FAQs,MCQs and Viva Voce

Frequently Asked Questions — Pericardium, Heart, and Foetal Circulation

1. What are the coverings of the heart?

- The heart is enclosed in the **pericardium**, which has:
  - **Fibrous pericardium** (outer tough layer)
  - **Serous pericardium** (inner layer with parietal and visceral parts)
- The **visceral layer** forms the **epicardium**.

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2. What is the function of the pericardium?

- It **fixes the heart's position** within the mediastinum.
- **Prevents overdistension** during sudden volume increase.
- Provides **lubrication** for friction-free movement during contraction.
- Protects the heart from **infection spread** from nearby structures.

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3. What are the contents of the pericardial cavity?

- A thin film of **serous fluid (~20–50 ml)** that allows smooth cardiac movement.

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4. What are the sinuses of the pericardium?

- **Transverse sinus:** Between aorta/pulmonary trunk and SVC/left atrium — used for **surgical clamping** in bypass surgery.
- **Oblique sinus:** Blind sac behind the left atrium, between pulmonary veins.

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5. What is cardiac tamponade?

- Rapid accumulation of fluid in pericardial cavity compressing the heart.
- Prevents diastolic filling ? ? cardiac output.
- **Beck's triad:** Hypotension, muffled heart sounds, distended neck veins.

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6. What is pericardiocentesis and where is it performed?

- **Procedure:** Aspiration of pericardial fluid for diagnosis or to relieve tamponade.
- **Site:** Left 5th or 6th intercostal space close to the sternum (needle directed upward and backward).

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7. What are the chambers of the heart and their functions?

- **Right atrium:** Receives deoxygenated blood from body.
- **Right ventricle:** Pumps blood to lungs.
- **Left atrium:** Receives oxygenated blood from lungs.
- **Left ventricle:** Pumps blood to systemic circulation.

8. Which part of the heart forms the apex, base, and borders?

- **Apex:** Left ventricle (5th left intercostal space).
- **Base:** Left atrium (posterior surface).
- **Right border:** Right atrium.
- **Left border:** Left ventricle and auricle.
- **Inferior border:** Right ventricle.

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9. What is coronary dominance?

- Determined by which artery gives rise to the **posterior interventricular artery**.
  - **Right dominance:** RCA (70%).
  - **Left dominance:** LCX (10%).
  - **Co-dominance:** Both (20%).

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10. What are the main branches of the coronary arteries?

- **RCA:** SA nodal, marginal, posterior interventricular.
- **LCA:** Anterior interventricular (LAD), circumflex, diagonal.

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11. Which coronary artery is most commonly affected in myocardial infarction?

- **Left anterior descending (LAD)** — often called the "**widow-maker artery**".

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12. What is the conducting system of the heart?

- **SA node ? AV node ? AV bundle (Bundle of His) ? Right & Left bundle branches ? Purkinje fibers**.

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13. What are the heart sounds and what causes them?

- **S? (First sound):** Closure of **mitral and tricuspid valves**.
- **S? (Second sound):** Closure of **aortic and pulmonary valves**.
- **S?:** Ventricular filling sound (abnormal in adults).
- **S?:** Atrial contraction sound (pathological).

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14. What is angina pectoris?

- Chest pain due to **transient myocardial ischemia** without cell death.
- Triggered by exertion; relieved by **rest or nitroglycerin**.

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15. What is myocardial infarction (MI)?

- **Irreversible necrosis** of cardiac muscle due to coronary artery occlusion.
- Symptoms: Severe chest pain, sweating, nausea, radiating pain to left arm.

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16. What are the fetal shunts and their functions?

- **Foramen ovale:** Bypasses pulmonary circulation (RA ? LA).
- **Ductus arteriosus:** Connects pulmonary trunk and aorta.
- **Ductus venosus:** Bypasses liver to join IVC.

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17. What changes occur in fetal circulation after birth?

- **Lungs expand ? pulmonary pressure falls ? left atrial pressure rises ? foramen ovale closes.**
- **Ductus arteriosus** ? *ligamentum arteriosum*.
- **Umbilical vein** ? *ligamentum teres hepatis*.
- **Ductus venosus** ? *ligamentum venosum*.
- **Umbilical arteries** ? *medial umbilical ligaments*.

