



SIMPLE MUSCLE TWITCH






Contraction of a Skeletal Muscle

Begins with electrical excitation of muscle, called a **stimulus**

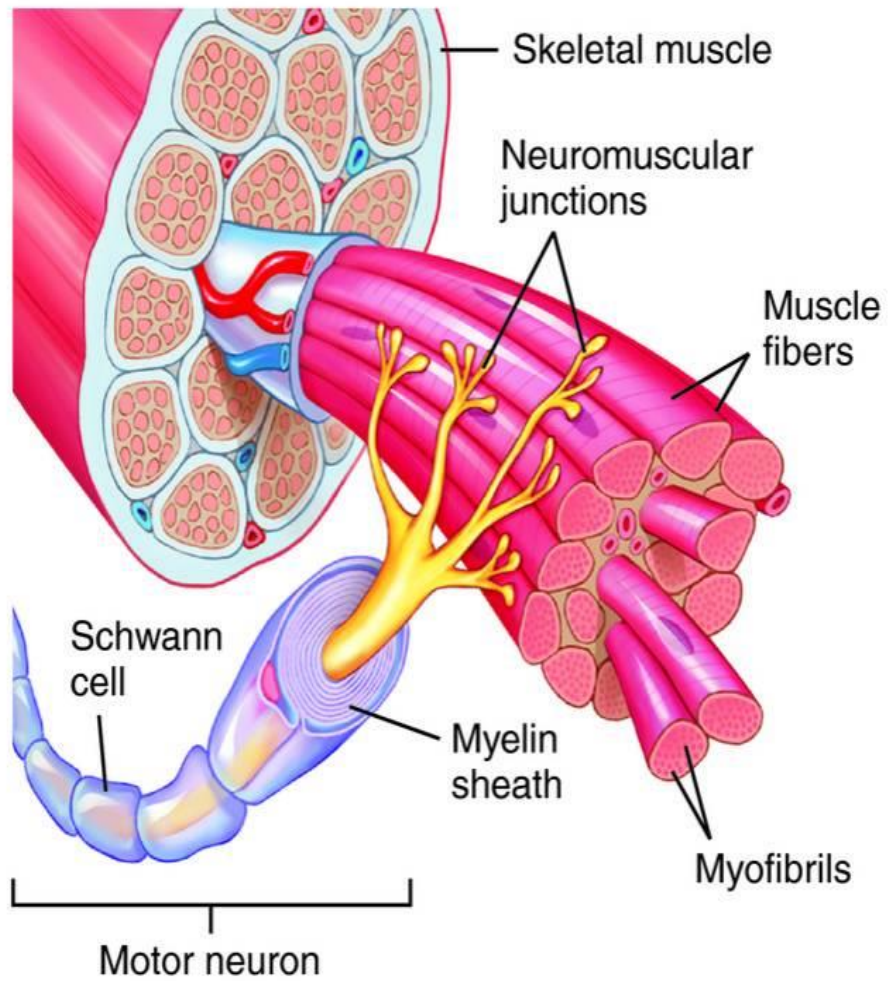
The stimulus must be of certain strength to generate a response



- 
- **Sub threshold stimulus** - too weak to generate a response
 - **Threshold stimulus** – strong enough to generate a minimal response (muscle contraction)
- 



◀ **motor unit** consist of one motor neuron of the spinal cord (its axon & its branches as it enters a muscle) and the muscle fibers innervated by this neuron



MUSCLE TWITCH

response of a motor unit to a single action
potential


(quick contraction followed by relaxation)



Phases of muscle twitch

1-Latent Period

Time taken by the action potential to travel from point of stimulation to the motor end plate.






