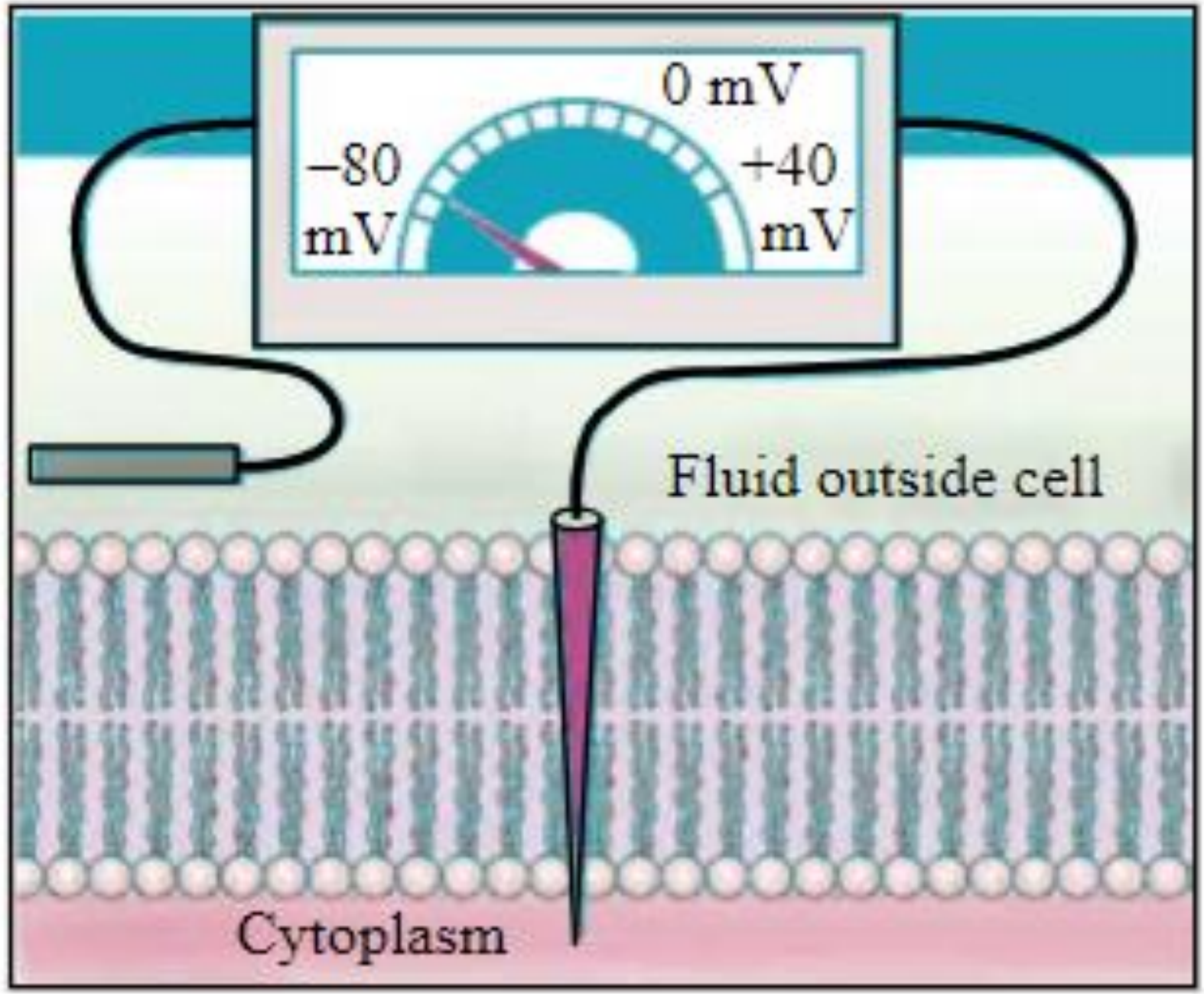
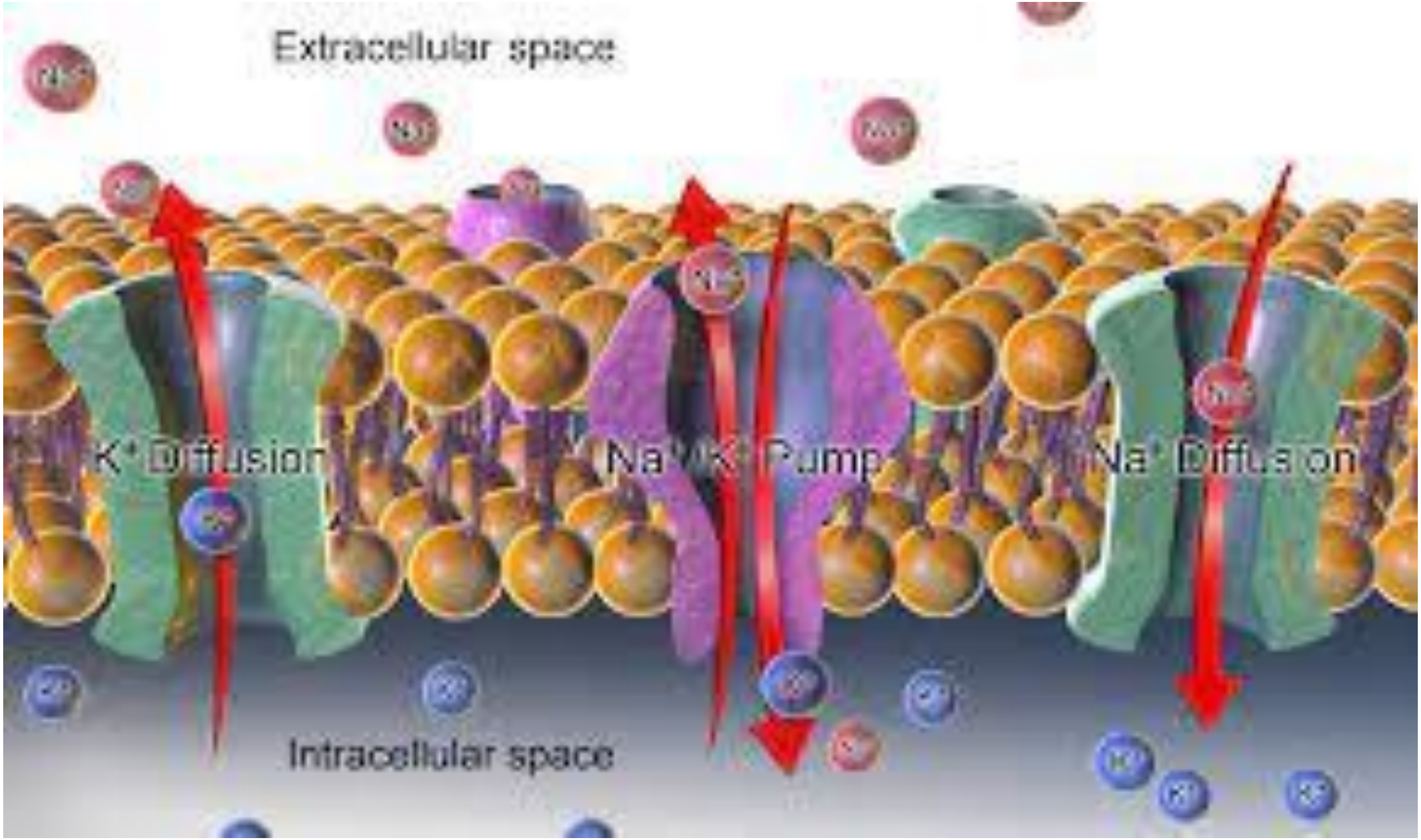
فیزیولوژی یک، جلسه پنجم:

۱- الکتروفیزیولوژی غشای پلاسمایی

۲- روش های شناسایی کانال های یونی

۳- انکلوزیون ها و ارگانل ها


0 mV
−80
mV
+40
mV
Fluid outside cell
Cytoplasm


Extracellular space
K+ Diffusion
Na+/K+ Pump
Na+ Diffusion
Intracellular space

Ion channels have been recognized by:

Using electrophysiological & pharmacological methods

ECR & ICR

ICR:

Voltage clamp & Current clamp

Cytoplasm

- Cytosol:
  - largely water with dissolved protein, salts, sugars, and other solutes
- Cytoplasmic organelles:
  - metabolic machinery of the cell
- Inclusions:
  - chemical substances such as glycosomes (glycogen granules) and pigments

فیزیولوژی یک، جلسه ششم:

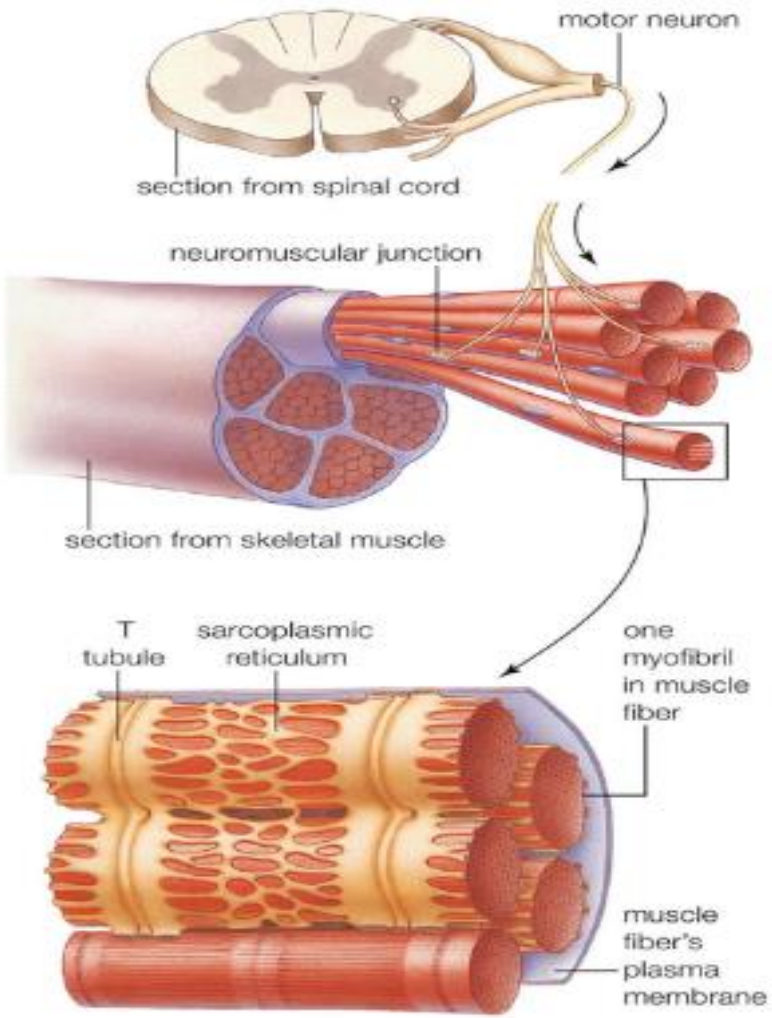
۱- معرفی سلول های تحریک پذیر

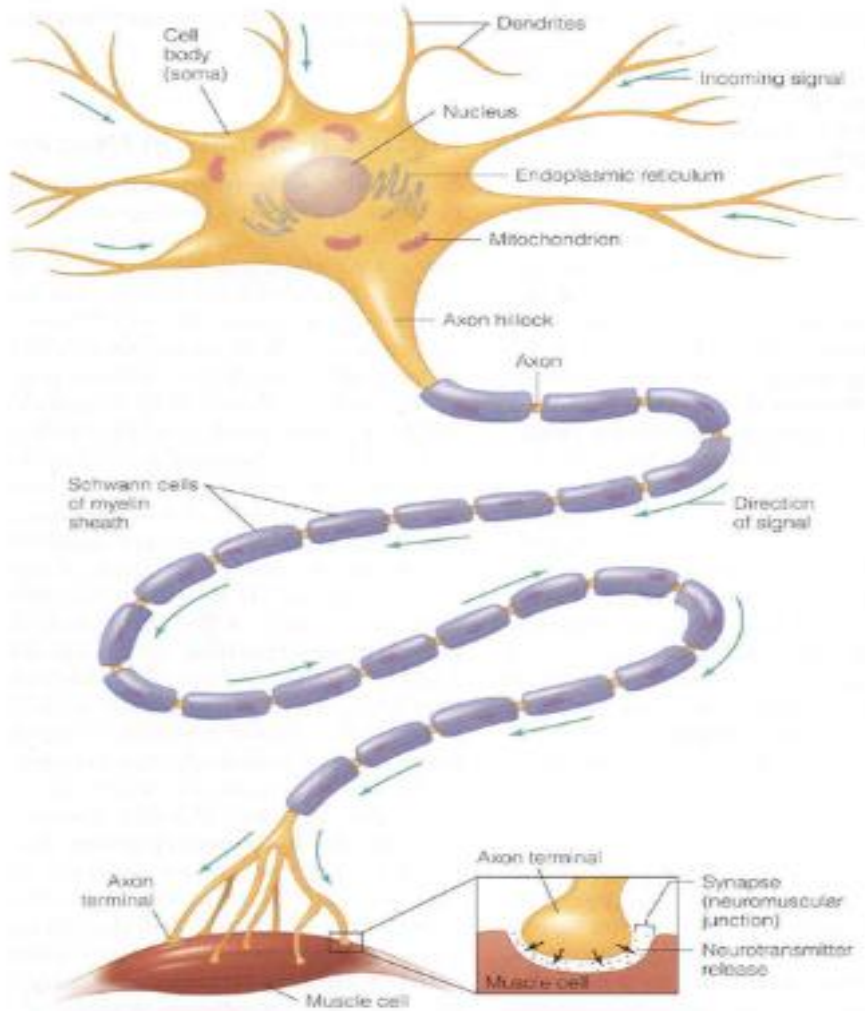
۲- پتانسیل های استراحت و عمل و نمودارهای آنها

