

Experiments with Isolated Skeletal Muscle Answer Key

1. The latent period is the time it takes for the stimulus to reach the sarcoplasmic reticulum (SR) and for the Ca^{++} to diffuse into the spaces between the actin and myosin filaments, causing tropomyosin to be repositioned. The contraction period occurs as the myosin heads attach to the actin molecules in a series of ratchet-like movements and pull the Z lines together. The relaxation period occurs as the Ca^{++} ions are pumped back into the SR and the tropomyosin returns once again and blocks the binding of the myosin heads to the actin. Without this binding, the Z- lines move apart as actin and myosin spontaneously slide into their resting positions.
2. The strength with which an entire muscle (an organ) contracts depends upon the number of muscle fibres (cells) that are contracting at a given time.
3. Summation occurs when successive twitches are “added together,” producing sustained contraction or tetanus. As shown in the myogram, the force of contraction during tetanus is greater than the force of an individual twitch. This increase in force is thought to be due to the reduced friction between the filaments because the muscle is warmed by ATP breakdown.
4. Because skeletal muscles are in opposing pairs, tetanus in one muscle (e.g., biceps) is accompanied by relaxation in the opposing muscle (triceps). Movement could not occur with tetanus in both opposing muscles at the same time.