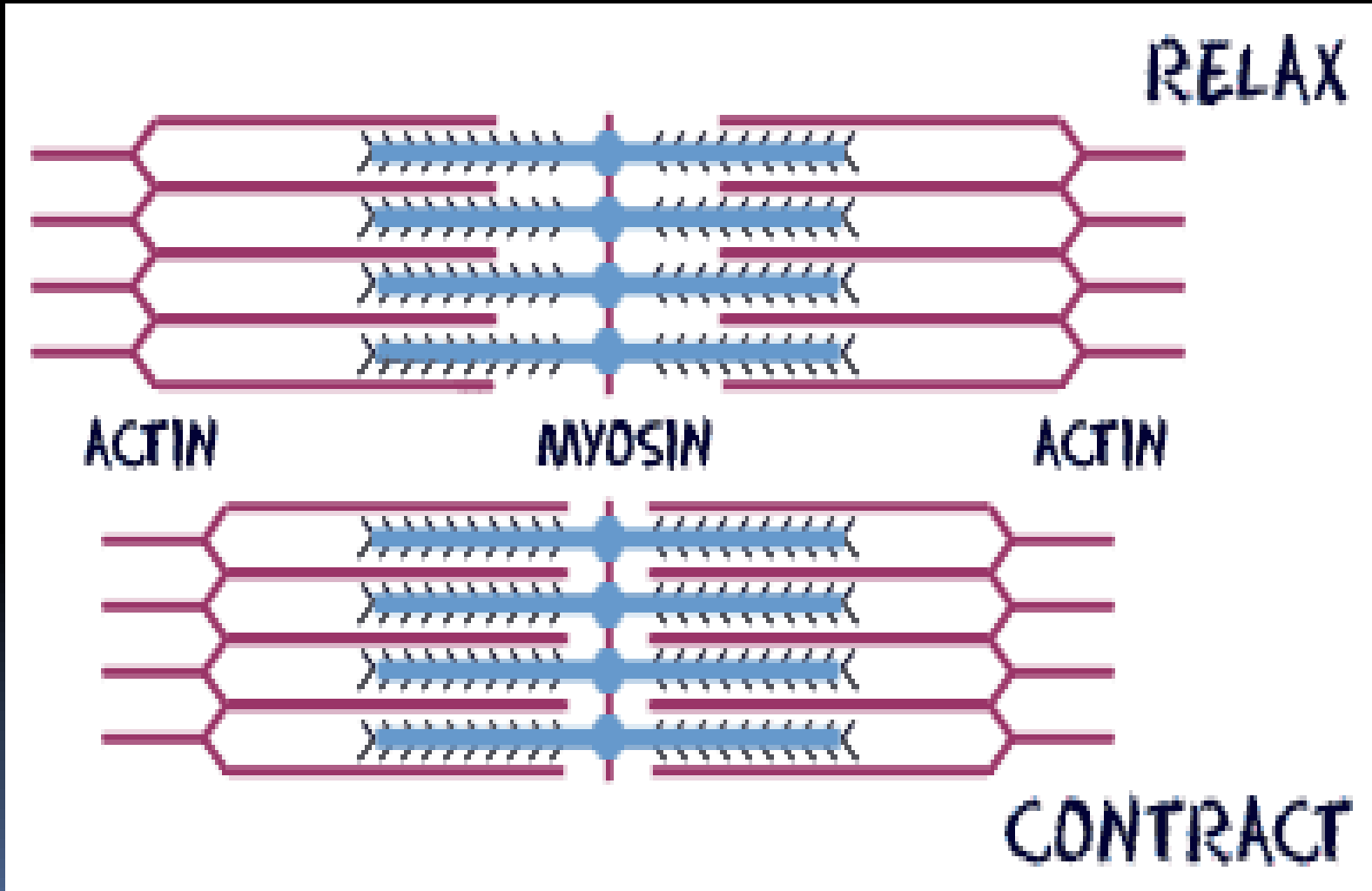
2-Period of Contraction

- Generation of action potential (depolarization)

- release of calcium ions from sarcoplasmic reticulum


- muscle shorten occur due to movement of actin (thin filaments) over myosin (thick filaments) and formation of cross bridges