۳- نامگذاری نورون ها

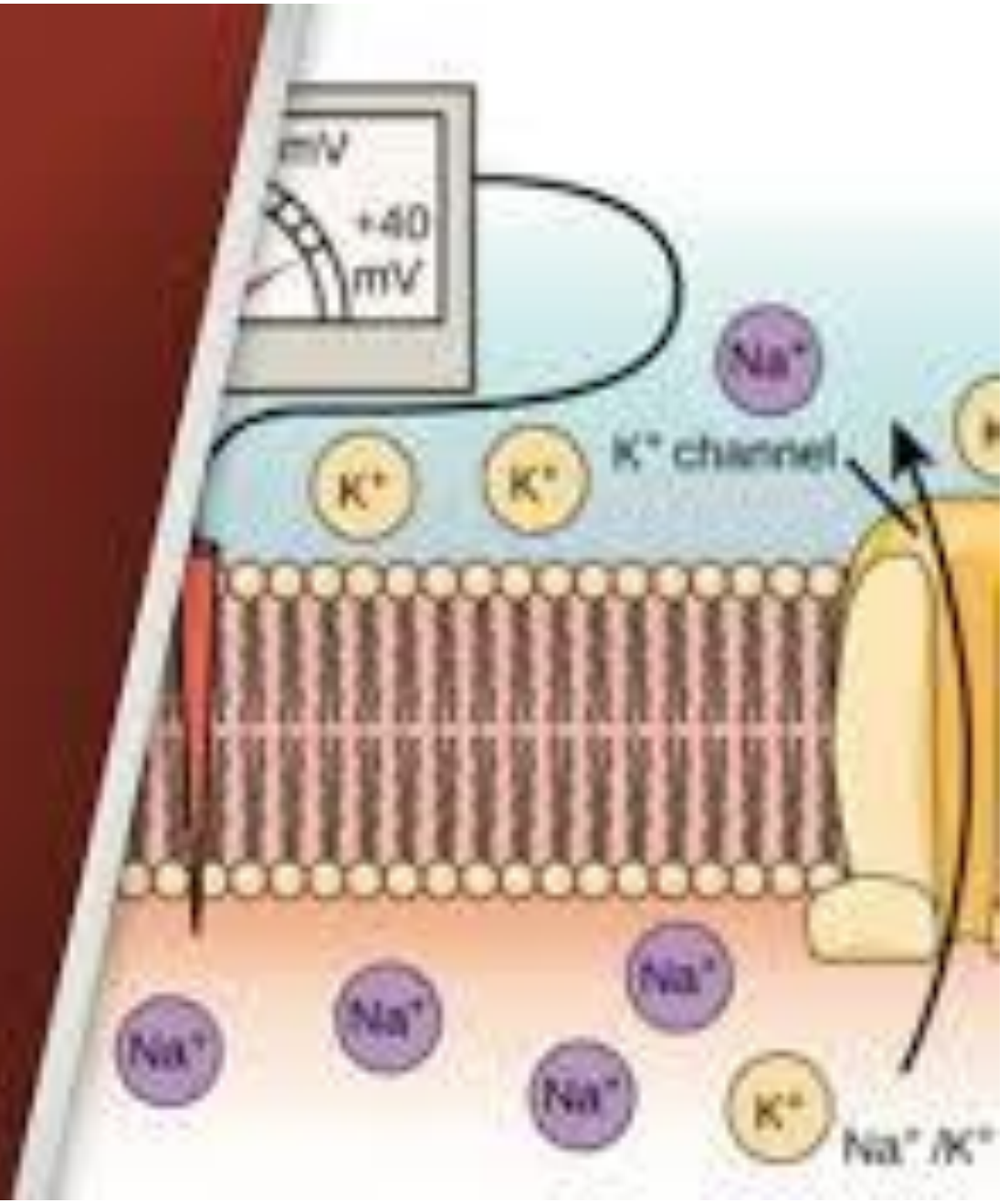
۴- پتانسیل های پس سیناپسی و جمع های زمانی و فضایی

Excitable Cells

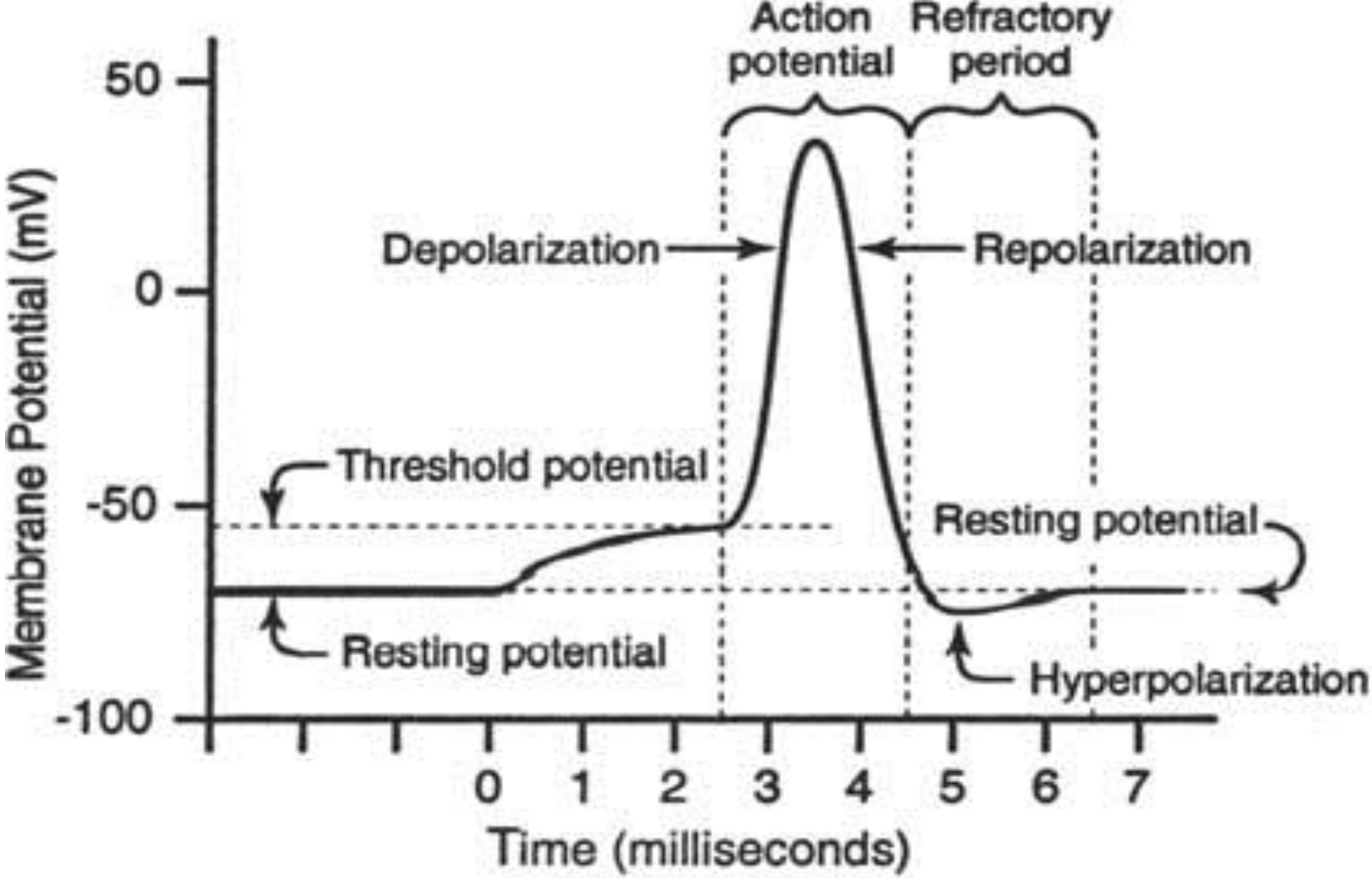




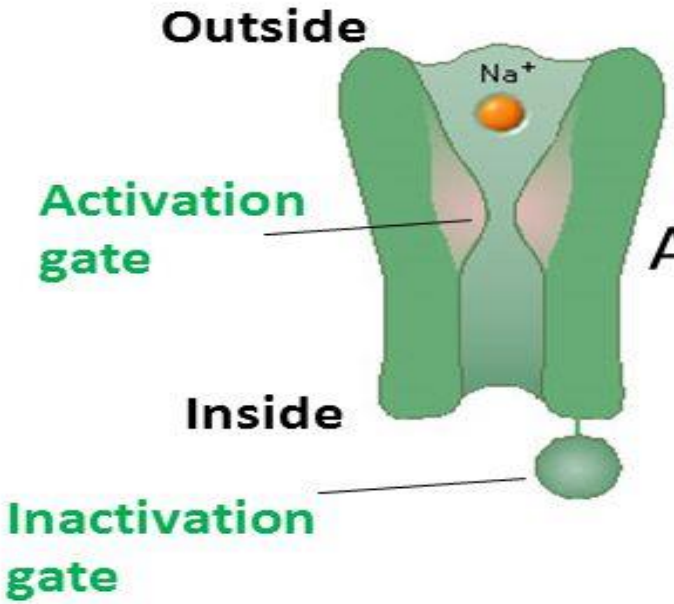
RESTING MEMBRANE POTENTIAL



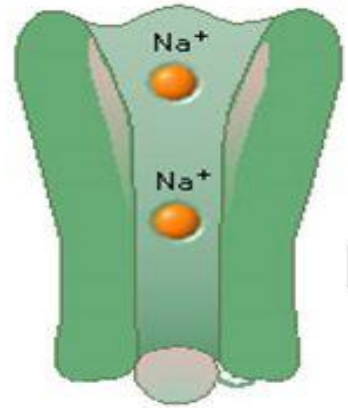

ACTION POTENTIAL
1
2
3
4
5
6
Na+ IN
K+ OUT
Membrane Potential (mV)
30
-70
-90
TIME


Action potential
Refractory period
50
0
-50
-100
Membrane Potential (mV)
Depolarization
Repolarization
Threshold potential
Resting potential
Resting potential
Hyperpolarization
0
1
2
3
4
5
6
7
Time (milliseconds)

