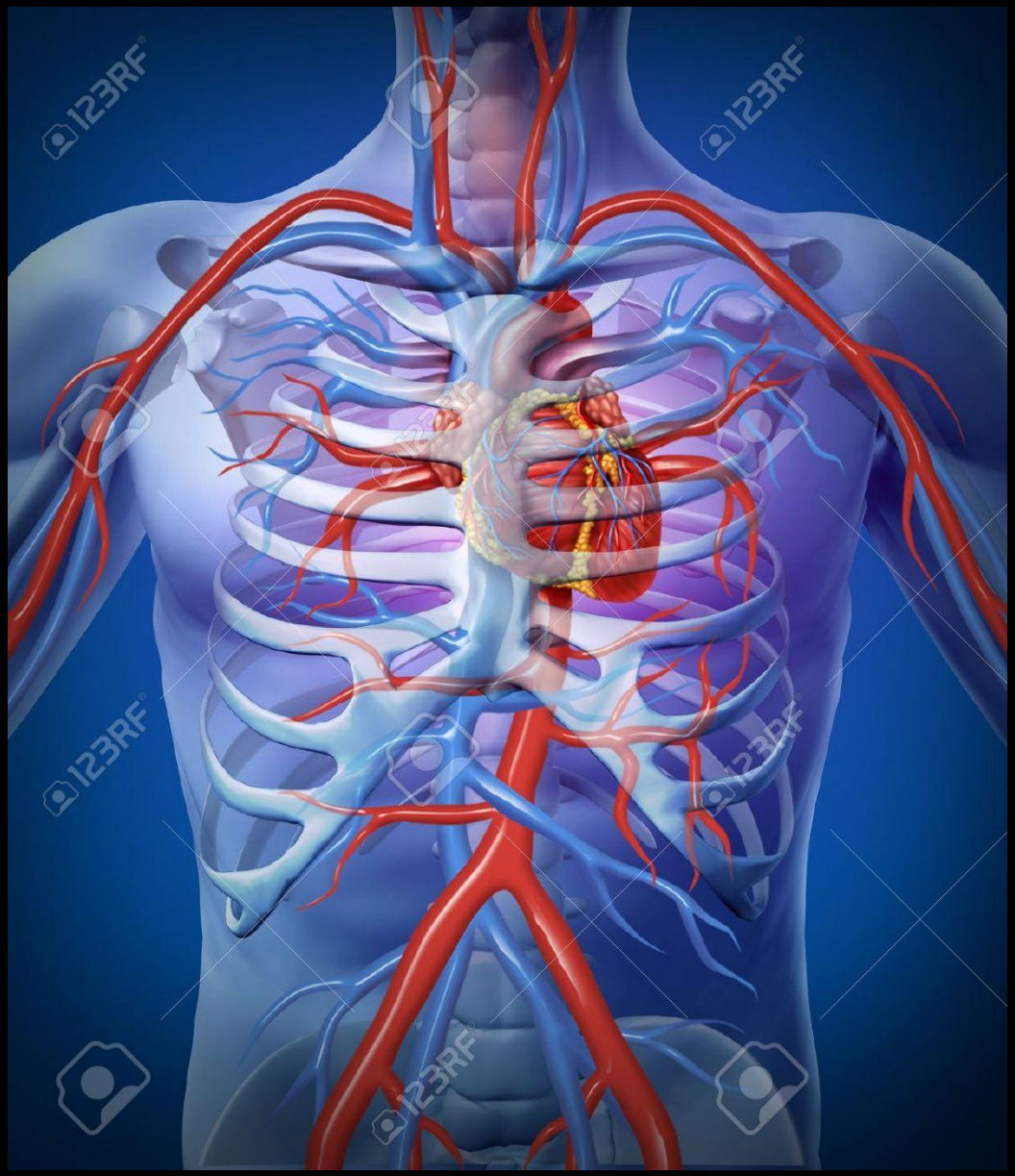
HEART

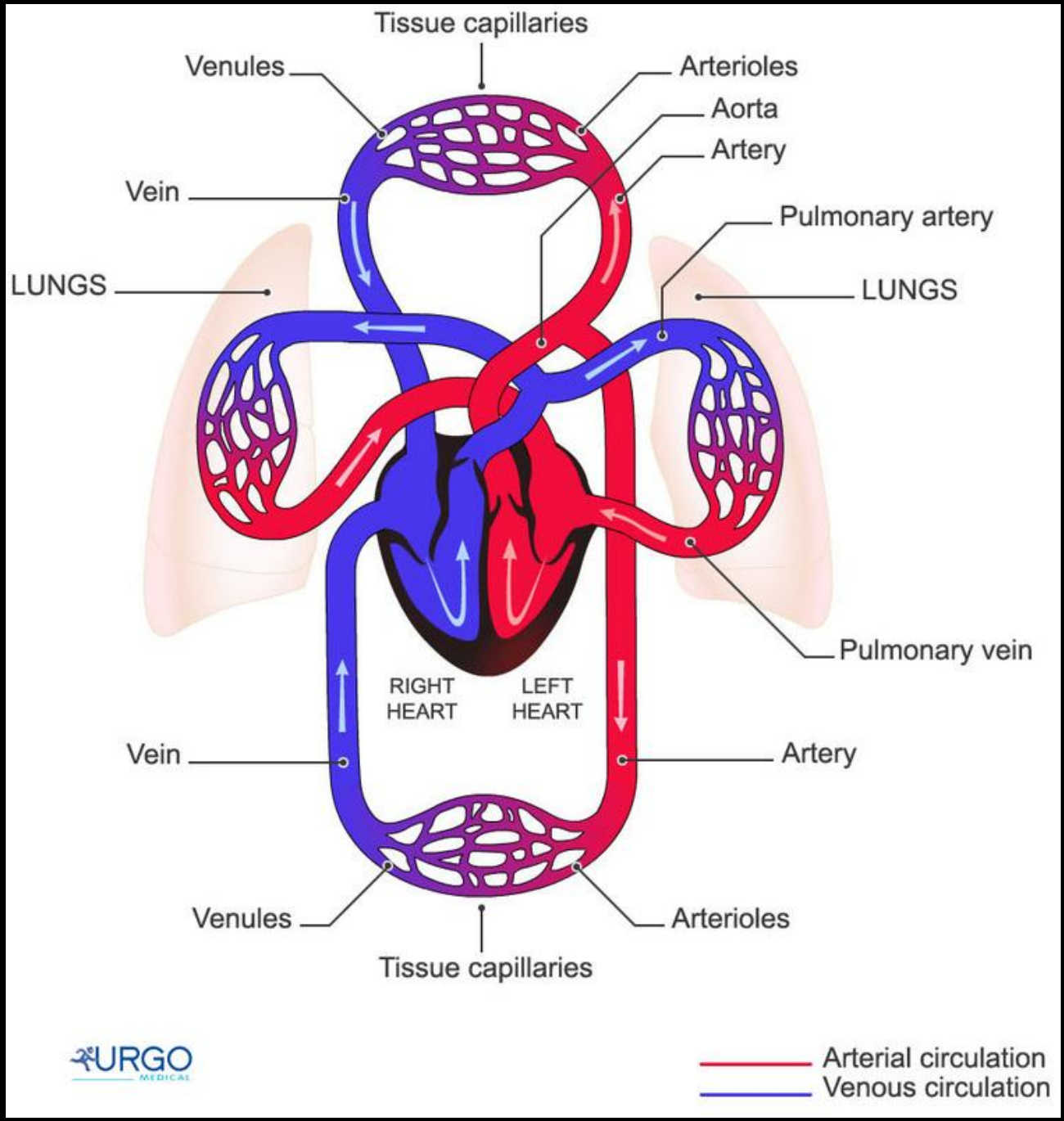
II semester

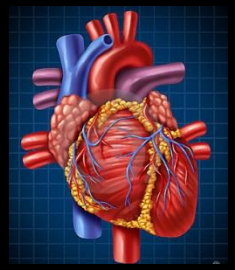
Associate Professor,

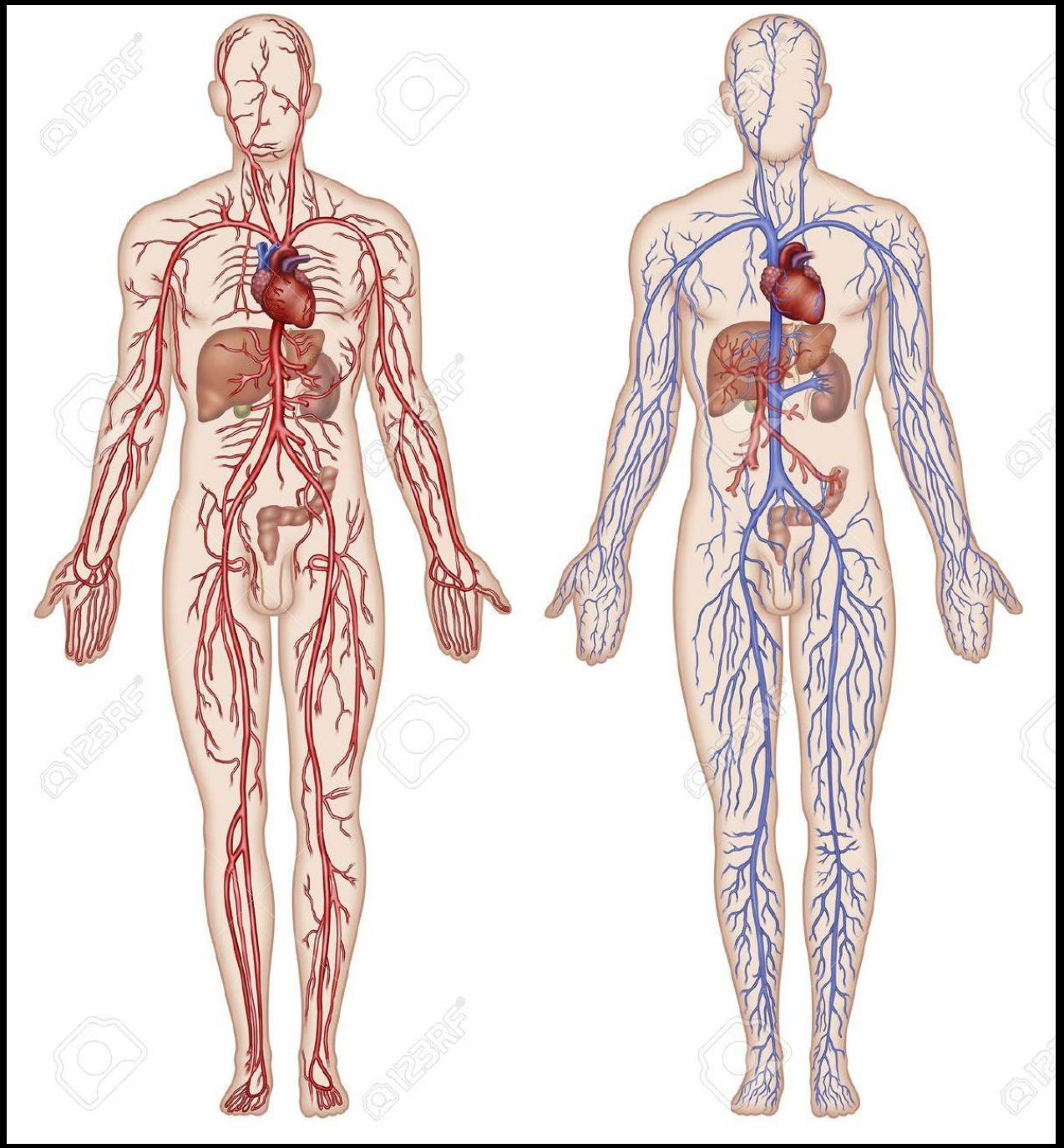
Lilia R. Shaymardanova, M.D., Ph.D.



BLOOD CIRCLES


Tissue capillaries
Venules
Arterioles
Aorta
Artery
Vein
Pulmonary artery
LUNGS
LUNGS
Pulmonary vein
RIGHT HEART
LEFT HEART
Vein
Artery
Venules
Arterioles
Tissue capillaries
URGO MEDICAL
Arterial circulation
Venous circulation