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18. What is patent ductus arteriosus (PDA)?

- Persistence of ductus arteriosus postnatally ? **left-to-right shunt**.
- Produces a continuous **machinery murmur** at 2nd left intercostal space.

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19. What are common congenital heart diseases?

- **Acyanotic (L?R shunt):** ASD, VSD, PDA.

- **Cyanotic (R?L shunt):** Tetralogy of Fallot, Transposition of great vessels.

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20. What are the features of Tetralogy of Fallot?

- Pulmonary stenosis
- Right ventricular hypertrophy
- Overriding aorta
- Ventricular septal defect
  ? Results in **cyanosis and squatting attacks**.

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21. What is the embryological origin of the smooth and rough parts of atria?

- **Right atrium:**
  - Smooth part ? right horn of sinus venosus.
  - Rough part ? primitive atrium.
- **Left atrium:**
  - Smooth part ? absorbed pulmonary veins.
  - Rough part ? primitive atrium.

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22. What are the components of the fibrous skeleton of the heart?

- **Four fibrous rings** around valve orifices.

- **Right and left fibrous trigones** connecting them.
- Provides **electrical insulation** between atria and ventricles.

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23. Why is the left ventricle thicker than the right?

- It pumps blood into the **systemic circulation**, which has higher resistance than pulmonary circulation.

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24. What is the nerve supply of the heart?

- **Sympathetic (T1–T5):** Increases heart rate and contractility.
- **Parasympathetic (Vagus nerve):** Decreases heart rate.
- Both contribute to **cardiac plexuses** (superficial and deep).

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25. What is the most common site for referred cardiac pain?

- **Left shoulder, arm, neck, and jaw** (T1–T5 dermatomes).

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26. What is the significance of the transverse pericardial sinus in surgery?

- It allows **clamping of aorta and pulmonary trunk** during open-heart surgery for cardiopulmonary bypass.

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27. What is the significance of coronary dominance in heart disease?

- Determines which artery supplies the **posterior interventricular septum and AV node**, influencing the **area of infarction** and **type of heart block**.

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28. What are the differences between fetal and adult circulation?

FETAL CIRCULATION	ADULT CIRCULATION
Oxygenation via placenta	Oxygenation via lungs
Presence of fetal shunts	Shunts closed
Umbilical vessels present	Ligaments formed postnatally

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29. What is the embryological basis of dextrocardia?

- **Abnormal looping of heart tube** to the left instead of right ? heart positioned on right side.

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30. What are the postnatal remnants of fetal vessels?

FOETAL VESSEL	ADULT REMNANT
Ductus arteriosus	Ligamentum arteriosum
Ductus venosus	Ligamentum venosum
Umbilical vein	Ligamentum teres hepatis
Umbilical arteries	Medial umbilical ligaments

Multiple Choice Questions (MCQs) — Pericardium, Heart, and Foetal Circulation

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1. The fibrous pericardium is derived from which embryonic structure?

A. Somatopleuric mesoderm
B. Splanchnopleuric mesoderm
C. Pleuropericardial membrane
D. Neural crest cells
? Answer: C. Pleuropericardial membrane

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2. The pericardial cavity contains:

A. 20–50 ml of serous fluid
B. 100 ml of blood
C. 150 ml of lymph
D. Air-filled space
? Answer: A. 20–50 ml of serous fluid

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3. The apex of the heart lies at:

A. 4th left intercostal space
B. 5th left intercostal space
C. 6th left intercostal space
D. 5th right intercostal space
? Answer: B. 5th left intercostal space

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4. The base of the heart is mainly formed by:

A. Right atrium
B. Left atrium
C. Left ventricle
D. Right ventricle
? Answer: B. Left atrium

5. The most common site for pericardiocentesis is:

A. Right 2nd intercostal space
B. Left 5th intercostal space close to sternum
C. 3rd left intercostal space in midclavicular line
D. 6th right intercostal space
? Answer: B. Left 5th intercostal space close to sternum

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6. The artery most commonly occluded in myocardial infarction is:

A. Right coronary artery
B. Left anterior descending artery
C. Left circumflex artery
D. Posterior interventricular artery
? Answer: B. Left anterior descending artery

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7. The SA node is located in:

A. Interatrial septum
B. Crista terminalis near SVC opening
C. Near AV valve
D. Apex of right atrium
? Answer: B. Crista terminalis near SVC opening

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8. The AV node is located in:

A. Interventricular septum
B. Floor of right atrium near coronary sinus
C. Apex of right ventricle
D. Wall of left atrium
? Answer: B. Floor of right atrium near coronary sinus

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9. The bundle of His passes through:

A. Membranous interventricular septum

B. Muscular interventricular septum

C. Aortic valve

D. Left atrial wall

? Answer: A. Membranous interventricular septum

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10. The coronary sinus opens into:

A. Right ventricle

B. Left atrium

C. Right atrium

D. Left ventricle

? Answer: C. Right atrium

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11. The valve present at the coronary sinus opening is called:

A. Eustachian valve

B. Thebesian valve

C. Mitral valve

D. Pulmonary valve

? Answer: B. Thebesian valve

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12. The smooth part of the right atrium is derived from:

A. Sinus venosus (right horn)

B. Primitive atrium

C. Primitive ventricle

D. Conus cordis

? Answer: A. Sinus venosus (right horn)

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13. The rough part of the left atrium is formed by:

A. Primitive atrium

B. Pulmonary veins

C. Sinus venosus

D. Primitive ventricle

? Answer: A. Primitive atrium

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14. The moderator band (septomarginal trabecula) is found in:

A. Left atrium

B. Right ventricle

C. Left ventricle

D. Right atrium

? Answer: B. Right ventricle

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15. Which structure is derived from the truncus arteriosus?

A. Ascending aorta and pulmonary trunk

B. Left ventricle

C. Coronary sinus

D. Sinus venosus

? Answer: A. Ascending aorta and pulmonary trunk

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16. The thickest chamber of the heart is:

A. Right atrium

B. Right ventricle

C. Left atrium

D. Left ventricle

? Answer: D. Left ventricle

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17. The foramen ovale is located in:

A. Interventricular septum

B. Interatrial septum

C. Right atrial wall

D. Left ventricular wall

? Answer: B. Interatrial septum

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18. The foramen ovale becomes what after birth?

A. Ligamentum arteriosum
B. Ligamentum venosum
C. Fossa ovalis
D. Ligamentum teres hepatis
? Answer: C. Fossa ovalis

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19. The ductus arteriosus connects:

A. Aorta and left atrium
B. Pulmonary trunk and aorta
C. Right ventricle and aorta
D. SVC and pulmonary vein
? Answer: B. Pulmonary trunk and aorta

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20. The ductus arteriosus becomes what after birth?

A. Ligamentum arteriosum
B. Ligamentum venosum
C. Ligamentum teres hepatis
D. Medial umbilical ligament
? Answer: A. Ligamentum arteriosum

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21. The ductus venosus connects:

A. Umbilical vein and IVC
B. IVC and SVC
C. Portal vein and hepatic vein
D. Left atrium and right atrium
? Answer: A. Umbilical vein and IVC

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22. The ductus venosus becomes:

A. Ligamentum teres hepatis
B. Ligamentum venosum
C. Medial umbilical ligament
D. Ligamentum arteriosum
? Answer: B. Ligamentum venosum

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23. Umbilical vein becomes:

A. Ligamentum teres hepatis
B. Ligamentum venosum
C. Medial umbilical ligament
D. Coronary ligament
? Answer: A. Ligamentum teres hepatis

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24. Umbilical arteries become:

A. Medial umbilical ligaments
B. Ligamentum venosum
C. Ligamentum teres
D. Round ligament of uterus
? Answer: A. Medial umbilical ligaments

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25. The first functional closure after birth occurs in:

A. Foramen ovale
B. Ductus venosus
C. Ductus arteriosus
D. Umbilical arteries
? Answer: A. Foramen ovale

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26. The commonest congenital heart disease is:

A. ASD
B. VSD
C. PDA

D. Tetralogy of Fallot

? Answer: B. VSD

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27. The most common cyanotic congenital heart disease is:

A. VSD

B. Tetralogy of Fallot

C. PDA

D. ASD

? Answer: B. Tetralogy of Fallot

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28. The characteristic murmur of PDA is:

A. Systolic murmur

B. Diastolic murmur

C. Continuous machinery murmur

D. Ejection click

? Answer: C. Continuous machinery murmur

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29. The right coronary artery supplies which part of the conduction system?

