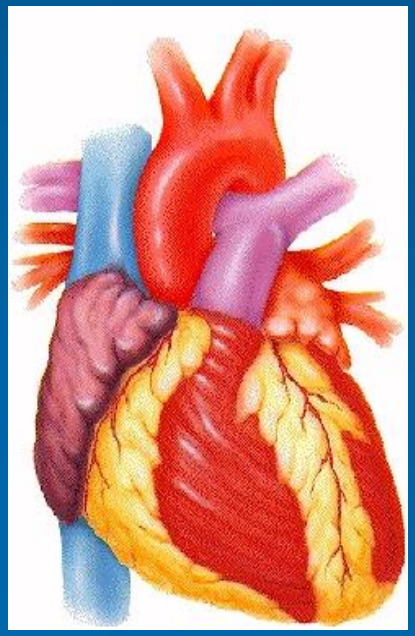
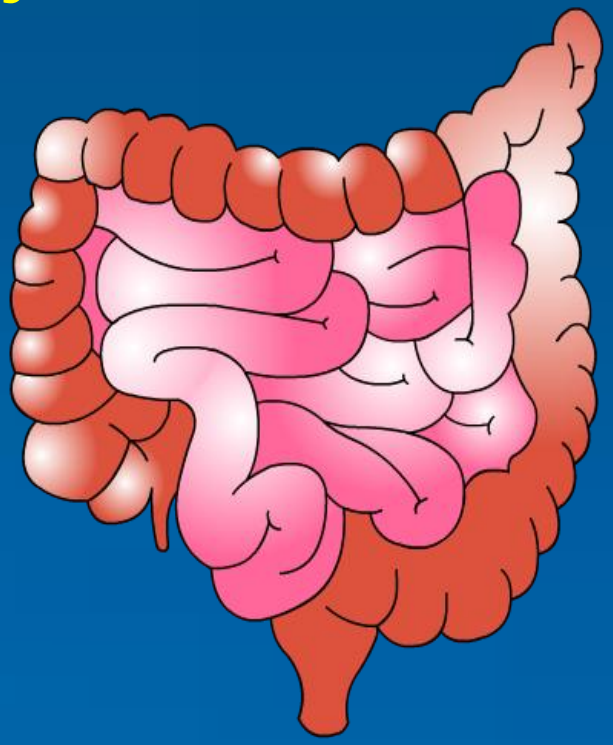
Comparison of different types of Muscle Physiology