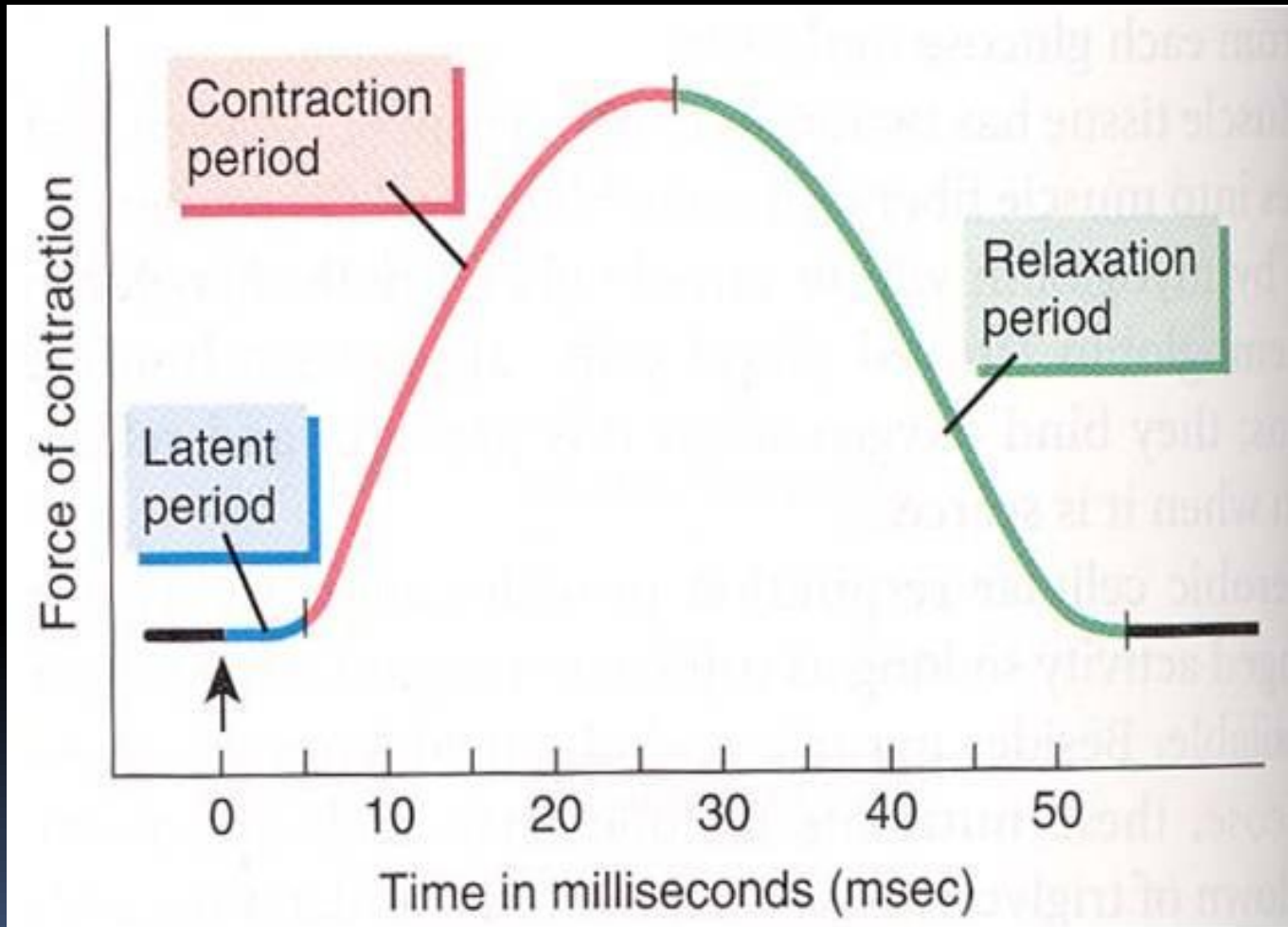




3- Period of Relaxation

- repolarization of muscle fibers
 - re-entry of Ca^{2+} into sarcoplasmic reticulum
 - tension decreases to zero
 - return to original length
- 