Sodium voltage - gated channels have two gates

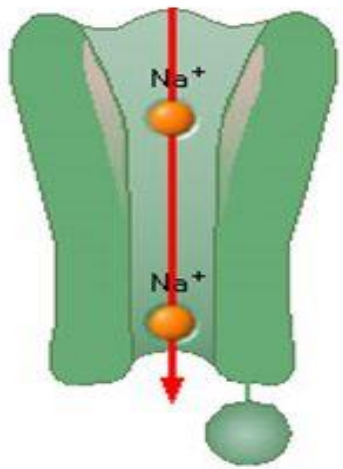


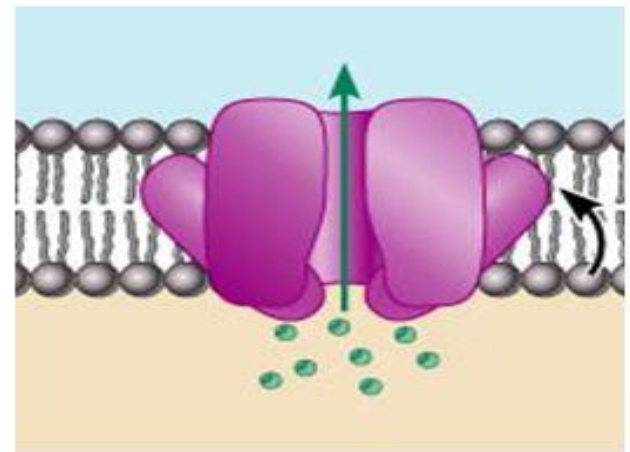
Activation gate closed



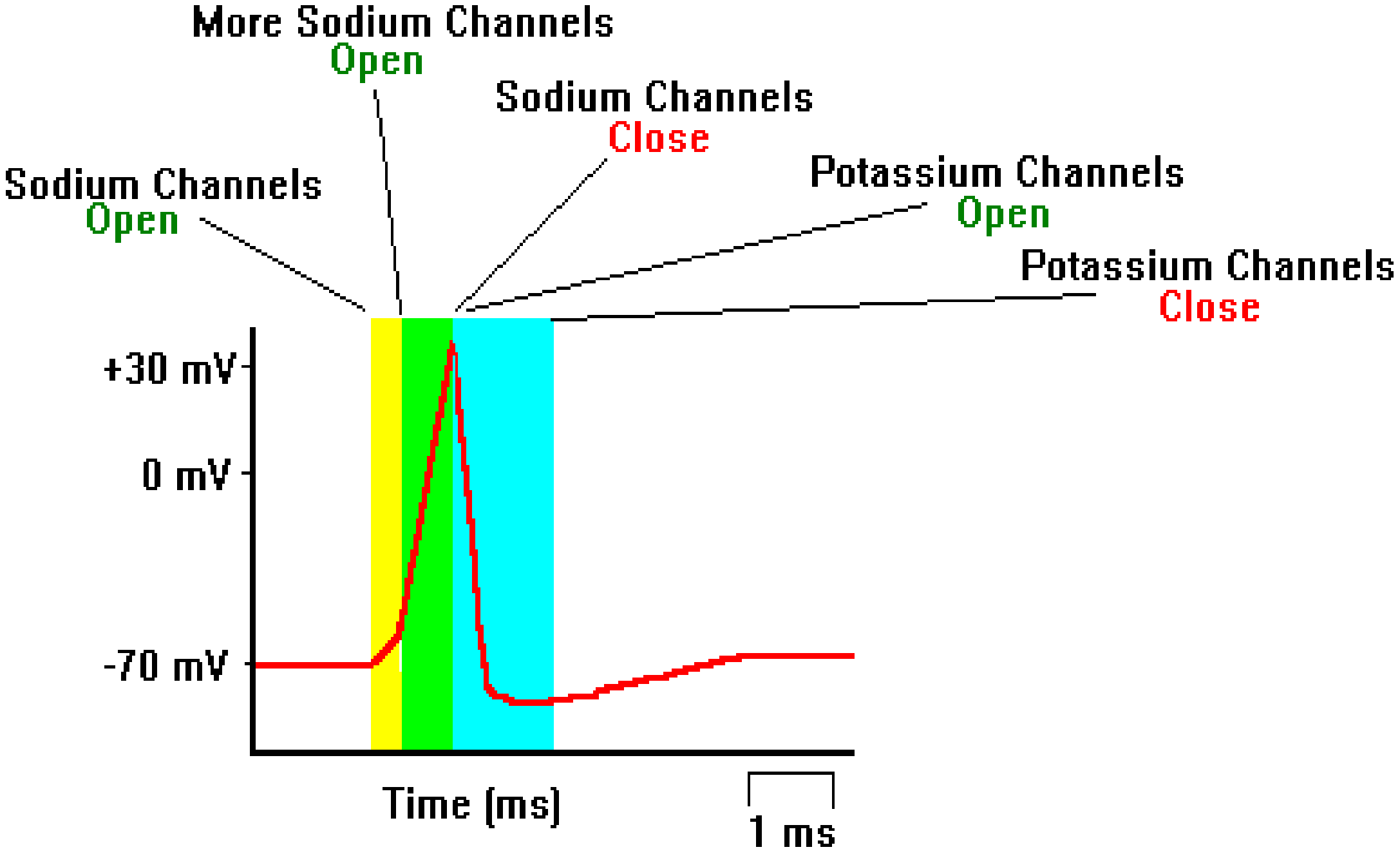
Inactivation gate closed

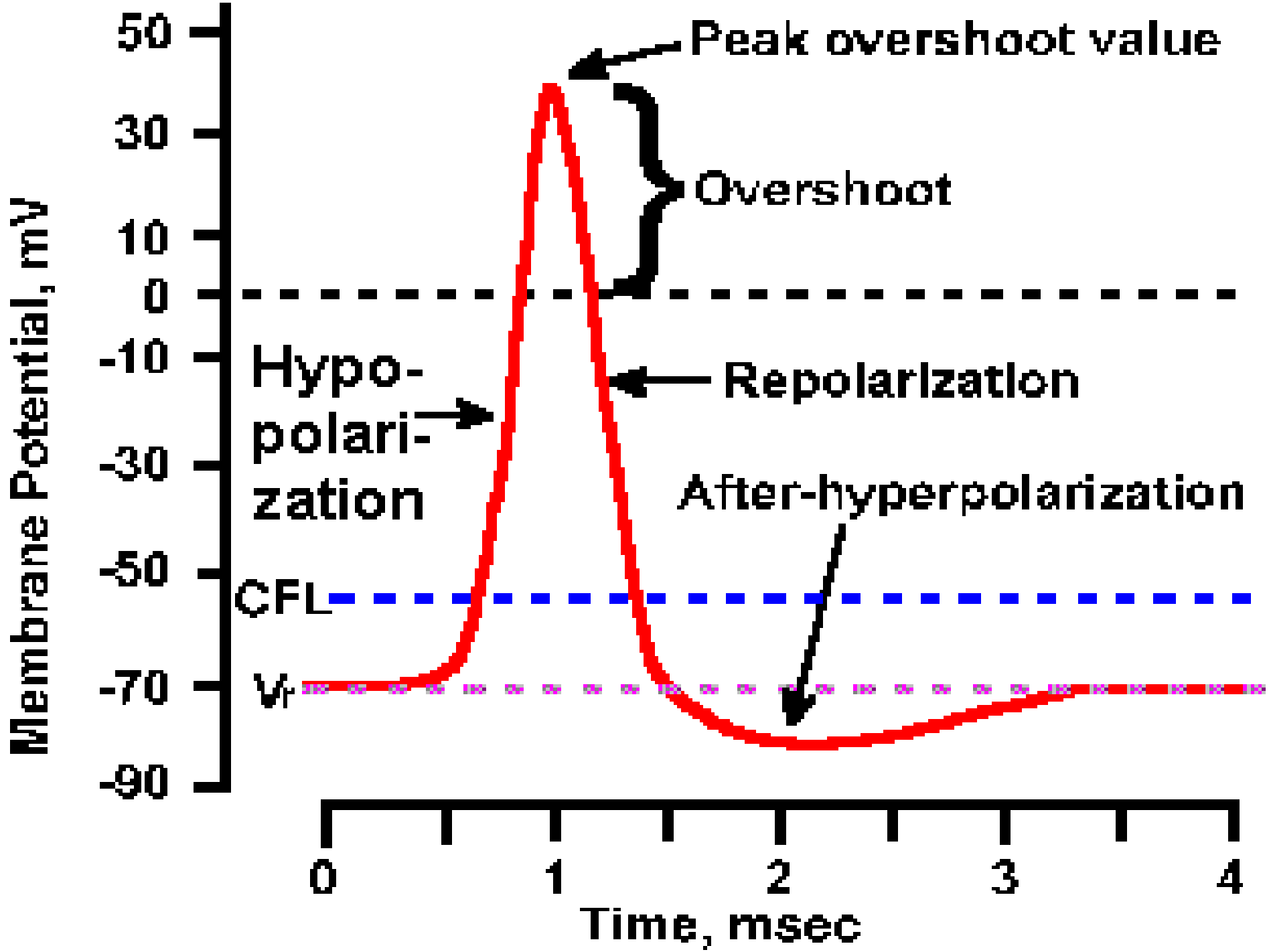
Both gates open

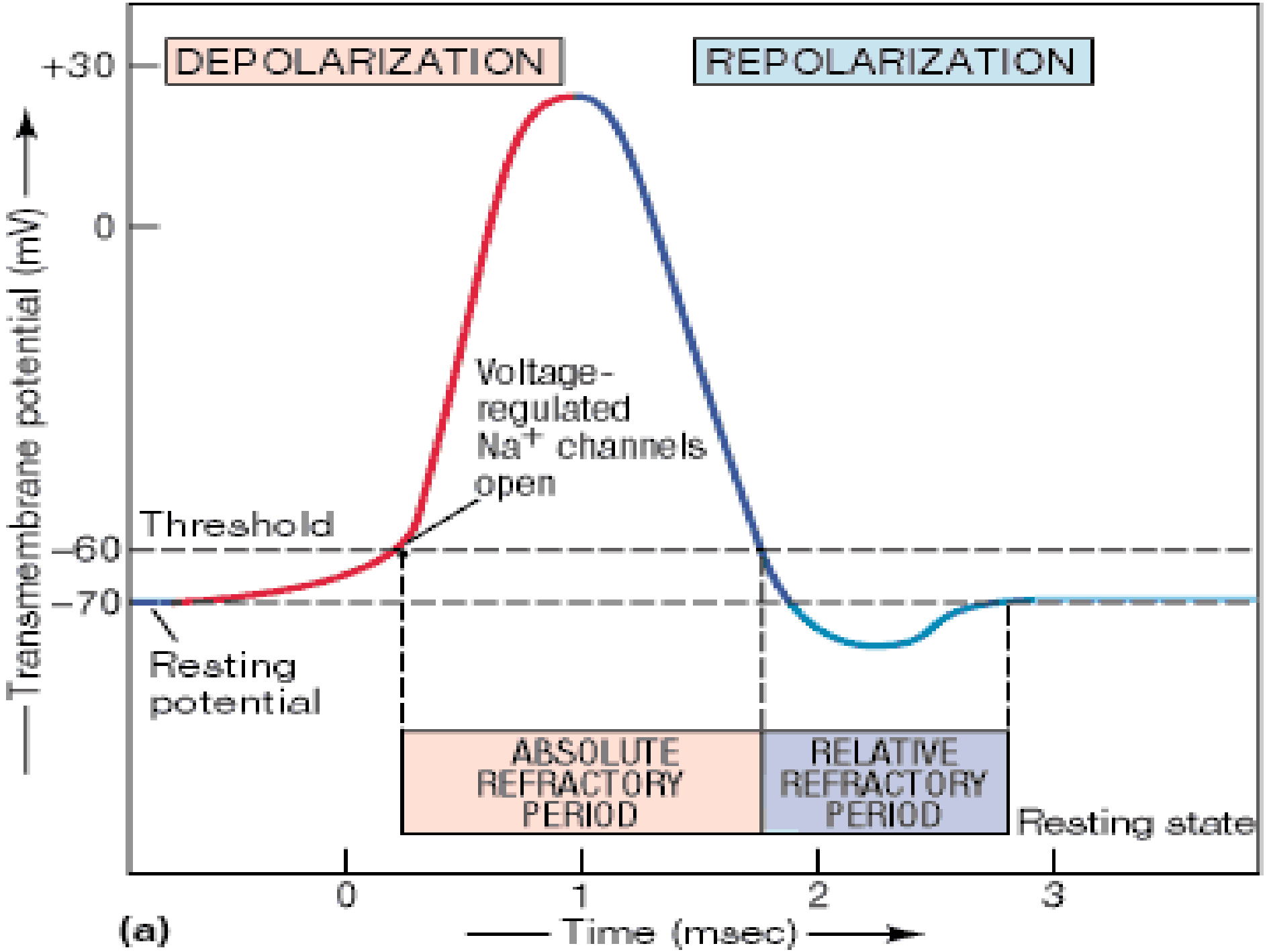




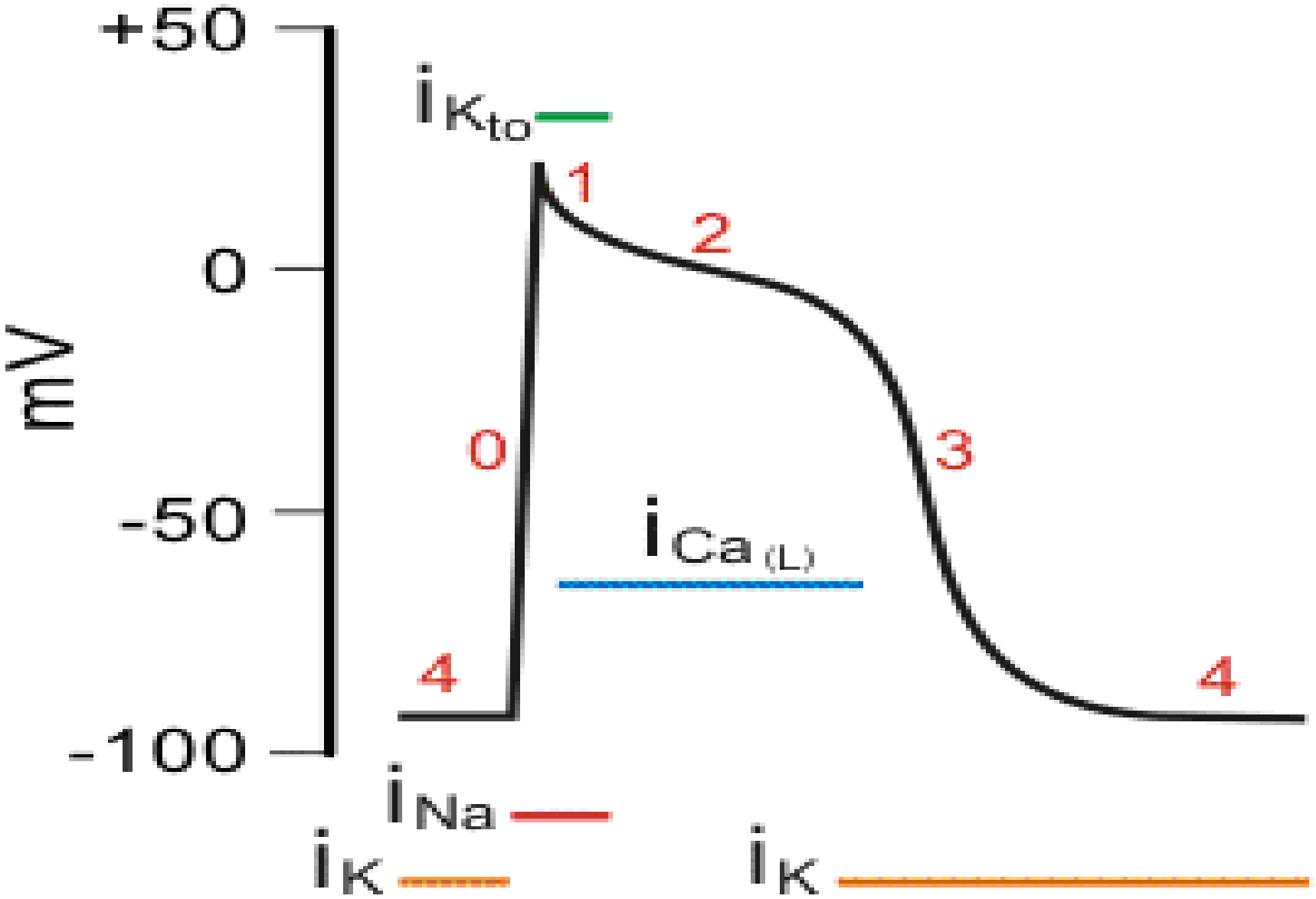
Potassium channel


More Sodium Channels
Open
Sodium Channels
Close
Sodium Channels
Open
Potassium Channels
Open
Potassium Channels
Close
+30 mV
0 mV
-70 mV
Time (ms)
1 ms


Peak overshoot value
Overshoot
Hypo-
polari-
zation
Repolarization
After-hyperpolarization
CFL
V_r
50
30
10
0
-10
-30
-50
-70
-90
Membrane Potential, mV
0
1
2
3
4
Time, msec


DEPOLARIZATION
REPOLARIZATION
+30
0
−60
−70
Transmembrane potential (mV)
Voltage-regulated Na+ channels open
Threshold
Resting potential
ABSOLUTE REFRACTORY PERIOD
RELATIVE REFRACTORY PERIOD
Resting state
0
1
2
3
Time (msec)
(a)