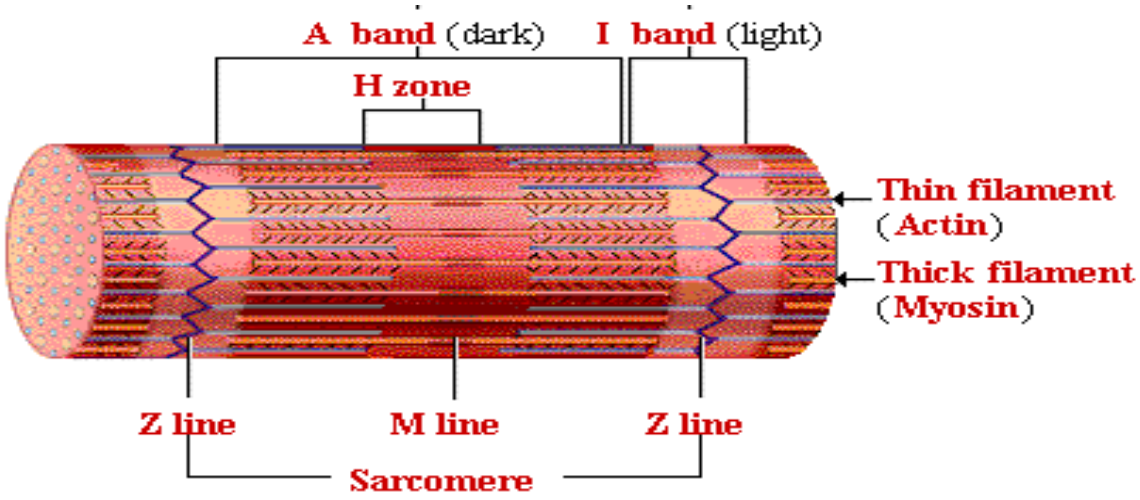
Prof. Khaled Abdel-Sater

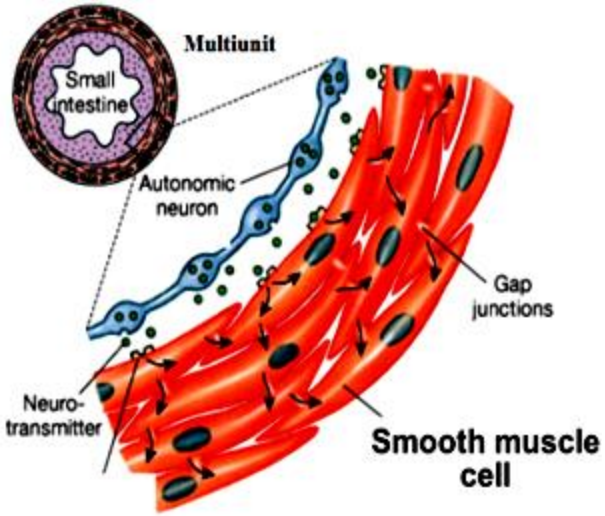
Physiology of muscle

Types of muscles

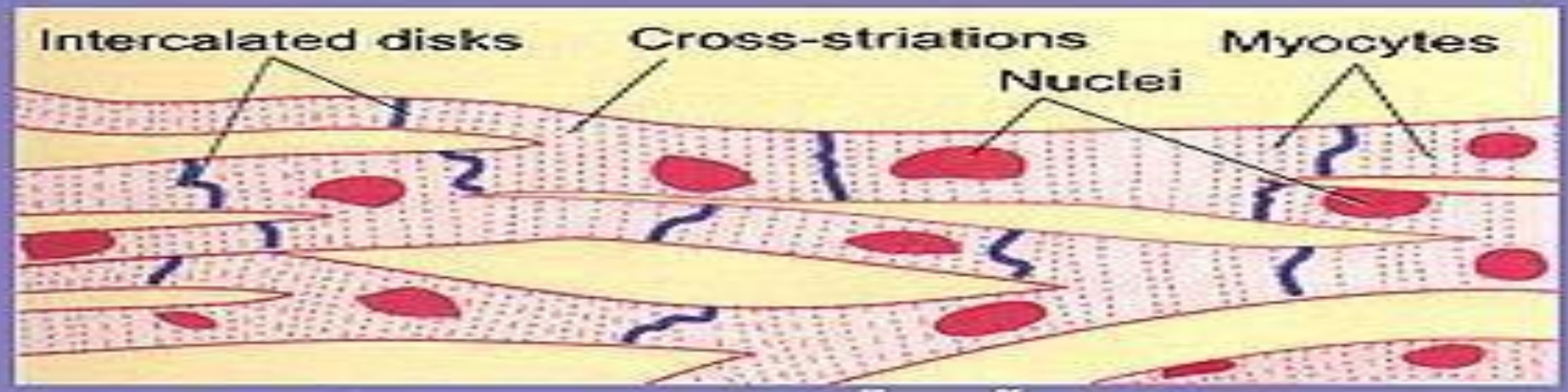
2 Types

- Striated muscle
  - Skeletal muscles
  - Cardiac muscles
- Smooth muscles

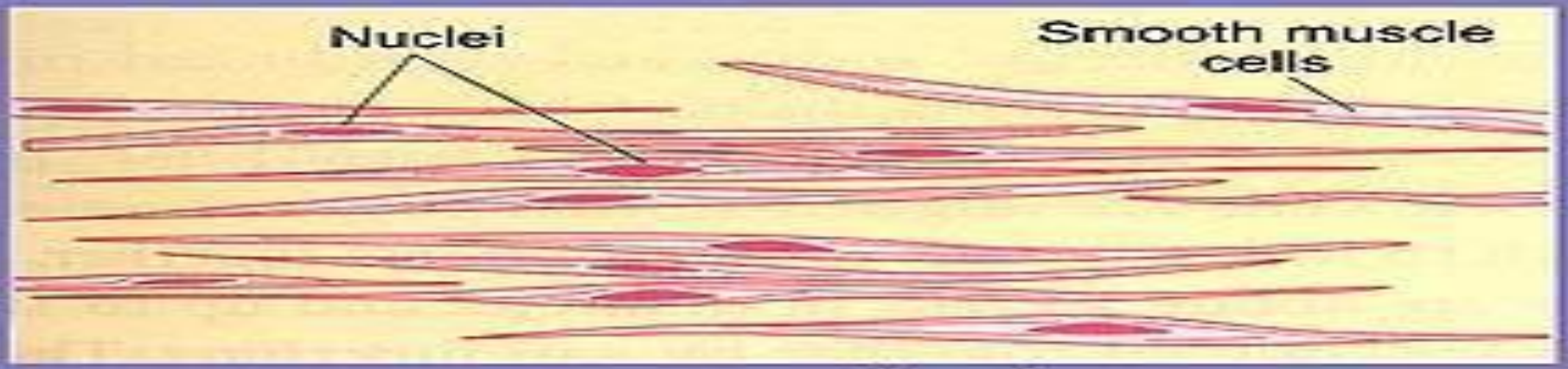




Skeletal muscle (กล้ามเนื้อลาย)