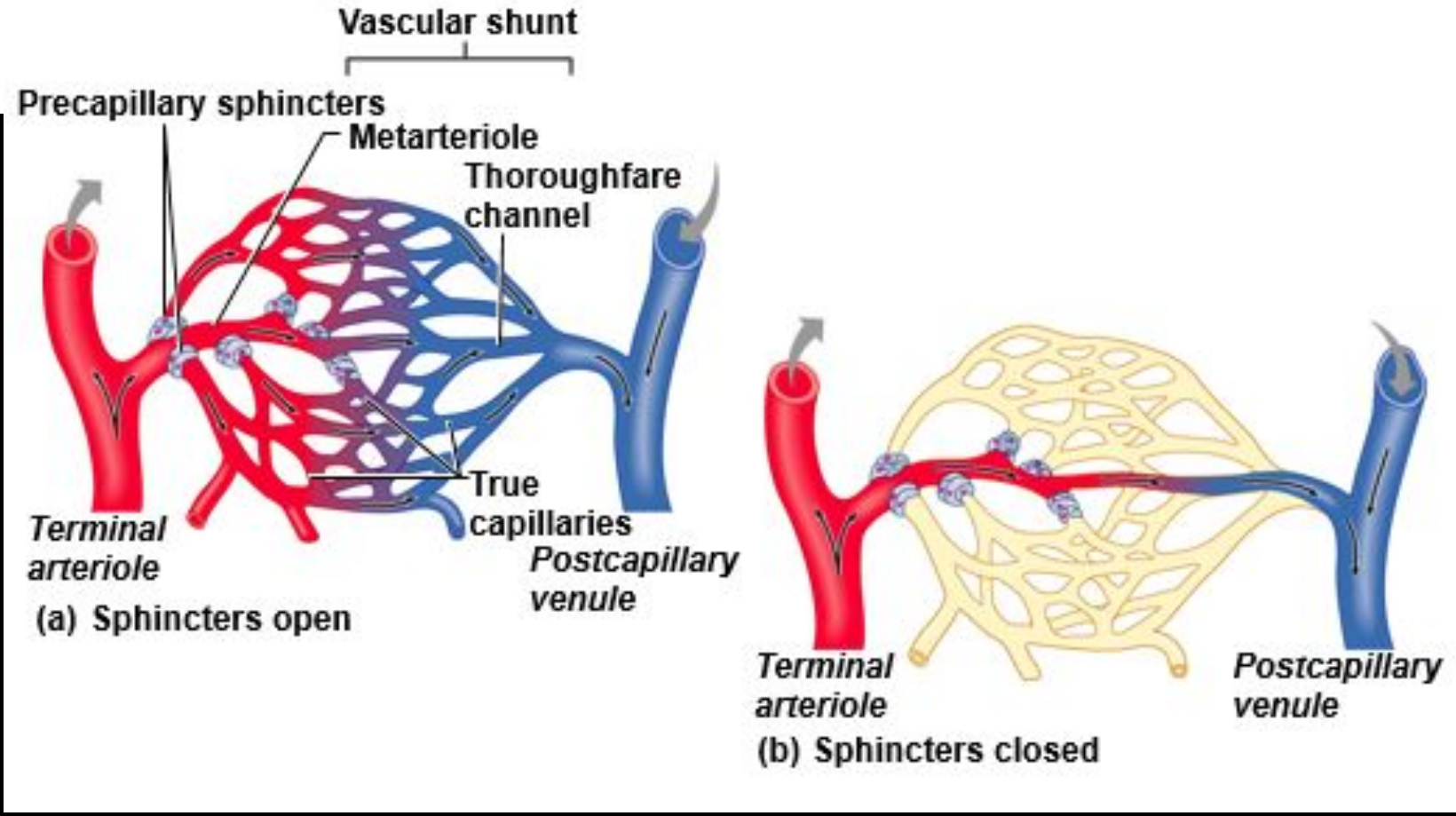




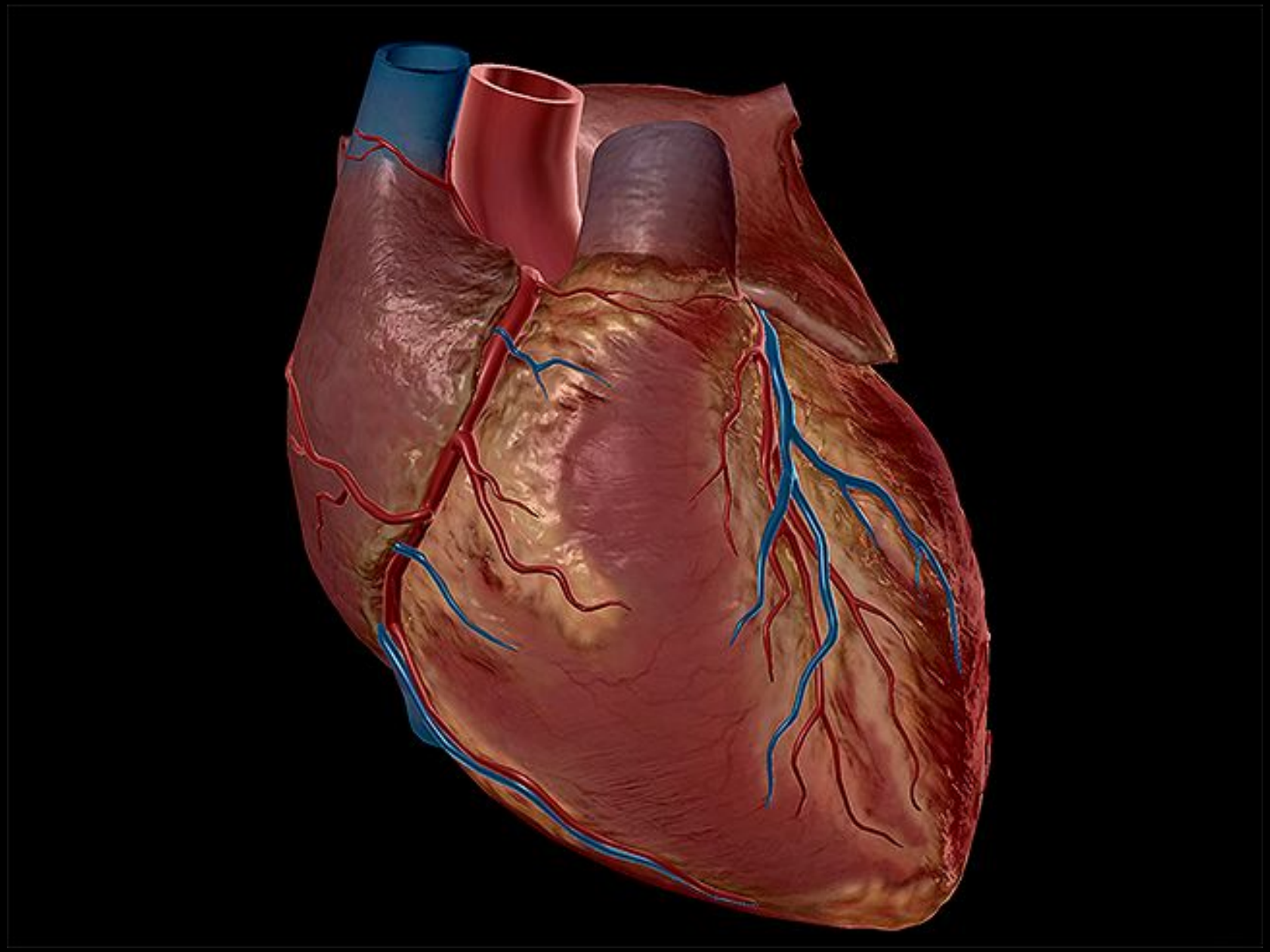
MICROCIRCULATORY BED

MICROCIRCULATORY BED COMPRISES SEVEN STRUCTURES

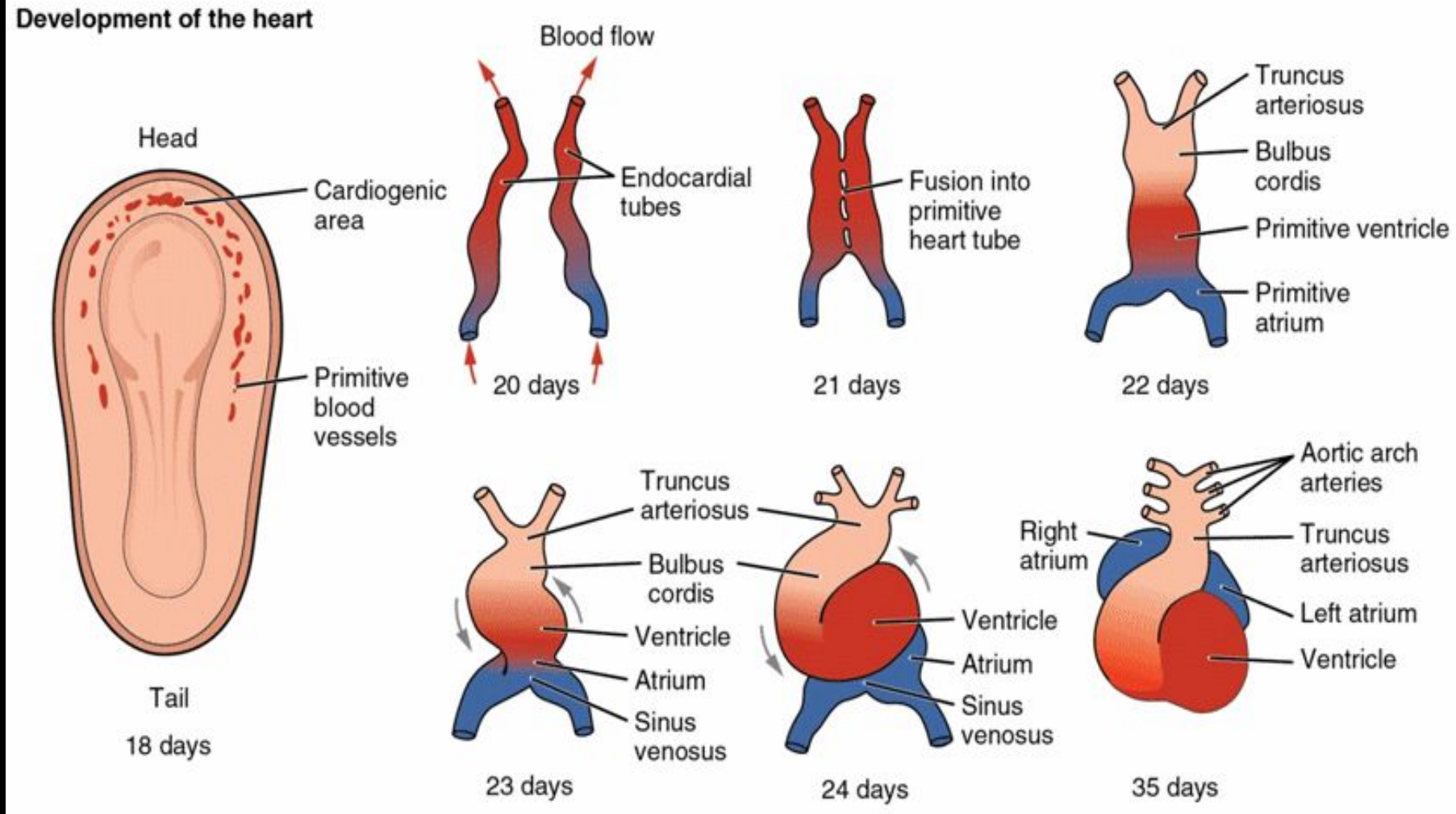
- ARTERIOLES
- PRECAPILLARY ARTERIOLES
- CAPILLARIES
- POSTCAPILLARY VENULES
- VENULES
- PRECAPILLARY SPHINCTERS
- AV SHUNT



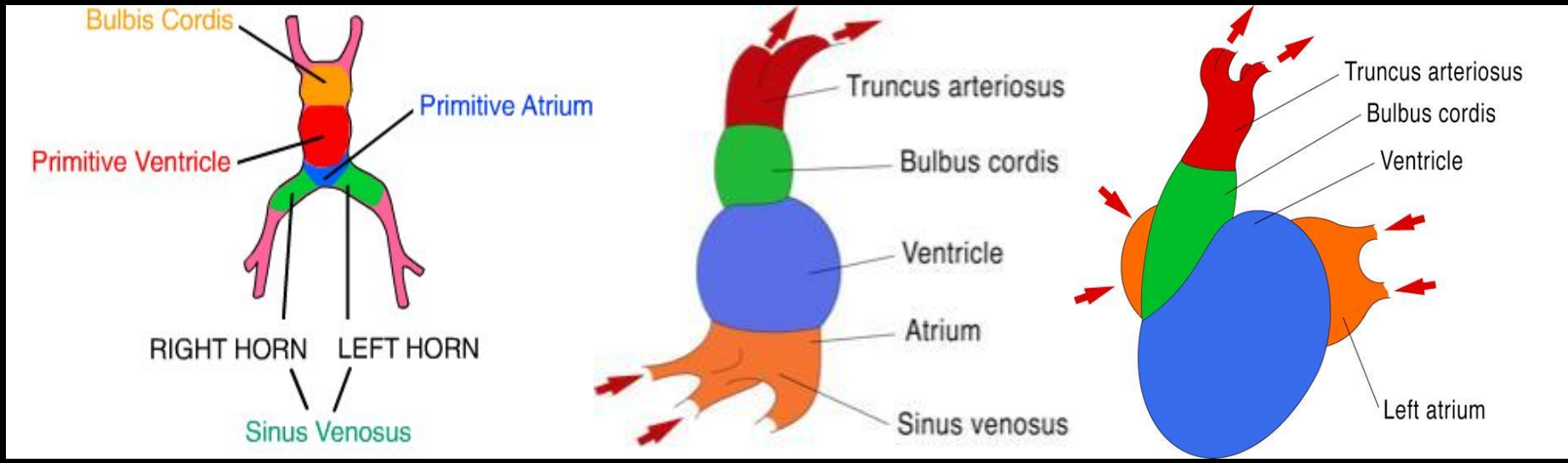
ISSUES COVERED:

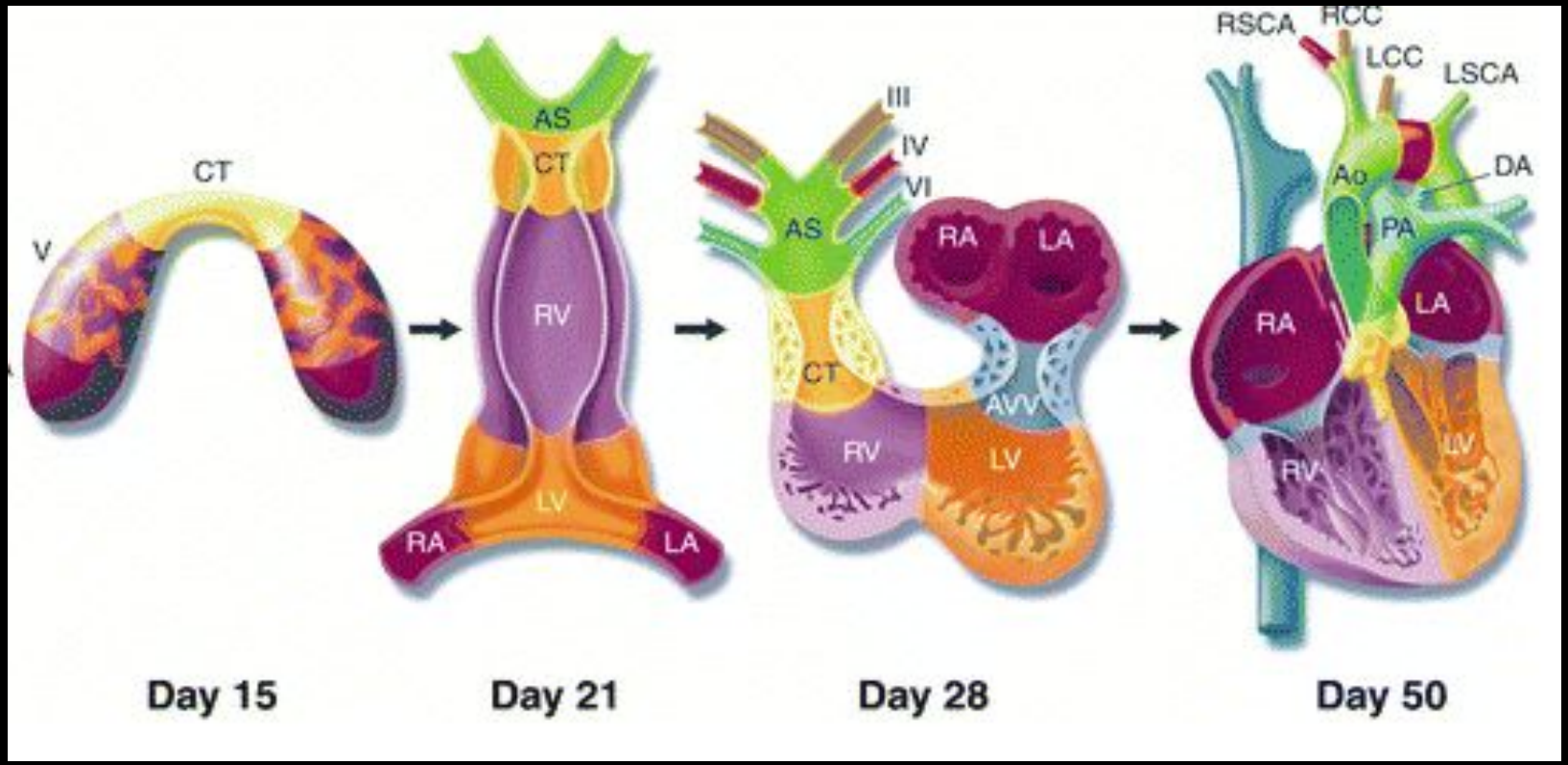


EMBRYOLOGY

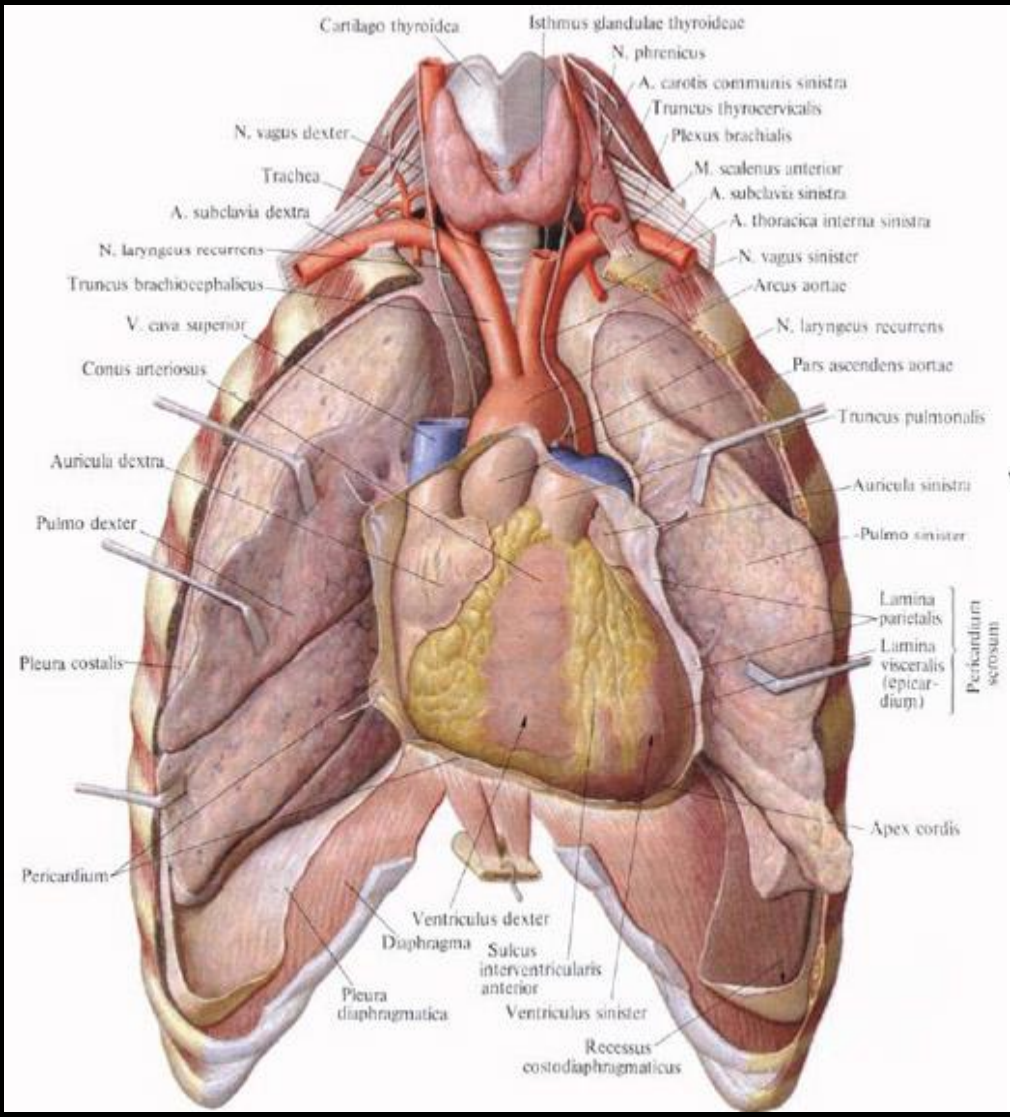


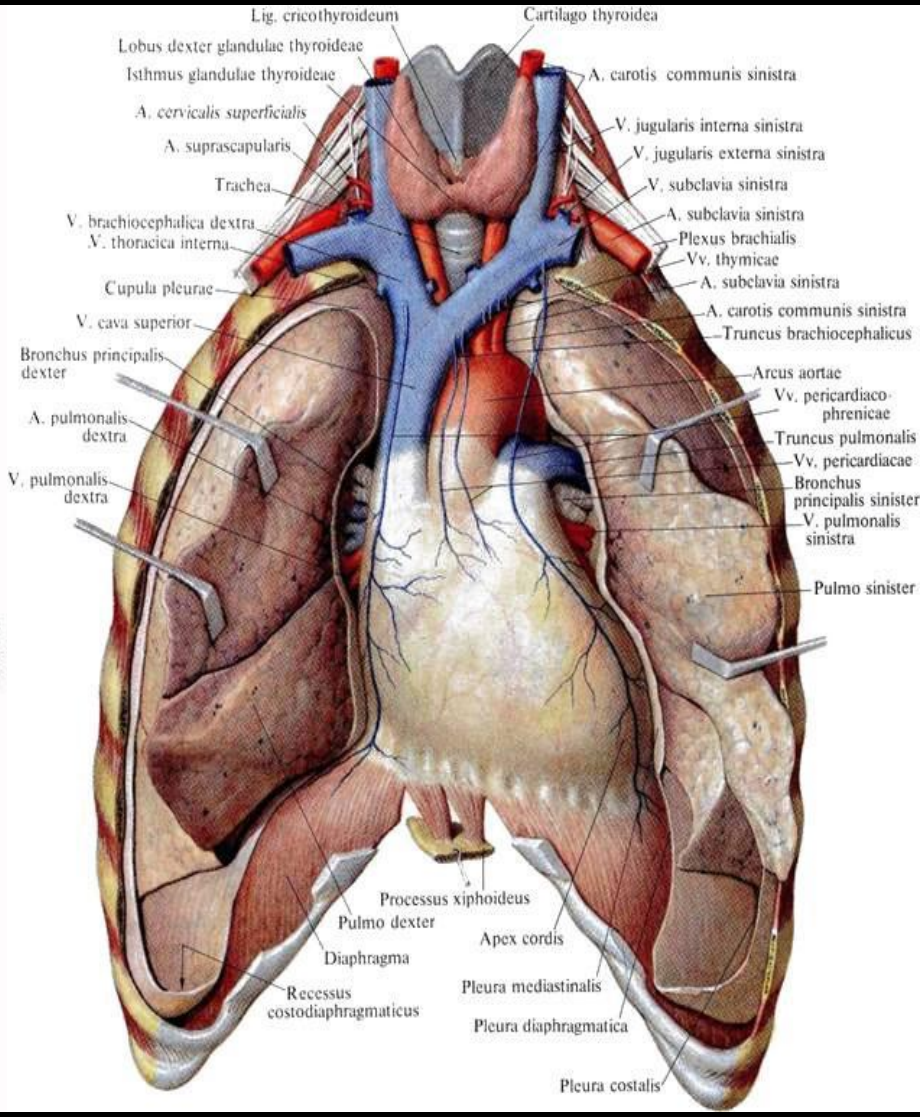
☆Cardiogenic area begins right in the middle of head pole


Bulbis Cordis
Primitive Atrium
Primitive Ventricle
RIGHT HORN
LEFT HORN
Sinus Venosus
Truncus arteriosus
Bulbus cordis
Ventricle
Atrium
Sinus venosus
Truncus arteriosus
Bulbus cordis
Ventricle
Left atrium

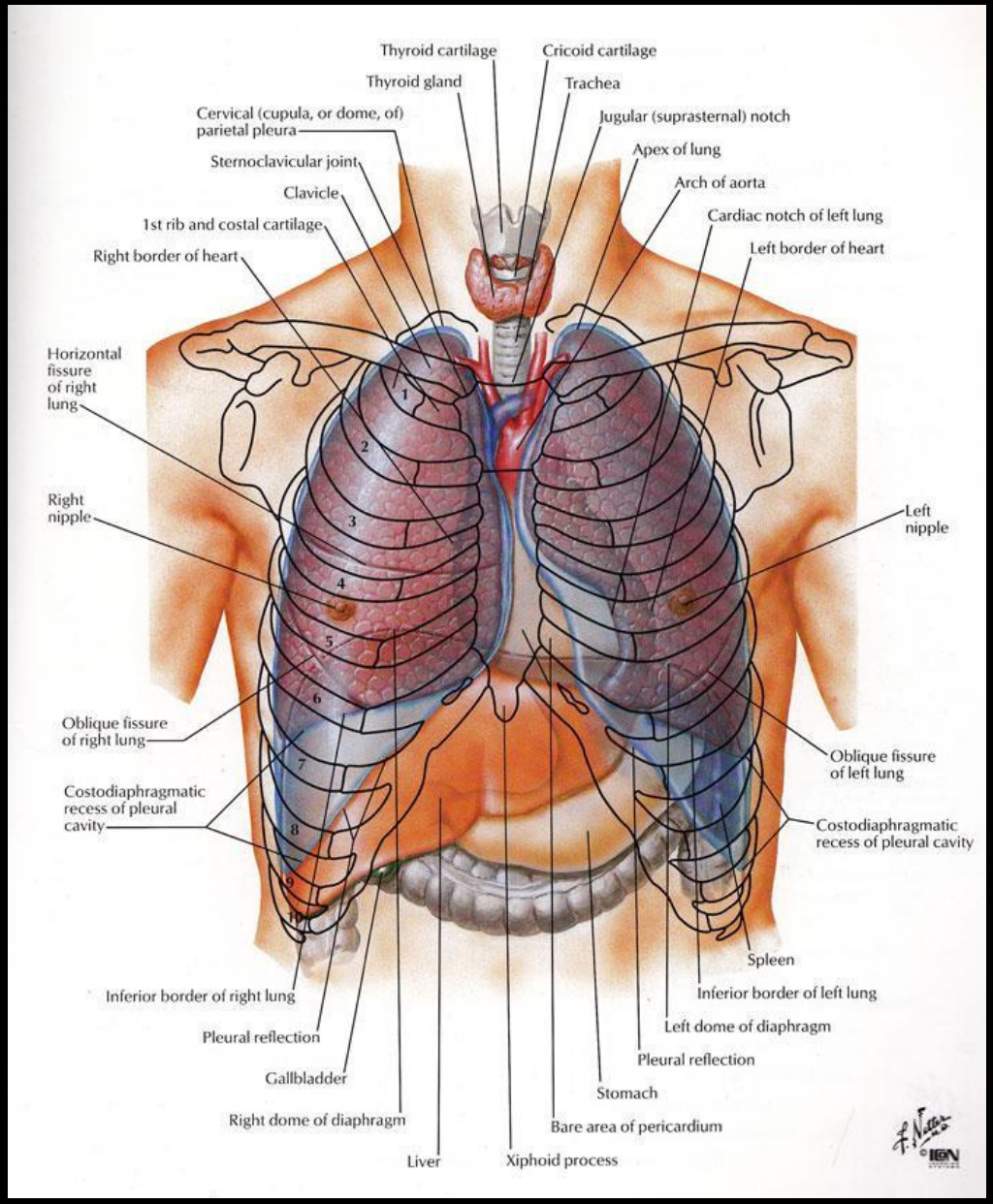

CT
V
AS
CT
RV
LV
RA
LA
III
IV
VI
AS
RA
LA
CT
AVV
RV
LV
RSCA
RCC
LCC
LSCA
Ao
DA
PA
RA
LA
RV
LV
Day 15
Day 21
Day 28
Day 50