Twitch curve



Abrón
instruments



ABRON EXPORTS



RS4 50-7368 Handred Apparatus

Effect of temperature on simple muscle twitch



◀ **increase** of temperature shortens the latent

, contraction & relaxation periods up to 43 ,

why? increase excitability and hasten metabolic

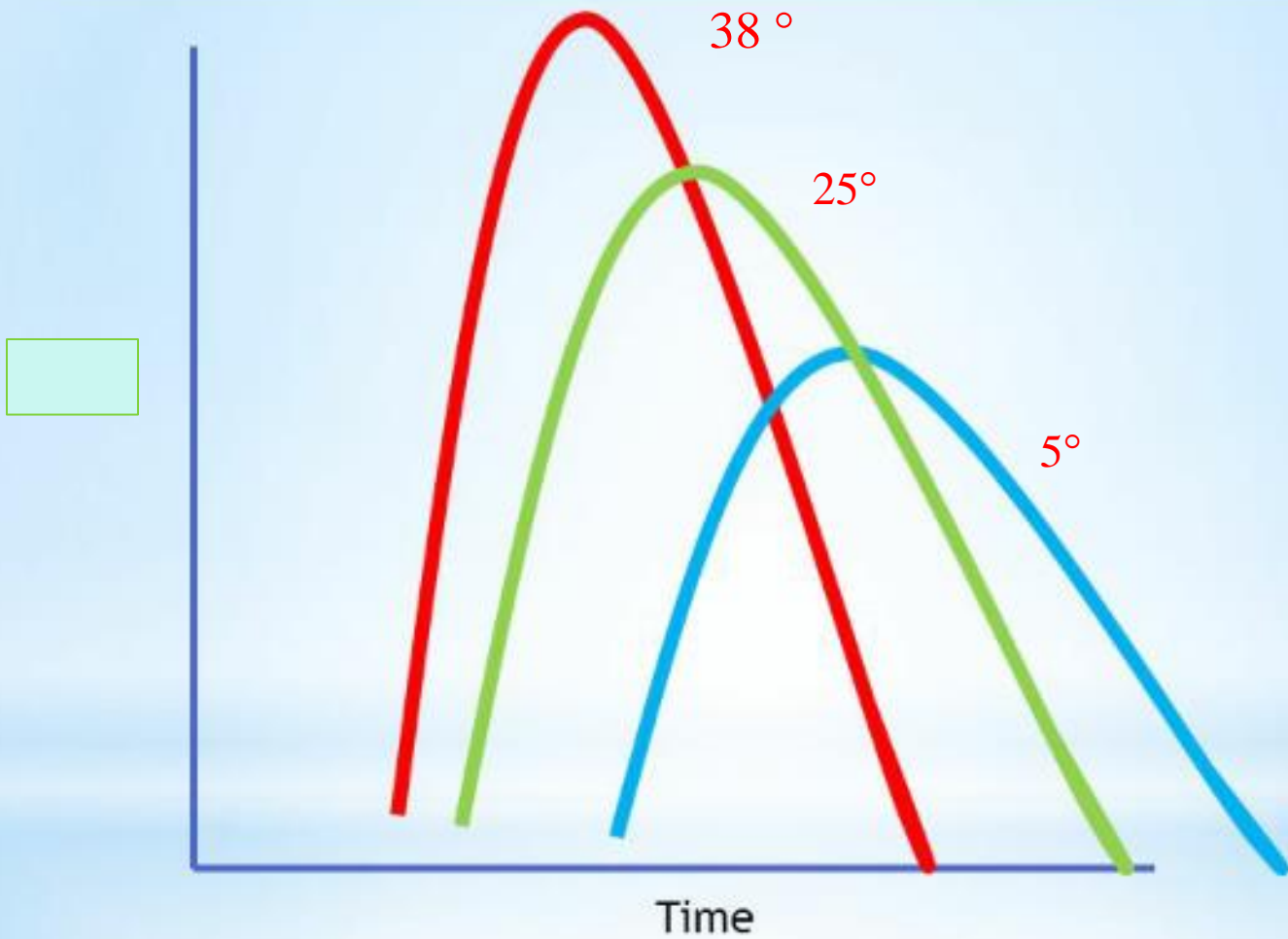
Processes of the muscle

Increase temperature >43 ?



◀ A decrease of temperature has an opposite effect on the latent, contraction & relaxation periods.


