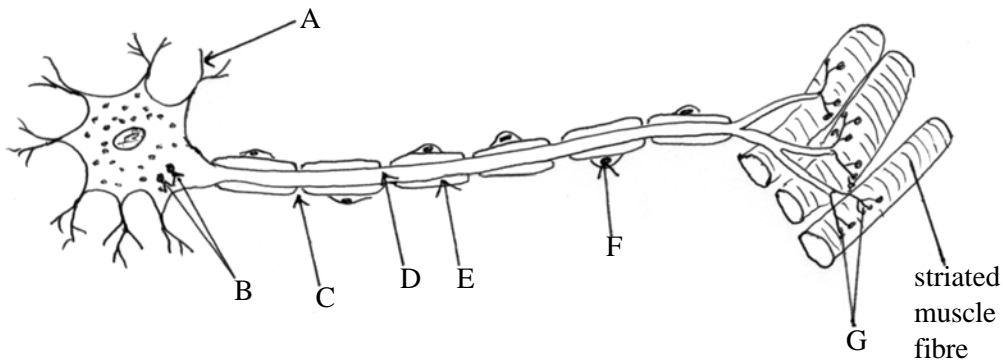


The diagram below is of a mammalian nerve cell.



(a) (i) What functional type of neurone is shown in the diagram?

..... [1]

(ii) Name the parts labelled A to G.

A: ..... B: .....

C: ..... D: .....

E: ..... F: .....

G: ..... [7]

(b) State one function of each of the parts labelled A, E and F.

A. ....

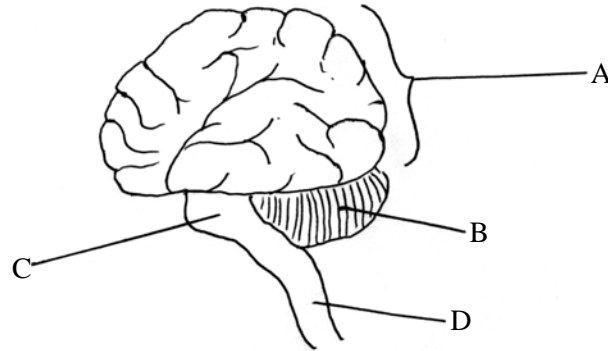
E. ....

F. .... [3]

(c) Explain briefly how part G depolarises the muscle fibre.

.....  
.....  
.....  
.....  
.....  
..... [4]

The diagram below shows a human brain viewed from the left side.



(a) Name the parts labelled A to D.

A: ..... B: .....

C: ..... D: .....

[4]

(b) Give one function for each of A, B, C and D.

A: .....

B: .....

C: .....

D: .....

[4]

(c) Suggest reasons for the folding of part A.

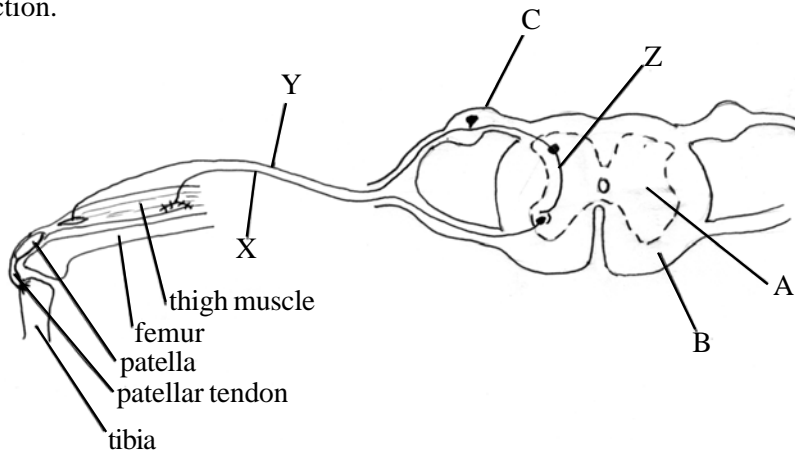
.....

.....

.....

[2]

The diagram below shows the spinal cord of a mammal in transverse section and the neurones involved in a knee jerk reflex action.



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

A: ..... B: .....

C: ..... [3]

(ii) Distinguish between parts A and B.

..... [2]

(b) (i) Name neurone types X, Y and Z and indicate the direction of impulse passage by putting arrows on the neurones in the diagram.

X: ..... Y: .....

Z: ..... [4]

(ii) What stimulus would cause a knee jerk reflex to operate?

..... [1]

(c) The knee jerk reflex is an example of a spinal reflex since it operates via the spinal cord. Cranial reflexes operate via the brainstem. Give three examples of cranial reflexes.