Ventricular Myocyte Action Potential

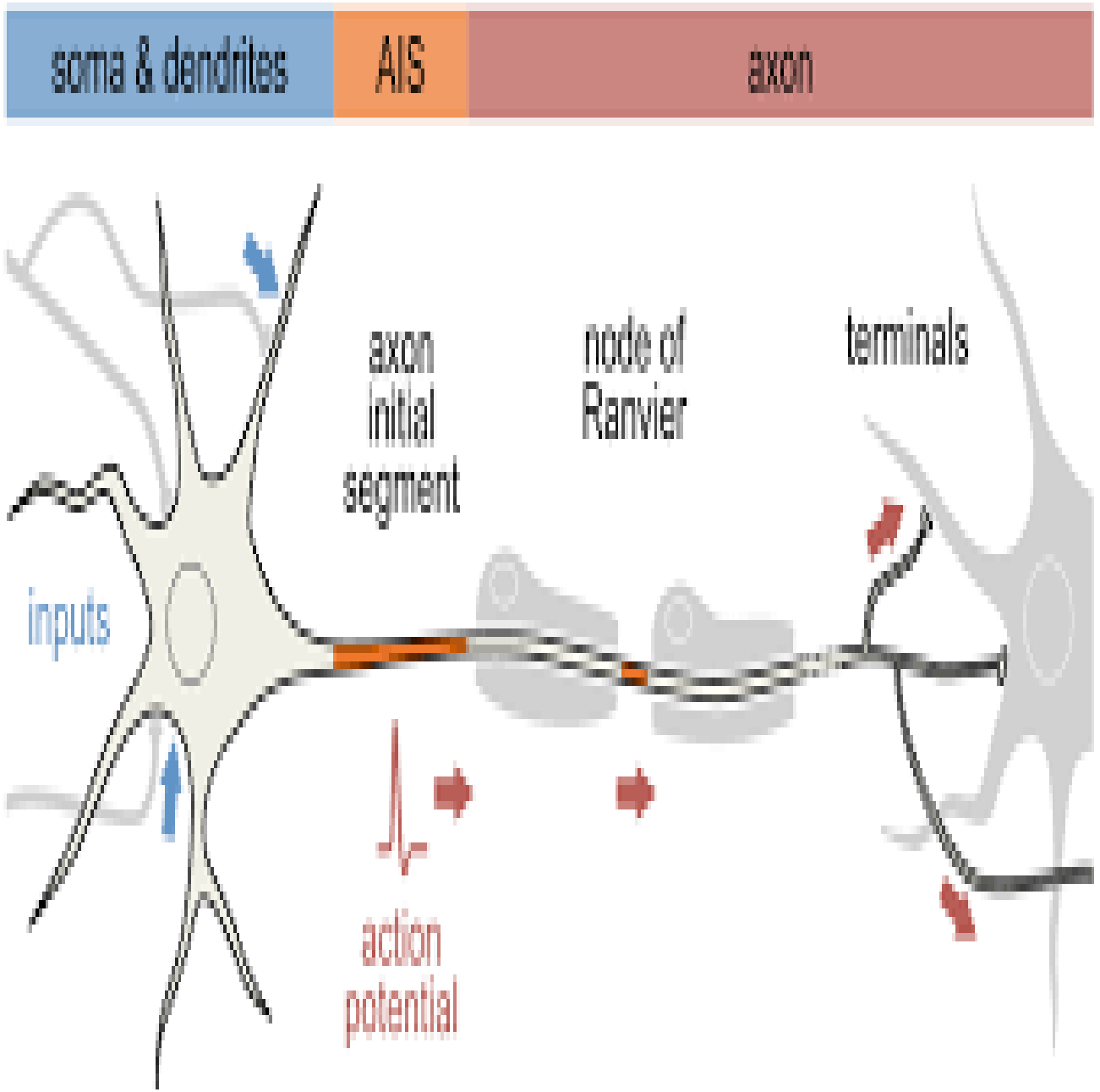


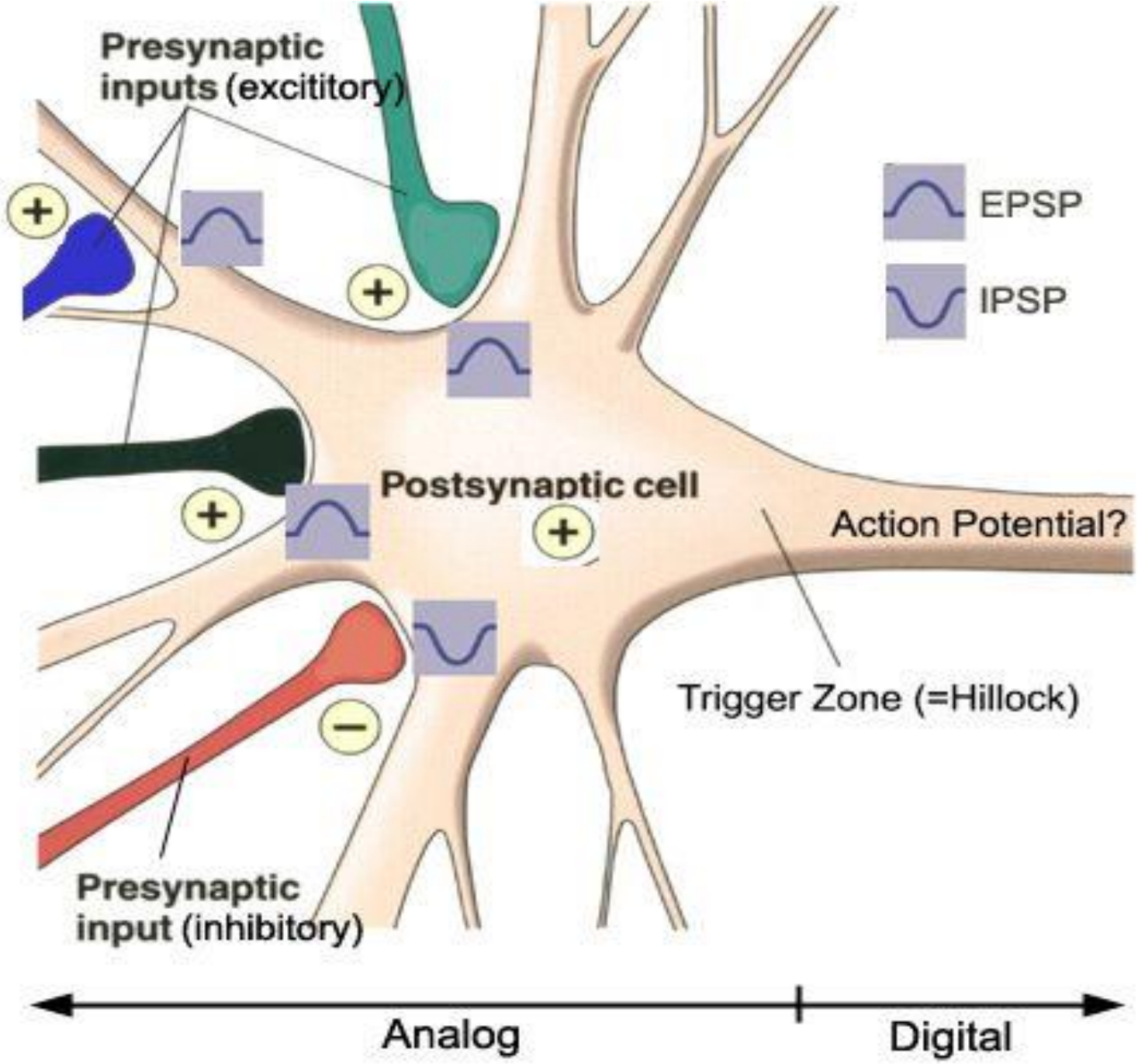
Naming of Neurons:

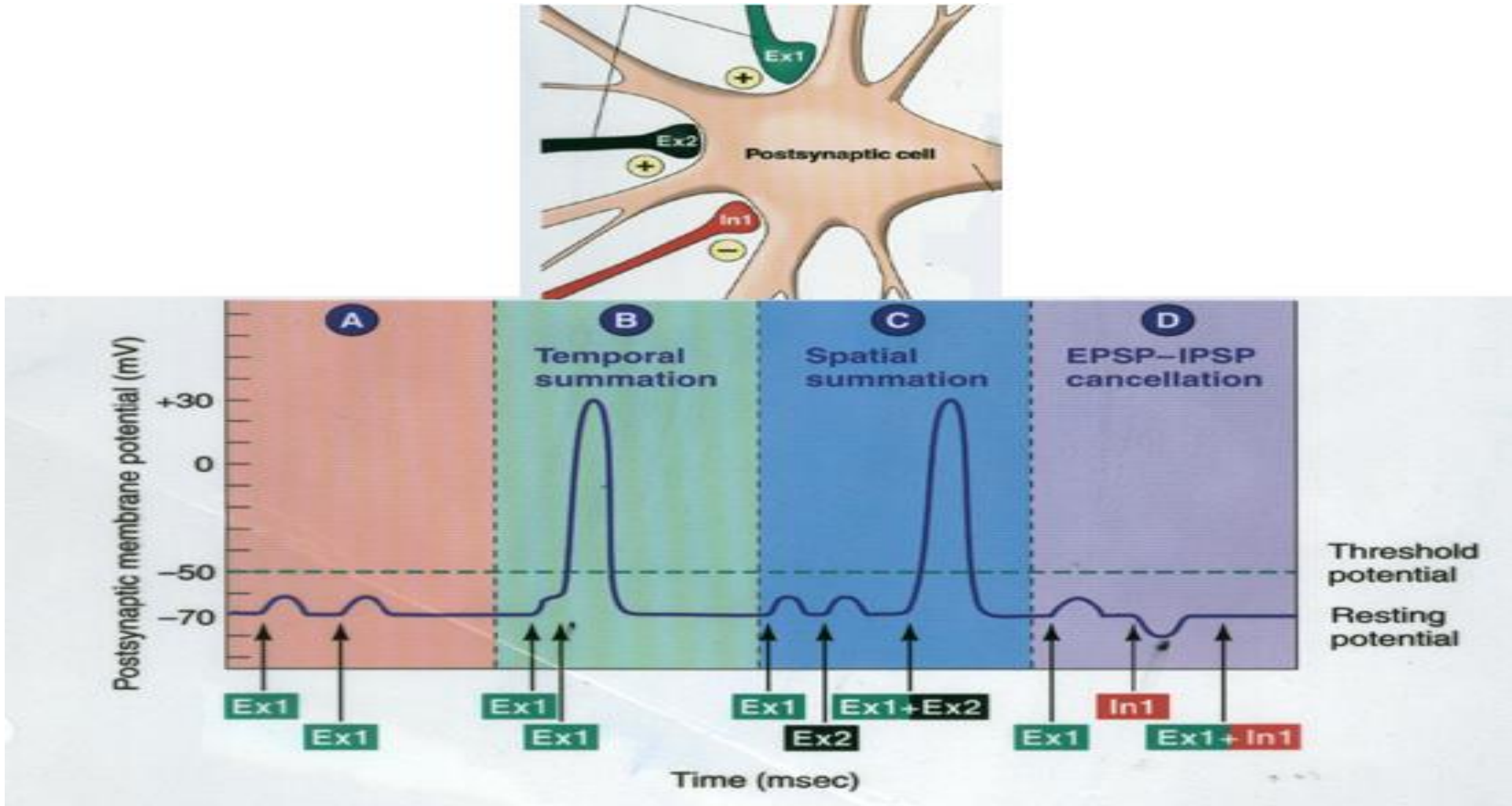
Neurotransmitter + ergic:

Cholinergic, Dopaminergic, Histaminergic

Lutkenhaus C., Curr Top Membr (2016)




Presynaptic
inputs (excititory)
EPSP
IPSP
Postsynaptic cell
Action Potential?
Trigger Zone (=Hillock)
Presynaptic
input (inhibitory)
Analog
Digital


Ex1
Ex2
In1
Postsynaptic cell
A
B
C
D
Temporal summation
Spatial summation
EPSP–IPSP cancellation
Postsynaptic membrane potential (mV)
+30
0
–50
–70
Threshold potential
Resting potential
Ex1
Ex1
Ex1
Ex1
Ex1
Ex2
Ex1+Ex2
Ex1
In1
Ex1+In1
Time (msec)

فیزیولوژی یک، جلسه هفتم:

۱- سیناپس های تحریکی و مهاری

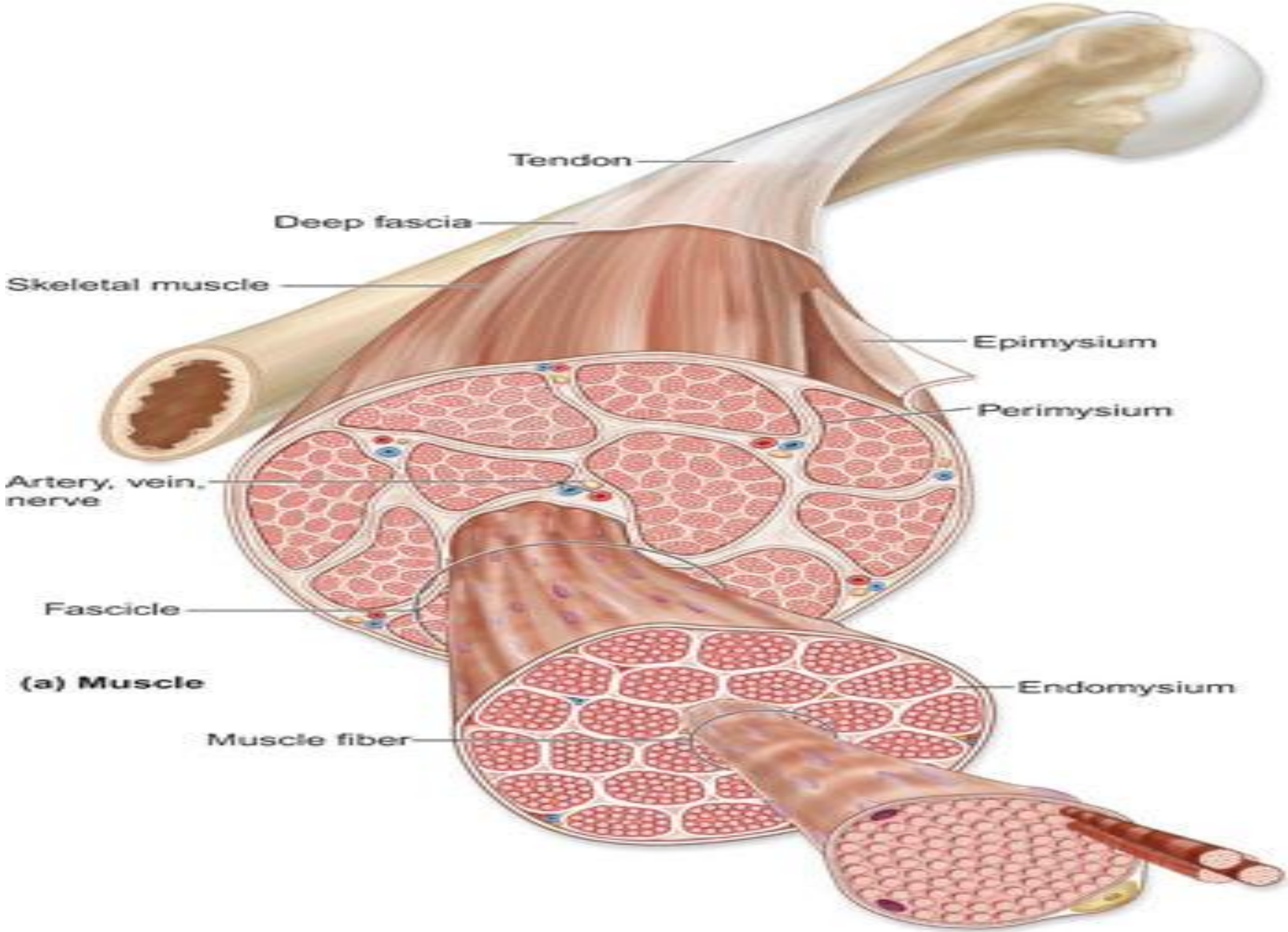
۲- اصول مشترک در فیزیولوژی سلول های عضلانی

