

Investigation 10.A: Observing Muscle Tissue

Answers to Analysis Questions

- **Smooth muscle** cells are long and tapered at each end like a spindle. Each has a single nucleus and the cells are usually arranged in parallel lines.
 - **Cardiac muscle** is unique to the heart and forms the wall of this organ. Its cells are striated (have bands of light and dark), and each has a single nucleus. Cardiac muscle cells are tubular and branched, forming a netlike structure.
 - **Skeletal muscle** cells are tubular and striated. Skeletal muscle cells are very long, and each has many nuclei.
- Involuntary contraction occurs without conscious control. Voluntary muscle contraction is consciously controlled by the nervous system. No, you couldn't distinguish this in your observations because nervous tissue was not involved in this investigation.
- The heart needs a unique type of muscle to suit its function—to contract and relax repeatedly and endlessly for scores of years, from before birth to death.
- Controlled variables could include the size and thickness of the myofibrils; the amount of glycerol on the slide; the amount of ATP and salt solution added; and the length of time you waited for the muscle fibres to contract.

Manipulated variables are the salt and ATP solutions.

Observations should note that the myofibrils do not contract until both ATP and salts (KCl and MgCl₂) are added to the slides. The myofibrils treated with ATP and the salt solutions should be approximately 50% shorter than those that have not been treated with these solutions.

Answers to Conclusions Questions

- The following is an example of a possible answer:

Smooth muscle cells are long and tapered at each end like a spindle. Each has a single nucleus and the cells are usually arranged in parallel lines, forming sheets. Although smooth muscle is slower to contract than skeletal muscle, it can sustain prolonged contractions and does not fatigue easily.

The cells of cardiac muscle are striated (have bands of light and dark) and each has a single nucleus. Cardiac muscle cells are tubular and branched, forming a net-like structure. This structure provides the strength required to pump blood to all cells of the body.

Skeletal muscle cells are very long, and each has many nuclei—the length of the muscle cell and its needs for energy and materials are too much to be coordinated by a single nucleus. Striated muscle is often used in short, intense bursts, whereas smooth muscle sustains longer, or even near-permanent, contractions.
- The factors that are required for muscle contraction are ATP and salt solutions (ions).
- You will soon learn about the sliding filament model of muscle contraction. The intent of this question, however, is to prompt you to think of your own plausible model. Don't look ahead in the text until you have come up with a model on your own.