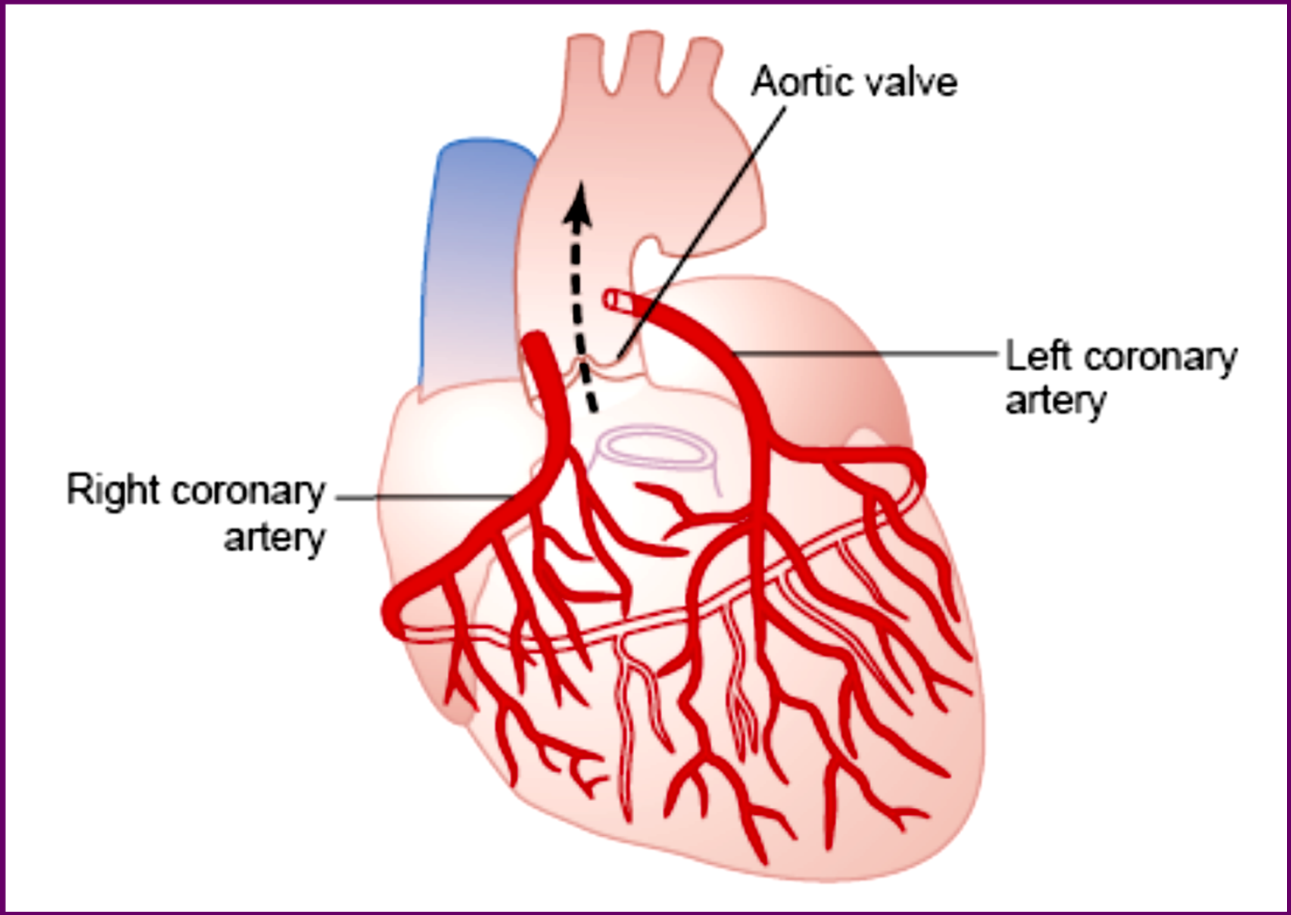
CARDIO VASCULAR SYSTEM

Dr. Chetna Ramanuj



CORONARY CIRCULATION

a) Physiological anatomy of coronary blood supply

b) Normal value- rest & emergency

c) Regulation (chemical & nervous)

d) Autoregulation

e) Factors affecting

f) Measurement

g) Clinical

CORONARY CIRCULATION

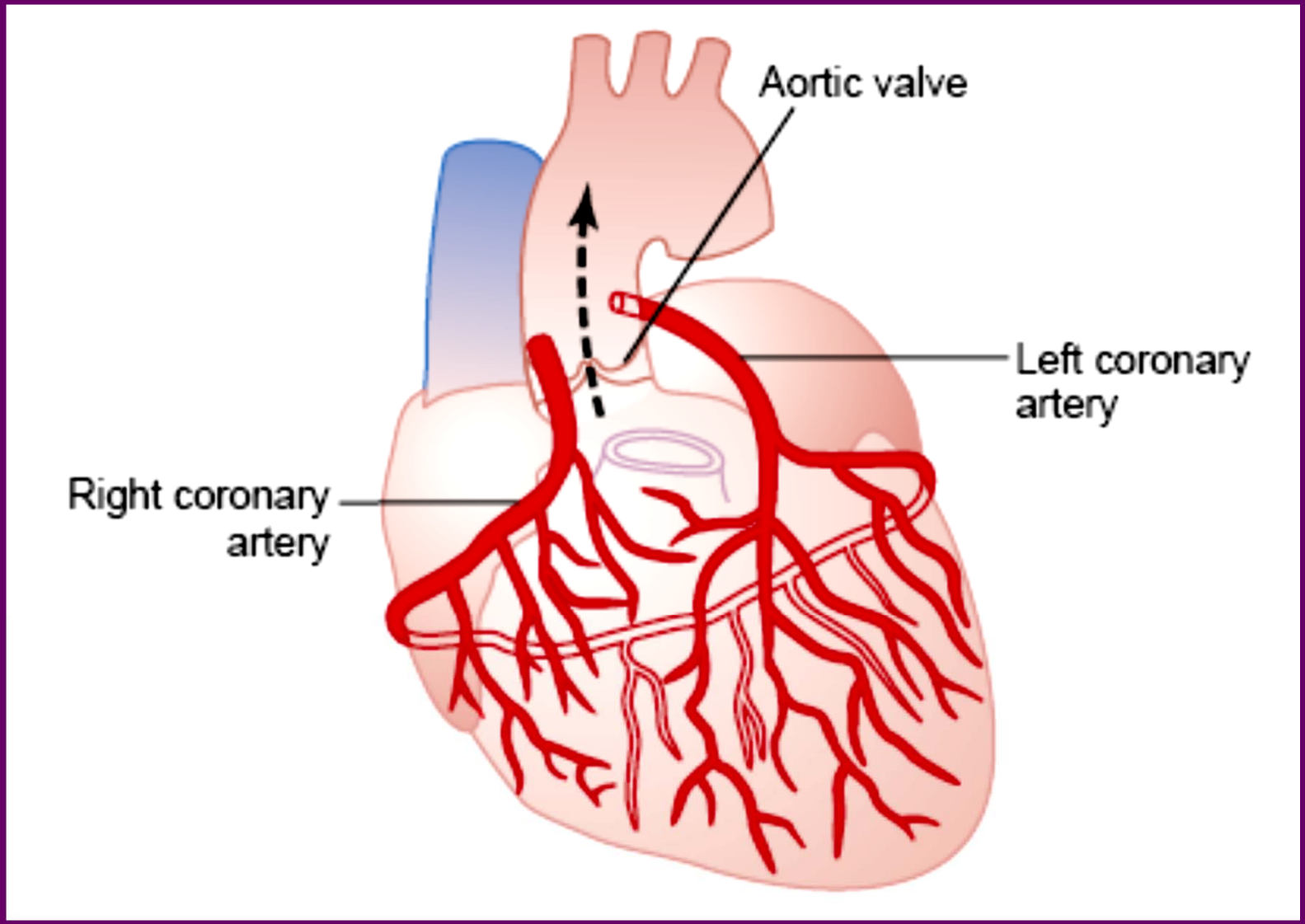
- TWO CORONARY ARTERIES:

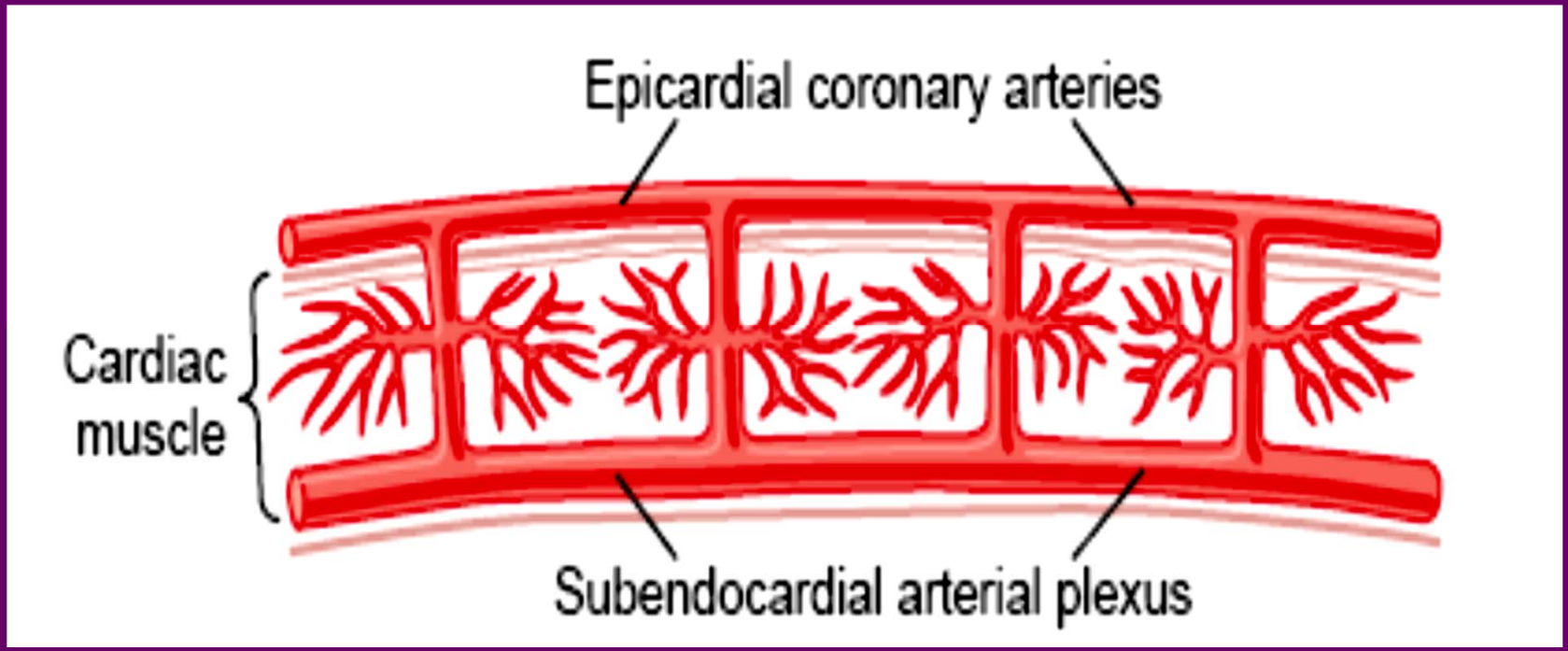
  RIGHT AND LEFT

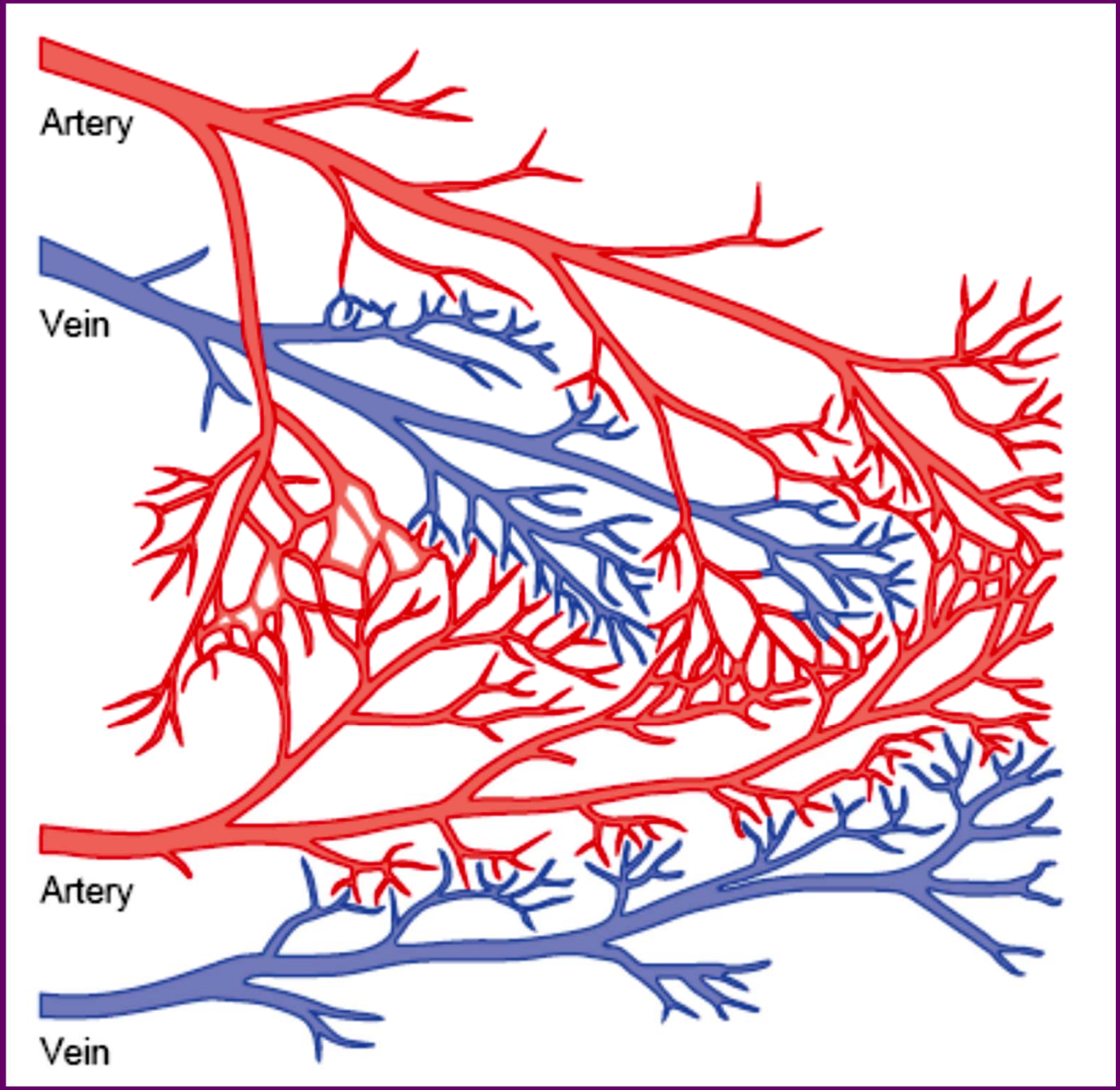
- NORMAL CORONARY BLOOD FLOW:

  200 ML/MINUTE

  4% OF CARDIAC OUTPUT


Aortic valve
Left coronary artery
Right coronary artery


Epicardial coronary arteries
Cardiac muscle
Subendocardial arterial plexus


Artery
Vein
Artery
Vein

Physiological anatomy of coronary blood supply

Left coronary artery supplies the anterior & lateral portions of left ventricle. Right coronary artery supplies most of the right ventricle & posterior part of the left ventricle.

In about 20% of people, left artery predominates and in 20% both arteries provide nutrients equally. In 60% of people, right coronary artery predominates

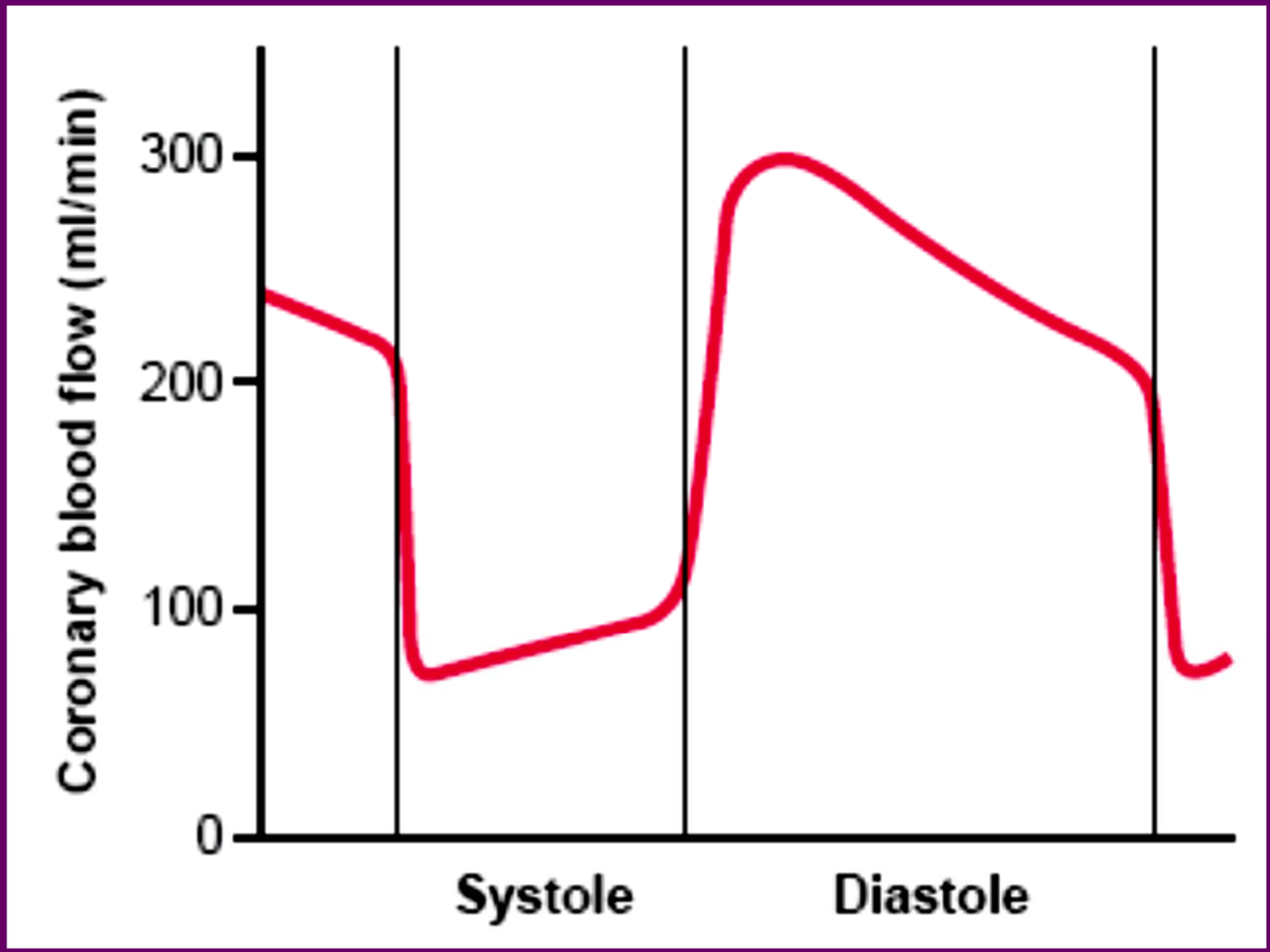
venous blood from the left ventricles is collected by way of coronary sinus (it is 75% of total coronary flow) while rt. ventricles by anterior cardiac veins & small amount by thebesian veins.

Normal value / resting coronary blood flow

225 ml/min or 5% of cardiac output.

PHASIC CHANGES IN CORONARY BLOOD FLOW

- SYSTOLE: BLOOD FLOW DECREASES
- DIASTOLE: BLOOD FLOW INCREASES


Coronary blood flow (ml/min)
300
200
100
0
Systole
Diastole

Regulation

Chemical/metabolic-

hypoxia due to increase work done/o2 used produce coronary vasodilators (main is adenosine, other- K, H, CO2)