Cardiac muscle (กล้ามเนื้อหัวใจ)



Smooth muscle (กล้ามเนื้อเรียบ)

Comparison of skeletal, smooth & cardiac muscles

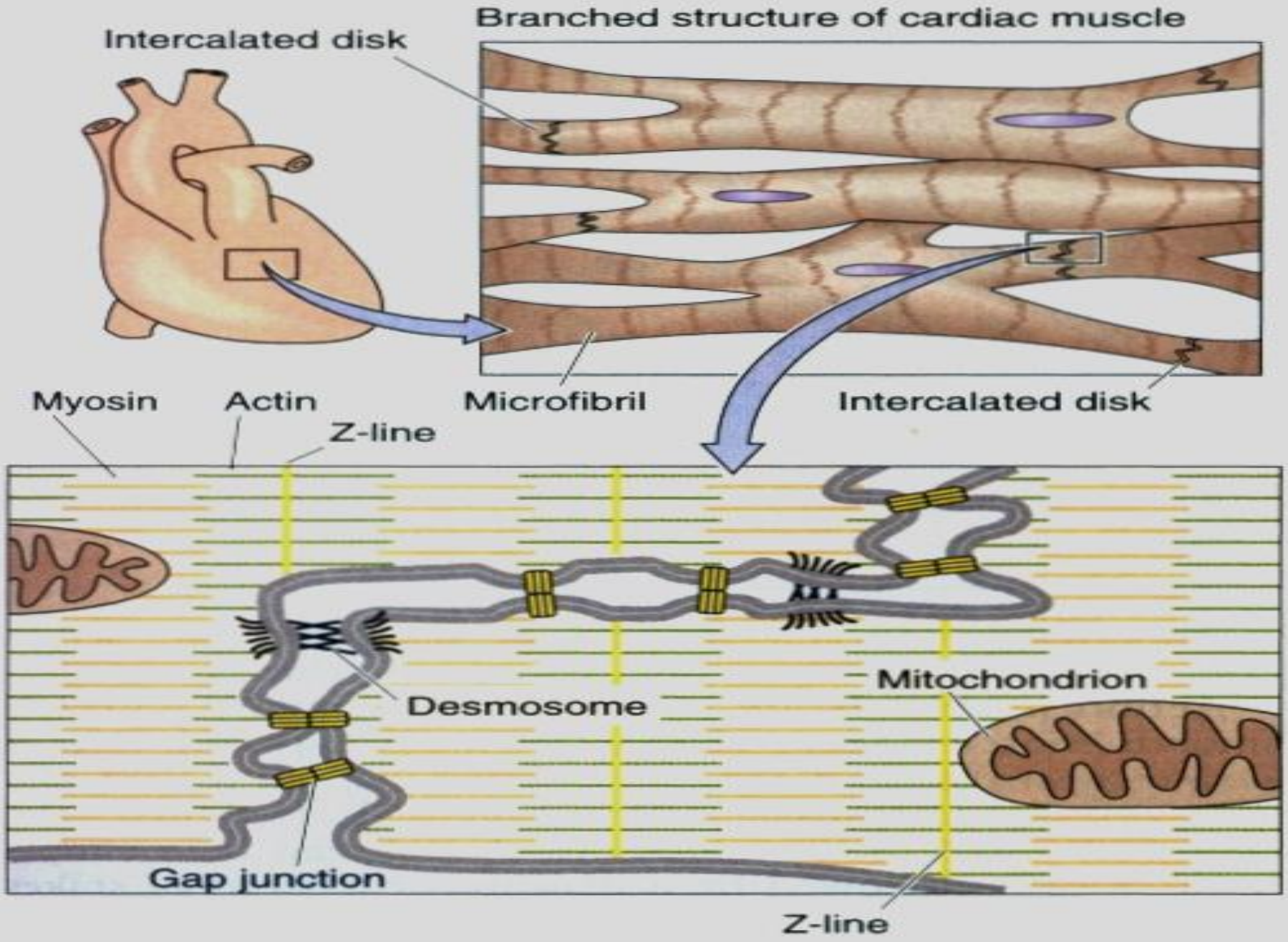
Structural features

	Skeletal m.	Cardiac m.	Smooth m.
location	In association with bone	In the heart	In the viscera
Striations	Striated	Striated	Non striated
Branching of fibers	Absent	Present	Absent
Connection between fibres	Absent	Functional connections present	Functional connections present (In single unit)
