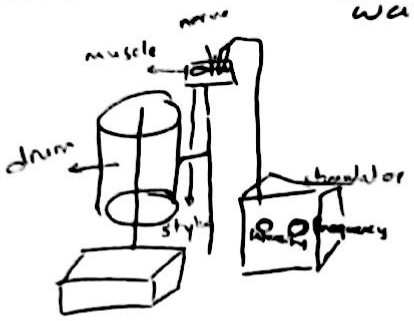
# Physiology lab : skeletal muscle contraction

→ will use a device called Kymograph
wave writer




(isotonic contract)

→ we use frog's gastrocnemius muscle & sciatic n.

frog's muscle can function at room temperature without blood supply. can get $O_2$ via diffusion from air to the solution bathing the preparation.

⇒ simple muscle twitch : (single response to single stimulus)

start with the lowest intensity (of single impulse), we ↑ it gradually until reaching threshold stimulus (voltage) : minimal stimulus that causes full response

then we ↑ intensity to reach maximal effect
(maximal stimulus = a point where further ↑ in stimulus intensity will not produce a larger muscle contraction)

## ⟹ summation :

→ give continuous stimuli with low frequency


(stimulating a muscle before it has relaxed from a previous stimulus.)

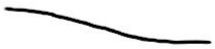
(possible bcoz contraction & relaxation periods are much longer than refractory period)

↑ frequency  wave/frequency summation.

↑↑ frequency  (unfused) incomplete tetanization

↑↑↑ frequency  (fused) tetanization (contraction without relaxation) or sustained contract.

→ any additional ↑ in frequency has no further effect in ↑ contractile force.

then will get  fatigue : due to consumption of neurotransmitters at neuromuscular junction

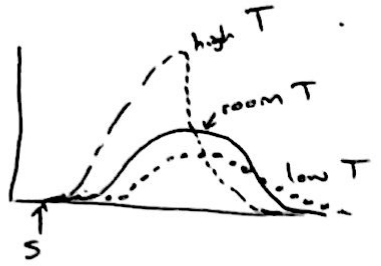
→ with summation the amplitude ↑ progressively due to ~~inability to~~ the accumulation of $Ca^{+}$ in sarcoplasm due to incomplete relaxation, so the next contraction will add to it, → ↑ amplitude

→ Treppe / Stair case phenomenon :

- not a way muscles exhibit graded contractions.
- it's warm up phenomenon
- due to ↑ efficiency of ion gates as they are repeatedly stimulated or ↑ $Ca^{++}$ in cytosol bcoz ↑ release by SR with each contraction & failure of sarcoplasm to reuptake ions properly
- the strength of the stimulus remains the same & the frequency
- ~~the~~

⇒ effects of temperature on muscle contraction :

- we will use Ringer Solution [ room temp. / hot / cold ]




→ Start with high temp. before cold bcoz cold T. will inhibit the enzymatic & metabolic activities of the muscle, may be difficult to revive muscle activities from effects of cold.

<u>↑ temp.</u> : ↓ latent period bcoz → ↑ conduction velocity in n. / ↑ rate of neuromuscular transmission

↑ amplitude bcoz → ↑ enzymatic & chemical activities in mus.

shortening of contraction- relaxation period bcoz →
- ↓ resistance of the muscle to contractions as the viscosity of muscle ↓.
- activation of myosin ATPase activity.

<u>↓ temp</u> : ↑ latent period, ↓ amplitude, prolongation of contraction-relaxation period bcoz →

↓ rate of conduction velocity in n. & through Neuromuscular junction

↑ viscosity of the muscle.

↓ enzymatic & chemical activities in the muscle.