Nervous-

by sympathetic & parasympathetic nerves direct but more strong indirect effect

Autoregulation-

Excellent autoregulation between BP 50 to 150 mmHg

Factors affecting-

Increase by

a) mean aortic pressure,
b) cardiac output,
c) exercise,
d) T3/T4

MEASUREMENT OF CORONARY BLOOD FLOW

- DIRECT METHOD
- INDIRECT METHOD
  - FICK'S PRINCIPLE
  - DOPPLER FLOW METER
  - VIDEODENSITOMETRY

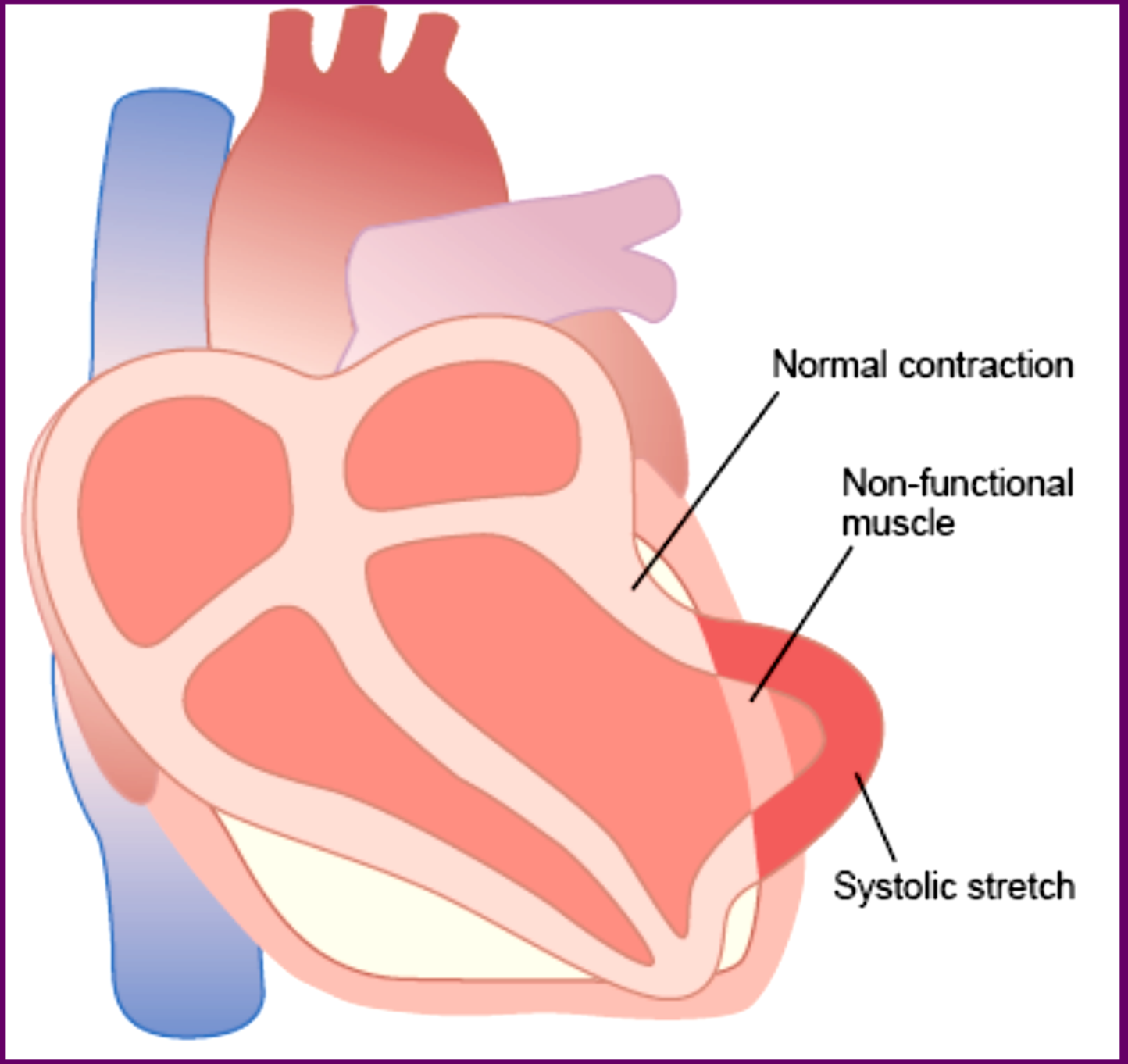
Clinical

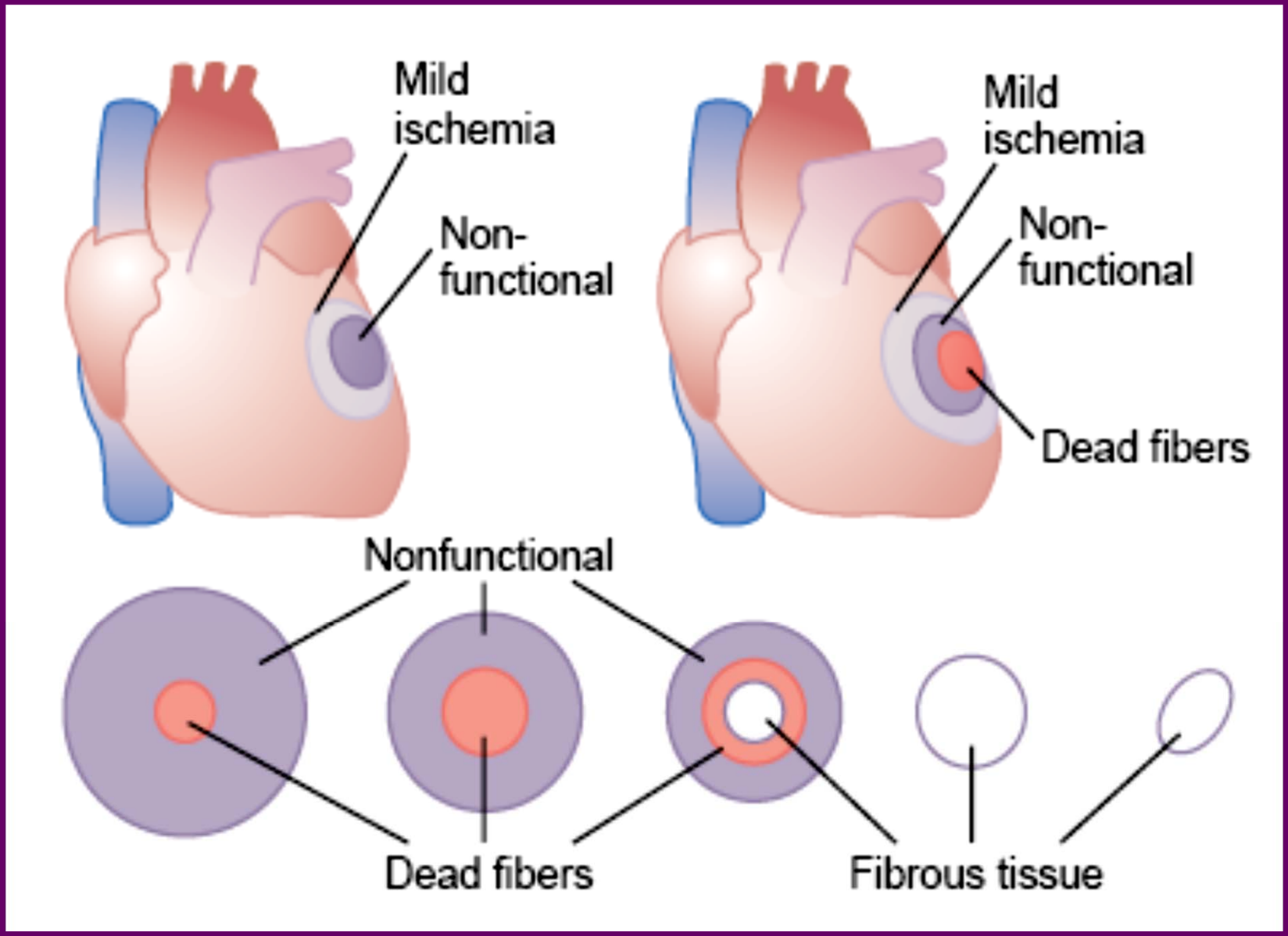
Ischemic heart disease –
a) angina pectoris b) myocardial infarction