Myofibrils	Present	Present	Absent
Sarcomere	Present	Present	Absent
Troponin	Present	Present	Absent (Calmodulin)
Sarcotubular system	Well developed	Well developed	Poorly developed
Nerve supply	Somatic nerve	Autonomic	Autonomic nerves
Control	Voluntary	Involuntary	Involuntary

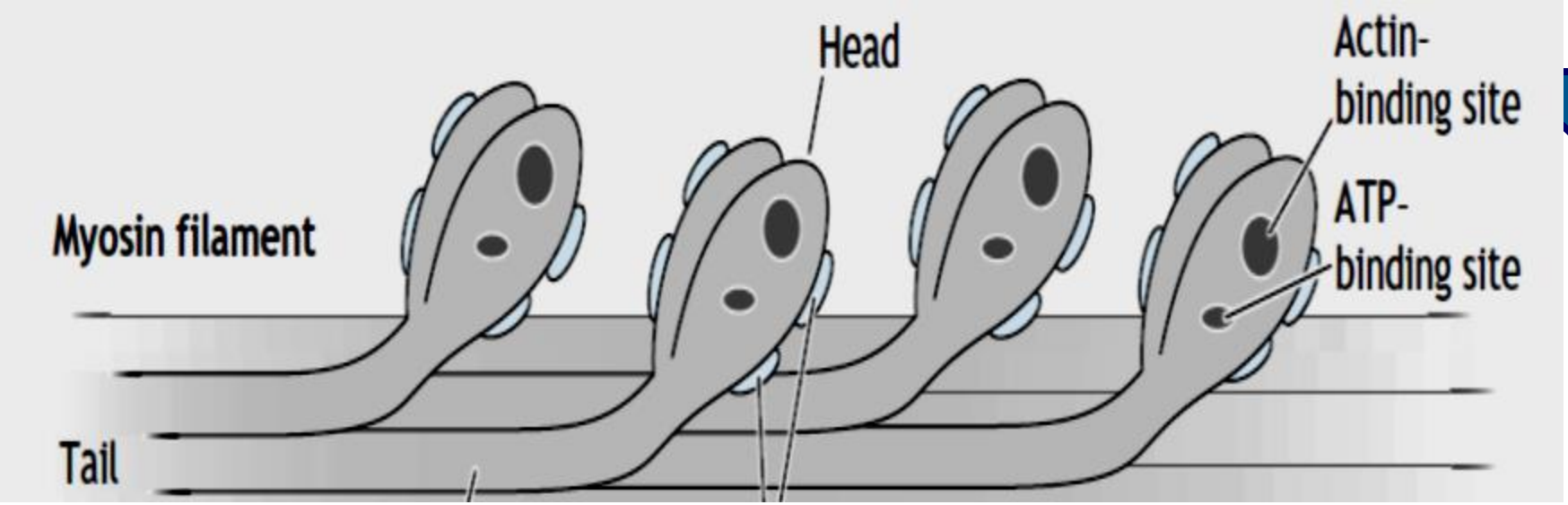
Comparison of skeletal, smooth & cardiac muscles