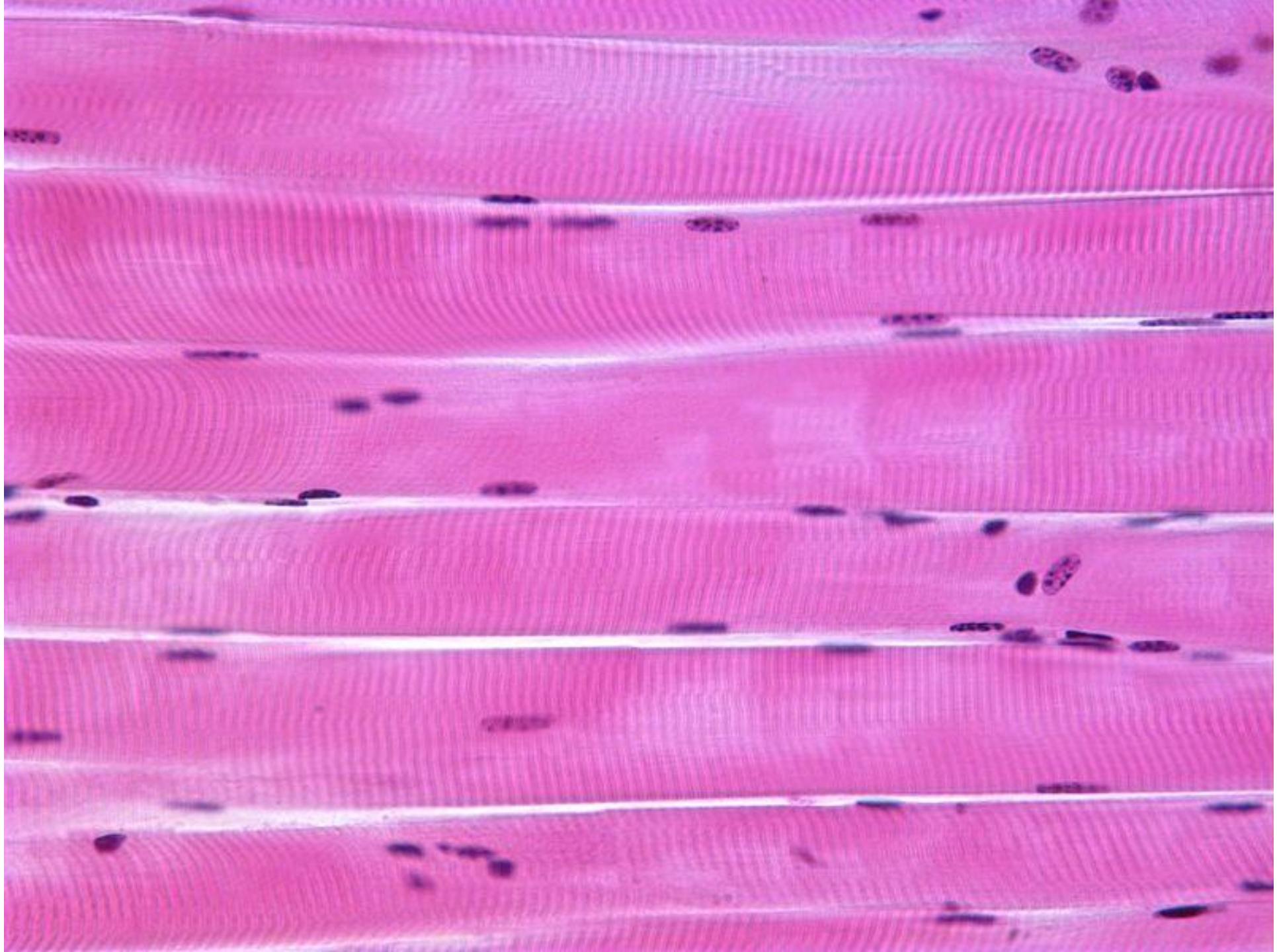
۳- تفاوتهای فیزیولوژیکی سلول های عضلانی

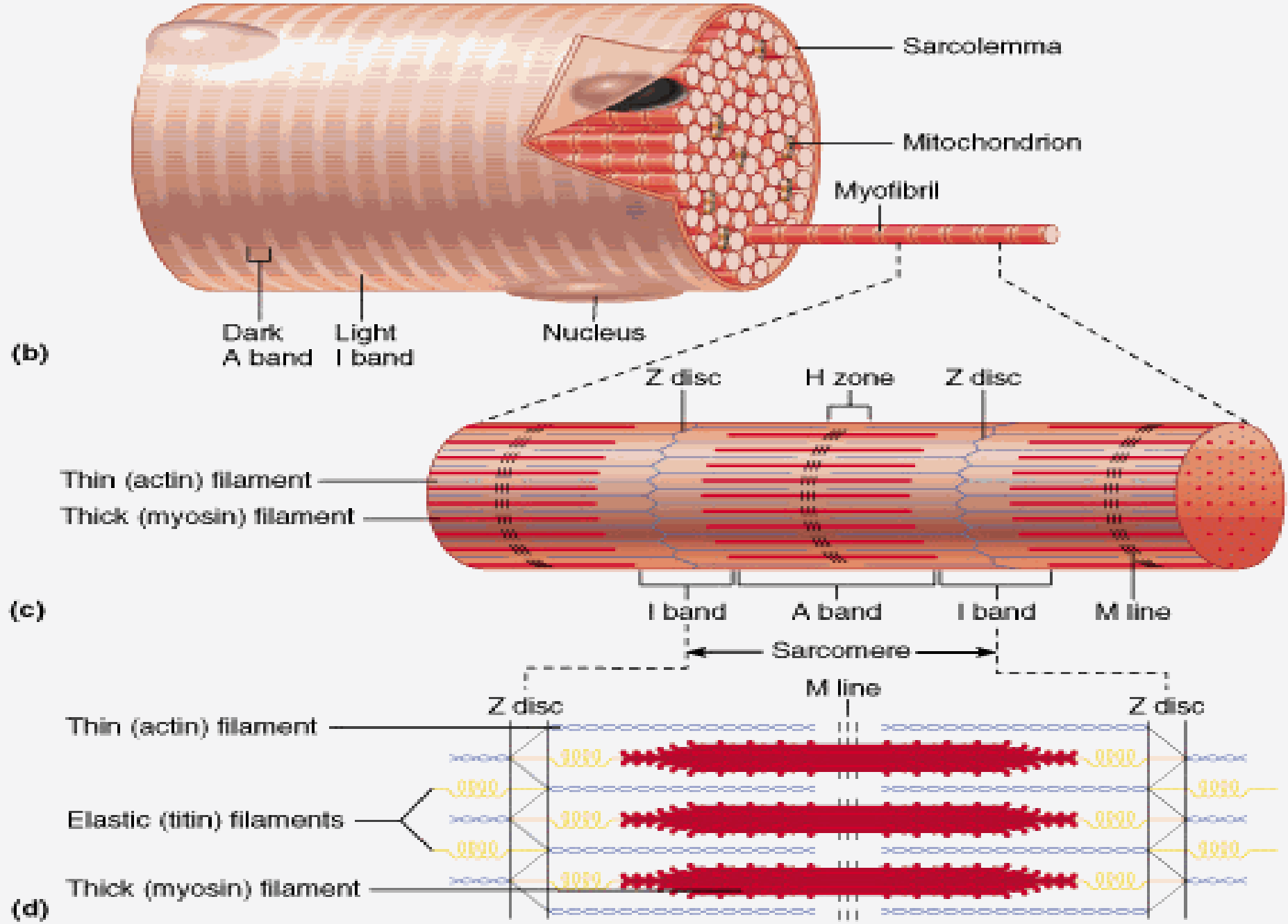
۴- فیلامانهای اکتین و میوزین

۵- عضله اسکلتی و مقایسه آن با عضله قلبی

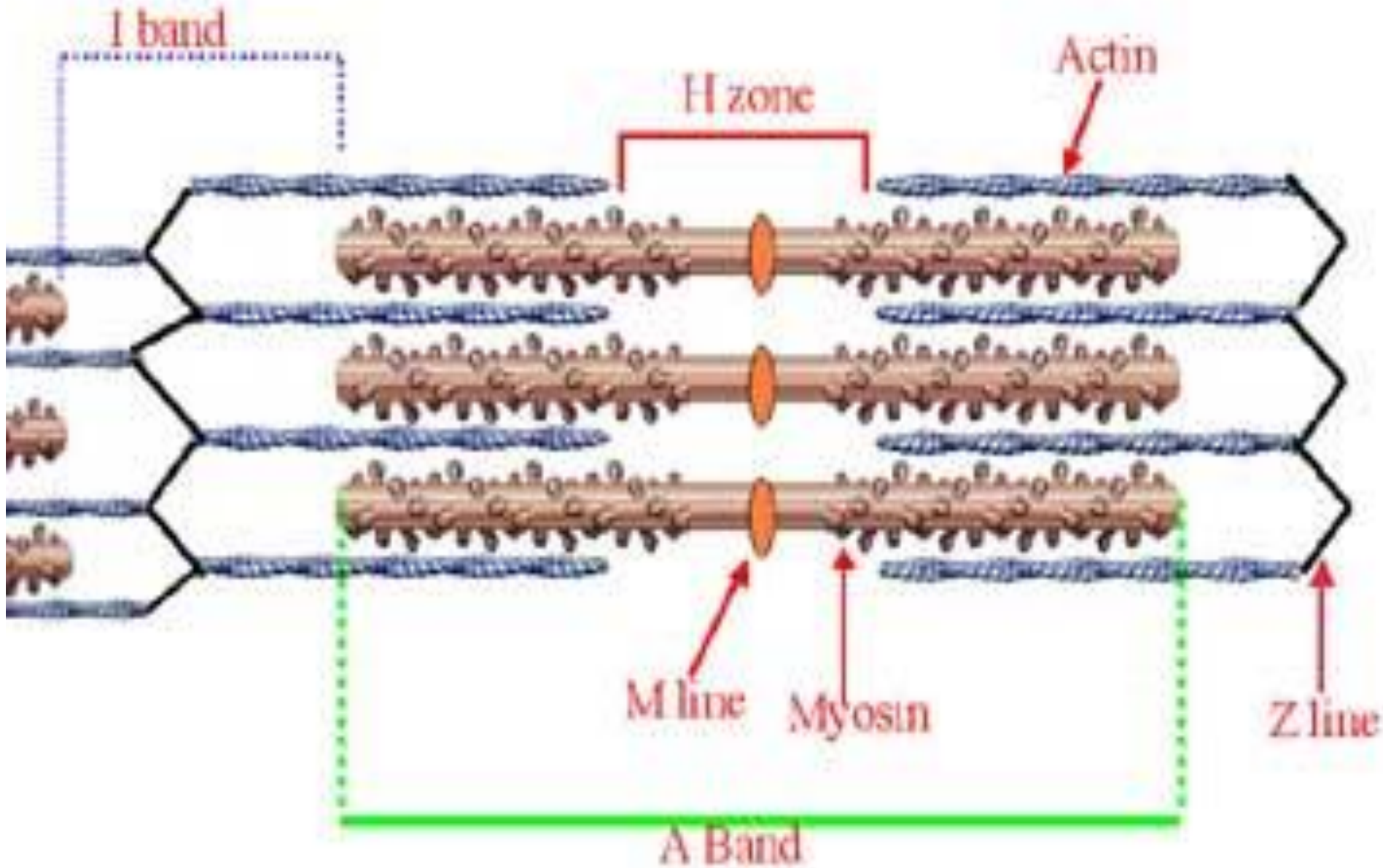
۶- عضلات صاف تک و چند واحدی

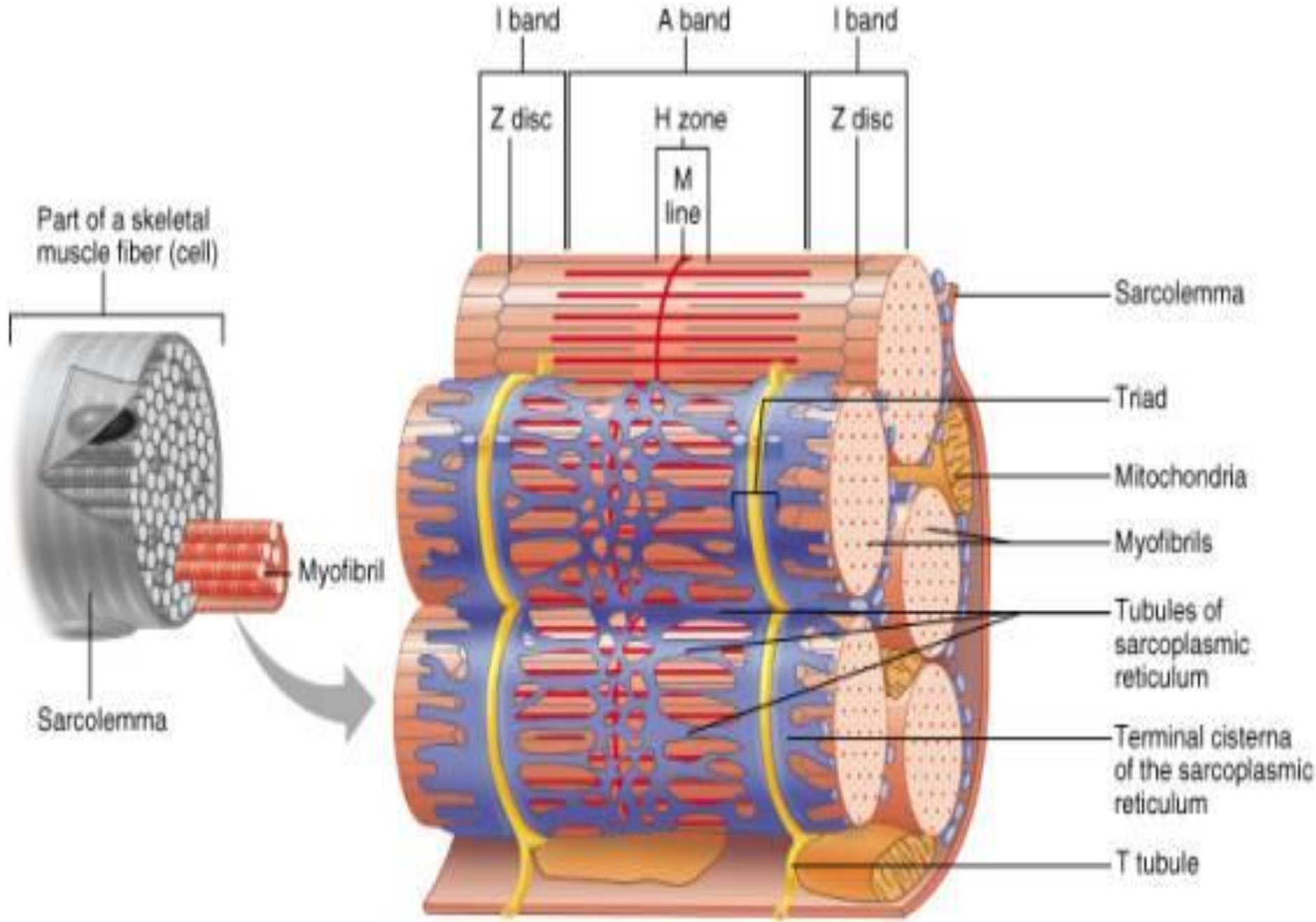




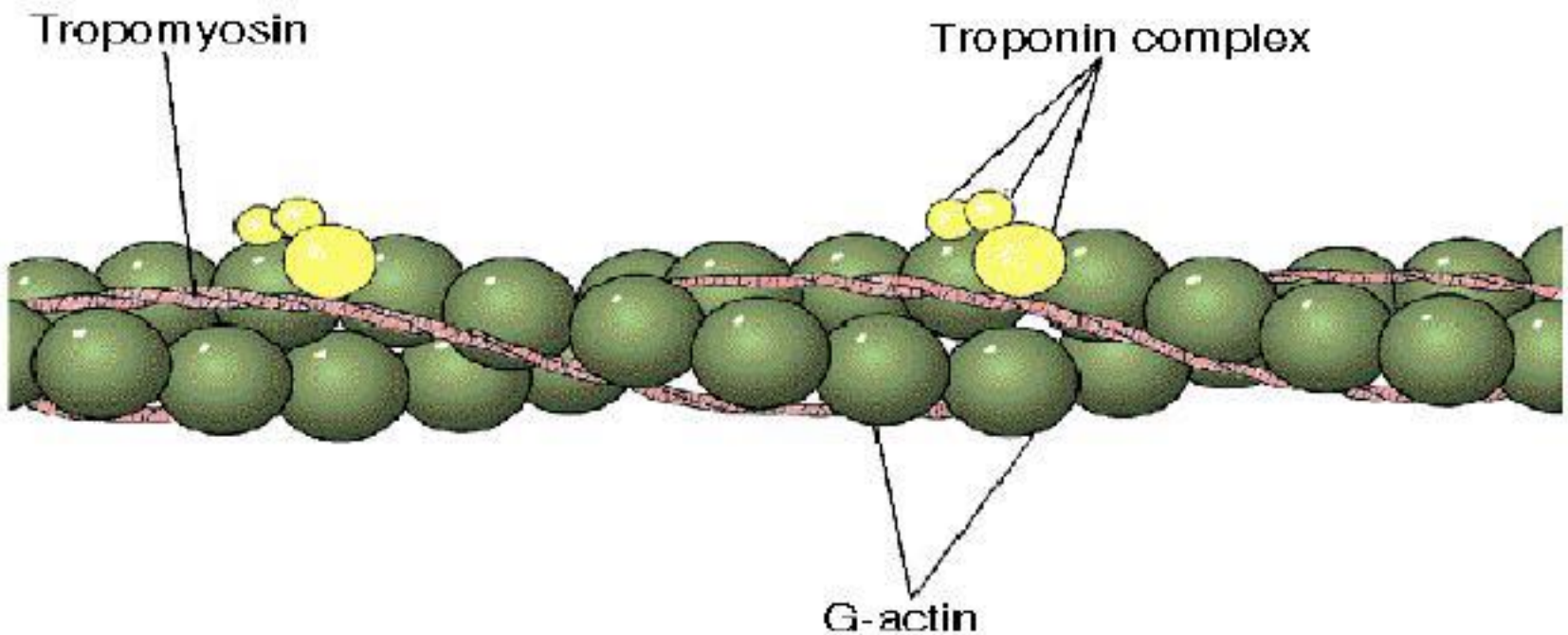