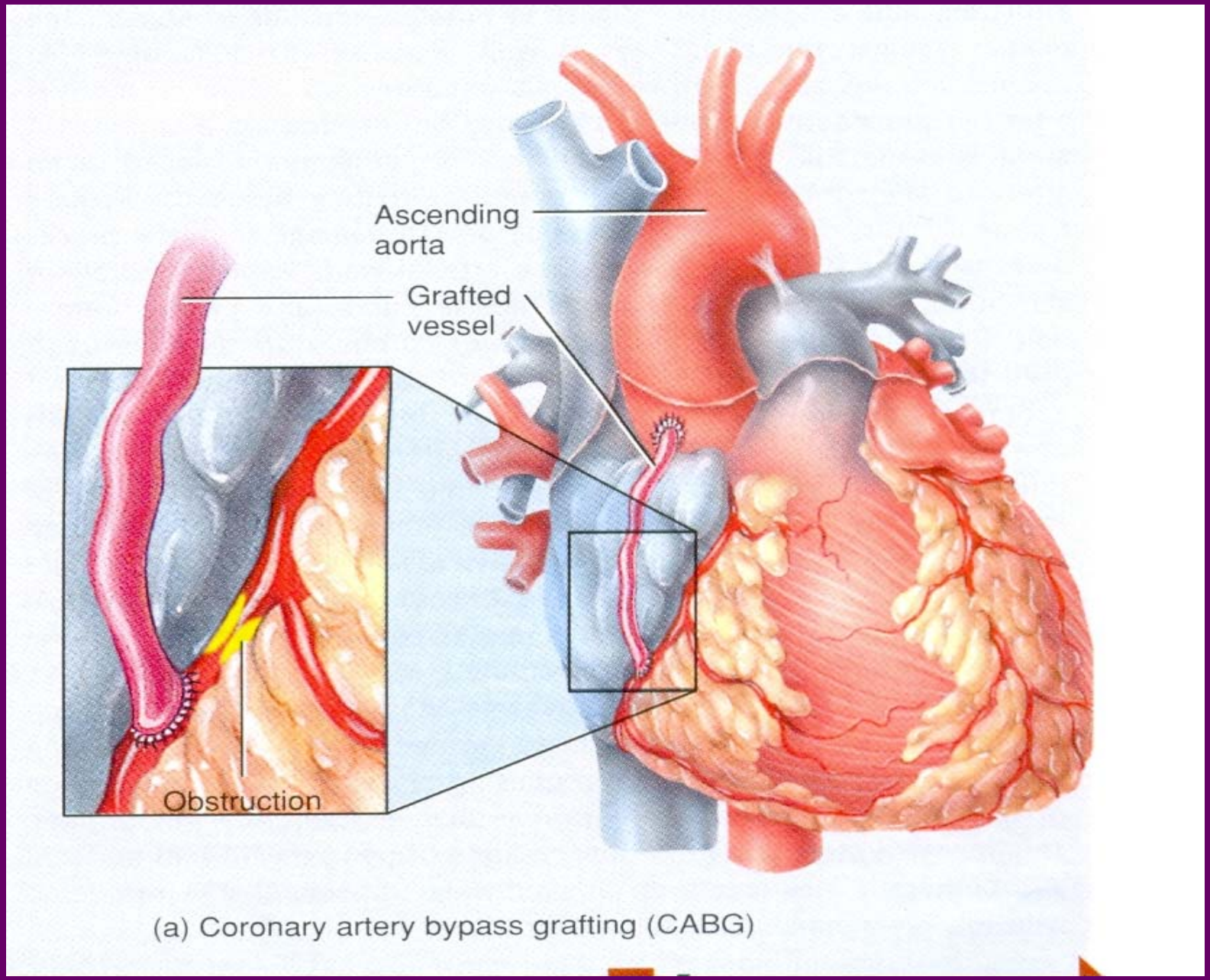
Coronary occlusion due to atherosclerosis

Treatment for coronary disease –

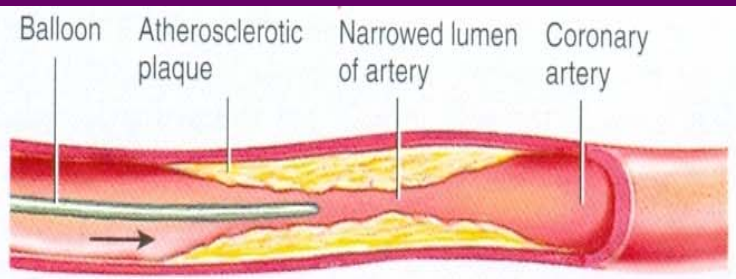
a) Life style modification,
b) Drugs (beta blockers, vasodilators like nitrates, ca channels blockers etc)
c) Surgical- Aortic coronary bypass & Coronary angioplasty


Normal contraction
Non-functional muscle
Systolic stretch

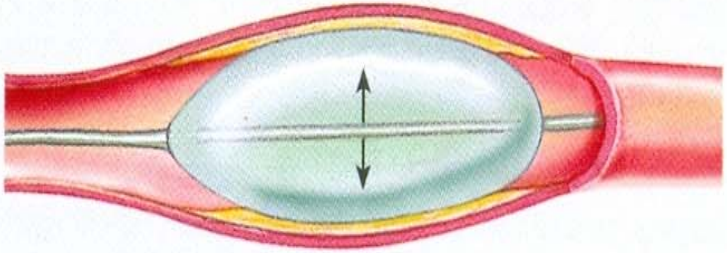

Mild ischemia
Non-functional
Mild ischemia
Non-functional
Dead fibers
Nonfunctional
Dead fibers
Fibrous tissue



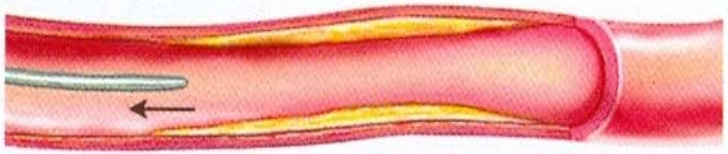
(a) Coronary artery bypass grafting (CABG)



Balloon catheter with uninflated balloon is threaded to obstructed area in artery

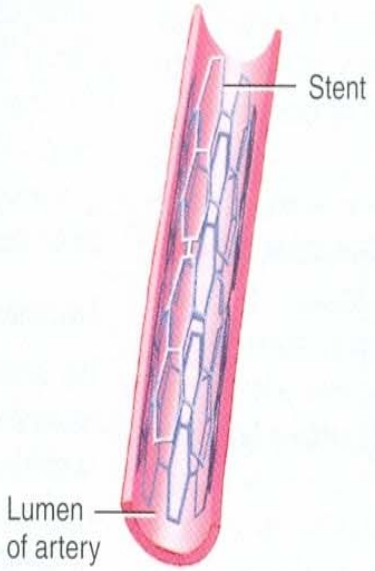


When balloon is inflated, it stretches arterial wall and squashes atherosclerotic plaque



After lumen is widened, balloon is deflated and catheter is withdrawn

(b) Percutaneous transluminal coronary angioplasty (PTCA)