1: .....

2: .....

3: .....

[3]

Read through the following passage on neurones and nerve impulses and then fill in the spaces with the most appropriate word or words.

The nervous system contains several types of neurones. .... neurones carry impulses to muscles and glands but ..... neurones carry impulses from receptors to the central nervous system. The interior of a resting nerve fibre has a lower concentration of ..... ions than its surroundings due to the actions of a ..... in its membrane. This leads to a ..... resting potential on the inside relative to the outside. Depolarisation occurs when the membrane permeability is changed by a ..... allowing ..... ions to flood in. If the depolarisation reaches a ..... value it is propagated along the fibre as an ..... . In some fibres an insulating layer of ..... allows the depolarisation to jump between ..... making nerve impulse transmission much ..... . Impulses are propagated across synapses by release of ..... from vesicles in the synaptic knobs. This release is triggered by an inflow of ..... ions.

## QUESTIONSHEET 5

The table below gives functions of the various regions of the brain. In each box write the name of the brain region which performs the function.

| Function   | Brain region |
|--|--------------|
| Regulation of heart rate   | (i)          |
| Osmoregulation   | (ii)         |
| Balance and muscular coordination                                | (iii)        |
| Pupil reflexes and accommodation                                 | (iv)         |
| Transfer of impulses between left and right cerebral hemispheres | (v)          |
| Regulation of menstrual cycle                                    | (vi)         |
| Regulation of body temperature                                   | (vii)        |

[7]

Answer the following questions about the mammalian nervous system.

(a) How are the brain and the spinal cord protected?

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

[3]

(b) What is the value of 'saltatory conduction of nerve impulses' to the organism?

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

[3]

(c) State two differences between the sympathetic and parasympathetic nervous systems.

1 .....

.....

2 .....

.....

[2]

All cells in the body have an electrical potential across their cell membranes which is called the 'resting potential', which is essential for the cell to be able to perform its functions correctly. Neurones can only develop and transmit nerve impulses if they possess a resting potential to begin with.

- (a) With reference to membrane permeabilities, ion pumps, sodium ions and potassium ions, explain how a resting potential is generated.

.....

.....

.....

.....

.....

.....

[5]

- (b) Sensory receptor cells in the body all possess resting potentials. These are developed into nerve impulses which are transmitted to the central nervous system when the stimulus acts on the receptor.

- (i) The table below refers to various receptor cells, their position in the body and the stimulus which activates them. Complete the table by filling in the empty boxes.

| Receptor            | Position in body | Stimulus                   |
|---------------------|------------------|----------------------------|
|                     |                  | bright light               |
| Paccinian corpuscle |                  |                            |
| osmoreceptor        |                  |                            |
|                     |                  | dim light                  |
|                     |                  | raised blood glucose level |
| thermoreceptor      |                  |                            |

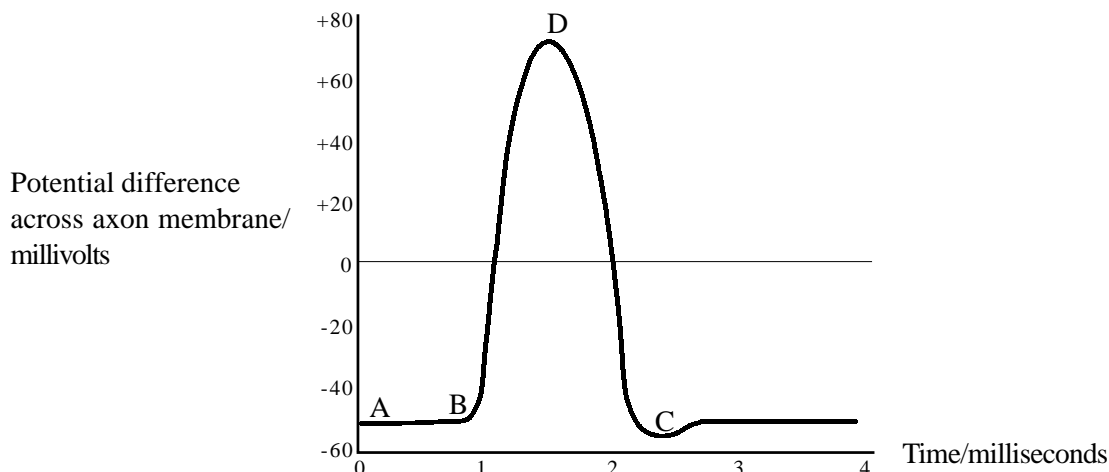
[6]

- (ii) Receptor cells act as transducers. What is a transducer?