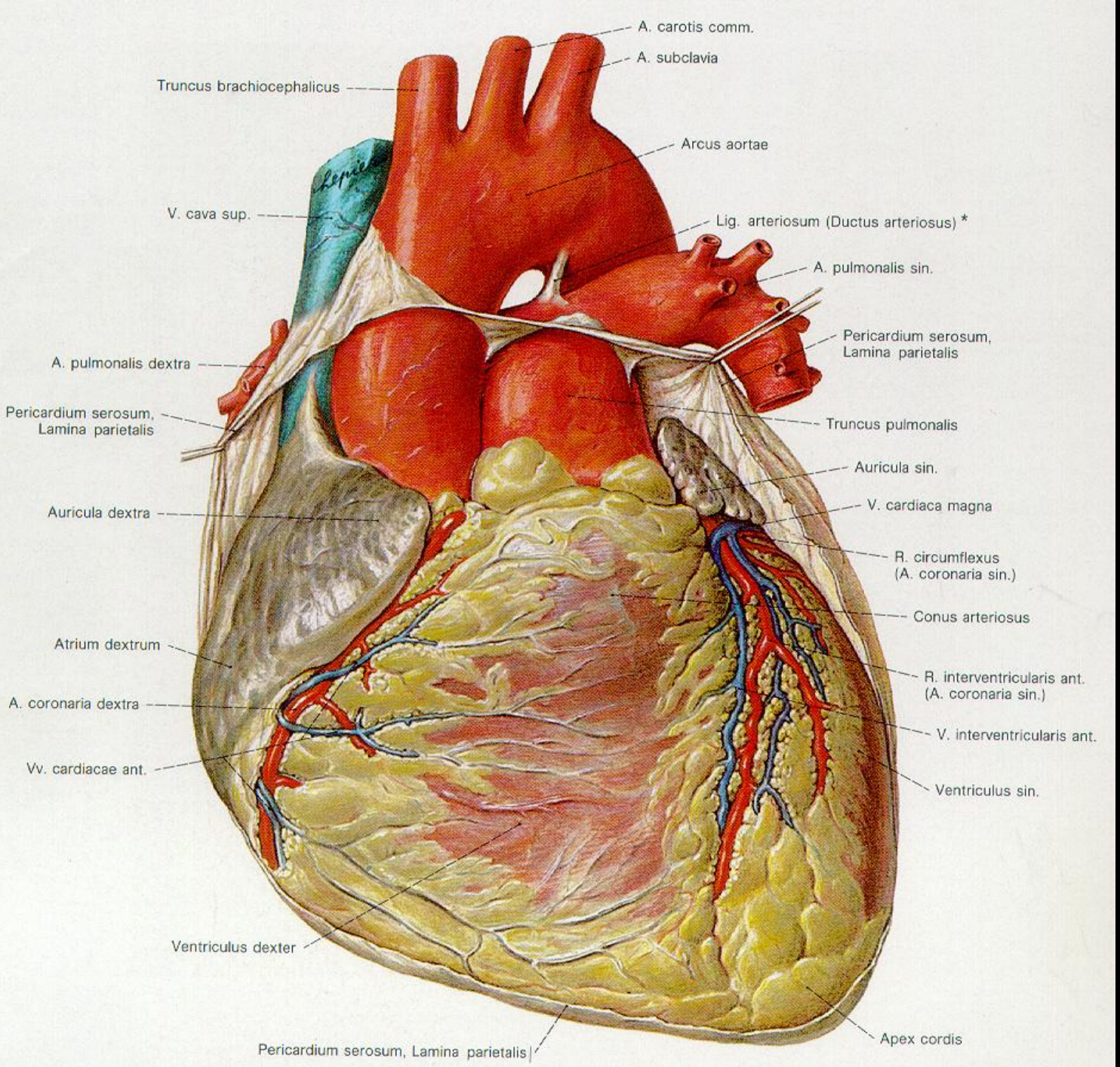
TOPOGRAPHY

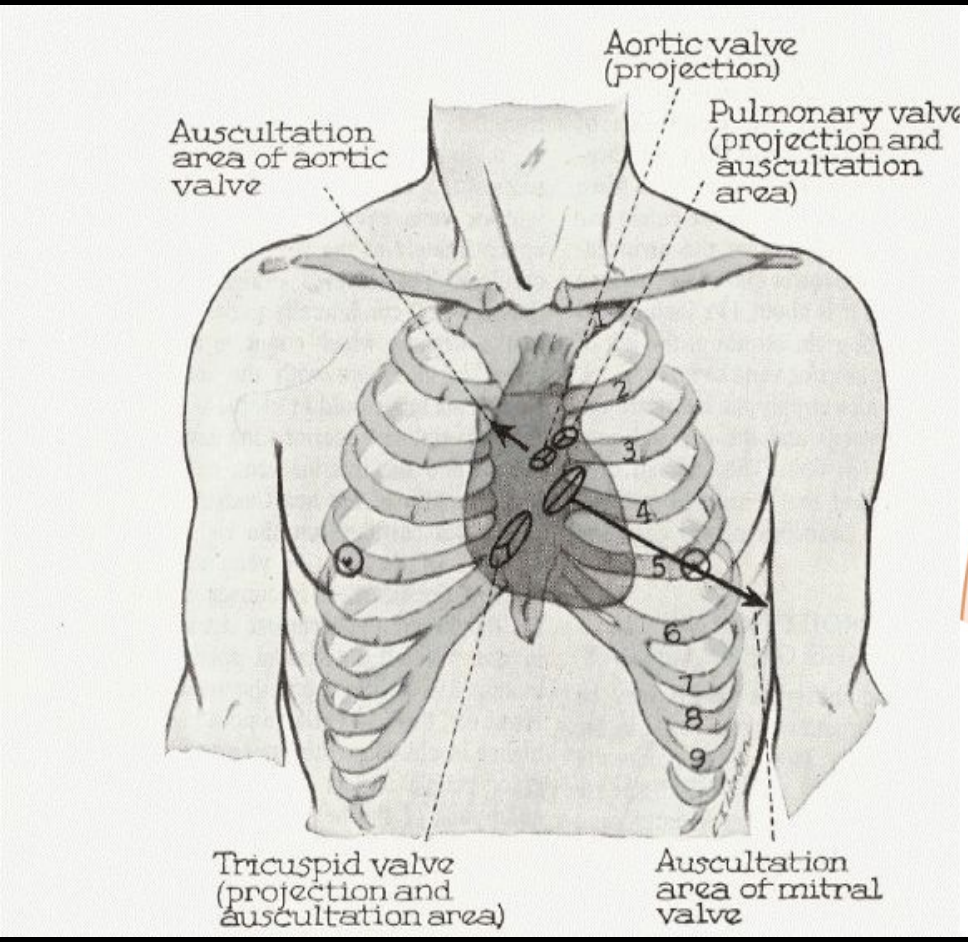

Cartilago thyroidea
Isthmus glandulae thyroideae
N. phrenicus
A. carotis communis sinistra
Truncus thyrocervicalis
Plexus brachialis
N. vagus dexter
M. scalenus anterior
Trachea
A. subclavia sinistra
A. subclavia dextra
A. thoracica interna sinistra
N. laryngeus recurrens
N. vagus sinister
Truncus brachiocephalicus
Arcus aortae
V. cava superior
N. laryngeus recurrens
Pars ascendens aortae
Conus arteriosus
Truncus pulmonalis
Auricula dextra
Auricula sinistra
Pulmo dexter
Pulmo sinister
Lamina parietalis
Lamina visceralis (epicardium)
Pericardium serosum
Pleura costalis
Apex cordis
Pericardium
Ventriculus dexter
Diaphragma
Sulcus interventricularis anterior
Pleura diaphragmatica
Ventriculus sinister
Recessus costodiaphragmaticus

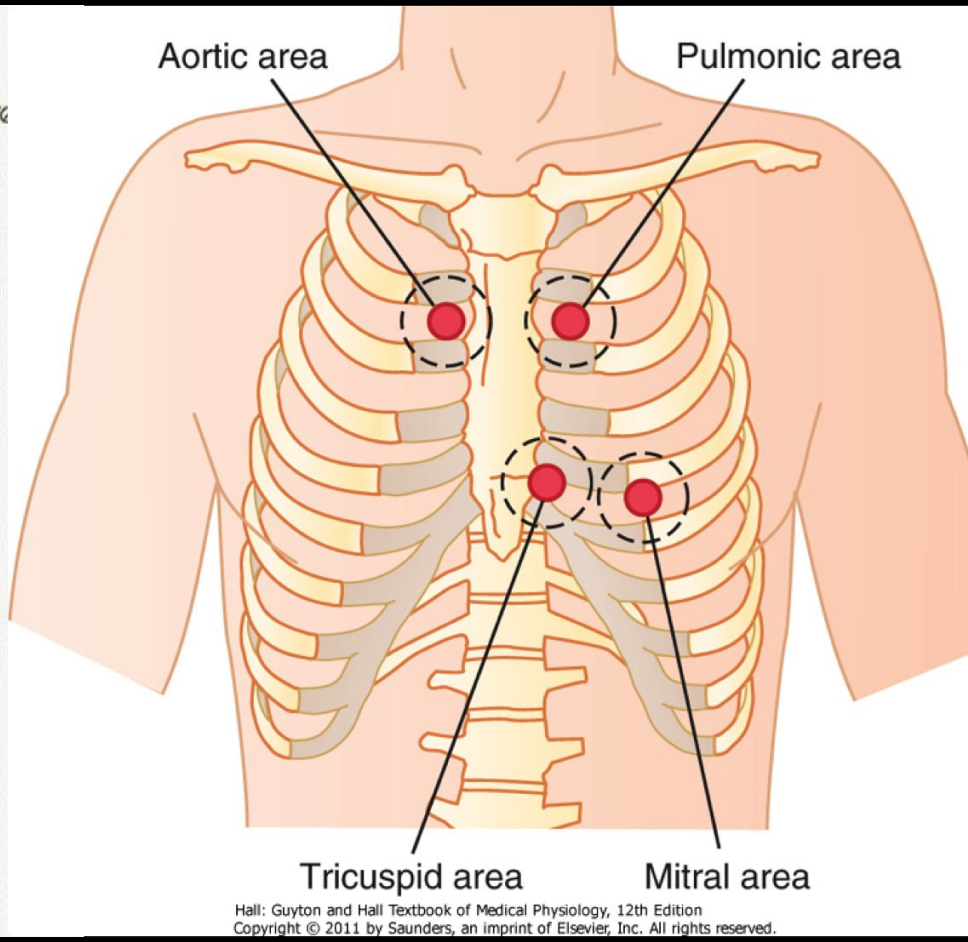

Lig. cricothyroideum
Cartilago thyroidea
Lobus dexter glandulae thyroideae
Isthmus glandulae thyroideae
A. carotis communis sinistra
A. cervicalis superficialis
V. jugularis interna sinistra
A. suprascapularis
V. jugularis externa sinistra
Trachea
V. subclavia sinistra
V. brachiocephalica dextra
A. subclavia sinistra
V. thoracica interna
Plexus brachialis
Vv. thymicae
Cupula pleurae
A. subclavia sinistra
V. cava superior
A. carotis communis sinistra
Truncus brachiocephalicus
Bronchus principalis dexter
Arcus aortae
Vv. pericardiacophrenicae
A. pulmonalis dextra
Truncus pulmonalis
Vv. pericardiacae
V. pulmonalis dextra
Bronchus principalis sinister
V. pulmonalis sinistra
Pulmo sinister
Processus xiphoideus
Pulmo dexter
Apex cordis
Diaphragma
Recessus costodiaphragmaticus
Pleura mediastinalis
Pleura diaphragmatica
Pleura costalis

TOPOGRAPHY


Thyroid cartilage
Cricoid cartilage
Thyroid gland
Trachea
Cervical (cupula, or dome, of) parietal pleura
Jugular (suprasternal) notch
Apex of lung
Sternoclavicular joint
Arch of aorta
Clavicle
Cardiac notch of left lung
1st rib and costal cartilage
Left border of heart
Right border of heart
Horizontal fissure of right lung
Right nipple
Left nipple
Oblique fissure of right lung
Oblique fissure of left lung
Costodiaphragmatic recess of pleural cavity
Costodiaphragmatic recess of pleural cavity
Spleen
Inferior border of right lung
Inferior border of left lung
Pleural reflection
Left dome of diaphragm
Pleural reflection
Gallbladder
Stomach
Right dome of diaphragm
Bare area of pericardium
Liver
Xiphoid process

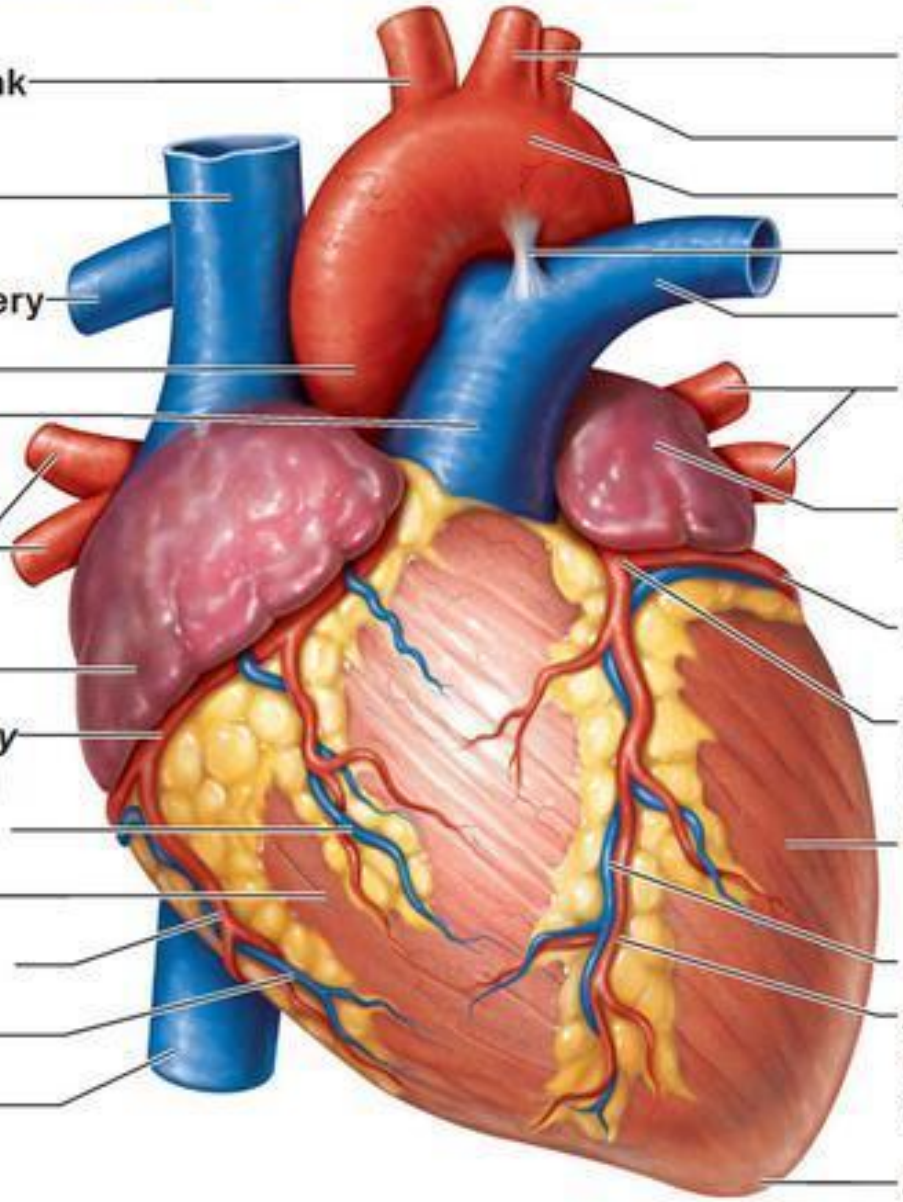

A. carotis comm.
A. subclavia
Truncus brachiocephalicus
Arcus aortae
V. cava sup.
Lig. arteriosum (Ductus arteriosus) *
A. pulmonalis sin.
Pericardium serosum, Lamina parietalis
A. pulmonalis dextra
Pericardium serosum, Lamina parietalis
Truncus pulmonalis
Auricula sin.
Auricula dextra
V. cardiaca magna
R. circumflexus (A. coronaria sin.)
Conus arteriosus
Atrium dextrum
R. interventricularis ant. (A. coronaria sin.)
A. coronaria dextra
V. interventricularis ant.
Vv. cardiacae ant.
Ventriculus sin.
Ventriculus dexter
Pericardium serosum, Lamina parietalis
Apex cordis





Gross Anatomy of the Heart

Anterior view



Brachiocephalic trunk

Superior vena cava

Right pulmonary artery

Ascending aorta

Pulmonary trunk

Right pulmonary veins

Right atrium

Right coronary artery (in coronary sulcus)