(c) Stent in an artery

(d) Angiogram showing a stent in the circumflex artery

CEREBRAL CIRCULATION

- BASILAR ARTERY & INTERNAL CAROTID ARTERY
- 750-800 ML PER MINUTE
- 15% OF TOTAL CARDIAC OUTPUT
- METHOD OF MEASUREMENT: FICK'S PRINCIPLE

REGULATION

- AUTOREGULATION
- CEREBRAL VASCULAR RESISTANCE
- INTRACRANIAL PRESSURE

  CUSHING'S RELEX
- VISCOSITY
- CHEMICAL FACTORS
- NERVOUS FACTORS

CUTANEOUS CIRCULATION

- FUNCTIONS: NUTRITION, REGULATION OF BODY TEMPERATURE
- NORMAL CUTANEOUS BLOOD FLOW: 250 ML/SQ. MT./MIN
- REGULATION:

  BODY TEMPERATURE

  HYPOTHALAMUS

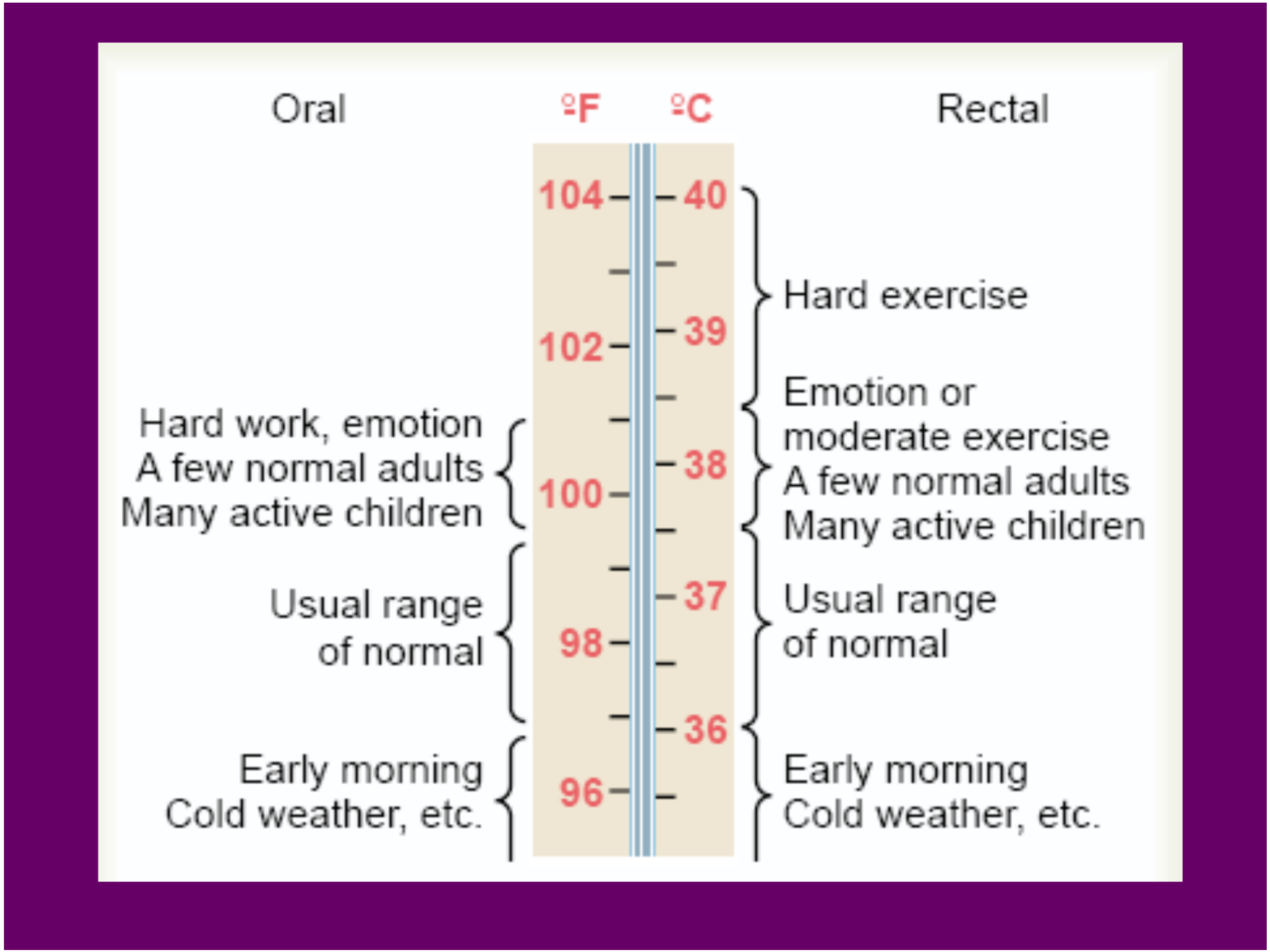
VASCULAR RESPONSES OF SKIN TO MECHANICAL STIMULUS

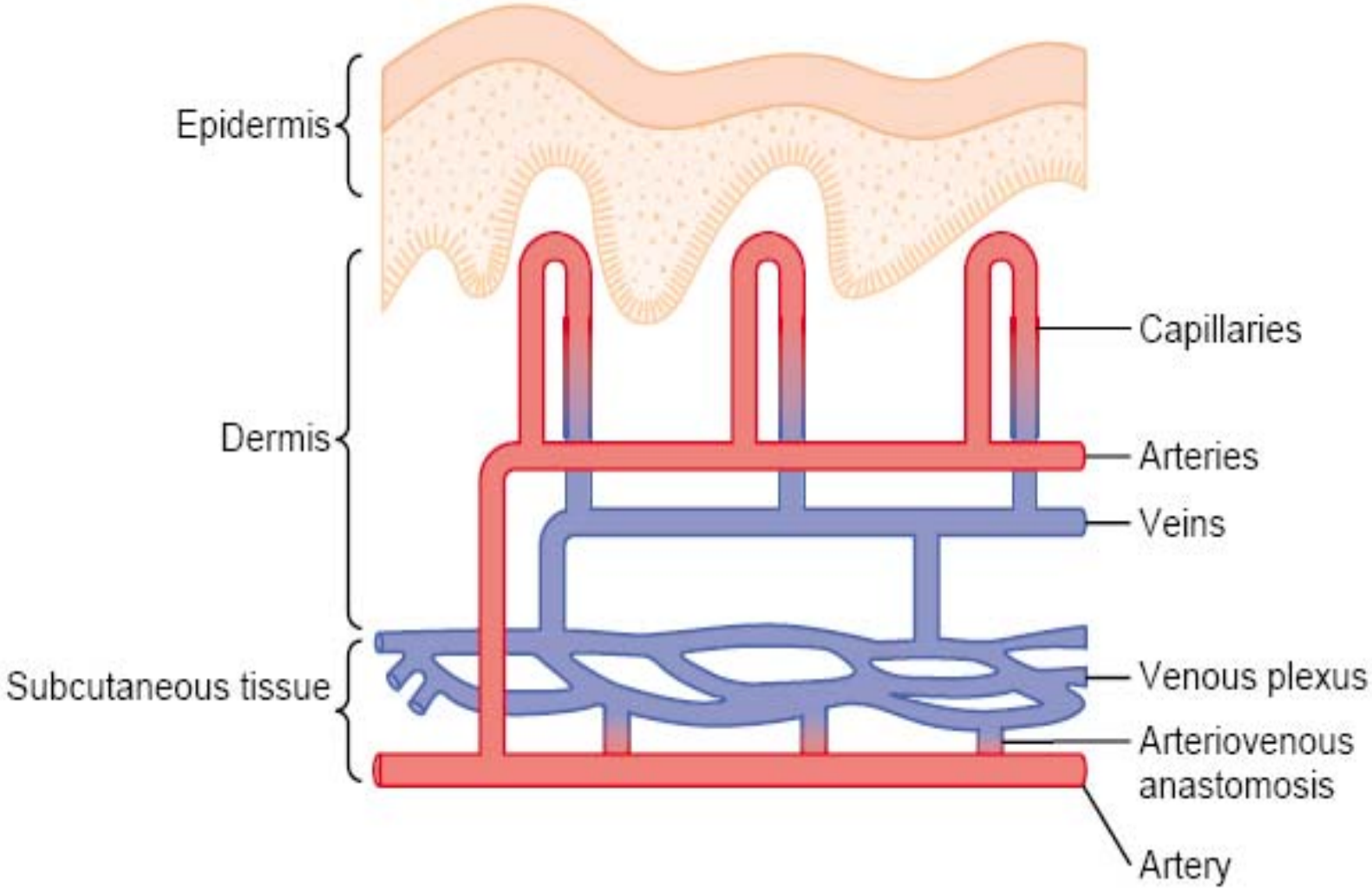
- WHITE REACTION
- TRIPLE RESPONSE:

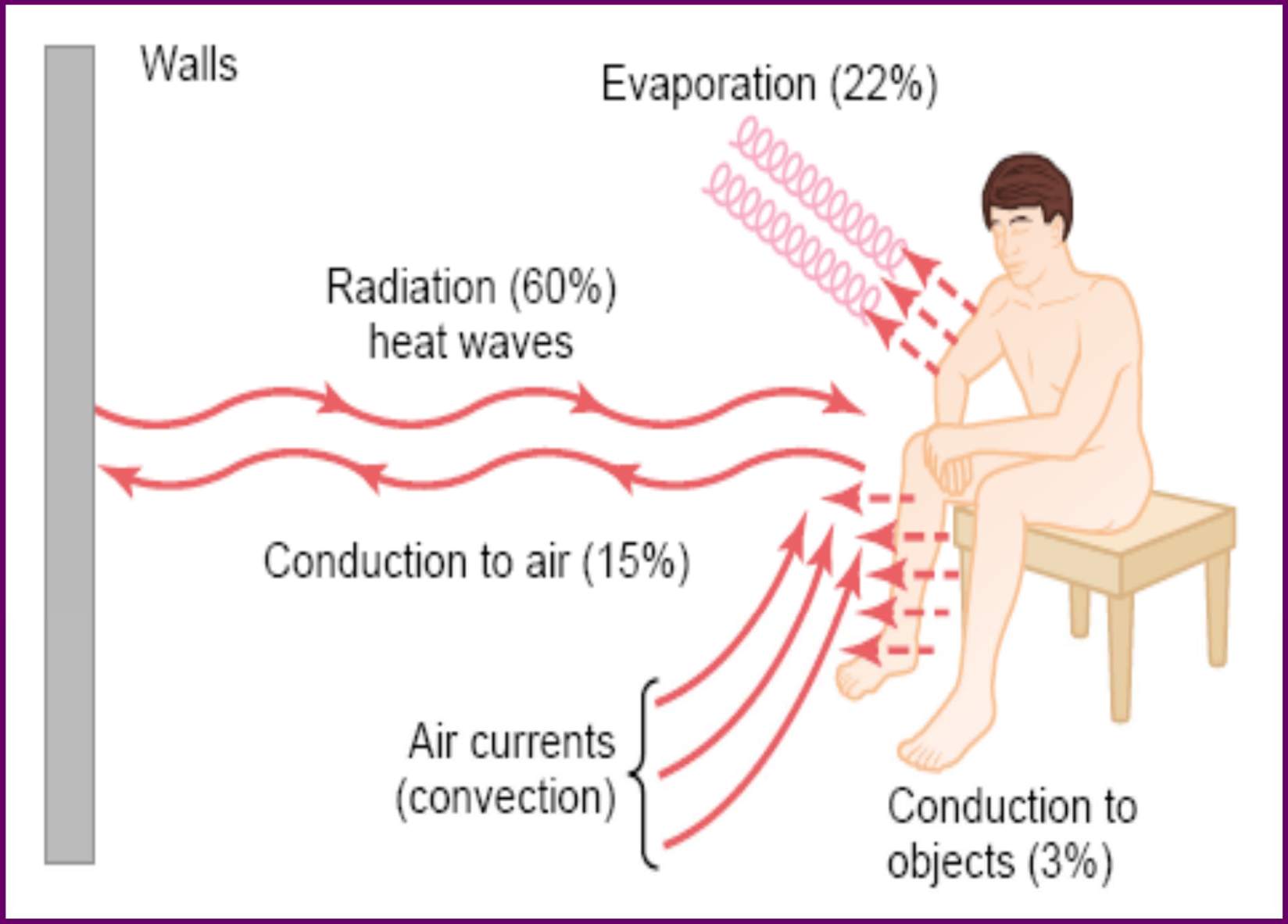
  RED LINE

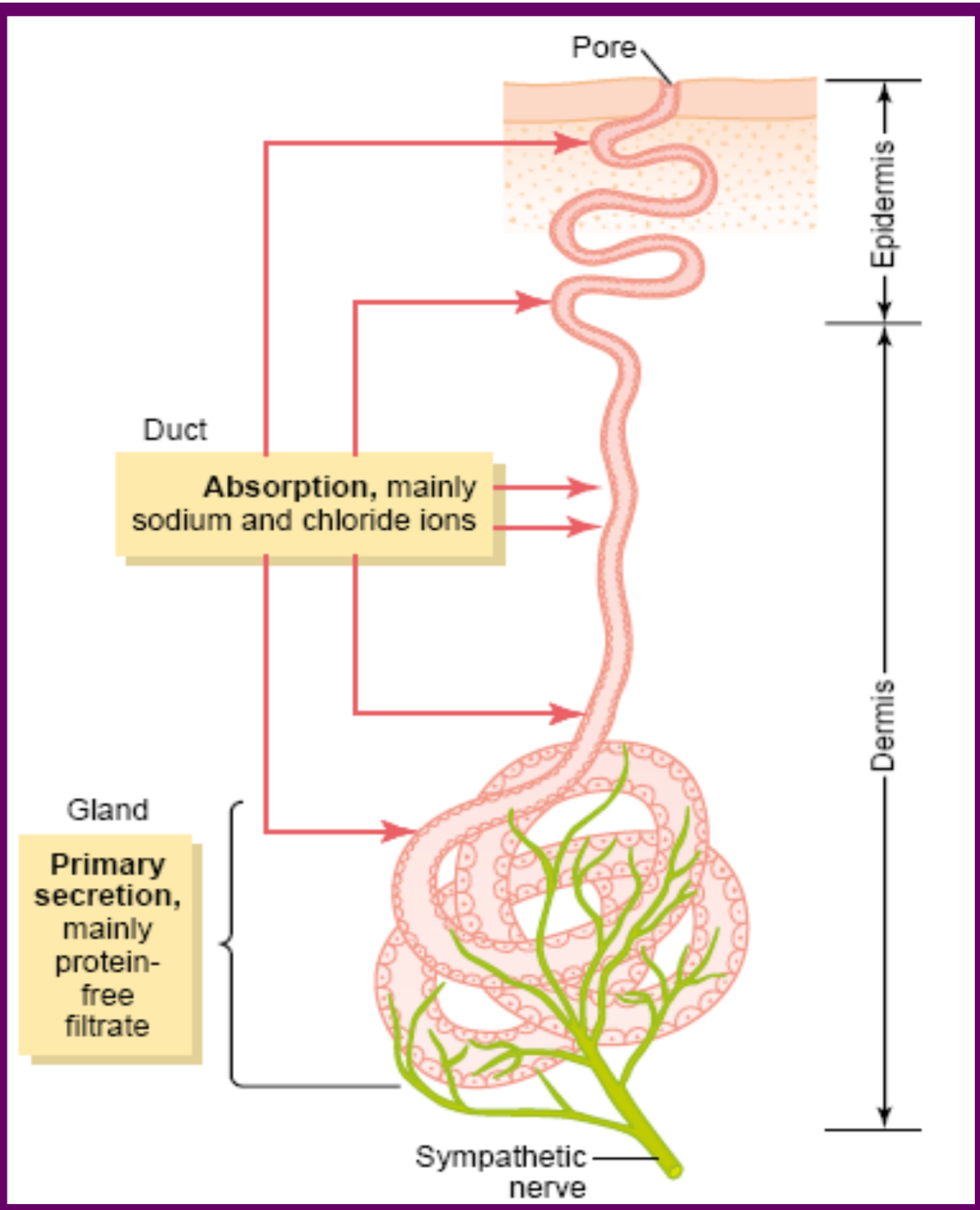
  FLARE

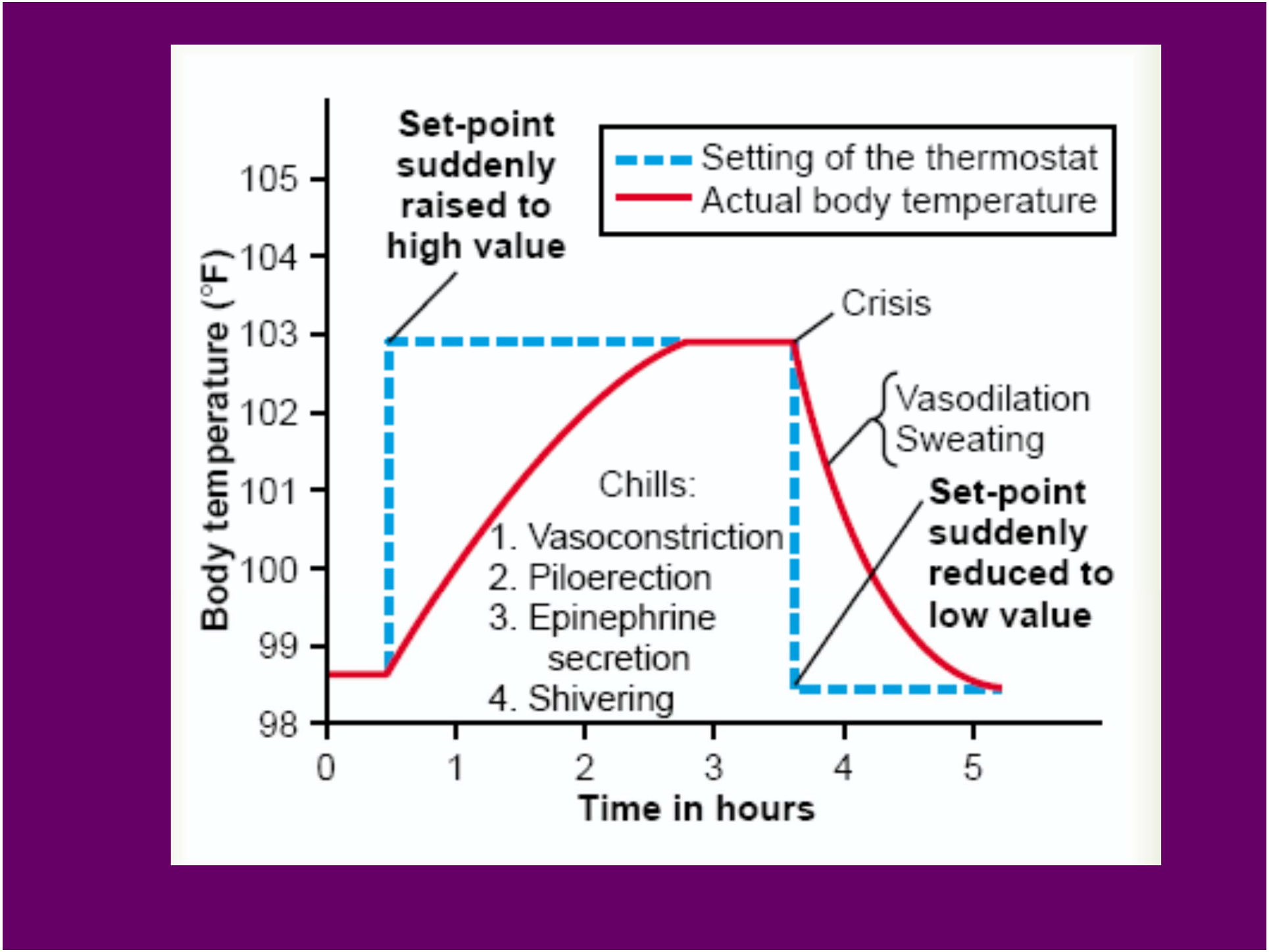
  WHEAL


Oral
°F
°C
Rectal
104
102
100
98
96
40
39
38
37
36
Hard work, emotion
A few normal adults
Many active children
Usual range
of normal
Early morning
Cold weather, etc.
Hard exercise
Emotion or
moderate exercise
A few normal adults
Many active children
Usual range
of normal
Early morning
Cold weather, etc.


Epidermis
Dermis
Subcutaneous tissue
Capillaries
Arteries
Veins
Venous plexus
Arteriovenous anastomosis
Artery


Walls
Evaporation (22%)
Radiation (60%)
heat waves
Conduction to air (15%)
Air currents
(convection)
Conduction to
objects (3%)


Pore
Epidermis
Dermis
Duct
Absorption, mainly sodium and chloride ions
Gland
Primary secretion, mainly protein-free filtrate
Sympathetic nerve


Set-point suddenly raised to high value
Setting of the thermostat
Actual body temperature
Crisis
Vasodilation
Sweating
Chills:
1. Vasoconstriction
2. Piloerection
3. Epinephrine secretion
4. Shivering
Set-point suddenly reduced to low value
Body temperature (°F)
105
104
103
102
101
100
99
98
0
1
2
3
4
5
Time in hours

DISCLAIMER

- All figures are taken from Guyton and Hall Textbook of Medical Physiology, 12th Edition.