A. SA and AV nodes (majority)

B. SA node only

C. AV node only

D. Purkinje fibers

? Answer: A. SA and AV nodes (majority)

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30. The left coronary artery supplies which part of the septum?

A. Posterior one-third

B. Anterior two-thirds

C. Entire septum

D. None

? Answer: B. Anterior two-thirds

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31. Which artery determines coronary dominance?

A. Artery giving posterior interventricular branch
B. Artery supplying left ventricle
C. Artery supplying right ventricle
D. Circumflex artery
? Answer: A. Artery giving posterior interventricular branch

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32. Which of the following is not a branch of RCA?

A. SA nodal artery
B. Right marginal artery
C. Circumflex artery
D. Posterior interventricular artery
? Answer: C. Circumflex artery

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33. Which vein drains the anterior interventricular area?

A. Great cardiac vein
B. Middle cardiac vein
C. Small cardiac vein
D. Anterior cardiac vein
? Answer: A. Great cardiac vein

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34. Which valve prevents backflow of blood from left ventricle to left atrium?

A. Tricuspid
B. Pulmonary
C. Aortic
D. Mitral
? Answer: D. Mitral

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35. Which valve prevents backflow from aorta to left ventricle?

A. Aortic valve

B. Pulmonary valve

C. Tricuspid valve

D. Mitral valve

? Answer: A. Aortic valve

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36. Which layer of the heart is responsible for contractile function?

A. Endocardium

B. Myocardium

C. Epicardium

D. Fibrous skeleton

? Answer: B. Myocardium

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37. Which is the pacemaker of the heart?

A. SA node

B. AV node

C. Bundle of His

D. Purkinje fibers

? Answer: A. SA node

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38. Which nerve causes bradycardia when stimulated?

A. Phrenic

B. Vagus

C. Sympathetic

D. Intercostal

? Answer: B. Vagus

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39. Which structure carries oxygenated blood in fetal life?

A. Umbilical artery

B. Umbilical vein

C. Ductus arteriosus

D. Ductus venosus

? Answer: B. Umbilical vein

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40. Which structure closes to form the ligamentum arteriosum after birth?

A. Ductus venosus

B. Ductus arteriosus

C. Foramen ovale

D. Umbilical vein

? Answer: B. Ductus arteriosus

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41. Which shunt connects the pulmonary trunk and aorta in fetal life?

A. Ductus arteriosus

B. Ductus venosus

C. Foramen ovale

D. Sinus venosus

? Answer: A. Ductus arteriosus

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42. Which shunt connects right atrium and left atrium in fetal life?

A. Foramen ovale

B. Ductus venosus

C. Ductus arteriosus

D. Umbilical artery

? Answer: A. Foramen ovale

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43. The fetal structure bypassing liver circulation is:

A. Ductus venosus

B. Foramen ovale

C. Ductus arteriosus

D. Umbilical artery

? Answer: A. Ductus venosus

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44. The first heart sound (S?) is due to closure of:

A. Mitral and tricuspid valves
B. Aortic and pulmonary valves
C. Tricuspid and pulmonary valves
D. Aortic and mitral valves
? Answer: A. Mitral and tricuspid valves

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45. The second heart sound (S?) is due to closure of:

A. Aortic and pulmonary valves
B. Mitral and tricuspid valves
C. Mitral and pulmonary valves
D. Tricuspid and aortic valves
? Answer: A. Aortic and pulmonary valves

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46. The “machinery murmur” is heard in:

A. ASD
B. PDA
C. VSD
D. Tetralogy of Fallot
? Answer: B. PDA

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47. The “blue baby” syndrome occurs in:

A. Acyanotic heart disease
B. Cyanotic heart disease
C. Valvular stenosis only
D. Pericarditis
? Answer: B. Cyanotic heart disease

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48. The wall between the ventricles is called:

A. Interventricular septum
B. Interatrial septum
C. Atrioventricular septum
D. None
? Answer: A. Interventricular septum

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49. The blood supply of the SA node is most commonly from:

A. Right coronary artery
B. Left coronary artery
C. Circumflex artery
D. Aortic arch
? Answer: A. Right coronary artery

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50. The condition with right-to-left shunt causing cyanosis is:

A. Tetralogy of Fallot
B. PDA
C. ASD
D. VSD
? Answer: A. Tetralogy of Fallot

Viva Voce — Pericardium, Heart, and Foetal Circulation

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1. What are the layers of the pericardium?