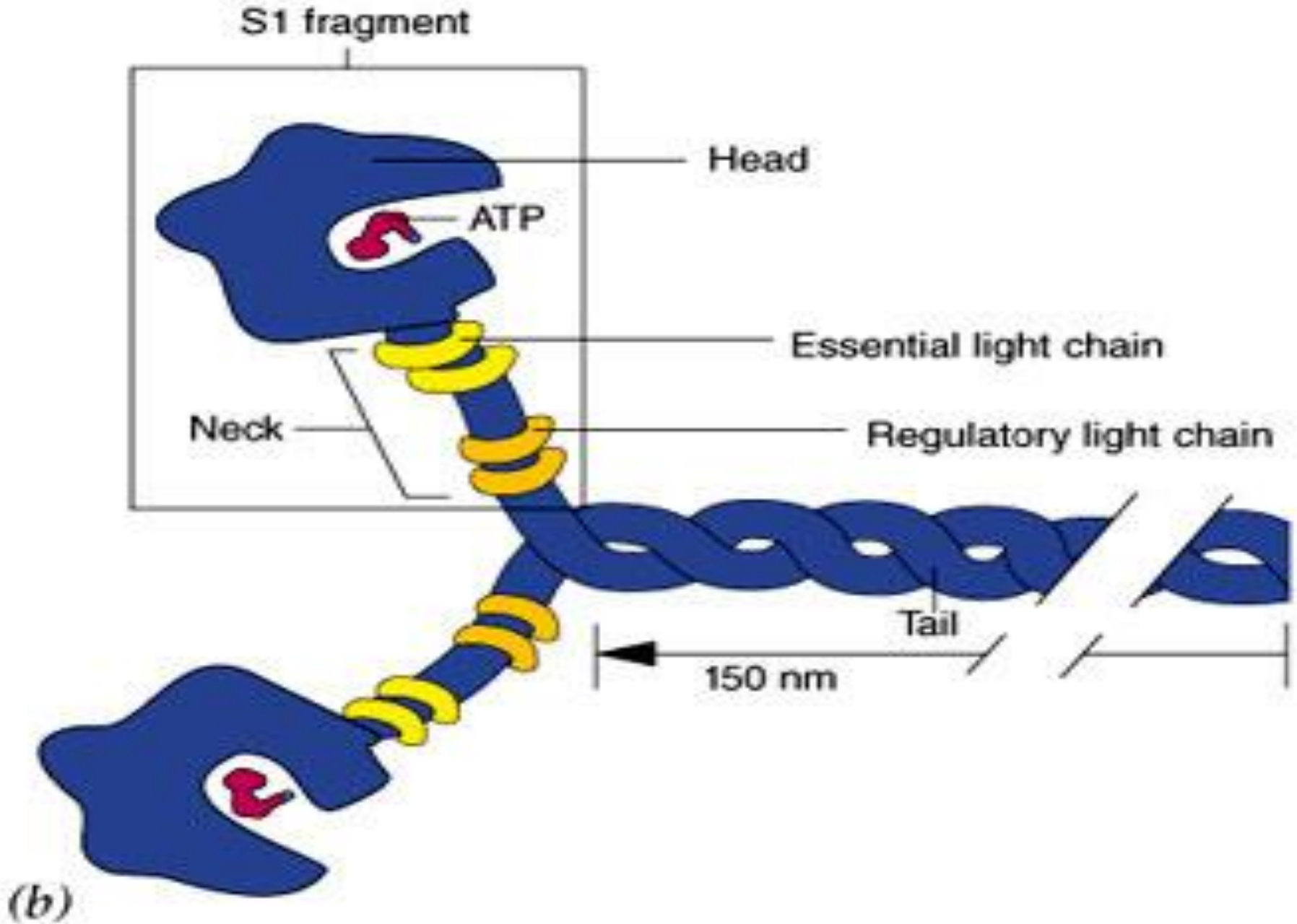
Sarcomere

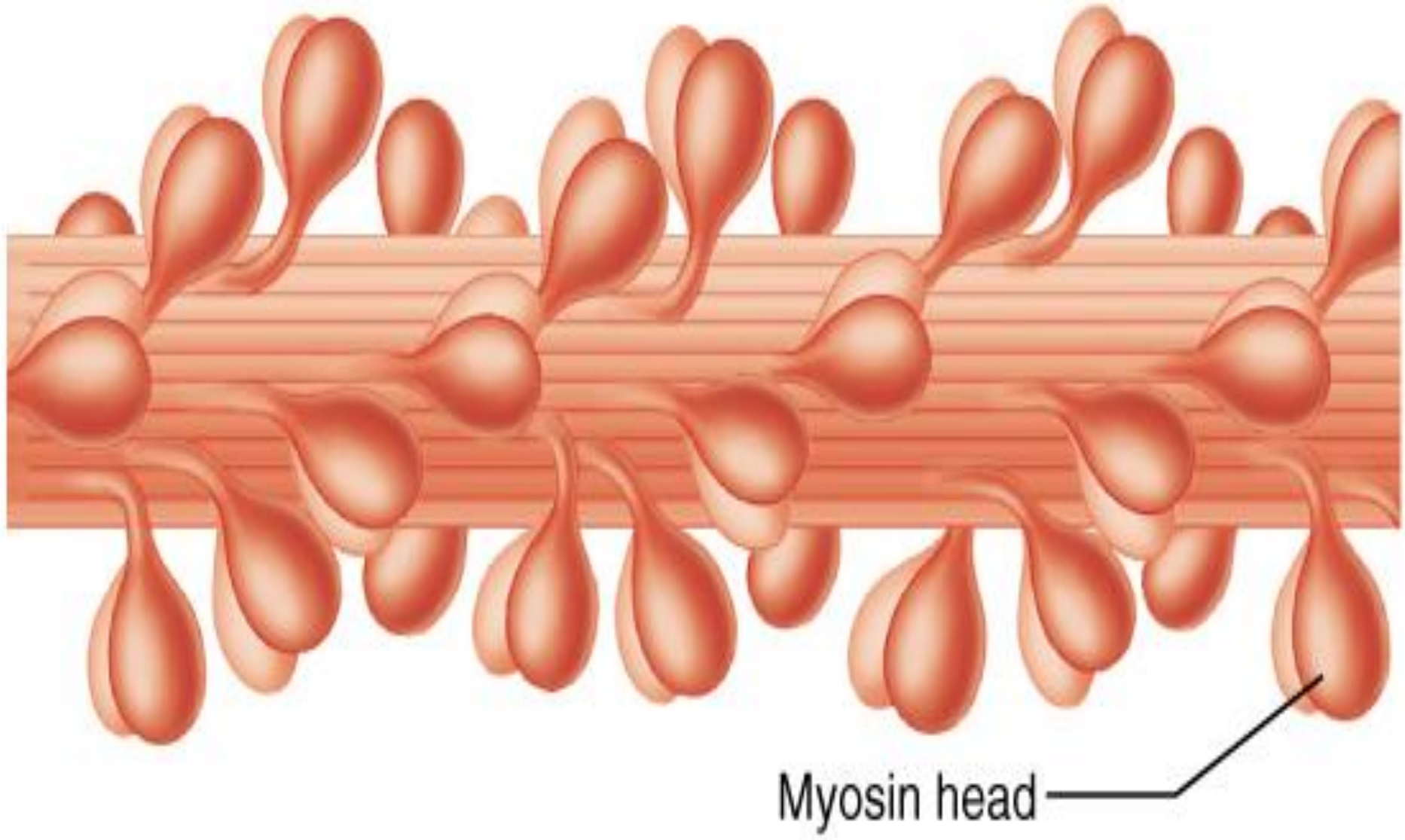




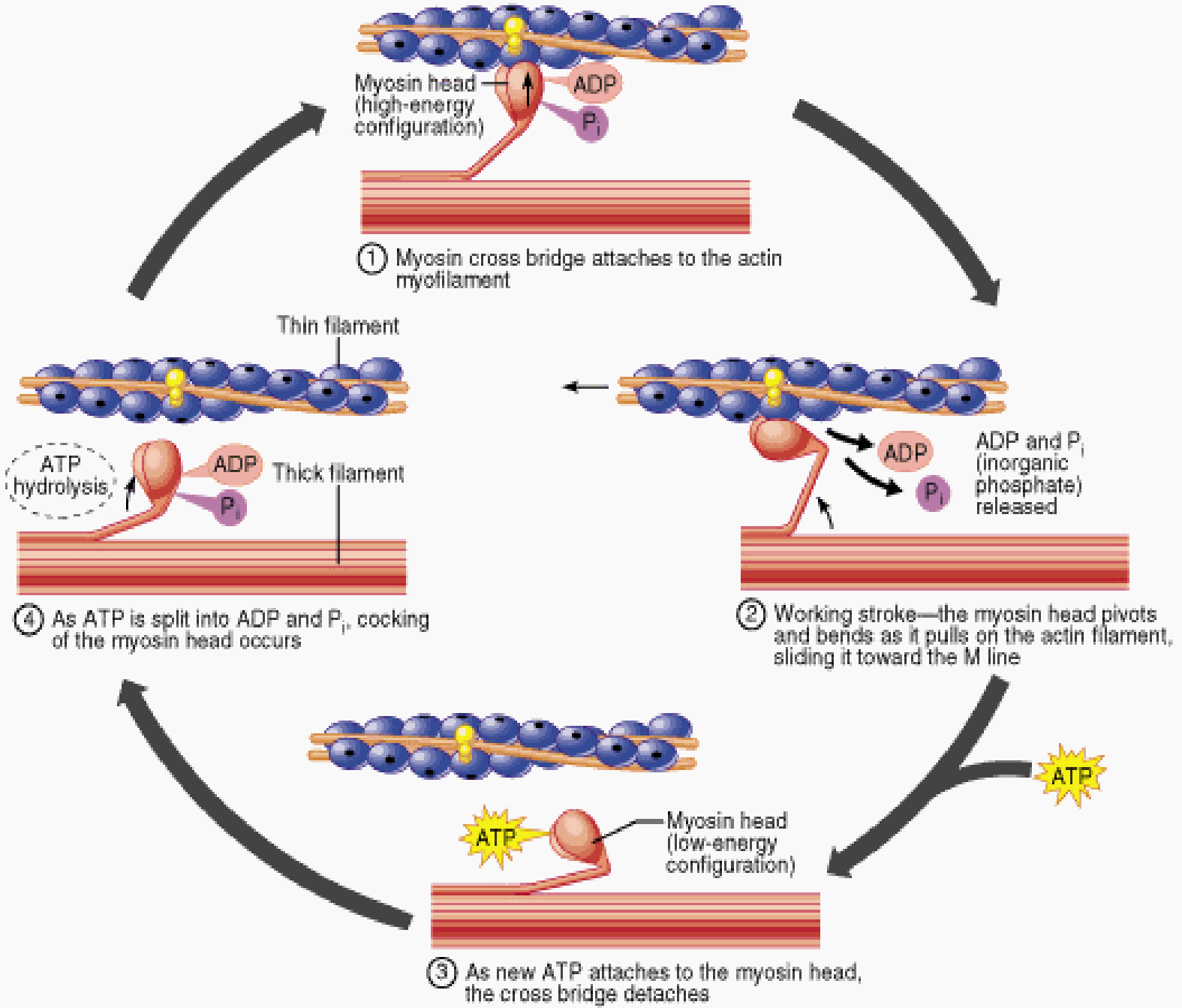
Thin Filament Structure

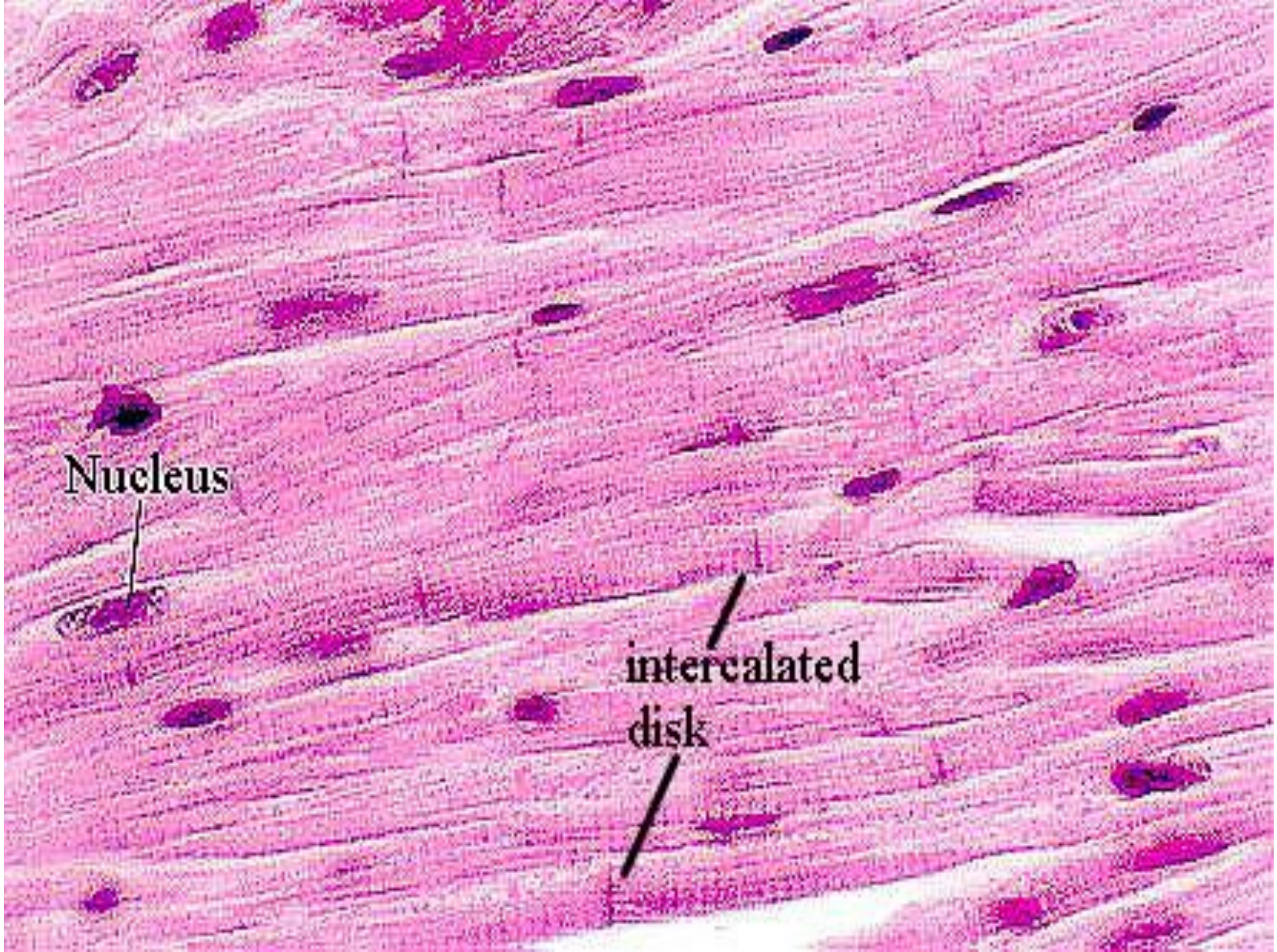


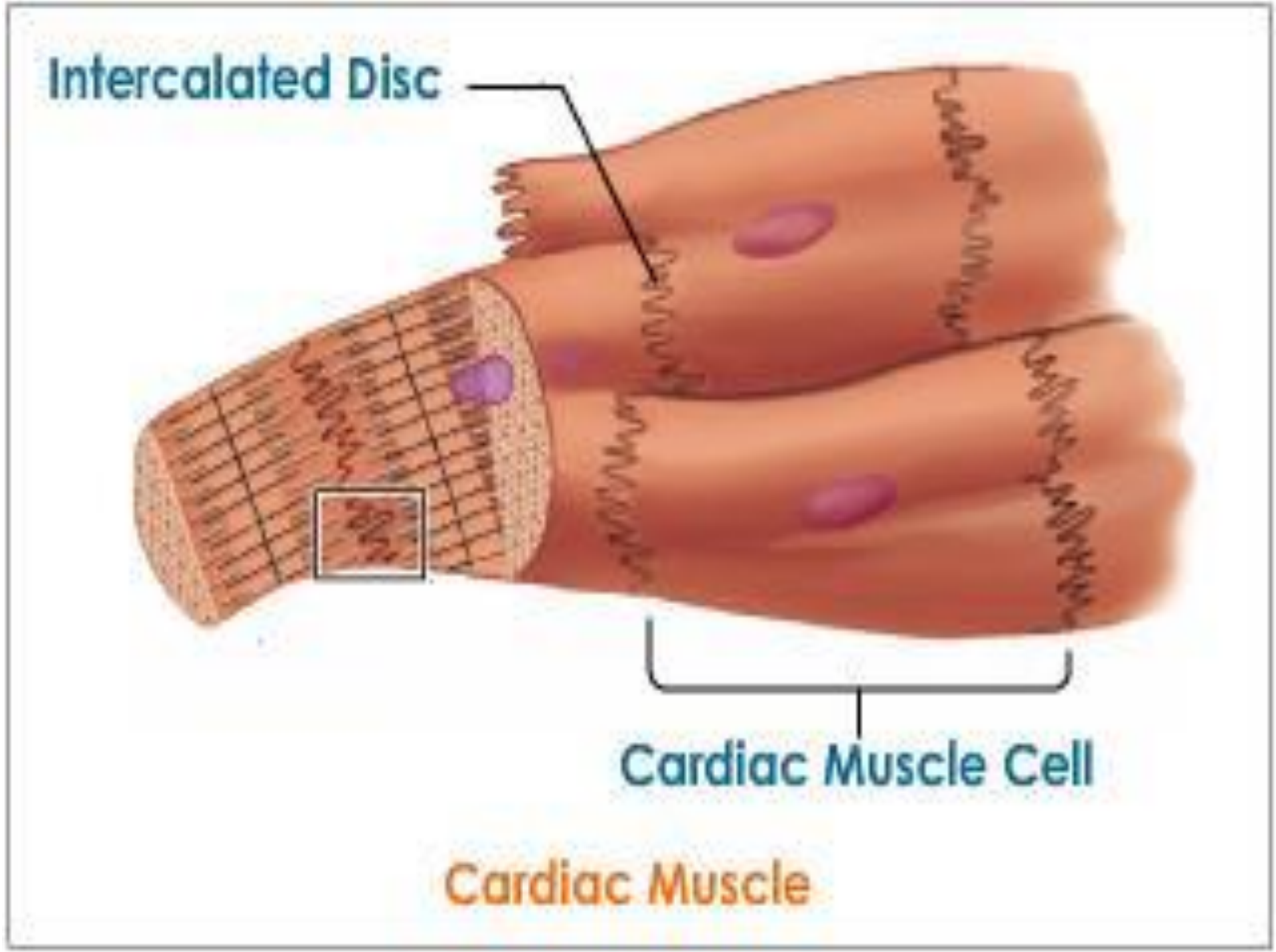


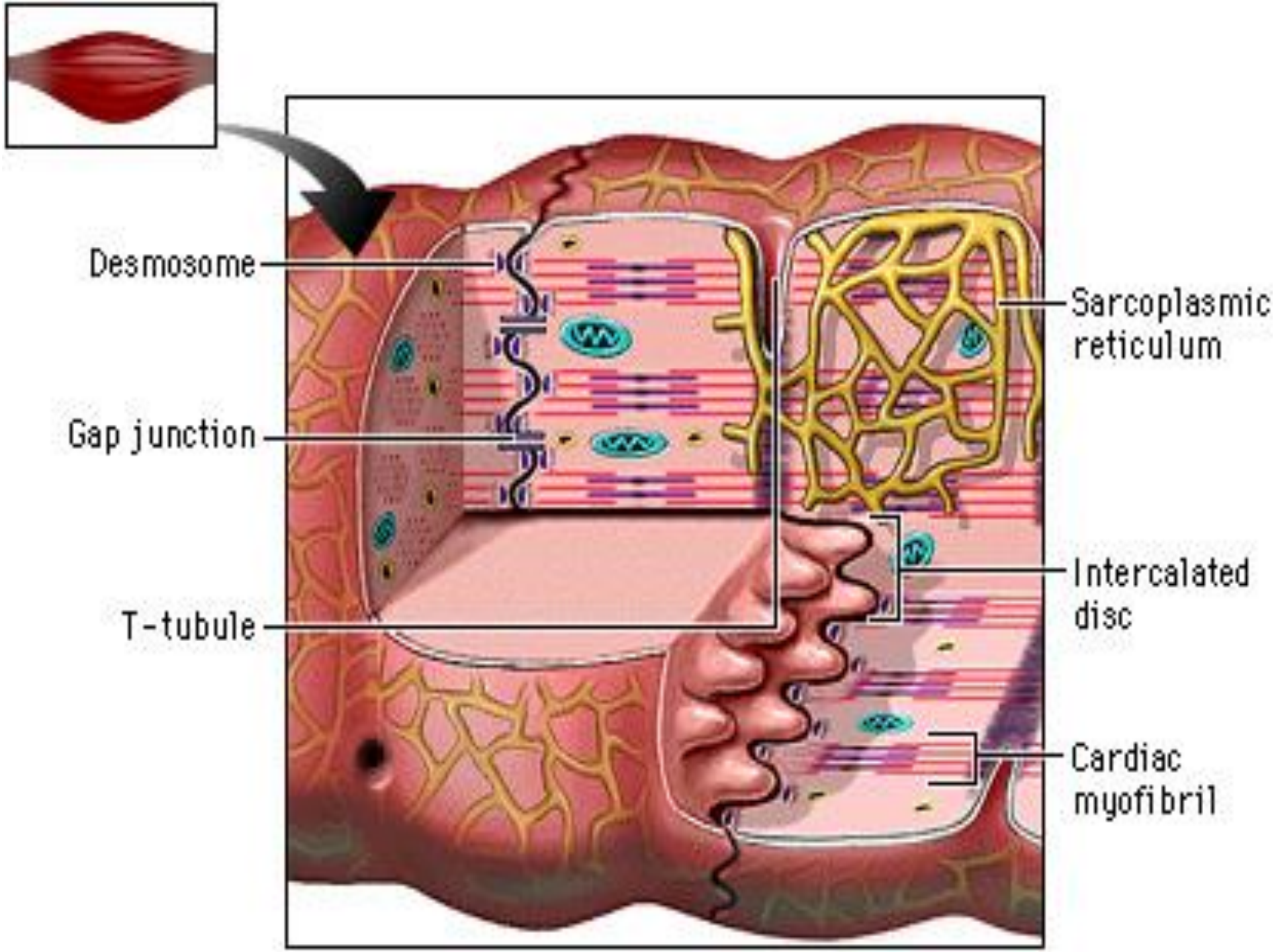


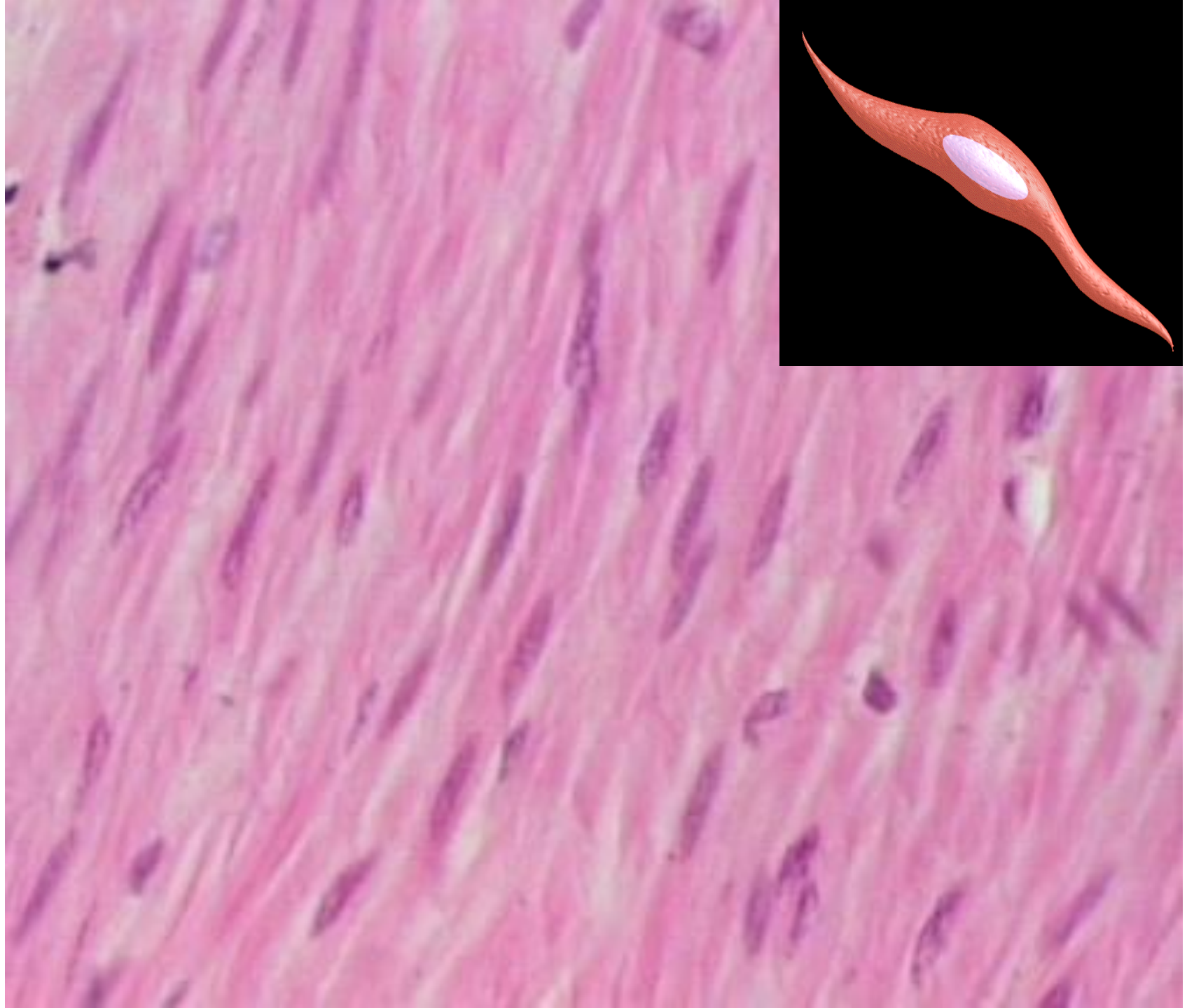
(b) Portion of a thick filament

