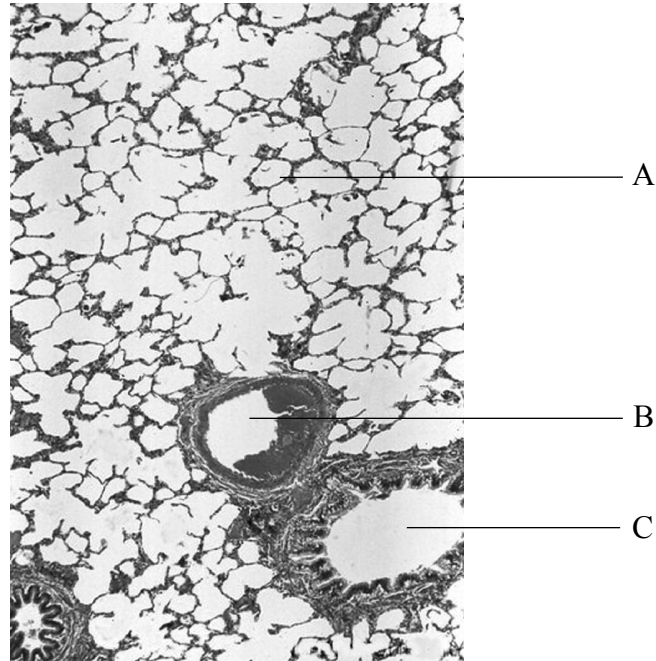
$$\text{Cardiac output} = \text{Heart rate} \times \text{Stroke volume}$$

Answer dm³ min⁻¹

(3)



9. The photograph below shows a section of lung tissue, as viewed using a light microscope.



(a) Name the structures labelled A, B and C.

A

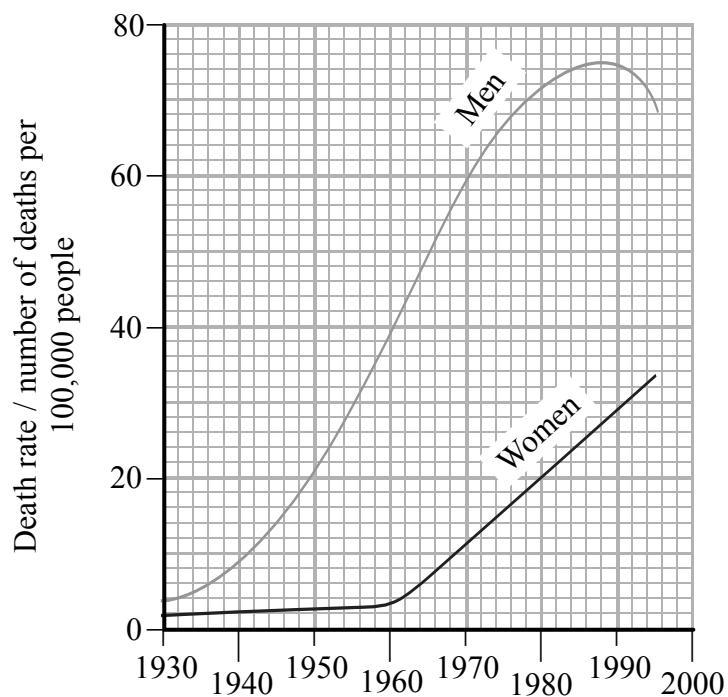
B

C

(2)



(b) The graph below shows the number of deaths per 100,000 people of men and women caused by lung cancer between 1930 and 1995.



(i) Compare the death rate due to lung cancer in men with the death rate due to lung cancer in women.

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(3)

QUESTION 9 CONTINUES OVERLEAF



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(ii) Suggest reasons for the differences in death rates due to lung cancer of men and women.

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(3)

(c) Name **two** possible treatments for lung cancer.

1.
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2.
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(2)

Q9

(Total 10 marks)

TOTAL FOR PAPER: 70 MARKS

END