- **Fibrous pericardium** — outer tough layer.
- **Serous pericardium** — inner layer divided into **parietal** and **visceral (epicardium)** layers.

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2. What is found between the layers of the serous pericardium?

- The **pericardial cavity**, containing a thin film of **serous fluid (20–50 ml)** that reduces friction during heart movements.

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3. What are the functions of the pericardium?

- Fixes the heart within the mediastinum.
- Prevents overdistension during diastole.
- Provides lubrication for smooth cardiac movement.
- Limits spread of infection from nearby structures.

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4. What are the pericardial sinuses?

- **Transverse sinus:** Lies between great arteries (aorta, pulmonary trunk) and veins (SVC, pulmonary veins).
- **Oblique sinus:** Behind left atrium between pulmonary veins.

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5. What is the clinical importance of the transverse sinus?

- During **cardiac surgery**, it allows the surgeon to pass a clamp or finger between the aorta and pulmonary trunk for **cardiopulmonary bypass**.

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6. What is cardiac tamponade?

- Life-threatening condition where **fluid or blood accumulates** in the pericardial cavity, compressing the heart and reducing diastolic filling.

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7. What is the procedure to relieve cardiac tamponade?

- **Pericardiocentesis** — aspiration of pericardial fluid.
- Commonly done at the **left 5th intercostal space near the sternum**.

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8. Which chambers form the borders of the heart on X-ray?

- **Right border:** Right atrium.
- **Left border:** Left ventricle and auricle.
- **Inferior border:** Right ventricle.
- **Superior border:** Great vessels and atria.

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9. Which chamber forms the apex of the heart?

- **Left ventricle**, located at the **5th left intercostal space** in the midclavicular line.

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10. Which chamber forms the base of the heart?

- **Left atrium**, posteriorly placed and receiving **four pulmonary veins**.

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11. What is the function of the right atrium?

- Receives deoxygenated blood from **SVC, IVC, and coronary sinus**.

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12. What is the function of the right ventricle?

- Pumps **deoxygenated blood** into the **pulmonary trunk** for oxygenation in the lungs.

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13. What is the function of the left atrium?

- Receives **oxygenated blood** from the lungs via **four pulmonary veins**.

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14. What is the function of the left ventricle?

- Pumps **oxygenated blood** into the **aorta** to supply the systemic circulation.

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15. Which is the thickest chamber of the heart? Why?

- **Left ventricle**, because it pumps blood against **systemic resistance** (high pressure).

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16. What is the fibrous skeleton of the heart?

- Framework of **four fibrous rings** surrounding valve orifices, connected by **fibrous trigones** — provides electrical insulation between atria and ventricles.

---

17. What is the conducting system of the heart?

- **SA node ? AV node ? Bundle of His ? Right and Left bundle branches ? Purkinje fibers.**

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18. What is the pacemaker of the heart?

- **SA node (Sinoatrial node)** — initiates impulses that regulate heart rhythm.

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19. What is the blood supply of the SA node?

- Usually from the **right coronary artery (RCA)** in 60–70% of individuals.

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20. What is coronary dominance?

- Determined by which coronary artery gives the **posterior interventricular branch**.
    - Right dominance — RCA (70%)
    - Left dominance — LCA (10%)
    - Co-dominance — both (20%)

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21. What are the branches of the right coronary artery (RCA)?

- SA nodal, right marginal, posterior interventricular, AV nodal branches.

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22. What are the branches of the left coronary artery (LCA)?

- **Anterior interventricular (LAD)**, **circumflex**, and **diagonal branches**.

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23. Which coronary artery is most commonly affected in myocardial infarction?

- **Left anterior descending (LAD) artery**, also called the "**widow-maker**".

---

24. What is angina pectoris?

- Pain due to **transient myocardial ischemia** without infarction, often triggered by exertion.

