

# Role of Calcium Ions Answer Key

1. Experiments 1 and 3 show that contraction results from stimulation only if  $\text{Ca}^{2+}$  ions are present in the fibre. Experiment 2 shows that  $\text{Ca}^{2+}$  alone can cause contraction. This suggests that stimulation is linked to contraction through the release of  $\text{Ca}^{2+}$ .
2. In Experiment 3, removal of  $\text{Ca}^{2+}$  prevented contraction of the fibre.
3. Tropomyosin inhibits muscle contraction by preventing myosin heads from binding to actin. Therefore, a lack of tropomyosin would prevent a muscle fibre from resting.
4. The  $\text{Ca}^{2+}$  ions are stored in the sarcoplasmic reticulum when the muscle is at rest. Nervous stimulation causes them to be released, after which they diffuse into the spaces between the actin and myosin filaments.
5. As the  $\text{Ca}^{2+}$  ions are actively transported back into the sarcoplasmic reticulum, the tropomyosin blocks the myosin binding sites on the actin, and the muscle fibre returns to a resting state.
6. Nervous stimulation  $\rightarrow$   $\text{Ca}^{2+}$  is released  $\rightarrow$  tropomyosin is repositioned  $\rightarrow$  myosin heads bond to actin  $\rightarrow$  fibre contracts  $\rightarrow$  nervous stimulation stops  $\rightarrow$   $\text{Ca}^{2+}$  is pumped back into sarcoplasmic reticulum  $\rightarrow$  tropomyosin blocks binding sites  $\rightarrow$  bonds between myosin and actin break  $\rightarrow$  myofilaments slide back to relaxed position