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Cardiac Cycle & Basic Cardiac Physiology

Exam — Cardiac Physiology

High-school/pre-med-level questions on the cardiac cycle, heart sounds, valve events, ECG relationships, and stroke volume.

32 items — Printable Exam

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Generated February 20, 2026

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1 **The cardiac cycle is best defined as:**

A The time from one P wave to the next P wave on the ECG

B The sequence of mechanical and electrical events in one heartbeat, from one ventricular systole to the next

C Only the period of ventricular contraction

D Only the period of ventricular relaxation

E The time for one complete circulation of blood through the body

2 **In a normal cardiac cycle, systole refers primarily to:**

A Relaxation of the ventricles and filling with blood

B Contraction of the ventricles and ejection of blood

C Contraction of the atria only

D Relaxation of all chambers

E The time between two T waves

3 **Which of the following lists the major mechanical phases of the ventricular cardiac cycle in the correct order, starting just AFTER atrial systole?**

A Ventricular ejection → isovolumetric contraction → isovolumetric relaxation → rapid filling

B Isovolumetric contraction → ejection → isovolumetric relaxation → ventricular filling

C Isovolumetric relaxation → ejection → isovolumetric contraction → ventricular filling

D Ejection → ventricular filling → isovolumetric contraction → isovolumetric relaxation

E Isovolumetric contraction → isovolumetric relaxation → ejection → ventricular filling

4 **During isovolumetric ventricular contraction:**

A All four heart valves are open and blood flows freely

B AV valves are open, semilunar valves are closed, and ventricular volume falls rapidly

C AV valves are closed, semilunar valves are closed, and ventricular pressure rises at constant volume

D AV valves are open, semilunar valves are open, and ventricular pressure is constant

E Semilunar valves are open, AV valves are closed, and blood is ejected

5 **Which event immediately causes closure of the atrioventricular (AV) valves (mitral and tricuspid)?**

A Atrial pressure falling below ventricular pressure

B Ventricular pressure rising above atrial pressure at the start of systole

C Ventricular pressure falling below atrial pressure at the start of diastole

D Aortic pressure exceeding ventricular pressure

E Atrial depolarisation (P wave)

6 **The first heart sound (S1, the 'lub') is primarily caused by:**

A Opening of the semilunar valves

B Closure of the AV valves at the start of ventricular systole

C Closure of the semilunar valves at the end of ventricular systole

D Opening of the AV valves at the start of diastole

E Blood flowing from atria to ventricles

7 **The second heart sound (S2, the 'dub') corresponds most closely to:**

A Opening of the AV valves at the beginning of ventricular diastole

B Closure of the semilunar valves (aortic and pulmonary) at the end of ventricular systole

C Closure of the AV valves at the end of ventricular systole

D Atrial contraction

E Maximum ventricular filling

8 **During most of ventricular ejection:**

A AV valves and semilunar valves are both closed

B AV valves are open and semilunar valves are closed

C AV valves are closed and semilunar valves are open

D AV valves are open and semilunar valves are open

E All valves are open and blood flows equally in all directions

9 **Most of the ventricular filling in a normal resting heart occurs:**

A During atrial systole only

B Passively during early diastole before atrial systole

C Only when the semilunar valves are open

D During isovolumetric contraction

E Only when heart rate exceeds 120 beats/min

10 **End-diastolic volume (EDV) in the ventricle is the volume of blood:**

A Remaining after ventricular contraction (end of systole)

B Just after atrial systole, at the end of ventricular filling

C In the atrium before atrial contraction

D Ejected in one beat

E In the ventricle during isovolumetric relaxation

11 **End-systolic volume (ESV) is:**

A The total volume of blood in the ventricle after filling

B The volume of blood ejected during one beat

C The volume of blood remaining in the ventricle after ventricular systole

D The volume of blood in the atrium after atrial contraction

E The volume of blood in the aorta at end-systole

12 **Stroke volume (SV) is calculated as:**

A $SV = EDV + ESV$

B $SV = EDV - ESV$

C $SV = ESV - EDV$

D $SV = HR \times EDV$

E $SV = CO \times HR$

13 **A left ventricle has an EDV of 140 mL and an ESV of 70 mL. What is the stroke volume?**

A 70 mL

B 140 mL

C 210 mL

D 110 mL

E 35 mL

14 **Using the previous data (EDV = 140 mL, ESV = 70 mL), what is the ejection fraction (EF) of this ventricle?**

A 25%

B 35%

C 50%

D 70%

E 100%

15 **Cardiac output (CO) is defined as:**

A Heart rate divided by stroke volume

B Stroke volume minus heart rate

C Stroke volume multiplied by heart rate

D End-diastolic volume multiplied by heart rate

E End-systolic volume divided by heart rate

16 **If a person has a heart rate of 75 beats/min and a stroke volume of 80 mL/beat, what is their approximate cardiac output?**

A 6 L/min

B 4 L/min

C 8 L/min

D 2 L/min

E 10 L/min

17 **On a normal ECG, which wave corresponds to ventricular depolarisation?**

A P wave

B QRS complex

C T wave

D U wave

E PR segment

18 **Mechanical ventricular contraction begins:**

A Exactly at the start of the P wave

B Slightly AFTER the QRS complex begins

C Exactly at the start of the T wave

D During the TP segment only

E Only after the T wave ends

19 Atrial systole (atrial contraction) occurs most closely after which ECG feature?

A Onset of the P wave

B Onset of the QRS complex

C Peak of the T wave

D End of the TP segment

E No relationship to the ECG

20 Which BEST explains why very fast heart rates (e.g. 180 beats/min) can reduce cardiac output, even though heart rate is higher?