---

25. What is myocardial infarction?

- Death (necrosis) of cardiac muscle due to **coronary artery occlusion**.

---

26. What are the heart sounds and what causes them?

- **S?:** Closure of AV valves (mitral & tricuspid).
- **S?:** Closure of semilunar valves (aortic & pulmonary).
- **S? & S?:** Abnormal in adults (ventricular filling sounds).

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27. What are the fetal shunts?

- **Foramen ovale** — between atria.
- **Ductus arteriosus** — between pulmonary trunk and aorta.
- **Ductus venosus** — bypasses liver.

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28. What are the adult remnants of fetal shunts?

- **Foramen ovale ? Fossa ovalis**

- **Ductus arteriosus ? Ligamentum arteriosum**
- **Ductus venosus ? Ligamentum venosum**
- **Umbilical vein ? Ligamentum teres hepatis**
- **Umbilical arteries ? Medial umbilical ligaments**

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29. What is the most common congenital heart disease?

- **Ventricular septal defect (VSD).**

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30. What is the most common cyanotic congenital heart disease?

- **Tetralogy of Fallot** (VSD, pulmonary stenosis, overriding aorta, RV hypertrophy).

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31. Why does referred pain occur in angina pectoris?

- Cardiac pain fibers travel via **sympathetic nerves (T1–T5)** ? pain felt in **left arm, shoulder, and jaw**.

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32. What is the nerve supply of the heart?

- **Sympathetic (T1–T5):** Increases rate and force.
- **Parasympathetic (vagus):** Decreases rate and force.
- Both form **cardiac plexuses**.

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33. What are the cardiac plexuses?

- **Superficial plexus:** Below aortic arch.
- **Deep plexus:** In front of tracheal bifurcation.
- Both carry sympathetic and parasympathetic fibers.

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34. What happens to ductus arteriosus after birth?

- Closes functionally within hours and anatomically within days ? **ligamentum arteriosum**.

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35. What is patent ductus arteriosus (PDA)?

- Persistence of ductus arteriosus after birth causing **left-to-right shunt** and a **machinery murmur**.

---

36. What is the embryological origin of the smooth and rough parts of atria?

- **Right atrium:**
  - Smooth ? Right horn of sinus venosus.
  - Rough ? Primitive atrium.
- **Left atrium:**
  - Smooth ? Pulmonary veins.
  - Rough ? Primitive atrium.

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37. What is dextrocardia?

- A congenital anomaly where the heart is located on the **right side** due to **abnormal looping** during development.

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38. What is the function of the cardiac skeleton?

- Supports valve openings, prevents overstretching, and provides **electrical insulation** between atria and ventricles.

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39. Which fetal structure carries oxygenated blood?

- **Umbilical vein** — carries oxygenated blood from placenta to fetus.

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40. Which fetal structure carries deoxygenated blood to placenta?

- **Umbilical arteries.**

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41. What causes closure of foramen ovale after birth?

- Increased **left atrial pressure** due to lung expansion ? fusion of septum primum and secundum ? **fossa ovalis**.

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42. What is the ligamentum teres hepatis derived from?

- **Umbilical vein** of the fetus.

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43. What is the ligamentum venosum derived from?

- **Ductus venosus**.

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44. What is the ligamentum arteriosum derived from?

- **Ductus arteriosus.**

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45. What is the most common site of referred cardiac pain?

- **Left shoulder and arm (T1–T5 dermatomes).**

---

46. Why is the left ventricle thicker than the right?

- It pumps blood into the **systemic circulation**, which requires greater pressure.

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47. What is the “widow-maker” artery and why is it called so?

- **Left anterior descending (LAD)** artery — supplies major part of left ventricle; its occlusion causes fatal infarction.

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48. What are the major cardiac valves and their positions?

- **Mitral** – left 5th intercostal space midclavicular line.
- **Tricuspid** – right 4th/5th intercostal space near sternum.
- **Aortic** – right 2nd intercostal space.
- **Pulmonary** – left 2nd intercostal space.

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49. What is the clinical importance of the coronary sinus?

- Major venous drainage of heart; used in **retrograde cardioplegia** during cardiac surgery.

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50. What causes bradycardia?

- **Increased vagal tone** or **stimulation of the parasympathetic fibers** of the heart.