Effect of Temperature on Simple Muscle Twitch




Graded Muscle Response

Increased stimulus intensity (higher voltage) leads to increased muscle contraction, because it activates additional motor units

Maximum contraction occurs when all motor units in a muscle are stimulated to contract



why the force of contraction can not increase
after the strength of stimulus is increased beyond
the maximal level?



Maximum stimulation excites all the motor fibers
so all the motor units are already contracting to
their maximum extent (all or none law)

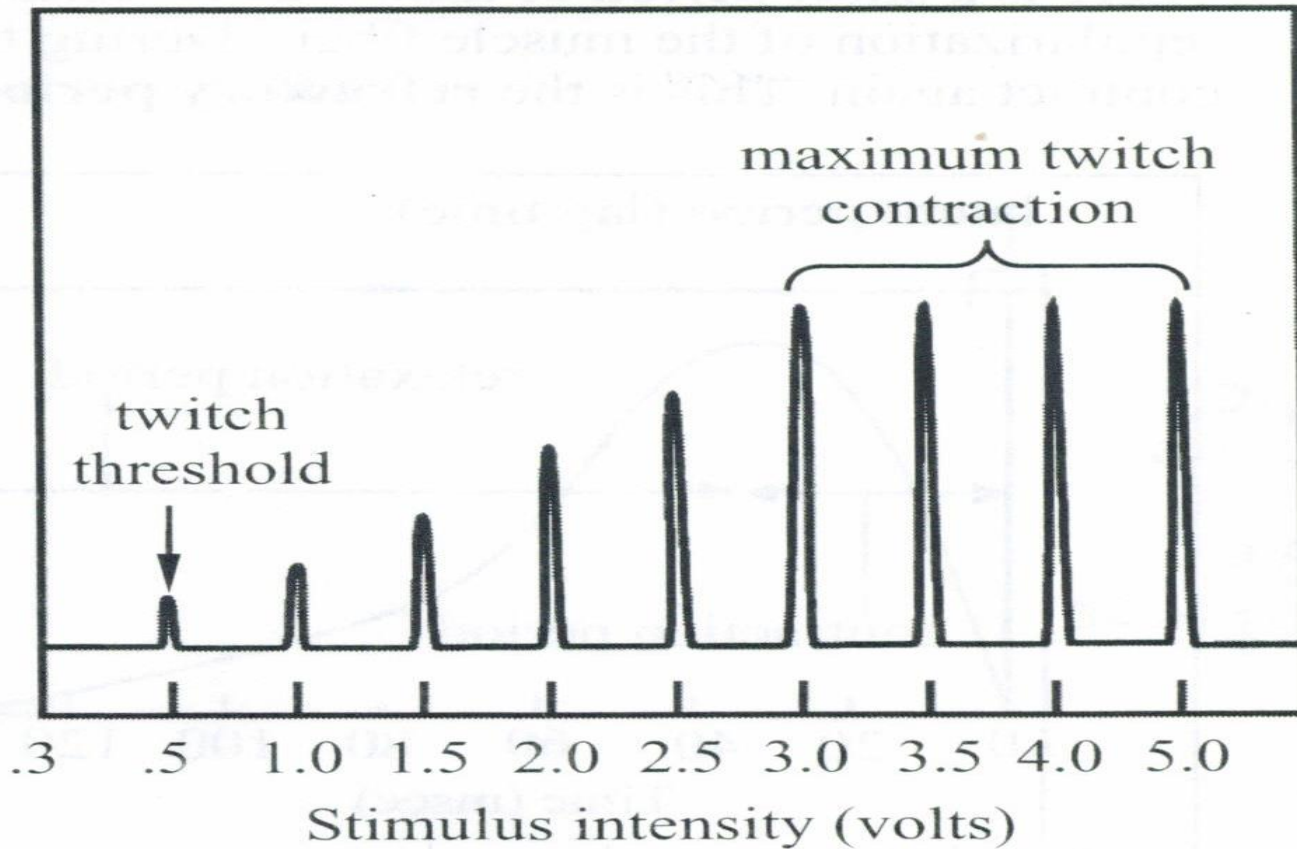




Fig 6.2 Graded muscle response to increased stimulus intensity.