A Systole becomes much shorter, and the ventricles cannot contract

B Diastole is greatly shortened, so the ventricles do not have enough time to fill

C The lungs cannot oxygenate blood at high heart rates

D Stroke volume always falls to zero at high heart rates

E The AV valves remain open throughout systole

21 During isovolumetric RELAXATION of the ventricles:

A All valves are open; ventricular volume is falling rapidly

B AV valves are open and semilunar valves are closed; rapid filling occurs

C AV valves and semilunar valves are both closed; ventricular pressure falls at constant volume

D Semilunar valves are open and AV valves are closed; blood is ejected

E AV valves are open and semilunar valves are open; blood flows in both directions

22 When do the AV valves OPEN during the cardiac cycle?

A When ventricular pressure exceeds aortic and pulmonary artery pressure

B When ventricular pressure falls below atrial pressure at the start of ventricular diastole

C Immediately after the QRS complex begins

D During isovolumetric contraction

E During ventricular ejection

23 Which of the following is TRUE about atrial contraction (atrial systole) in a healthy resting adult?

A It contributes almost all of the ventricular filling volume

B It contributes only a small fraction (about 10–20%) of ventricular filling, the rest is passive

C It occurs before ventricular filling begins

D It is essential for survival at rest; without it, the heart cannot pump any blood

E It occurs at the same time as ventricular ejection

24 **In atrial fibrillation, the atria do not contract effectively. Which effect on the cardiac cycle is MOST likely at rest in an otherwise healthy person?**

A Stroke volume becomes zero because ventricles cannot fill at all

B Ventricular filling is slightly reduced because the atrial 'kick' is lost

C Ventricular filling becomes much greater than normal

D Heart sounds disappear completely

E Semilunar valves do not open

25 **Preload is most closely related to which quantity in the cardiac cycle?**

A End-systolic volume (ESV)

B End-diastolic volume (EDV) or ventricular stretch just before contraction

C Systolic blood pressure in the aorta

D Heart rate

E Stroke volume

26 **Afterload for the left ventricle is most closely approximated by:**

A Venous pressure in the vena cava

B End-diastolic volume

C Aortic pressure during systole

D Heart rate

E End-systolic volume

27 **Which change would most directly INCREASE stroke volume according to the Frank–Starling mechanism?**

A Decreased venous return and EDV

B Increased venous return leading to greater EDV

C Decreased EDV and increased afterload

D No change in EDV but decreased contractility

E Increased heart rate with no change in filling

28 **Which phase of the cardiac cycle corresponds to the RAPID RISE in left ventricular pressure without any change in volume?**

A Atrial systole

B Isovolumetric contraction

C Rapid ejection

D Isovolumetric relaxation

E Ventricular filling

29 **Which event marks the BEGINNING of ventricular systole in the left heart?**

A Opening of the mitral valve

B Closure of the aortic valve

C Closure of the mitral valve (S1)

D Opening of the aortic valve

E Peak of the T wave

30 **Which statement about the timing of the cardiac cycle is TRUE?**

A At resting heart rate, systole and diastole are equal in duration

B At resting heart rate, diastole is longer than systole

C At resting heart rate, diastole is shorter than systole

D Increasing heart rate lengthens diastole more than systole

E Systole disappears at very low heart rates

31 **During which part of the cardiac cycle is coronary blood flow to the LEFT ventricle greatest?**

A During ventricular systole, when the myocardium is contracting strongly

B During ventricular diastole, when the myocardium is relaxed

C Only during isovolumetric contraction

D Only during atrial systole

E Coronary flow is constant throughout the cycle

32 **A murmur heard between S1 and S2 (during ventricular systole) is BEST described as:**

A A diastolic murmur

B A systolic murmur

C An atrial murmur

D An innocent venous hum unrelated to the heart

E A pericardial friction rub

Answer Key

#	Ans	Answer Text
1	B	The sequence of mechanical and electrical events in one heartbeat, from ...
2	B	Contraction of the ventricles and ejection of blood
3	B	Isovolumetric contraction → ejection → isovolumetric relaxation → ventri...
4	C	AV valves are closed, semilunar valves are closed, and ventricular press...
5	B	Ventricular pressure rising above atrial pressure at the start of systol...
6	B	Closure of the AV valves at the start of ventricular systole
7	B	Closure of the semilunar valves (aortic and pulmonary) at the end of ven...
8	C	AV valves are closed and semilunar valves are open
9	B	Passively during early diastole before atrial systole
10	B	Just after atrial systole, at the end of ventricular filling
11	C	The volume of blood remaining in the ventricle after ventricular systole
12	B	SV = EDV − ESV
13	A	70 mL
14	C	50%
15	C	Stroke volume multiplied by heart rate
16	A	6 L/min
17	B	QRS complex
18	B	Slightly AFTER the QRS complex begins
19	A	Onset of the P wave
20	B	Diastole is greatly shortened, so the ventricles do not have enough time...
21	C	AV valves and semilunar valves are both closed; ventricular pressure fal...
22	B	When ventricular pressure falls below atrial pressure at the start of ve...
23	B	It contributes only a small fraction (about 10–20%) of ventricular filli...
24	B	Ventricular filling is slightly reduced because the atrial 'kick' is los...
25	B	End-diastolic volume (EDV) or ventricular stretch just before contractio...
26	C	Aortic pressure during systole
27	B	Increased venous return leading to greater EDV
28	B	Isovolumetric contraction
29	C	Closure of the mitral valve (S1)
30	B	At resting heart rate, diastole is longer than systole
31	B	During ventricular diastole, when the myocardium is relaxed
32	B	A systolic murmur