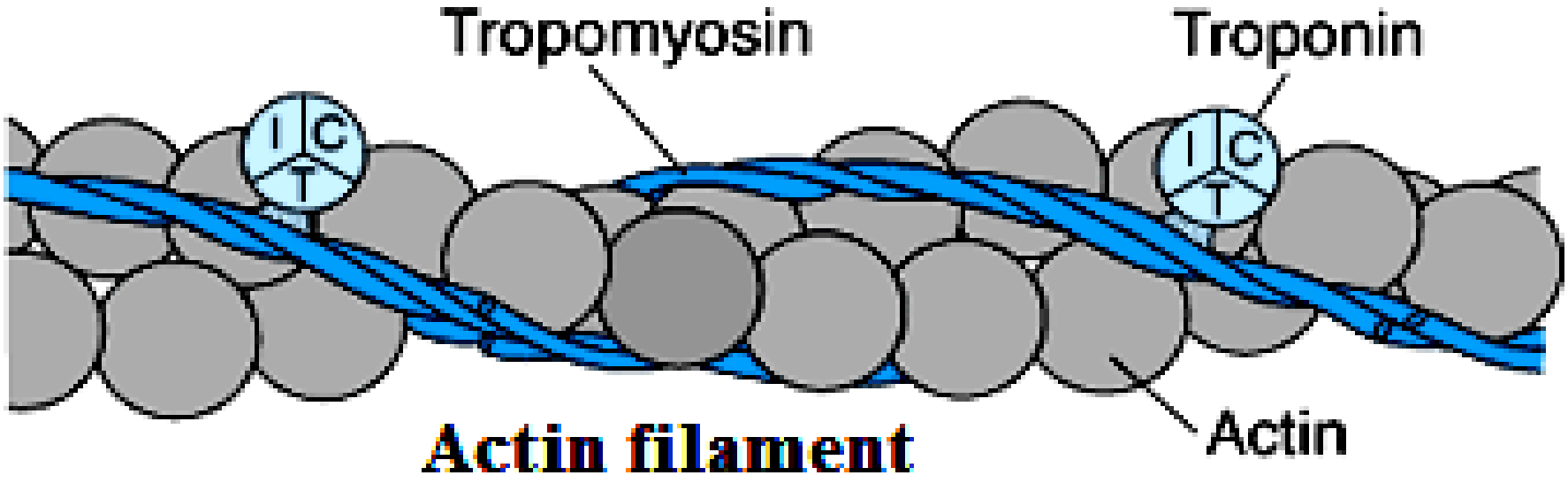
Electrical & Mechanical properties

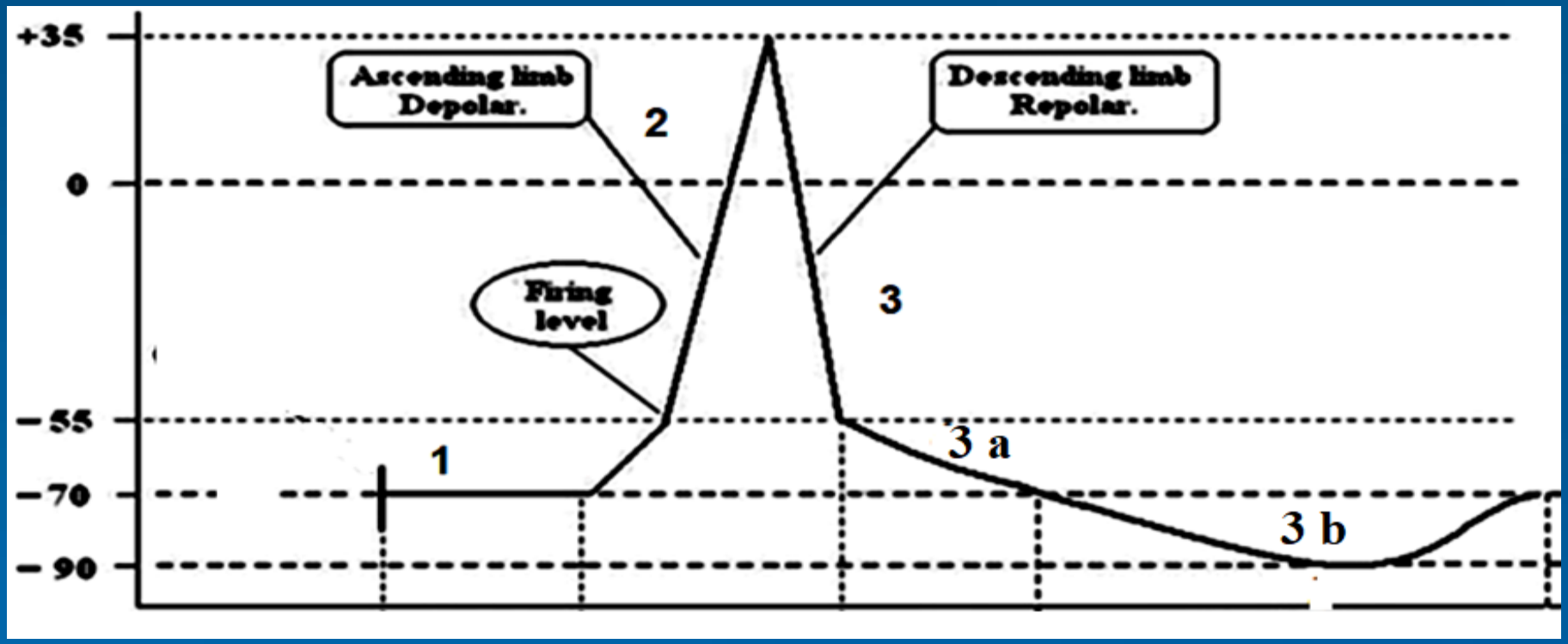
	Skeletal m.	Cardiac m.	Smooth m.
RMP	–90 mV	–90 mV	–55 mV (unstable)
Action potential shape & duration	Spike potential 5 msec.	Plateau potential 300 msec.	Spike potential Plateau potential 100 msec
Autorhythmicity	Not present	Present	Present (in single unit)
Source of Ca++ in contraction	Cisternae	Extracellular fluid	Extracellular fluid
Rate of contraction	Fast	Fast	slow
Rate of relaxation	Fast	Fast	slow
All or none law	Single m. fiber	Whole muscle	Whole muscle (single unit)
Tetanus & fatigue	Possible	Not possible	Not possible