Right ventricle

Inferior vena cava

Left common carotid artery

Left subclavian artery

Aortic arch

Ligamentum arteriosum

Left pulmonary artery

Left pulmonary veins

Auricle of **left atrium**

Circumflex artery

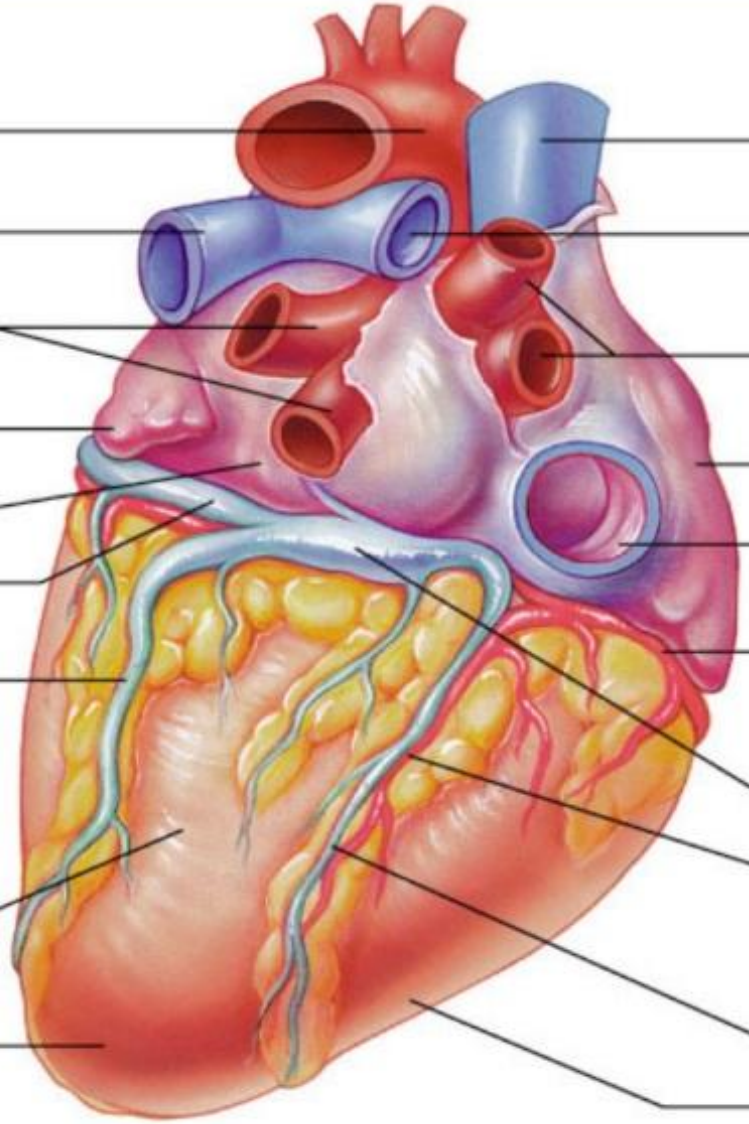
Left coronary artery (in coronary sulcus)

Left ventricle

Anterior interventricular artery (in anterior interventricular sulcus)

Apex

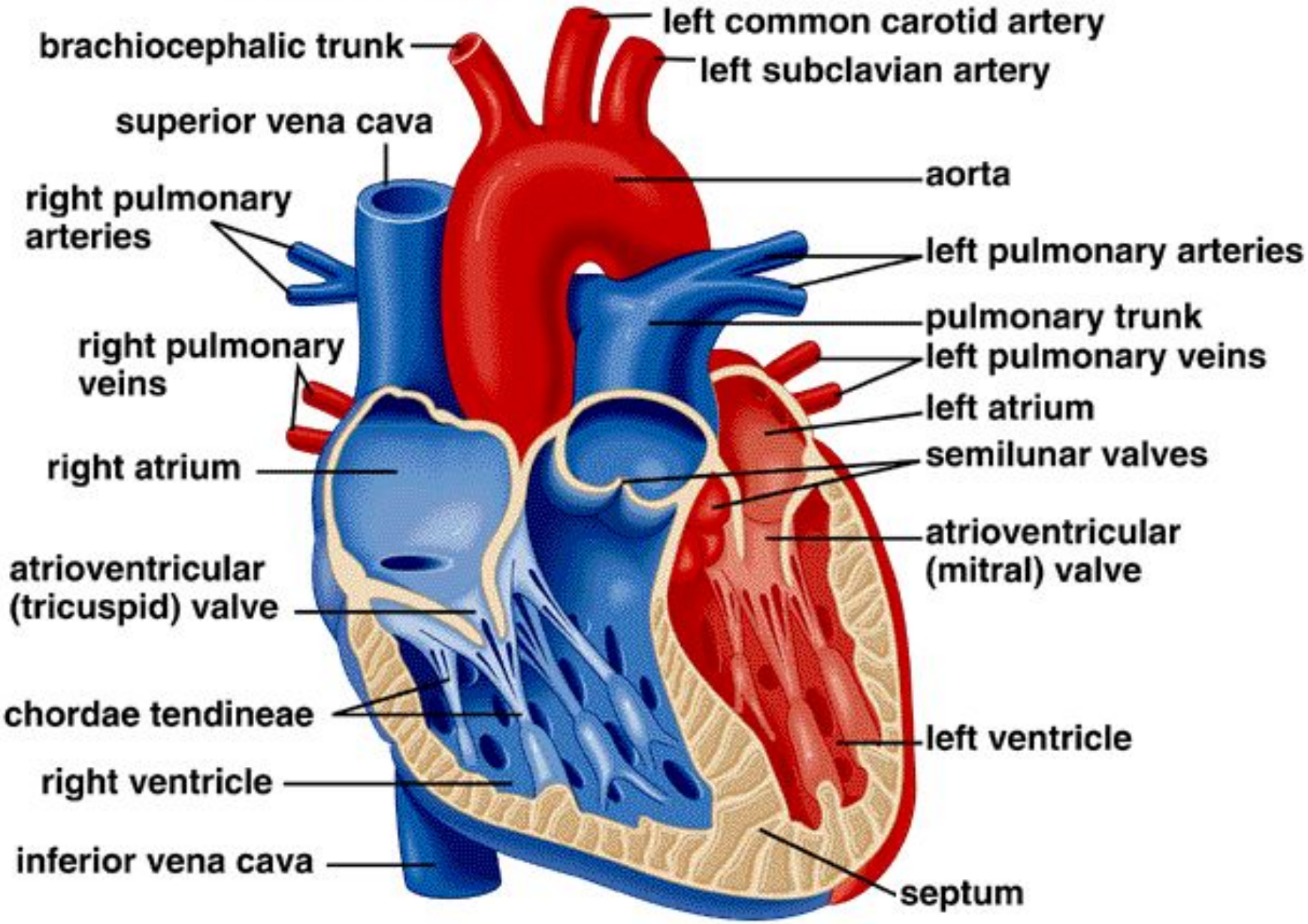
External Heart: Posterior View



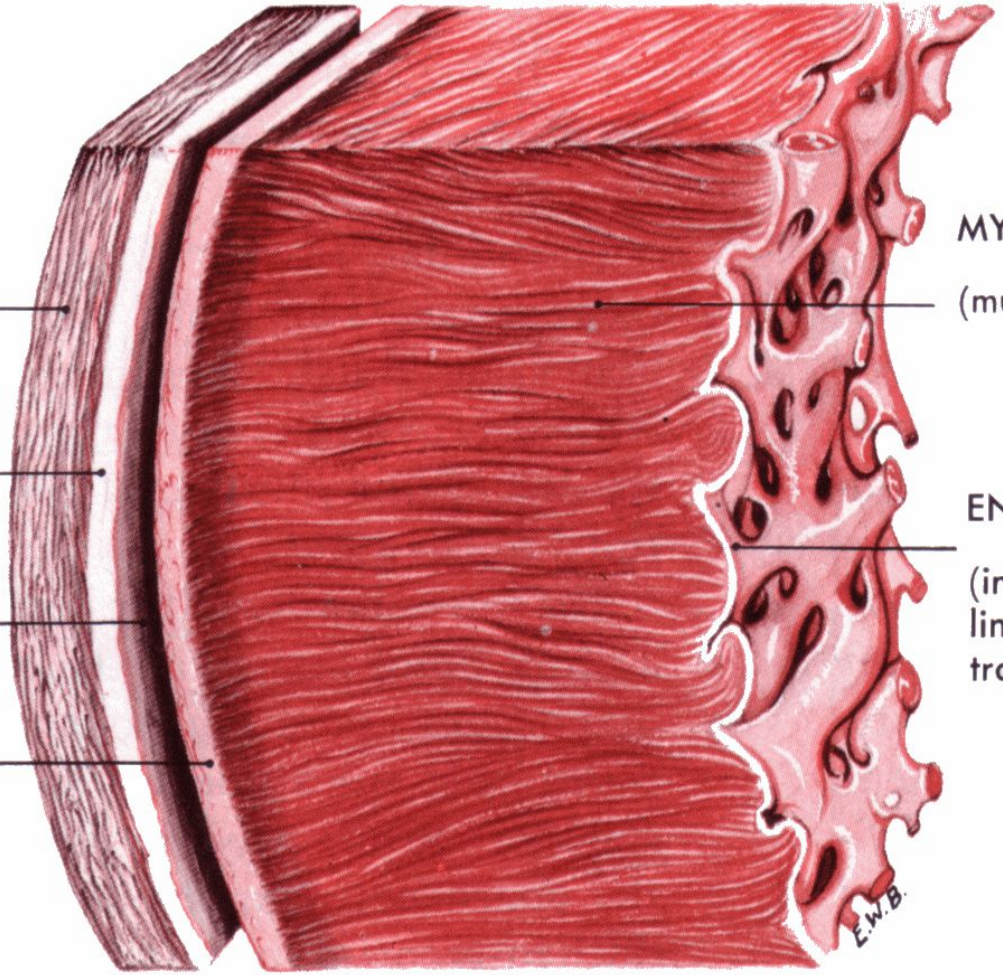
Aorta
Left pulmonary artery
Left pulmonary veins
Auricle of left atrium
Left atrium
Great cardiac vein
Posterior vein of left ventricle
Left ventricle
Apex
(d)

Superior vena cava
Right pulmonary artery
Right pulmonary veins
Right atrium
Inferior vena cava
Right coronary artery (in right atrioventricular groove)
Coronary sinus
Posterior interventricular artery (in posterior interventricular sulcus)
Middle cardiac vein
Right ventricle

Internal View of Heart



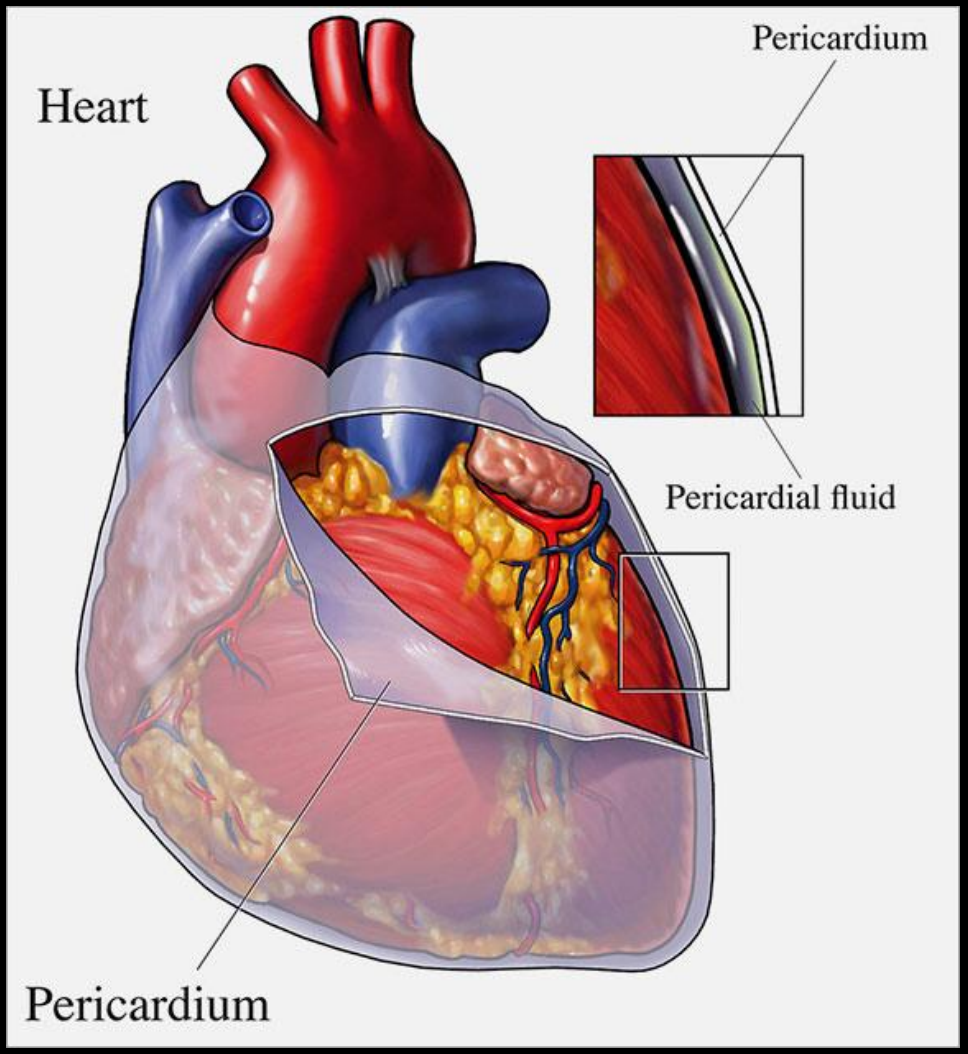
LAYERS OF THE HEART WALL

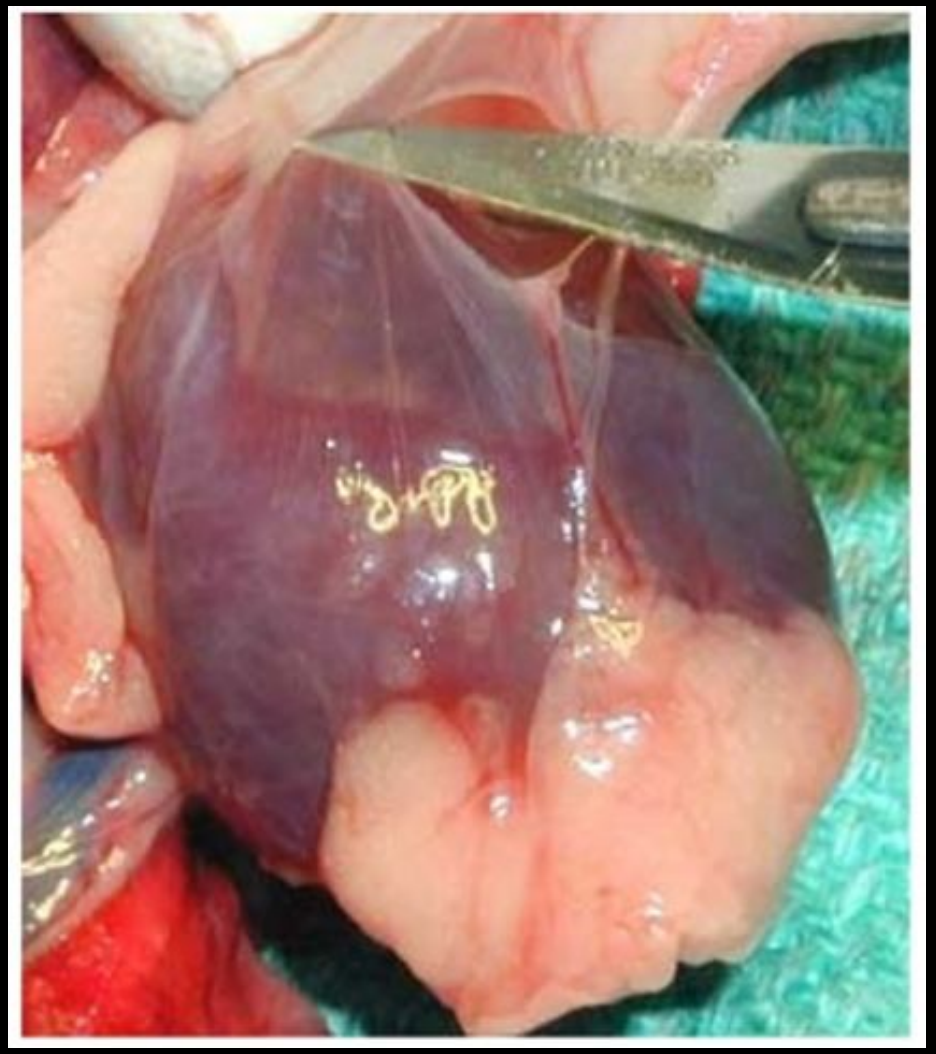


Section of the heart wall showing the components of the outer pericardium (heart sac), muscle layer (myocardium), and inner lining (endocardium).

