

PHYSIOLOGY

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



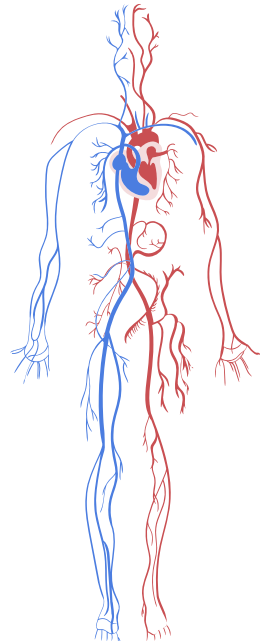
PAST PAPERS

وَلَقَدْ خَلَقْنَا الْإِنْسَانَ وَنَعْلَمُ مَا تُوَسْوِسُ بِهِ نَفْسُهُ وَنَحْنُ أَقْرَبُ إِلَيْهِ مِنْ حَبْلِ الْوَرِيدِ
اللهم إنا نعوذ بك من شرور أنفسنا ومن سيئات أعمالنا

Lectures(1-8)

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Lecture 1:

Intro

اللهم افتح عليّ فتوح العارفين، وعلمني ما ينفعني، وانفعني بما علمتني، وزدني علمًا

Q1: Regarding the heart, one of the following is not true:

- a. The heart muscle can be stimulated during the refractory period.
- b. The heart muscle cells connected to each other by gap junctions.
- c. The heart work as a pump for systemic and pulmonary circulation.
- d. The heart muscle is described by its myogenic activity.
- e. More than one answer is not true.

Answer:a

Lecture 2 :

Cardiac Muscle Physiology

اللهم إني استودعتك ما علمتني إياه فردّه إليّ حين حاجتي إليه ولا تنسيني إياه بفضلِكَ وكرمِكَ يا أرحم الراحمين

Q1: Your uncle was diagnosed with atrial fibrillation (A-fib), what is true about this condition?

- a. It's life threatening
- b. It increases ventricular filling
- c. Management includes anti-coagulants if not contraindicated

Answer: c

Q2: Concerning cardiac muscle excitation-contraction coupling. Cardiac muscle contraction requires Ca^{2+} from:

- a. Sarcoplasmic reticulum
- b. ECF from calcium channels
- c. Both SR and ECF

Answer: c

Q3: You're a researcher studying the Plateau phase of the action potential, which of the following is the correct statement regarding it?

- a. It allows time for relaxation between two action potentials
- b. Allows enough contraction to pump the blood
- c. Enough calcium to enter the cell
- d. Protects the heart from tetanus
- e. All of the above

Answer: e

Q4: In contrast to skeletal muscles, ventricular muscles are special in:

- A. Well-developed sarcoplasmic reticulum
- B. Small amount of mitochondria
- C. Presence of calcium in sarcoplasmic reticulum
- D. Presence of Gap junction
- E. Rich in T-tubules

Answer: d

Q5: Myocardial contractility is best corrected (correlated) with the intracellular concentration of :

- a. HCO_3^-
- b. Na^+
- c. Ca^{++}
- d. K^+
- e. Cl

Answer:c

Q6: Which of the following statements about cardiac muscle is most accurate:

- a. In cardiac muscle the initiation of the action potential causes an immediate opening of fast Ca^{++} channels (L type).
- b. Refractory period is shorter in cardiac muscle than in skeletal muscle.
- c. Cardiac muscle repolarization is fast and due to 5-times higher permeability of K permeability than in skeletal muscle.
- d. The strength and contraction of cardiac muscle depends on the amount of Ca^{+2} surrounding cardiac myocytes (extracellular) but in skeletal only intracellular Ca^{+2} .
- e. The T-tubules of cardiac muscle can store much less calcium than T-tubules in skeletal muscle.

Answer:d

Q7: One of the following regarding the cardiac muscle is incorrect:

- a. The refractory period is longer than the one in skeletal muscle.
- b. the pace maker control the heart rhythm.
- c. The cardiac muscle tetanize.
- d. The heart muscle work as a syncytium.
- e. All the mentioned are true.

Answer:c

Q8: The main source of energy for cardiac muscle:

Answer: Fatty acids

Q9: Tetanization doesn't occur in cardiac muscles due to:

- A. Na⁺ channels are inactivated & closed
- B. Short phase 2
- C. Slower repolarization

Answer:a

Q10: The function of positive inotropic agents is:

- A. Increase Ca^{++} intracellularly
- B. Decrease Ca^{++} intracellularly
- C. Decrease Na^{+} intracellularly

Answer:a

Lecture 3 :

Conduction System

اللهم إني أسألك فهم النبيين، وحفظ المرسلين، والملائكة المقربين

Q1: Which of the following combinations is true regarding the pacemaker action potential in the heart?

