

(b) The outermost region of the cerebrum is called the cerebral cortex.

The cerebral cortex can be subdivided into the three areas listed below.

- sensory areas
- association areas
- motor areas

Describe the role of each of these areas in the human brain.

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[3 marks]

(c) One of these areas can be further subdivided into more specialised regions.

Suggest and explain which area of the cerebral cortex can be further subdivided.

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[2 marks]

[Total: 8]



(e) Autonomic motor neurones can be further subdivided into two types.

State the name of these two types and compare them.

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[8 marks]

[Total: 16]



3 (a) Outline the events that occur at a neuromuscular junction to initiate contraction.

You should make clear the sequence of these events in your answer.

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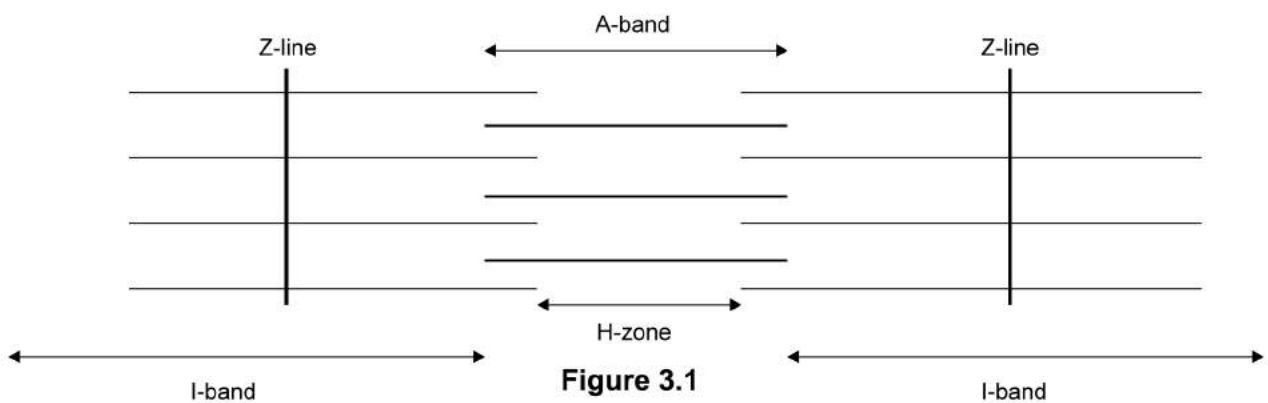
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[6 marks]

(b) Figure 3.1 shows the bands and zones present within a sarcomere.



Explain briefly what is meant by a sarcomere.

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[1 mark]



4 An investigation into the effect of various factors on muscle contraction is conducted.

An outline of the procedure is detailed below.

- A slide is prepared containing myofibril suspension.
- The slide is mounted onto an electron microscope with magnification $\times 20000$.
- The length of the sarcomere after 30 seconds is measured using the reticule.
- More slides containing myofibril suspension are prepared but without a coverslip.

Figure 4.1 on the insert shows the electron micrograph of the first slide observed.

(a) State the name given to the structure labelled X.

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[1 mark]

(b) The length of the sarcomere under the electron microscope measures 5 cm.

Calculate the actual length of the sarcomere.

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[2 marks]

(c) Table 4.1 shows the results obtained.

Slide	Calcium ions added	ATP added	Length of sarcomere / cm
A	no	no	5.0
B	yes	no	3.5
C	no	yes	5.0
D	yes	yes	1.0

Table 4.1





Describe and explain the results of slide B.

Dotted lines for writing the answer to the question about slide B.

[3 marks]

(d) Using Table 4.1, explain the effect of ATP on muscle contraction.

Dotted lines for writing the answer to question (d) regarding ATP and muscle contraction.

[3 marks]

(e) Outline the sources of ATP in a muscle cell.

Dotted lines for writing the answer to question (e) regarding sources of ATP.

[3 marks]

[Total: 12]



5 Muscles are important in coordination.

(a) Explain how skeletal muscles work to move the arm at the elbow joint.

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[3 marks]

(b) Tendons attach voluntary muscle to the skeleton.

Tendons are made from collagen.

Explain how the structure of collagen makes it suitable for tendons.

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[3 marks]

(c) **Figure 5.1** on the insert shows a light micrograph of a muscle.

Suggest what type of muscle this shows.

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[2 marks]



(d) Muscles are stimulated by action potentials arriving at neuromuscular junctions.

Complete the table below that compares neuromuscular junctions with synapses.

	Synapses	Neuromuscular junctions
One structural difference		
One functional difference		
One structural similarity		
One functional similarity		

[4 marks]

[Total: 9]