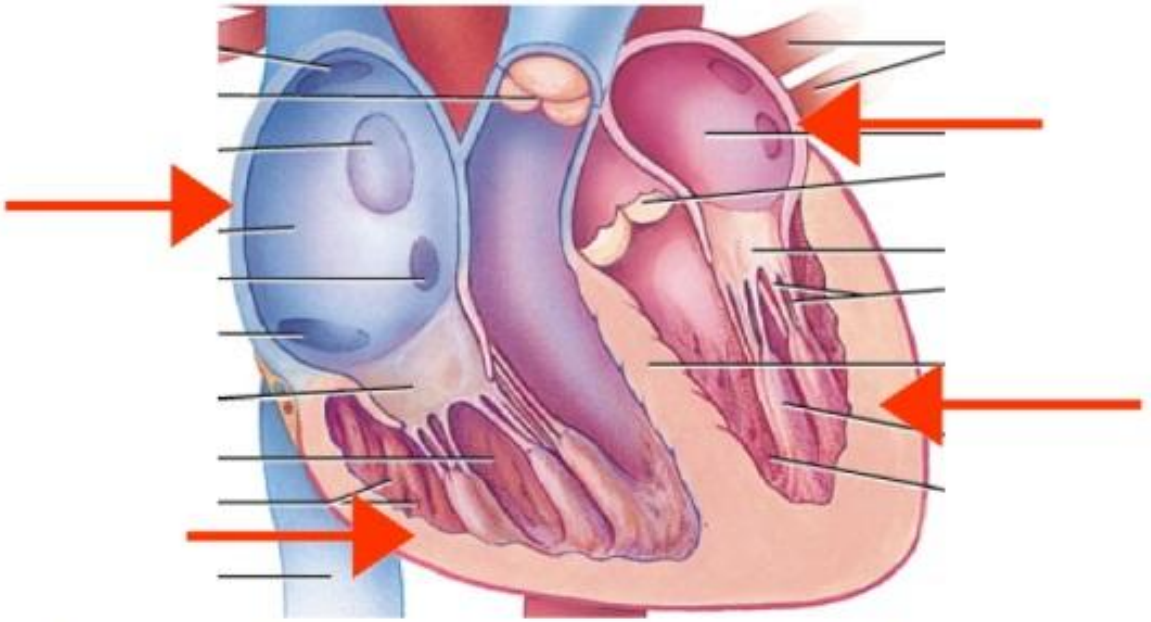
- Three layers of heart
  - Endocardium
  - Myocardium
  - Epicardium
- Pericardium
- Pericardial space, with 10 to 30 mL fluid

PERICARDUIM





Myocardial Thickness and Function



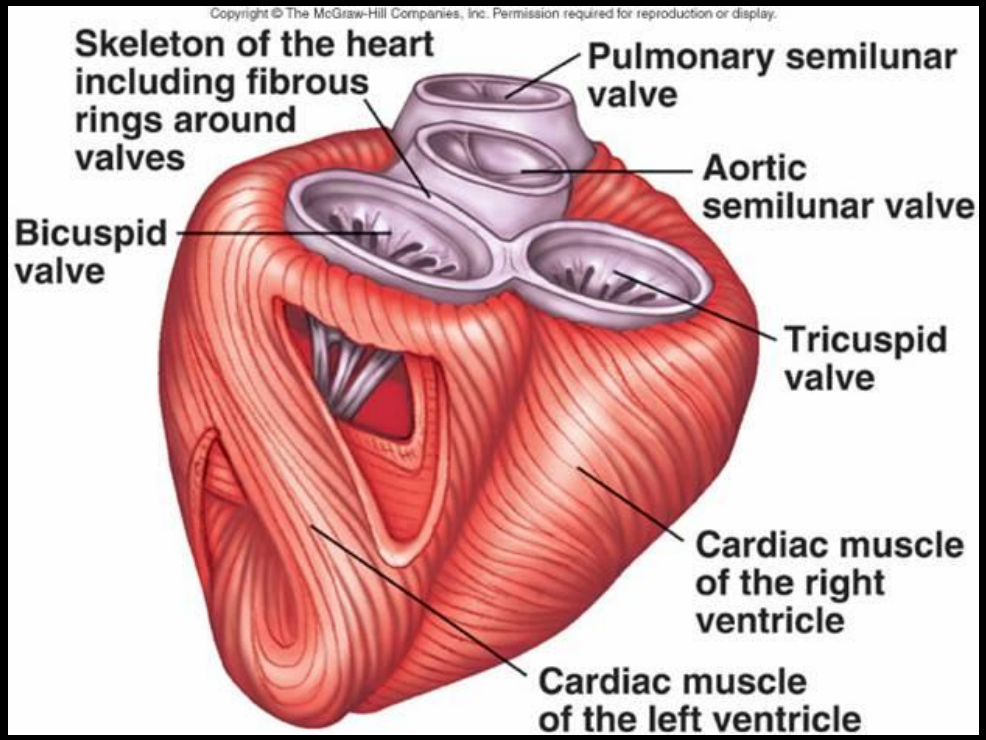
Thickness of myocardium varies according to the function of the chamber

Atria are thin walled, deliver blood to adjacent ventricles

Ventricle walls are much thicker and stronger

- right ventricle supplies blood to the lungs (little flow resistance)
- left ventricle wall is the thickest to supply systemic circulation

MYOCARDIUM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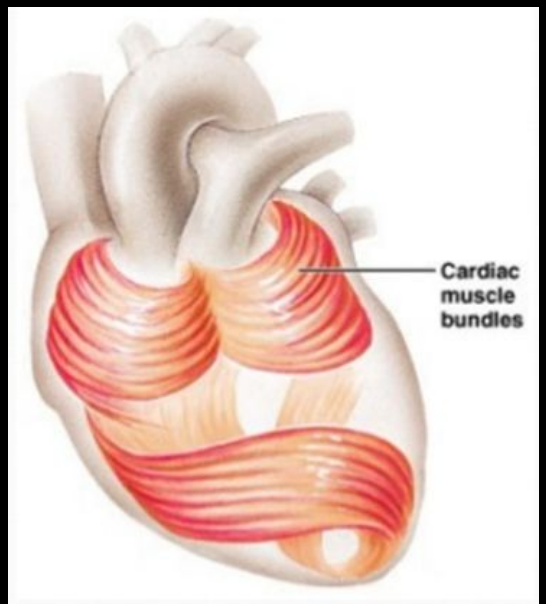
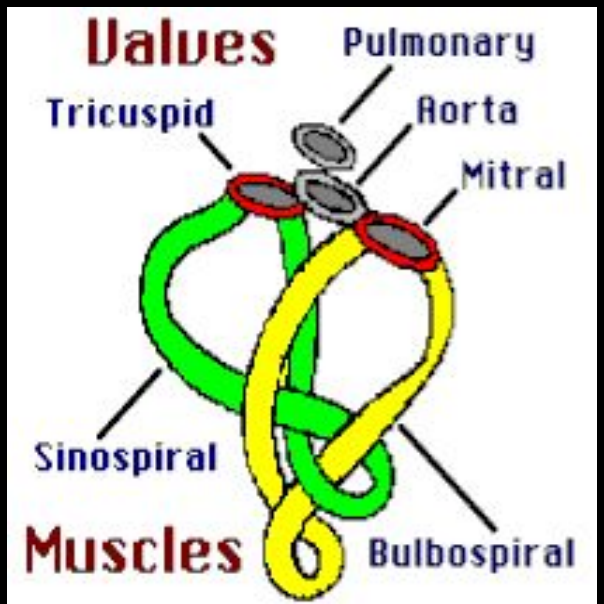
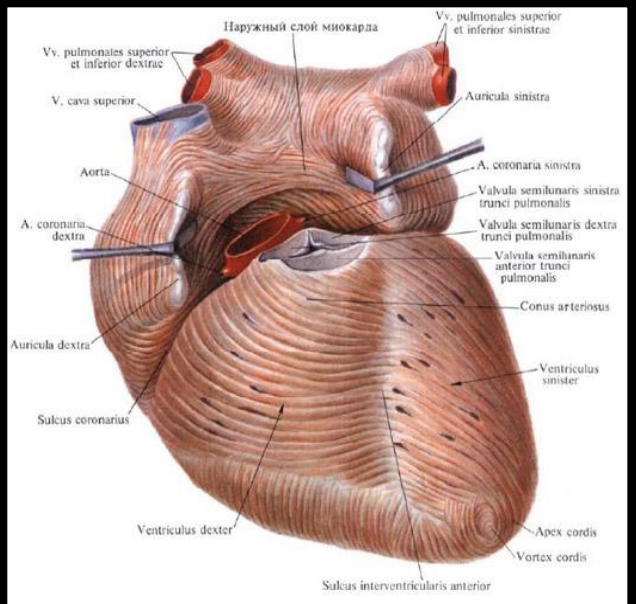
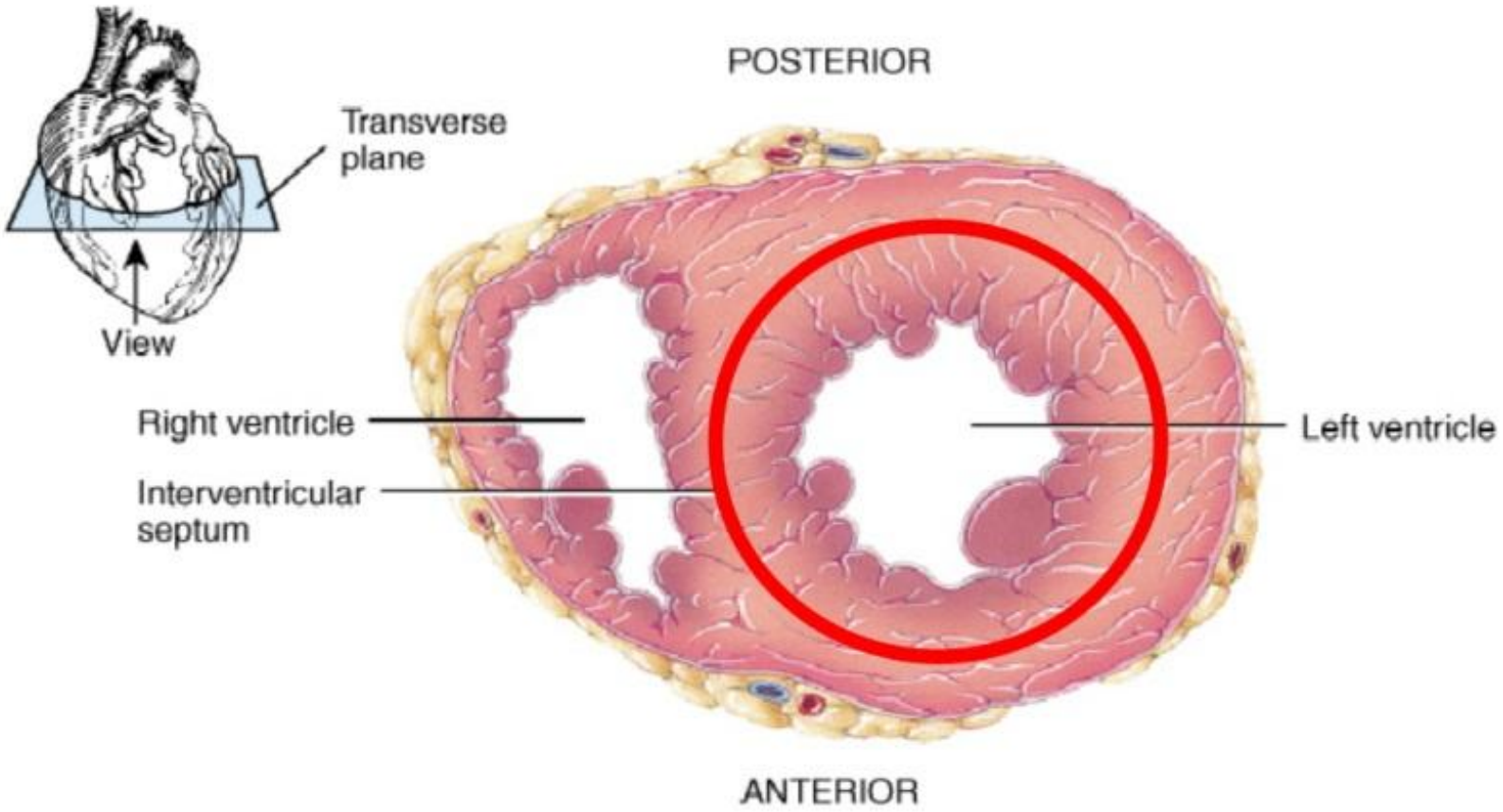
Skeleton of the heart including fibrous rings around valves
Pulmonary semilunar valve
Aortic semilunar valve
Bicuspid valve
Tricuspid valve
Cardiac muscle of the right ventricle
Cardiac muscle of the left ventricle


