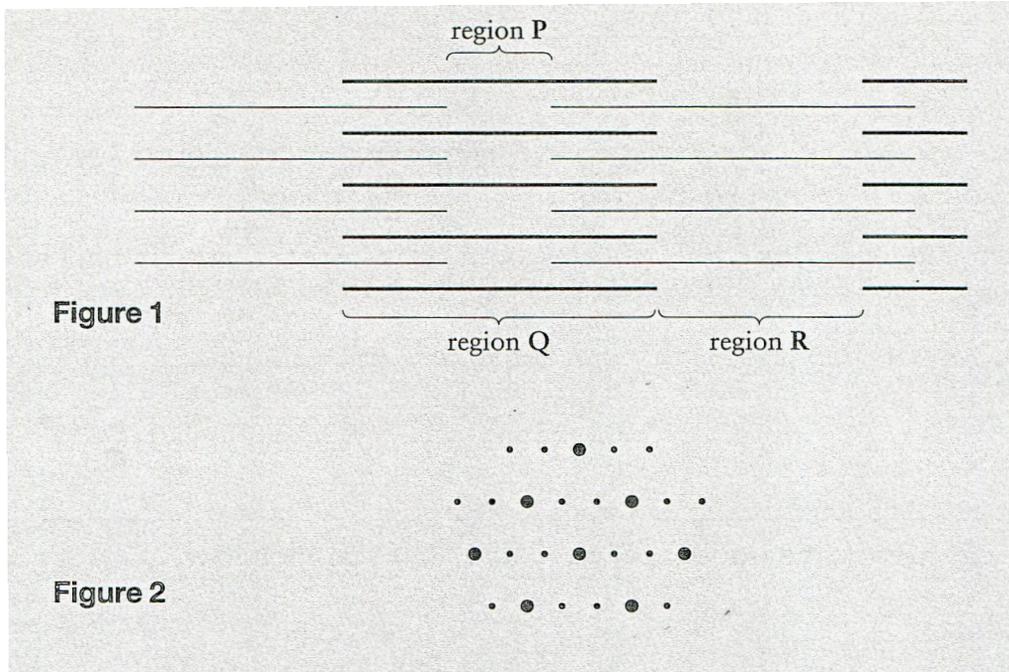
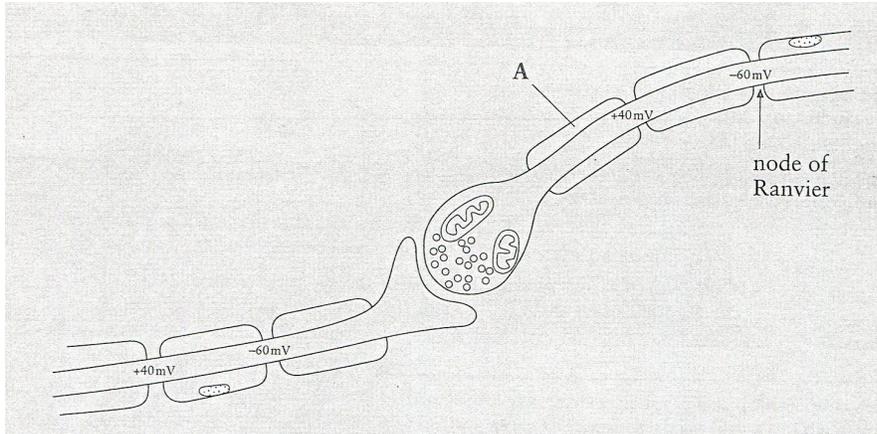


Figure 1 below shows a sarcomere from a skeletal muscle. Figure 2 shows a cross section through this sarcomere as it would appear when seen on an electron micrograph.



- (a) Copy figure 1 and draw on a line to show from where the cross-section the muscle in figure 2 was taken.
- (b) Name the main protein found in region P.
- (c) When the muscle contracts, what happens to the length of:
- Region Q;
 - Region R?
- (d) Explain why there is an increase in the rate of respiration of muscle when it contracts.

The figure below shows part of a sensory neuron and a motor neuron in a simple reflex arc. The potential differences across the axon membranes at the nodes of Ranvier are shown.



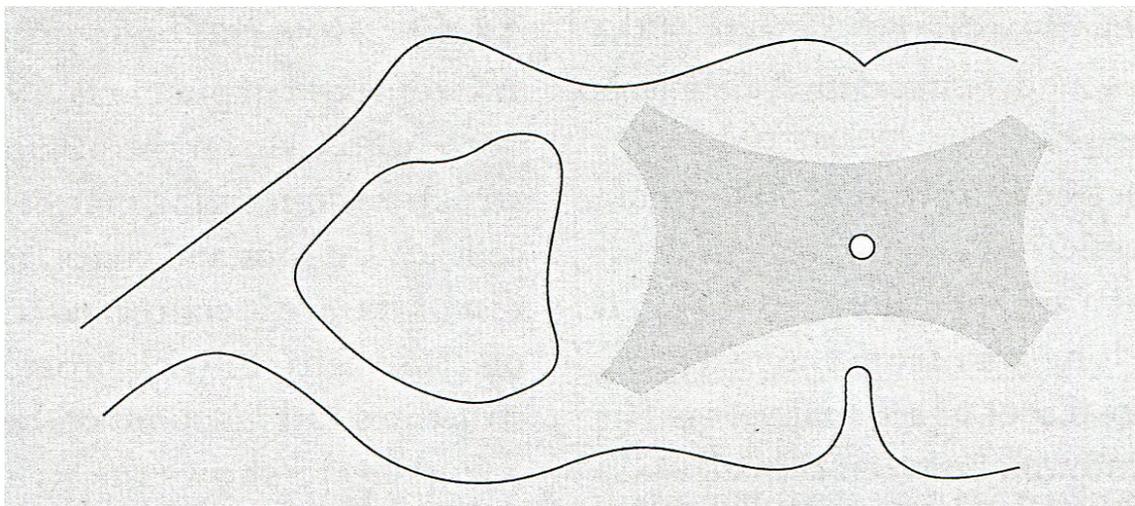
- a) Copy the diagram and label each of the following. In each case, explain how you make your decision.
 - i. Where you would find receptors for a transmitter substance
 - ii. The axon of the motor neuron
 - iii. Where an action potential is occurring
- b) State the name of, or write the chemical symbol for, an ion which
 - i. diffuses into the presynaptic neuron when an action potential arrives, and causes the vesicles to fuse with the presynaptic membrane;
 - ii. is in a higher concentration outside a resting neuron than inside it, and floods into the neuron when an action potential is generated.
- c)
 - i. Name part A.
 - ii. What is part A made of?

- iii. What effects does part A have on the transmission of action potentials along with the neuron?
- d) In certain diseases, the motor neurons are progressively damaged. Suggest **two** ways in which a person with such a disease may be affected.

Reflexes are found in all animals that have a nervous system.

(a) What is a reflex?

(b) Copy and complete the diagram below by adding and labeling the structures and pathways involved in a spinal reflex.



(c) Suggest why you may feel pain when you touch a hot object even if you move your hand away quickly.