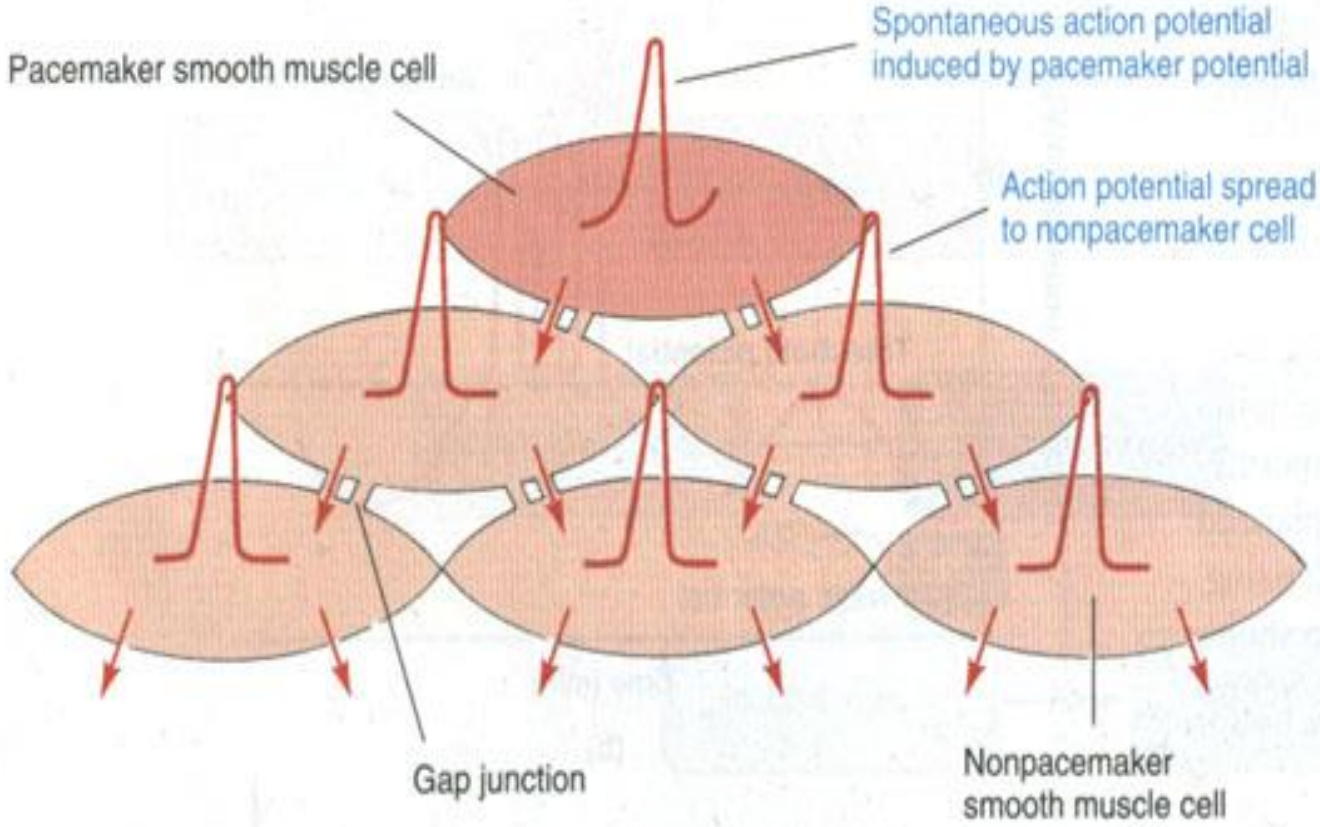



Nucleus
intercalated
disk

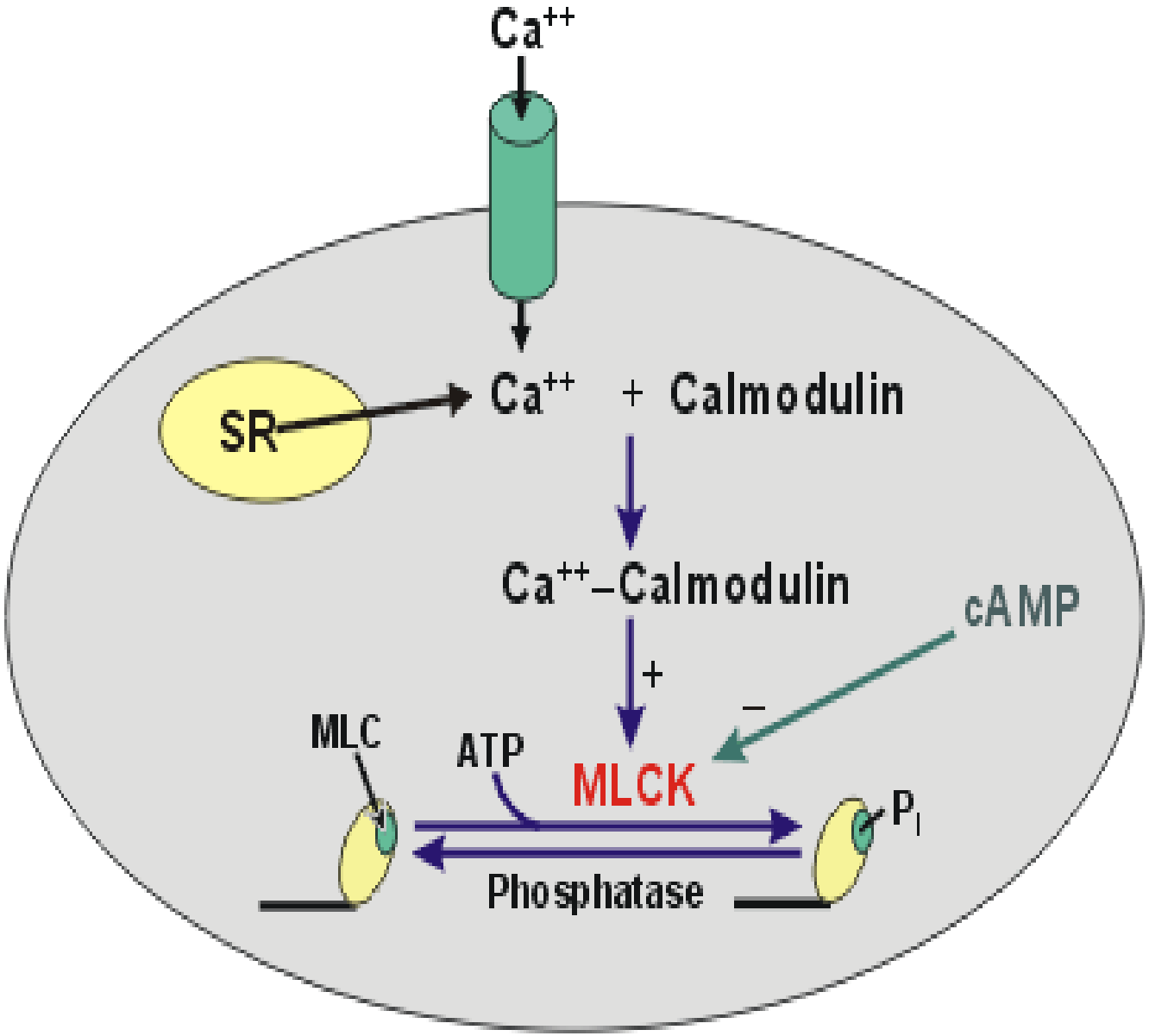

Intercalated Disc
Cardiac Muscle Cell
Cardiac Muscle


Desmosome
Gap junction
T-tubule
Sarcoplasmic reticulum
Intercalated disc
Cardiac myofibril





Sherwood
Figure 8-33
(5th edition)


Ca++
SR
Ca++ + Calmodulin
Ca++–Calmodulin
cAMP
+
–
MLC
ATP
MLCK
Pi
Phosphatase