- a. Funny sodium channels (Lf) --> Phase 3
- b. T-Type Calcium Channel → Phase 0
- c. Potassium and Calcium channels → Plateau Phase
- d. Pacemaker action potential --> Very high threshold
- e. Pacemaker action potential is less negative than Cardiac action potential

Answer: e

Q2. An engineer that is attempting to design a pacemaker calls you and asks why the SA node is the pacemaker of the cell?

- a. It has the fastest conduction rate
- b. It has the fastest discharge rate
- c. It contains the most gap junctions
- d. Its intranodal fibers increase its threshold
- e. None of the above

Answer: b

Q3.About the cardiac conductivity, all the following are true EXCEPT:

- a. It is increased by sympathetic stimulation.
- b. It is slowest in the A-V node.
- c. It is slowest in the ventricular muscle.
- d. It is decreased by vagal stimulation.
- e. It is maximal in the Purkinje fibres.

Answer: c

Q4. Sympathetic stimulation causes all of the following EXCEPT:

- a. Positive inotropic action
- b. Decreases conduction time in AV node
- c. Decreases SA node K^+ permeability
- d. Decreases slope of phase 4 in SA node
- e. Increases heart rate

Answer: d

Q5. Which condition at the SA node decreases heart rate?

- a. ↑ Norepinephrine
- b. ↑ Calcium permeability
- c. ↑ $\text{Na}^+/\text{Ca}^{2+}$ permeability
- d. ↑ Potassium permeability
- e. ↓ Acetylcholine

Answer: d

Q6. AV node delay is due to:

- a. ↓ Number of gap junctions
- b. ↓ Na⁺ permeability
- c. ↑ K⁺ permeability
- d. ↓ Ca²⁺ permeability

Answer: a

Q7. SA node is the pacemaker because:

- a. Leakier to K^+
- b. Only Na^+ -leaky cells
- c. Reaches threshold fastest
- d. Location
- e. ANS connection

Answer: c

Q8. Important function of Purkinje system:

- a. Increase conduction
- b. No conduction role
- c. Increase force
- d. Amplify impulses
- e. Slow conduction

Answer: a

Q9. Sympathetic stimulation normally causes:

- a. ↓ atrial contractility (negative inotropy)
- b. ↓ AV node conduction (negative dromotropy)
- c. Ach release
- d. Negative chronotropy
- e. ↑ ventricular force (positive inotropy)

Answer: e

Q10. Slow-response AP SA node: leakiness to Na^+ occurs in:

- a. Phase 4
- b. Phase 0
- c. Phase 3
- d. Phase 4 and 0
- e. None

Answer: a

Q11. Caused by acetylcholine:

- a. $\uparrow$ Ca^{2+} permeability
- b. AV node depolarization
- c. $\downarrow$ SA node K^+ permeability
- d. Hyperpolarization of SA node
- e. $\uparrow$ HR

Answer: d

Q12. Highest conduction rate:

- a. AV bundle
- b. Ventricular muscle
- c. Anterior internodal pathway
- d. Atrial muscle
- e. Purkinje fibers

Answer: e

Q13. Most delay in conduction occurs in:

- a. SA node
- b. AV node
- c. Purkinje
- d. Bundle of His
- e. A+B

Answer: b

Q14. If SA node stops, which takes over?

- A. AV node
- B. Purkinje fibers
- C. Bundle of His
- D. Once SA has failed, death is the faith
- E. Parasympathetic stimulation can take over

Answer: a

Q15. Why is the SA node the pacemaker?

- a. Fastest conduction
- b. Fastest discharge rate
- c. Most gap junctions
- d. Higher threshold

Answer: b

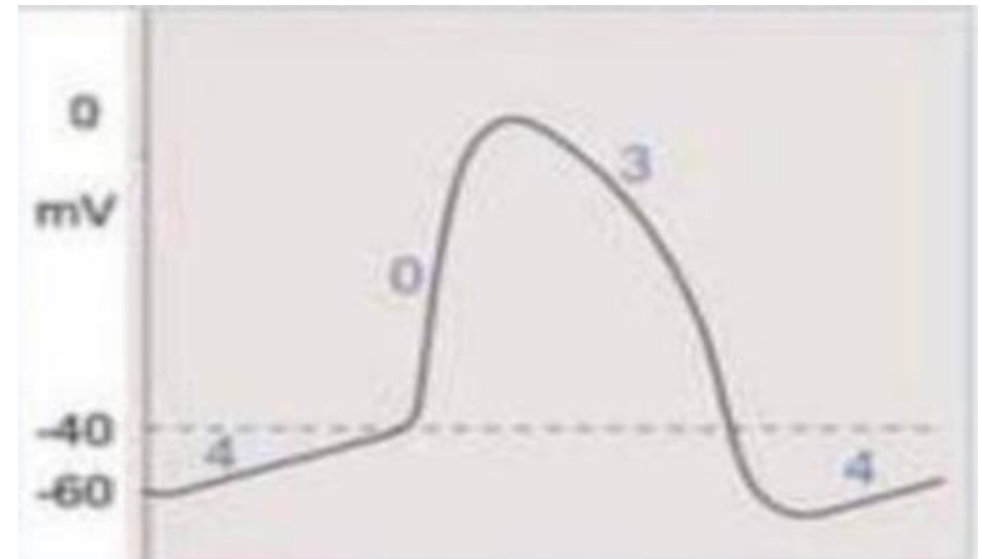
Q16. Which of the following best describes Stokes–Adams syndrome?