Increased Frequency of Stimulation

(Same Stimulus Intensity)


Increasing the rate at which a stimulus is applied
(frequency)



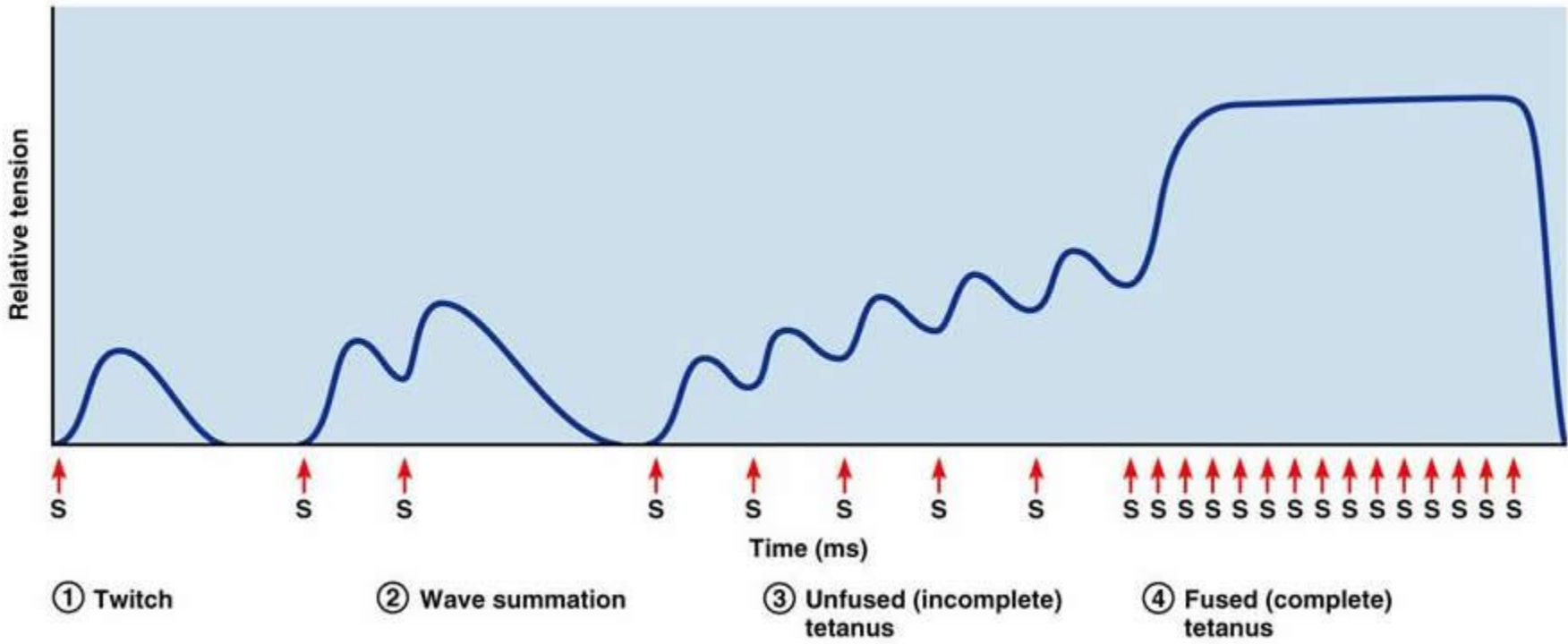
Repeated stimulation before relaxation has occurred produces additional activation of contractile elements & a response added to the contraction already present.



So the tension developed is greater than that during single twitch leading to contractions before any relaxation has occurred (continuous contraction) called **tetanic contraction** or **complete tetanus**.



While **incomplete tetanus** when periods of incomplete relaxation occur between Summated stimuli



① Twitch

② Wave summation

③ Unfused (incomplete) tetanus

④ Fused (complete) tetanus



Fatigue

State in which the muscle can not be contracted
Due to repeated stimulation of the muscle

The causes are

1-loss of nutrients

2-loss of oxygen

3-loss of ATP

4-depletion of acetyl choline

5-accumulation of acidosis products