Cardiac muscle bundles


Valves
Pulmonary
Tricuspid
Aorta
Mitral
Sinospiral
Muscles
Bulbospiral

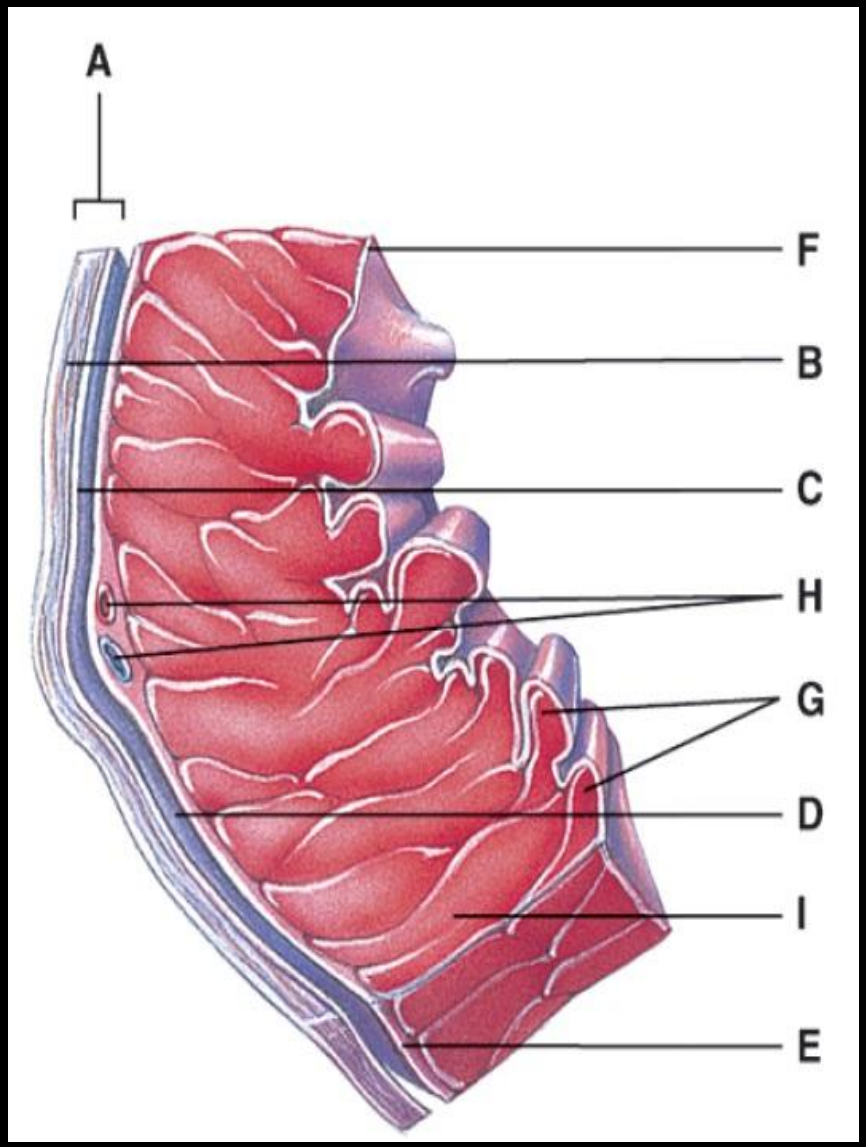

Наружный слой миокарда
Vv. pulmonales superior et inferior sinistrae
Vv. pulmonales superior et inferior dextrae
V. cava superior
Auricula sinistra
A. coronaria sinistra
Aorta
Valvula semilunaris sinistra trunci pulmonalis
A. coronaria dextra
Valvula semilunaris dextra trunci pulmonalis
Valvula semilunaris anterior trunci pulmonalis
Conus arteriosus
Auricula dextra
Ventriculus sinister
Sulcus coronarius
Ventriculus dexter
Apex cordis
Vortex cordis
Sulcus interventricularis anterior

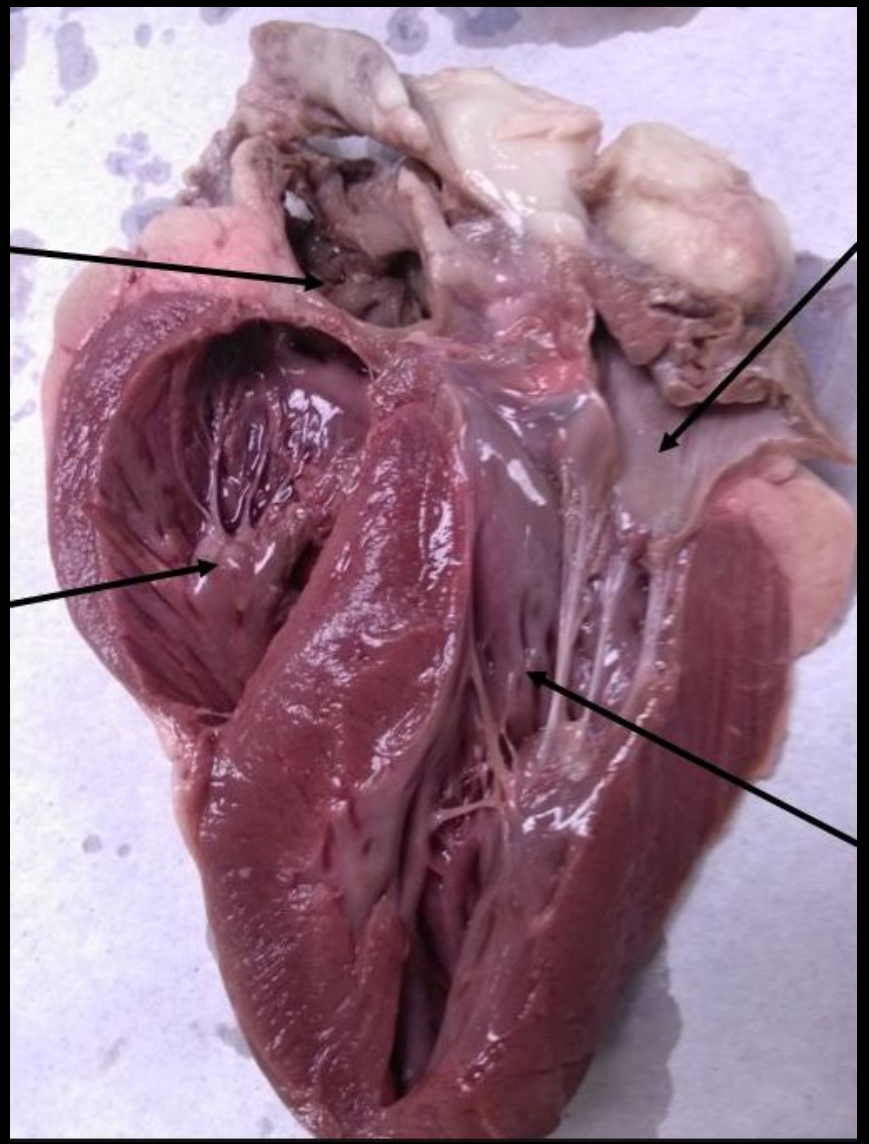
Thickness of Cardiac Walls



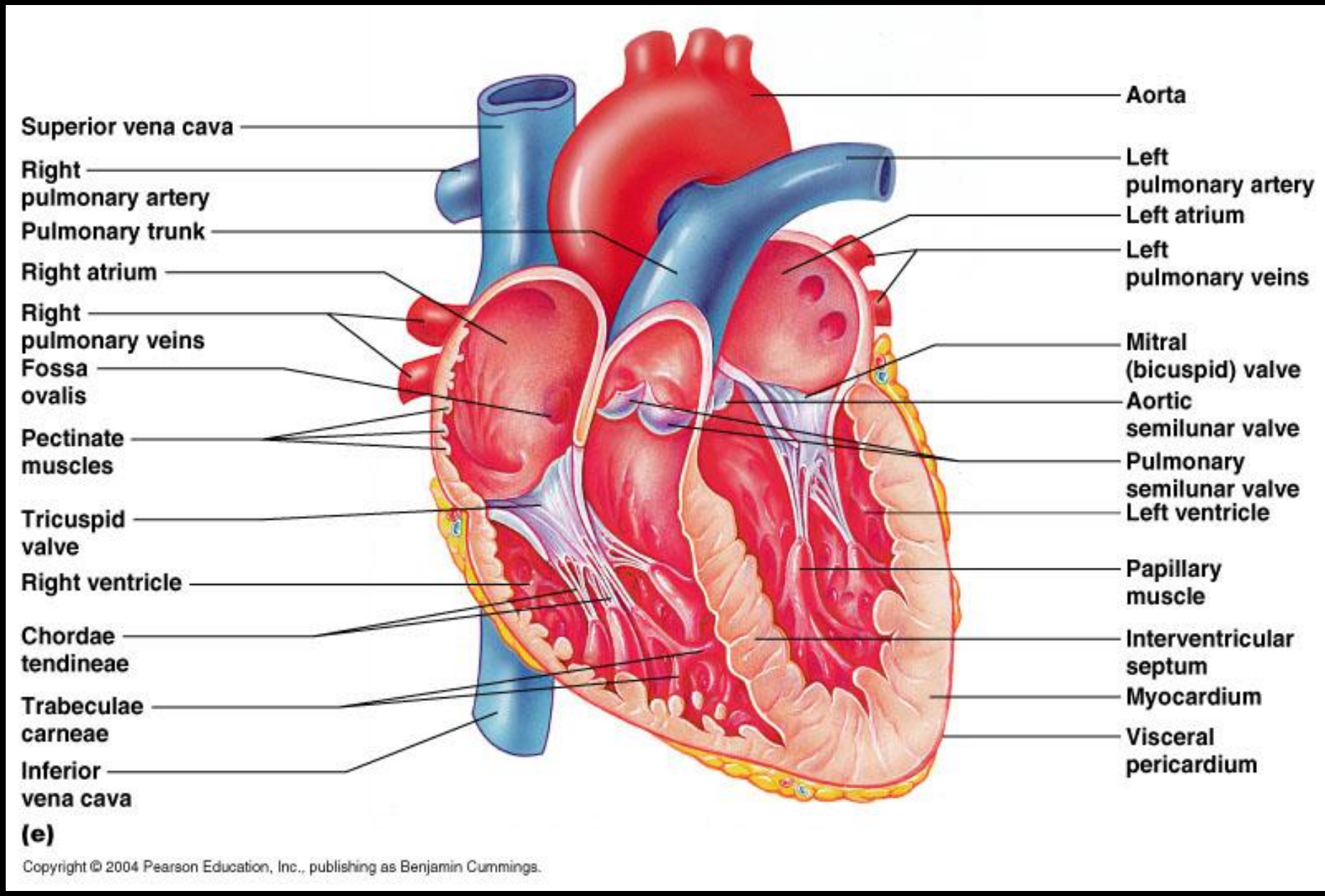
Myocardium of left ventricle is much thicker than the right.