- A. Sudden episodes of fainting due to transient AV block with ventricular escape
- B. Persistent sinus bradycardia caused by increased vagal tone
- C. Irregularly irregular rhythm caused by chaotic atrial activity
- D. Rapid polymorphic ventricular tachycardia due to prolonged QT
- E. Failure of the SA node to depolarize the atria

Answer: a

Q17. The curve below represents the slow response action potential of the sinoatrial node of the conduction system. Which of the above phases is due to leakiness of the cells to Na^+ ions :

- A. Phase 4
- B. Phase 0
- C. Phase 3
- D. Phase 4 and 0
- E. None of the above



Answer: a

Q18. Sympathetic stimulation causes all of the following in the heart EXCEPT :

- A. It has a positive inotropic action on the heart.
- B. It decreases the conduction time in the atrioventricular (AV) node.
- C. It decreases the permeability of sinoatrial (SA) node to K^+ .
- D. It decreases the slope of phase 4 of the slow response potential of the SA node.
- E. It increases the heart rate.

Answer: d

Q19. The total time for transmission of the cardiac impulse from SA node to the last of the ventricular muscle fibers at the epicardial surface at the base of the heart normally is about:

- A. 0.22 sec
- B. 0.06 sec
- C. 0.03 sec
- D. 0.12 sec
- E. 0.60 sec

Answer: a

Lecture 4:

ECG

اللهم اجعل لساني عامرًا بذكرك، وقلبي بخشيتك، وسرّي بطاعتك، إنك على كل شيء قدير

Q1: While working in the emergency department, a student approached you and asked about the electrode placement in Lead 2, what's your answer?

- a. Positive electrode on left arm, negative electrode on right arm
- b. Negative electrode on left arm, positive electrode on left foot
- c. Negative electrode on heart, positive electrode on left foot
- d. Positive electrode on right arm, negative electrode on left foot
- e. Negative electrode on right arm, positive electrode on left foot

Answer: e

Q2: A 54-year-old man with a history of hypertension and hyperlipidemia came in for a routine ECG checkup. The attending physician pointed to a negative deflection at the beginning of the QRS complex on lead 1; the q wave. What explains the q wave?

Answer: Septal depolarization from left to right

Q3: On an actual ECG you noticed that T waves are not the exact opposite of QRS complex as they 'logically' should be , what is the explanation for this?

Answer: Repolarization happens at different speeds and patterns than depolarization

Q4: A 28-year-old woman came in with complaints of heart palpitations. ECG examination has found a prolonged QT interval, the attending physician asks you what waves/segments does the QT interval include?

- a. QRS complex alone
- b. QRS complex + ST segment
- c. QRS complex + ST segment + T wave
- d. PR segment + QRS complex
- e. None of the above

Answer: c

Q5: ECG wave is present only with:

- A. Incomplete depolarization & complete repolarization
- B. Complete depolarization & incomplete repolarization
- C. Incomplete depolarization & incomplete repolarization
- D. Complete depolarization & complete repolarization

Answer: c

Q6: The QRS voltage was 0.5 mV in lead I and 1.5 mV in lead III.
What is the QRS voltage in lead II:

- A. 2.5 mV
- B. 1.5 mV
- C. 1.0 mV
- D. 2.0 mV
- E. 0.5 mV

Answer: d

Q7: In the frontal plane when mean cardiac axis angle is $+55$, this will cause a large negative deflection in which lead:

- A. Lead II
- B. aVR
- C. aVL
- D. Lead III
- E. aVF

Answer: b

Mean cardiac axis $+55$, aVR is -150 , to find the most negative deflection find the axis most opposite of the mean cardiac axis

Q8: You have the following choices read them then answer the question that follows :

1) Lead I. 2) lead II. 3) lead III. 4) aVF. 5) aVR.

The mentioned above that are unipolar and read the electrical activity of the frontal plane of heart is/are:

A. 1,2,3

B. 4,5

C. 1,4

D. 4,2

E. 6

Answer: b

Q9: The T wave precedes:

Answer: Isovolumetric Relaxation

Q10: The first area to depolarize is the first area to repolarize is characteristic of the following:

- a. Atria.
- b. Ventricles.
- c. Apex of the heart.
- d. Ventricular Septum.
- e. None of the mentioned choices is correct.

Answer: a

Q11: The following segments/wave in ECG recording represents a complete depolarization of ventricles:

- a. P wave.
- b. QRS wave.
- c. P-Q isoelectric line.
- d. S-T isoelectric line.
- e. T wave.