.....

[1]

The diagram below shows a recording of an action potential passing along a nerve axon.



(a) (i) What is meant by the term ‘threshold stimulus’?

.....  
 ..... [1]

(ii) By means of an arrow, indicate on the diagram the probable time when the stimulus was applied. [1]

(iii) What is the state of the axon membrane from A to B?

..... [1]

(b) (i) Describe the changes that are occurring in the axon during the period B to D.

.....  
 .....  
 ..... [2]

(ii) Describe the changes that are occurring in the axon during the period D to C.

.....  
 .....  
 ..... [2]

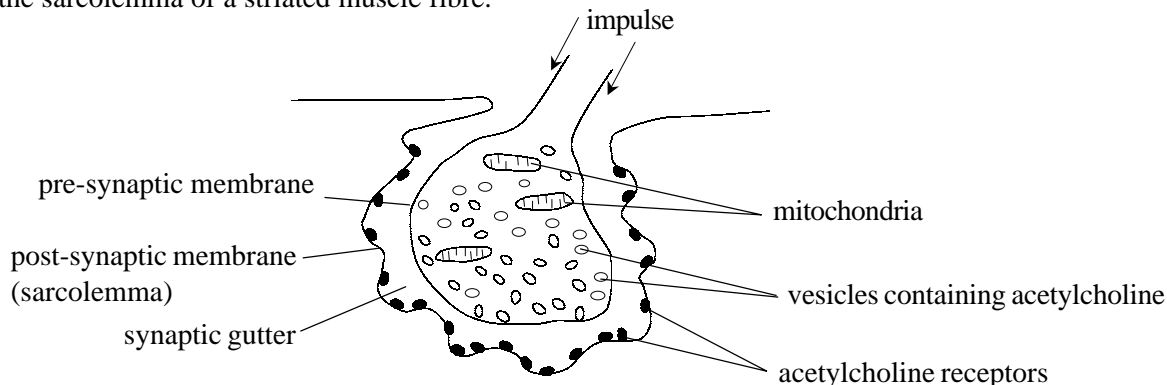
(c) Describe how action potentials are propagated along the axon during nerve impulse transmission.

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

[3]



The diagram below illustrates the structure of a cholinergic synapse between a voluntary motor nerve ending and the sarcolemma of a striated muscle fibre.



(a) (i) Why do synaptic knobs contain many mitochondria?

.....

.....

.....

[2]

(ii) Briefly describe how the arrival of an impulse at the synapse causes depolarisation of the post-synaptic membrane.

.....

.....

.....

.....

.....

[5]

(iii) How does the post-synaptic membrane become repolarised?

.....

.....

.....

[3]

(b)(i) How does an adrenergic synapse differ from a cholinergic synapse?

.....

.....

[2]

(ii) Where are adrenergic synapses found in the body?

..... [1]

Distinguish between each of the following pairs.

(a) The cerebellum and the cerebrum.

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

[3]

(b) A motor neurone and a motor nerve.

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

[3]

(c) A myelinated neurone and a non-myelinated neurone.

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

[2]

(d) Rods and cones.

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

[3]

Explain each of the following terms.

(a) Refractory period of a neurone.

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

[2]

(b) Temporal and spatial summation at synapses.

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

[2]

(c) The 'All or nothing' law.

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

[2]

(d) An excitatory synapse.

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

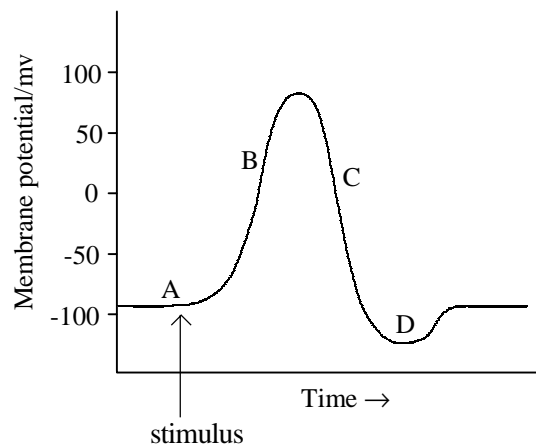
[2]

(e) An inhibitory synapse.

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

[2]

The diagram shows the effect of a stimulus on the membrane potential of a neurone.



Outline the events at each of the stages A-D:

A Resting state:

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

[3]

B Depolarisation:

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

[3]

C Repolarisation:

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

[3]

D Undershoot:

.....  
.....

[2]