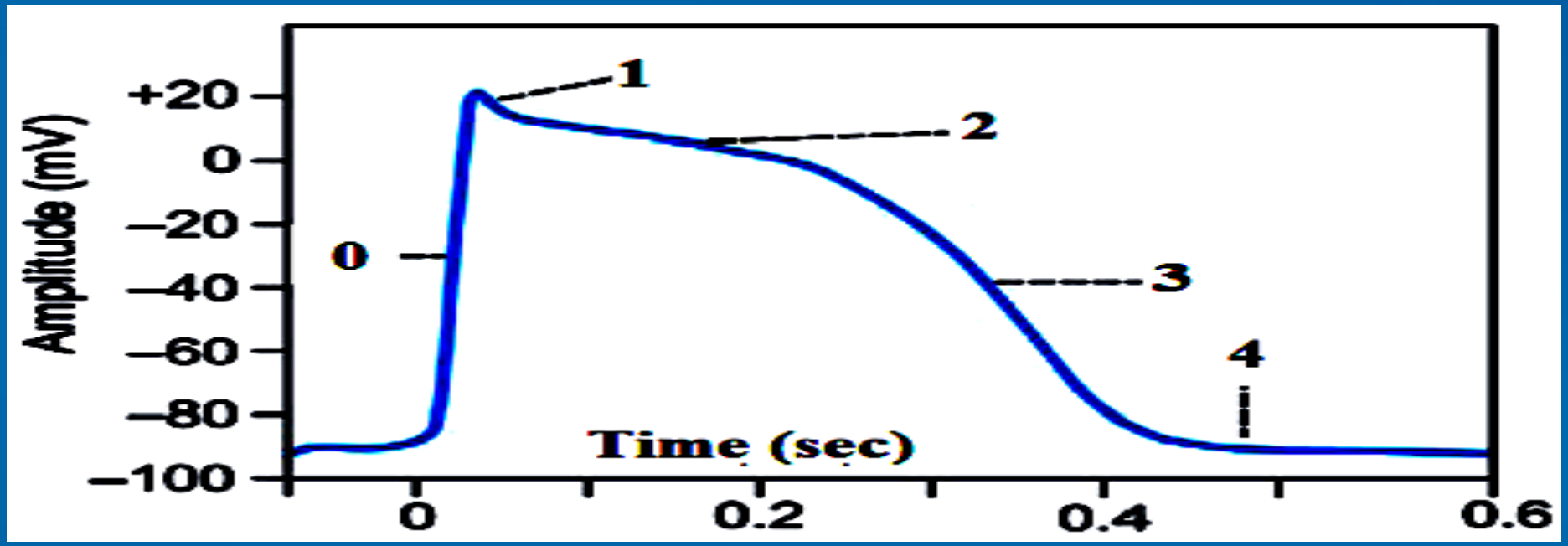

Intercalated disk
Branched structure of cardiac muscle
Myosin
Actin
Z-line
Microfibril
Intercalated disk
Desmosome
Mitochondrion
Gap junction
Z-line

Filaments


Head
Actin-binding site
ATP-binding site
Myosin filament
Tail


Tropomyosin
Troponin
T
I
C
Actin filament
Actin


+35
0
-55
-70
-90
Ascending limb
Depolar.
Descending limb
Repolar.
Firing
level
1
2
3
3 a
3 b


Amplitude (mV)
+20
0
–20
–40
–60
–80
–100
0
1
2
3
4
Time (sec)
0
0.2
0.4
0.6

Thank You