Answer:b

Q12: If abnormality was only found in lead II, III, aVF , most probably there is a problem in:

- a. Anterior septal part of ventricles.
- b. Inferior part of ventricles.
- c. Lateral part of ventricles.
- d. Base of ventricles.
- e. None of the mentioned choices is correct.

Answer:b

Lead II, III, aVF are all inferior leads

Q13: The segment/interval in ECG when the heart is fully relaxed is:

- a. PR interval.
- b. ST segment.
- c. TP segment.
- d. RR interval
- e. QT interval.

Answer:c

Q14: The small square in typical ECG graph represents:

- a. 0.2 S, 0.5 mV.
- b. 0.04 S, 0.1 mV.
- c. 0.04 S, 1 mV.
- d. 0.02 S, 1 mV.
- e. 0.4 S, 0.1 mV.

Answer: b

فَنَادَى فِي الظُّلُمَاتِ أَنْ لَا إِلَهَ إِلَّا أَنْتَ سُبْحَانَكَ إِنِّي كُنْتُ مِنَ الظَّالِمِينَ فَاسْتَجَبْنَا لَهُ وَنَجَّيْنَاهُ مِنَ الْغَمِّ وَكَذَلِكَ نُنْجِي الْمُؤْمِنِينَ

Q15: Right axis deviation lies within:

A. +90, +180

B. -30, -90

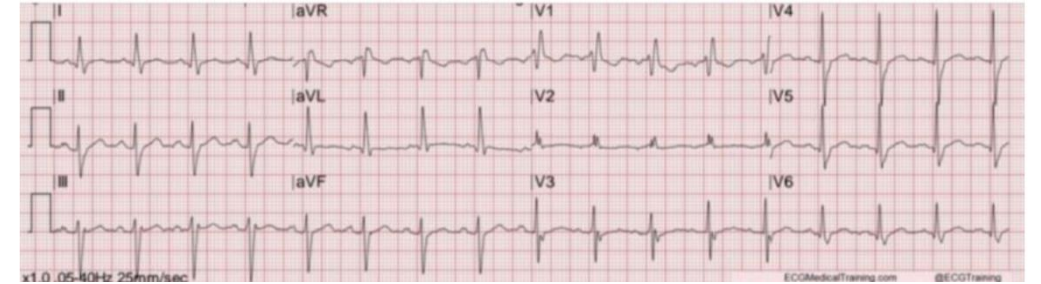
C. 0, +90

D. 0, -90

Answer: a

Q16: One of the following is true regarding the following ECG:

- A. Bradycardia
- B. Heart rate = 100 beats per minute
- C. Nothing can be determined from the information provided
- D. Severe right axis deviation



Answer: b

Probably lab material, but there is a diagram in the slides as well

Lecture 6-7✦

cardiac cycle

اللهم إني أسألك خير المسألة، وخير الدعاء، وخير النجاح، وخير العمل، وخير الثواب، وخير الحياة، وخير الممات

Q1. Which of the following is true regarding cardiac cycle?

- A. All valves never close simultaneously
- B. All valves never open simultaneously

Answer:b

Q2. A 54-year-old woman... EF = 32%. Which explains the pathophysiology?