ENDOCARDIUM

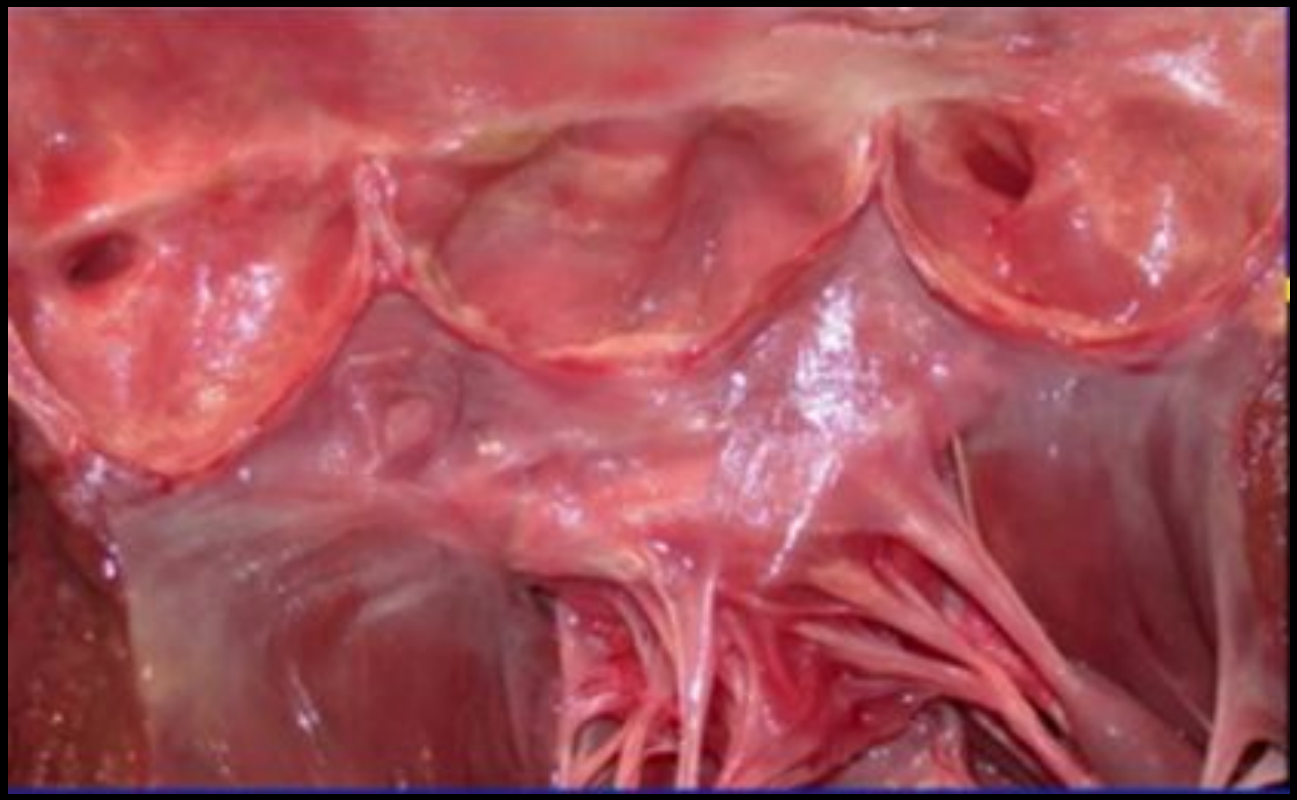




VALVES

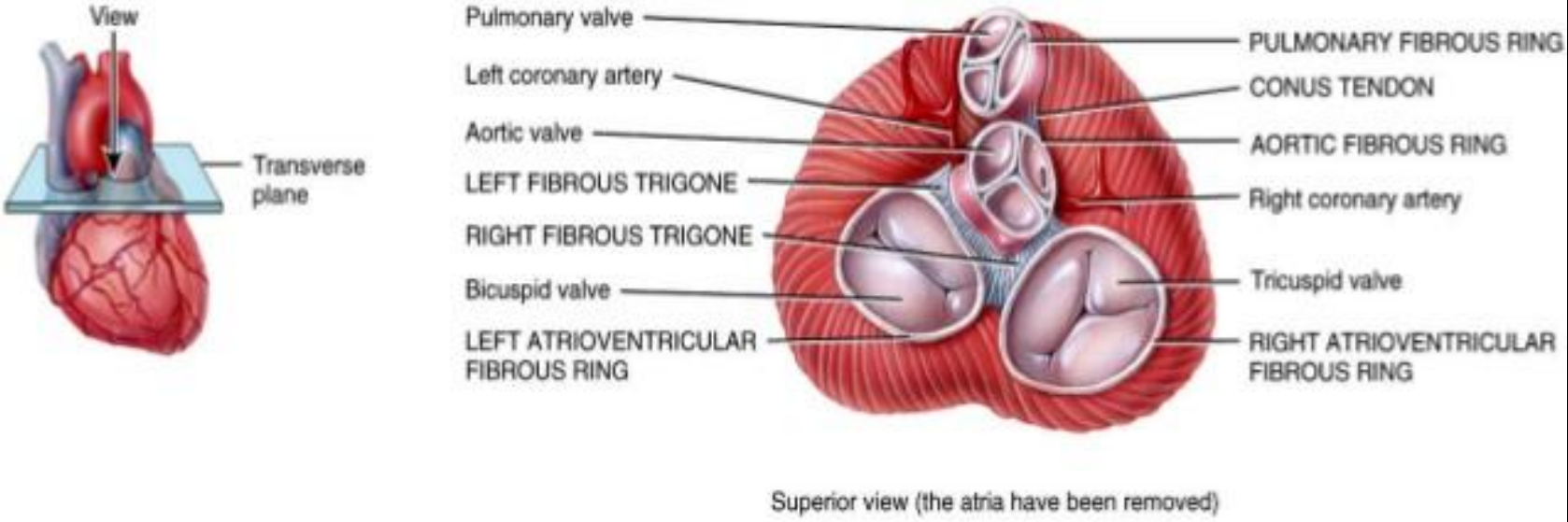


VALVES



STRUCTURE

Fibrous Skeleton of Heart

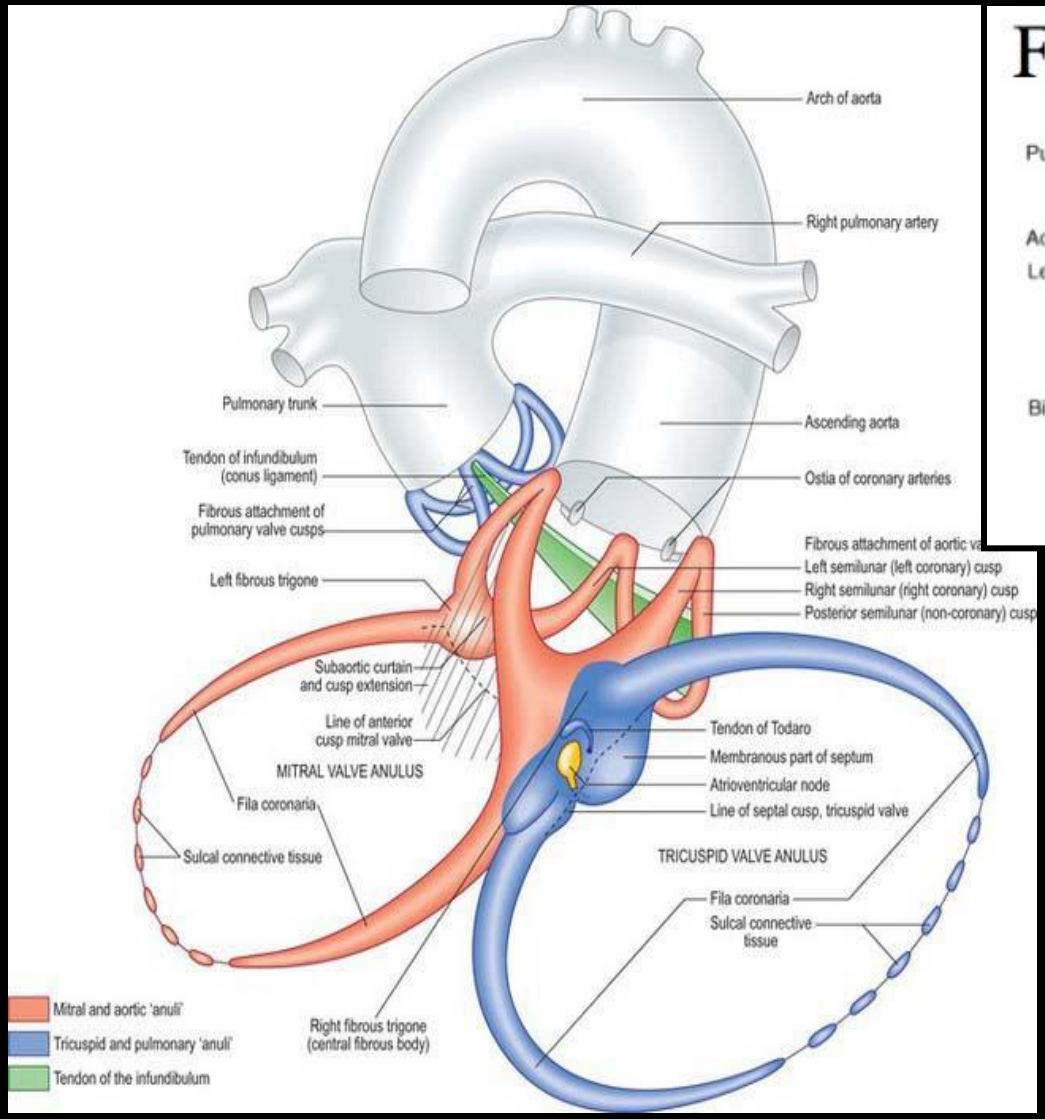


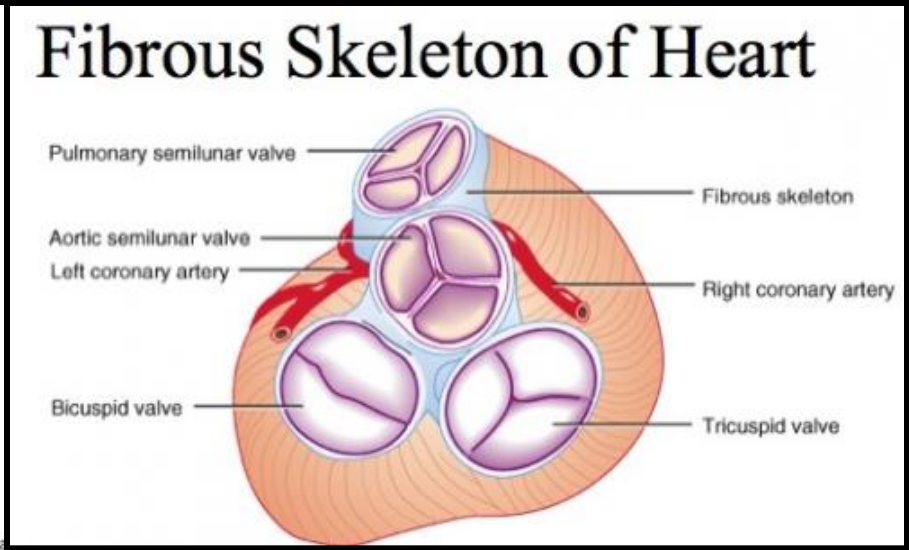
Superior view (the atria have been removed)

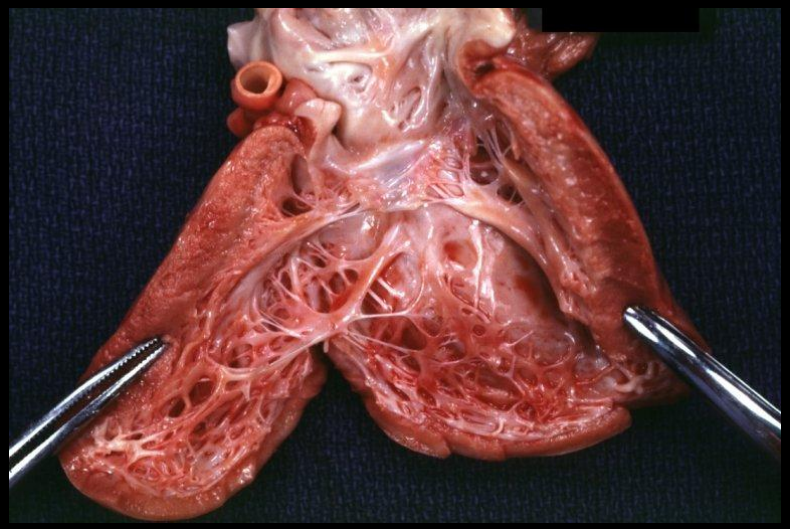
Dense CT rings surround heart **valves**
- fuse together & merge with interventricular septum

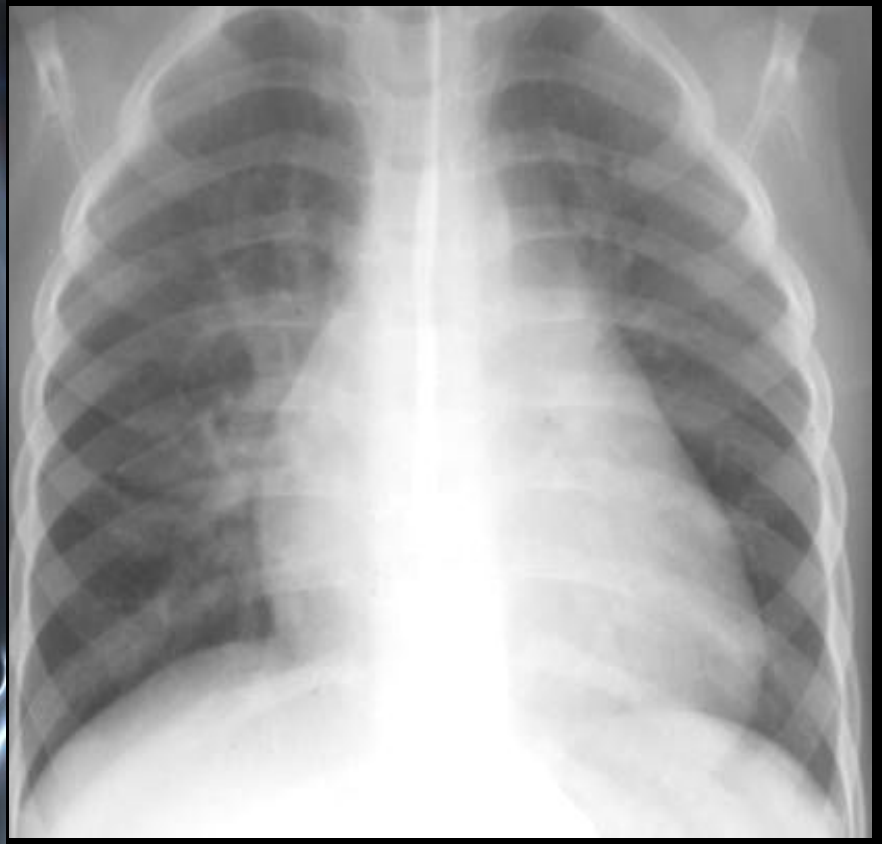
Functions of fibrous skeleton:
- valve support structure
- Prevents overstretching of the valves
- insertion point for cardiac muscle bundles
- electrical insulator b/w atria & ventricles

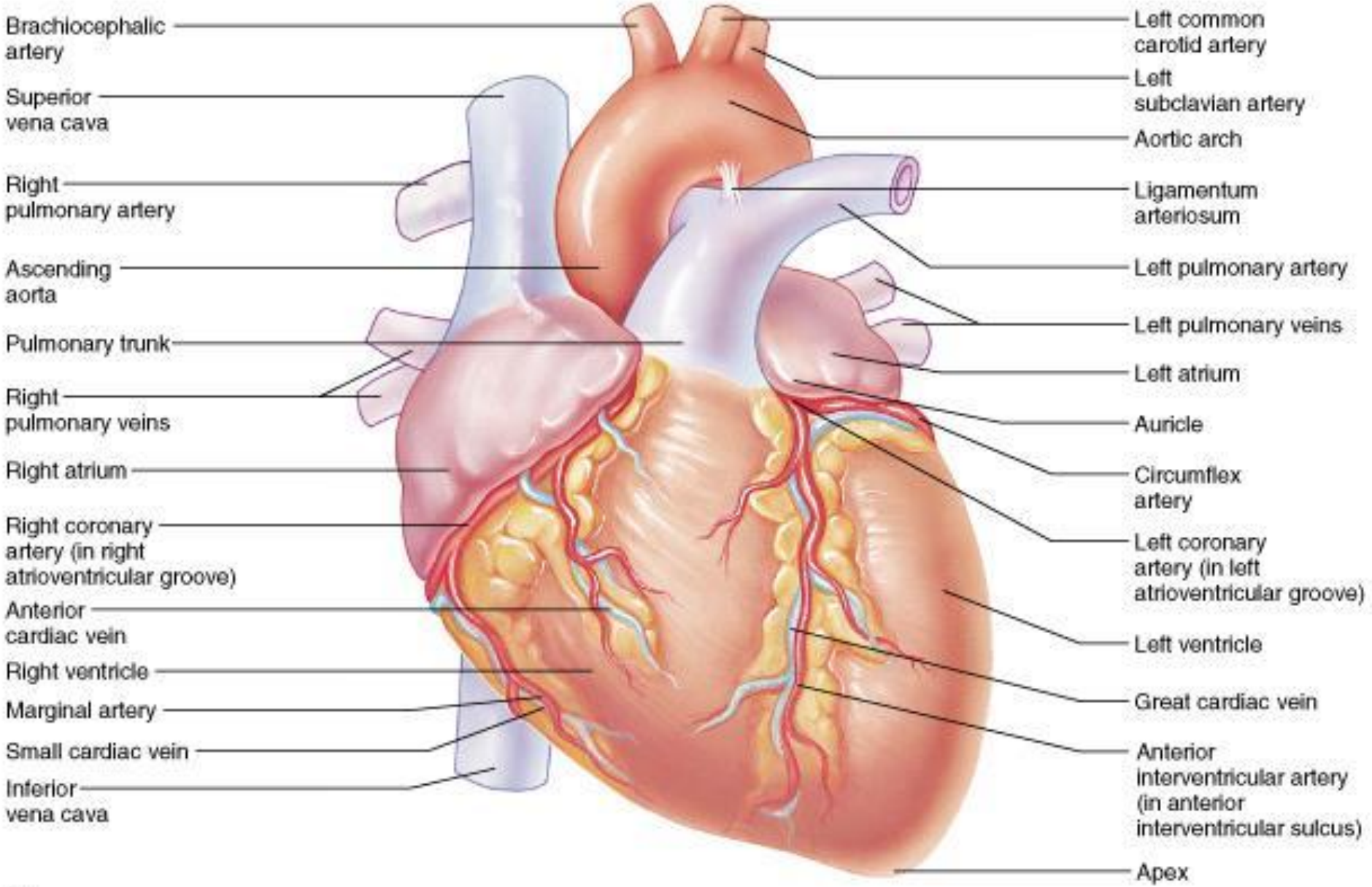
STRUCTURE


Arch of aorta
Right pulmonary artery
Pulmonary trunk
Ascending aorta
Tendon of infundibulum (conus ligament)
Ostia of coronary arteries
Fibrous attachment of pulmonary valve cusps
Fibrous attachment of aortic va
Left semilunar (left coronary) cusp
Right semilunar (right coronary) cusp
Posterior semilunar (non-coronary) cusp
Left fibrous trigone
Subaortic curtain and cusp extension
Line of anterior cusp mitral valve
Tendon of Todaro
Membranous part of septum
Atrioventricular node
Line of septal cusp, tricuspid valve
MITRAL VALVE ANULUS
Fila coronaria
Sulcal connective tissue
TRICUSPID VALVE ANULUS
Fila coronaria
Sulcal connective tissue
Mitral and aortic 'anuli'
Tricuspid and pulmonary 'anuli'
Tendon of the infundibulum
Right fibrous trigone (central fibrous body)


Fibrous Skeleton of Heart
Pulmonary semilunar valve
Fibrous skeleton
Aortic semilunar valve
Left coronary artery
Right coronary artery
Bicuspid valve
Tricuspid valve







(b)