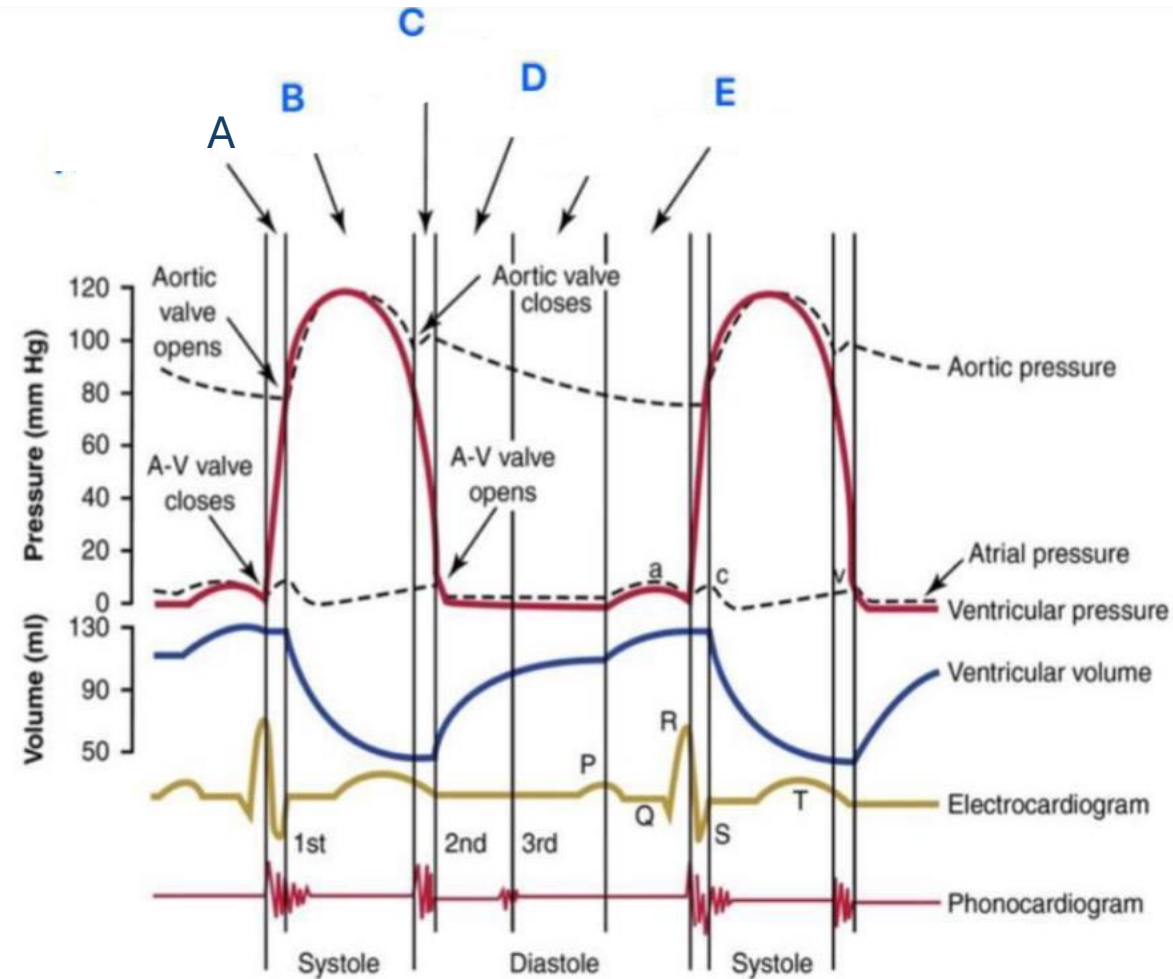
- a. Decreased ventricular filling → decreased LV compliance
- b. Increased cardiac output
- c. Decreased preload due to systemic vasodilation
- d. Decreased contractility due to weak myocardial cells

Answer: d

EF means ejection fraction

Q3. At which point does the ventricular pressure increase without a change in volume?

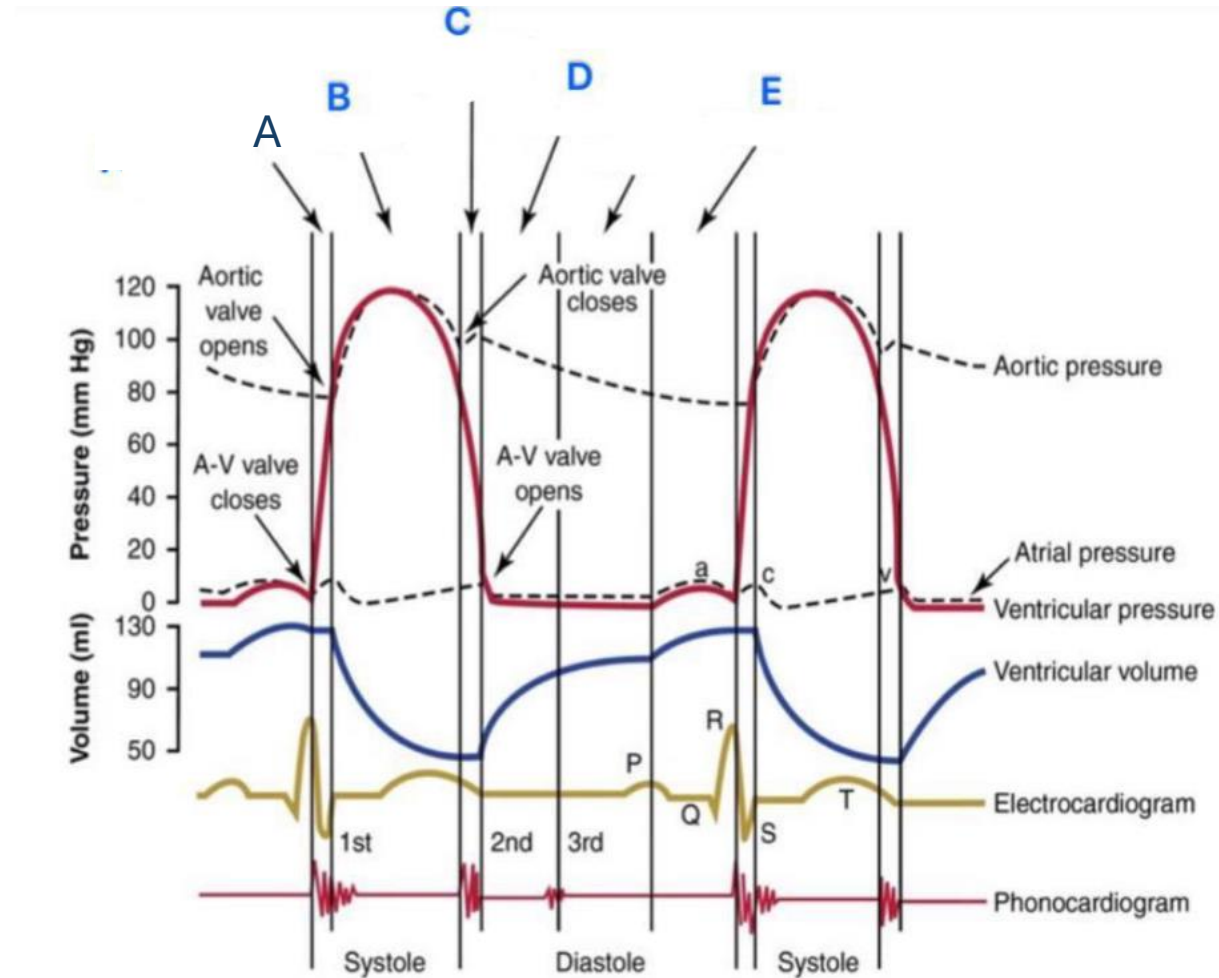
- a. A
- b. B
- c. C
- d. D
- e. A+B



Answer:a

Q4. At what point does the rapid filling phase occur?

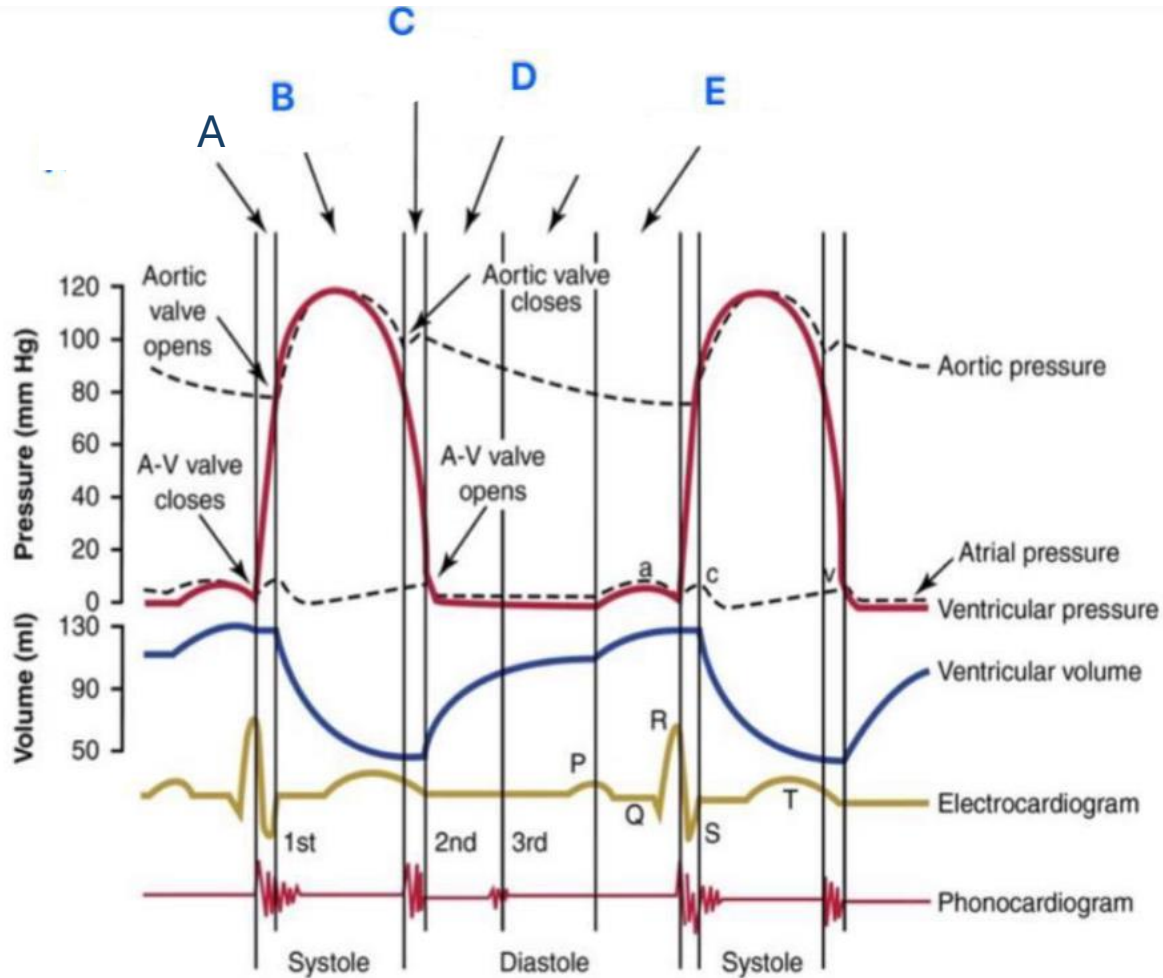
- a. C
- b. D
- c. A
- d. B



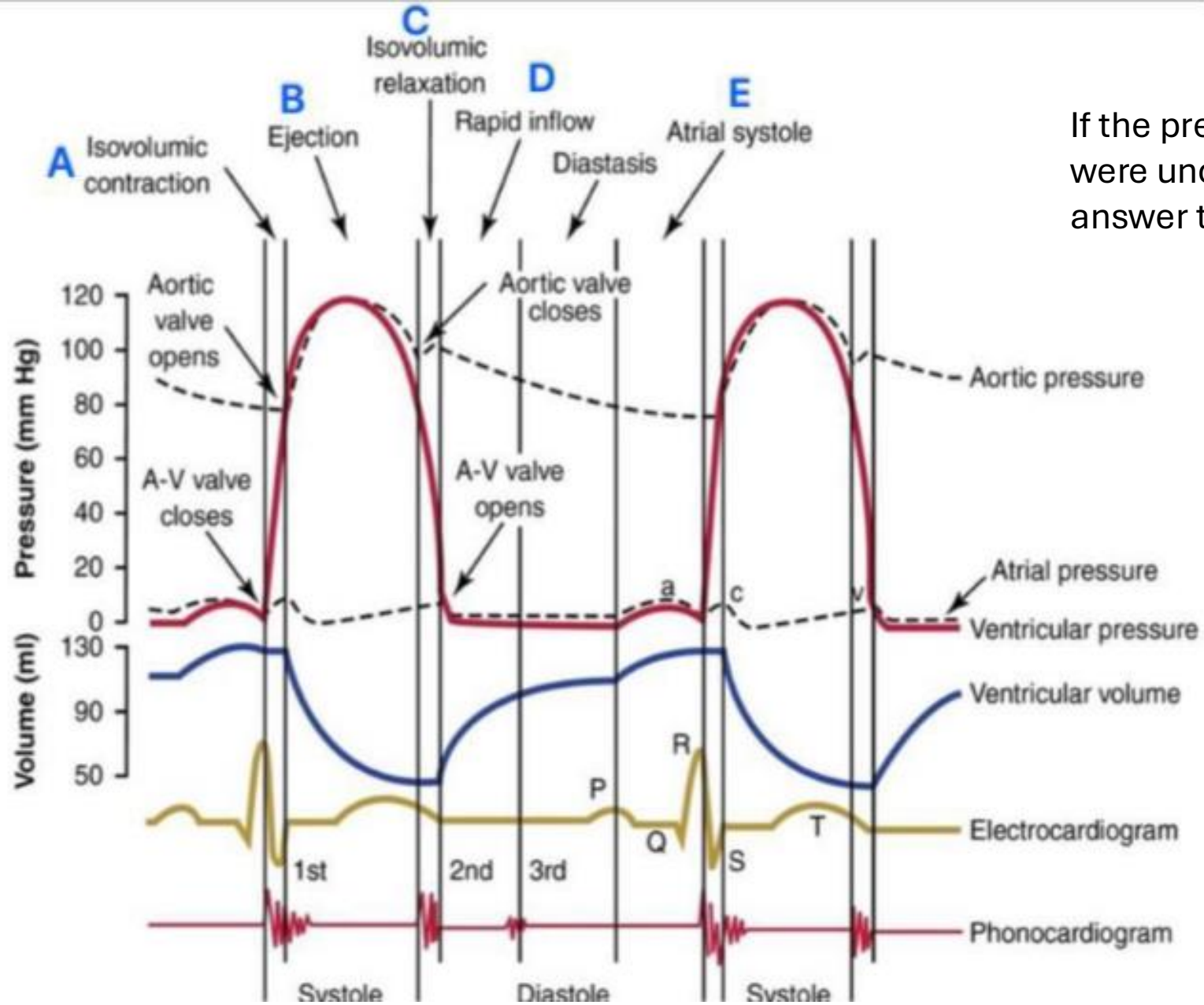
Answer: b

Q5. What are the cardiac events that happen at point E?

- a. Atrial systole
- b. AV valve closure



Answer: a



If the previous questions were unclear, here's the answer to help

Q6. Which of the following is correct about cardiac cycle:

- a. Ventricle contracts immediately after atrial diastole
- b. Ventricular contraction is masked in ECG
- c. Ventricle and atria contract same time
- d. We cannot have atrial & ventricular systole at same time
- e. None

Answer: d

Q7. Last 1/3 filling of ventricle caused by:

- a. Passive filling
- b. Ventricular systole
- c. Ventricular diastole
- d. Atrial diastole
- e. Atrial systole

Answer: e

Q8. Which of the following cardiac events occurs immediately after the T wave on the ECG?

- A. Rapid ejection
- B. Isovolumetric contraction
- C. Passive ventricular filling
- D. Isovolumetric relaxation
- E. Atrial systole

Answer: d

Q9. The primary factor responsible for reduced stroke volume :

- A. Increased afterload due to increased arterial pressure
- B. Increased preload due to reduced ventricular filling
- C. Increased myocardial contractility
- D. Decreased heart rate limiting ventricular filling
- E. Decreased afterload due to decreased venous return

Answer: a

Q10. Ventricular pressure is higher than atrial pressure in all phases except:

- A. Isometric contraction phase
- B. Atrial systole phase
- C. Maximum ejection phase
- D. Reduced ejection phase

Answer: b

Q11. The first heart sound coincides with:

- A. Isometric contraction phase
- B. Isometric relaxation phase
- C. Ejection phase
- D. Protodiastolic phase

Answer: a

Lecture 8:

cardiac output

ربّ أسألك صفاء الذهن، وأسألك القوة في الحفظ والسرعة في الفهم، وأسألك أن تدلني على الصواب حين الجواب، وأسألك بلوغ أعلى المراتب بالدنيا والآخرة

Q1. Athletes have larger hearts:

- A. They have higher heart rate
- B. They have lower stroke volume
- C. They have higher stroke volume
- D. They have smaller venous return
- E. They have lower cardiac output

Answer: c

Q2. A 28-year-old woman comes with palpitations. What is the cause of sinus tachycardia?

- A. Hypothyroidism
- B. β -blocker use
- C. Hyperkalemia
- D. Hypothermia
- E. Fever

Answer: e

Fever $\rightarrow$ $\uparrow$ metabolism $\rightarrow$ $\uparrow$ sympathetic tone $\rightarrow$ $\uparrow$ SA node firing $\rightarrow$ $\uparrow$ HR.

Q3. Beta-1 agonist drugs cause a decrease in:

- A. The duration of cardiac cycle
- B. The slope of phase 4

Answer: a

Q4. A 55-year-old woman presents to the clinic with progressive shortness of breath during exertion. She has a history of uncontrolled hypertension. On examination, blood pressure is 140/90 mmHg. No peripheral edema. Echocardiography reveals left ventricular hypertrophy, reduced stroke volume, reduced EDV, and normal ejection fraction. Which of the following is the primary factor responsible for her reduced stroke volume?

- A. Increased afterload due to increased arterial pressure
- B. Increased preload due to reduced ventricular filling
- C. Increased myocardial contractility due to diabetic cardiomyopathy
- D. Decreased heart rate limiting ventricular filling
- E. Decreased afterload due to decreased venous return

Answer: a

Unfortunately, we haven't found enough MCQs from this lecture. All of the following questions are test bank, **not past papers**.

Q5. Increasing right atrial pressure from 0 to +4 mmHg increases cardiac output in the normal heart primarily because:

- A. Afterload decreases
- B. Myocardial contractility increases intrinsically
- C. Sarcomere length moves toward optimal length ($\approx 2.2 \mu\text{m}$)
- D. Heart rate reflexively increases
- E. Venous return decreases

Answer: c

وَلَا تَتَمَنَّوْا مَا فَضَّلَ اللَّهُ بِهِ بَعْضَكُمْ عَلَى بَعْضٍ ۚ لِلرِّجَالِ نَصِيبٌ مِّمَّا اكْتَسَبُوا وَلِلنِّسَاءِ نَصِيبٌ مِّمَّا اكْتَسَبْنَ ۚ وَاسْأَلُوا اللَّهَ مِنْ فَضْلِهِ ۗ إِنَّ اللَّهَ كَانَ بِكُلِّ شَيْءٍ عَلِيمًا

Q6. Which increases the plateau of the CO curve?

- A. Parasympathetic stimulation
- B. Valvular disease
- C. Chronic hypertension
- D. Sympathetic stimulation
- E. Tamponade

Answer: d

Q7. The Fick equation $CO = O_2 \text{ uptake} / (CaO_2 - CvO_2)$ means the denominator represents:

- A. Total oxygen consumption
- B. Oxygen used by tissues
- C. Mixed venous saturation
- D. Alveolar oxygen content
- E. Oxygen added to each mL of blood

Answer: e

Q8. A parallel rightward shift of the cardiac output curve with unchanged plateau occurs in:

- A. Tamponade
- B. Increased intrapleural pressure (less negative)
- C. Severe mitral regurgitation
- D. Massive sympathetic stimulation
- E. Hypereffective state

Answer: b

Q9. A decreased plateau of the CO curve occurs in all EXCEPT :

- A. Myocarditis
- B. Metabolic acidosis damage
- C. Cardiac tamponade
- D. Heart hypertrophy
- E. Valvular stenosis

Answer: d

Q10. Increased arterial pressure decreases stroke volume because:

- A. Preload increases
- B. Afterload increases
- C. Venous return increases
- D. Contractility decreases
- E. HR slows reflexively

Answer: b

سُورَةُ طهٍ

وَإِنِّي لَغَفَّارٌ لِّمَن تَابَ

وَعَمِلَ صَالِحًا ثُمَّ اهْتَدَى ﴿٨٢﴾



بواسطة تطبيق آية

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Corrections from previous versions:

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