CARDIAC ELECTROPHYSIOLOGY PRACTICE TEST (SAMPLE)

STUDY GUIDE

SAMPLE STUDY GUIDE WITH LIMITED QUESTIONS

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Introduction

Preparing for a certification exam can feel overwhelming, but with the right tools, it becomes an opportunity to build confidence, sharpen your skills, and move one step closer to your goals. At Examzify, we believe that effective exam preparation isn't just about memorization, it's about understanding the material, identifying knowledge gaps, and building the test-taking strategies that lead to success.

This guide was designed to help you do exactly that.

Whether you're preparing for a licensing exam, professional certification, or entry-level qualification, this book offers structured practice to reinforce key concepts. You'll find a wide range of multiple-choice questions, each followed by clear explanations to help you understand not just the right answer, but why it's correct.

The content in this guide is based on real-world exam objectives and aligned with the types of questions and topics commonly found on official tests. It's ideal for learners who want to:

• Practice answering questions under realistic conditions,

• Improve accuracy and speed,

• Review explanations to strengthen weak areas, and

• Approach the exam with greater confidence.

We recommend using this book not as a stand-alone study tool, but alongside other resources like flashcards, textbooks, or hands-on training. For best results, we recommend working through each question, reflecting on the explanation provided, and revisiting the topics that challenge you most.

Remember: successful test preparation isn't about getting every question right the first time, it's about learning from your mistakes and improving over time. Stay focused, trust the process, and know that every page you turn brings you closer to success.

Let's begin.

How to Use This Guide

This guide is designed to help you study more effectively and approach your exam with confidence. Whether you're reviewing for the first time or doing a final refresh, here's how to get the most out of your Examzify study guide:

1. Start with a Diagnostic Review

Skim through the questions to get a sense of what you know and what you need to focus on. Your goal is to identify knowledge gaps early.

2. Study in Short, Focused Sessions

Break your study time into manageable blocks (e.g. 30 – 45 minutes). Review a handful of questions, reflect on the explanations.

3. Learn from the Explanations

After answering a question, always read the explanation, even if you got it right. It reinforces key points, corrects misunderstandings, and teaches subtle distinctions between similar answers.

4. Track Your Progress

Use bookmarks or notes (if reading digitally) to mark difficult questions. Revisit these regularly and track improvements over time.

5. Simulate the Real Exam

Once you're comfortable, try taking a full set of questions without pausing. Set a timer and simulate test-day conditions to build confidence and time management skills.

6. Repeat and Review

Don't just study once, repetition builds retention. Re-attempt questions after a few days and revisit explanations to reinforce learning. Pair this guide with other Examzify tools like flashcards, and digital practice tests to strengthen your preparation across formats.

There's no single right way to study, but consistent, thoughtful effort always wins. Use this guide flexibly, adapt the tips above to fit your pace and learning style. You've got this!

Questions

1. **Which current predominates during phase 0 in pacemaker cells?**
    A. Fast Na+ current
    B. L-type calcium current
    C. T-type calcium current
    D. Potassium outward current

2. **Which phase of the non-pacemaker action potential is repolarization with high K+ currents?**
    A. Phase 3 repolarization
    B. Phase 2 plateau
    C. Phase 1 repolarization
    D. Phase 4 resting potential

3. **Which statement best describes global reentry?**
    A. Involves conduction between atria and ventricles leading to SVT
    B. Involves conduction within the SA node only
    C. Occurs only in the ventricles
    D. Only affects atrial tissue

4. **Which stimulus increases ERP in AV nodal tissue?**
    A. Vagal activation
    B. Sympathetic activation
    C. Ischemia
    D. Exercise

5. **Which ion movement contributes to more negative charges on the inside during resting membrane potential?**
    A. Na+ entering the cell
    B. K+ leaving the cell
    C. Ca++ entering the cell
    D. Cl- leaving the cell

6. Which ion concentration is higher inside the cell under resting conditions?

A. Na+

B. K+

C. Ca++

D. Cl-

7. Calcium-activated channels open in response to

A. Decreased intracellular Ca++

B. Increased intracellular Ca++

C. Decreased Na+

D. Voltage-dependent gating only

8. Sympathetic stimulation increases pacemaker rate by enhancing which channels?

A. If (funny) channels

B. Voltage-gated sodium channels in atrial myocytes

C. Potassium leak channels

D. Chloride channels

9. SA nodal firing rate is primarily controlled by which autonomic inputs?

A. Sympathetic and parasympathetic nerves

B. Only sympathetic nerves

C. Only parasympathetic nerves

D. Intrinsic rate only

10. Sodium channel activation is triggered by which event?

A. Rapid depolarization to threshold

B. Hyperpolarization

C. Maximum diastolic potential

D. Plateau onset

Answers

1. B
2. A
3. A
4. A
5. B
6. B
7. B
8. A
9. A
10. A

Explanations

1. Which current predominates during phase 0 in pacemaker cells?

A. Fast Na+ current

B. L-type calcium current

C. T-type calcium current

D. Potassium outward current

In pacemaker cells, the rapid upstroke of the action potential (phase 0) is driven mainly by calcium entry through L-type voltage-gated calcium channels. Unlike ventricular and atrial myocytes, which rely on a fast sodium current for phase 0, pacemaker cells have little fast INa and rely on ICa,L to depolarize to threshold quickly. The T-type calcium current can contribute to earlier or slower depolarization in some pacemaker contexts, but it is not the primary driver of phase 0. The outward potassium current, on the other hand, helps repolarize (phase 3) rather than initiate depolarization. So the predominant current during phase 0 in pacemaker cells is the L-type calcium current.

2. Which phase of the non-pacemaker action potential is repolarization with high K+ currents?

A. Phase 3 repolarization

B. Phase 2 plateau

C. Phase 1 repolarization

D. Phase 4 resting potential

Repolarization driven by strong outward potassium currents occurs during the final repolarization phase. In non-pacemaker (ventricular) action potentials, this is phase 3, when delayed rectifier K+ channels (I_Kr, I_Ks) open and push positive charge out of the cell to return toward the resting potential. Early repolarization (phase 1) is mainly due to a transient outward K+ current (not as sustained or large), and the plateau (phase 2) is balanced by calcium influx with some outward K+ as well. The resting phase (phase 4) is maintained mainly by inward rectifier K+ current. Therefore, the phase with repolarization powered by high K+ currents is phase 3.

3. Which statement best describes global reentry?

A. Involves conduction between atria and ventricles leading to SVT

B. Involves conduction within the SA node only

C. Occurs only in the ventricles

D. Only affects atrial tissue

Global reentry is a looping reentrant circuit that spans both atrial and ventricular tissue, creating a pathway that conducts from the atria into the ventricles and back to the atria. This setup sustains a rapid rhythm classified as a supraventricular tachycardia because the circuit uses an atrioventricular relationship rather than being confined to a single chamber. The description involving conduction between the atria and ventricles best captures this cross-chamber loop. In contrast, a circuit restricted to the SA node would be a nodal phenomenon, a circuit only in the ventricles would be ventricular reentry, and one that affects only atrial tissue would not involve the ventricles at all.

4. Which stimulus increases ERP in AV nodal tissue?

A. Vagal activation

B. Sympathetic activation

C. Ischemia

D. Exercise

The AV node's refractory behavior is strongly shaped by autonomic tone. Parasympathetic (vagal) activation increases AV nodal refractoriness, meaning the effective refractory period gets longer and conduction through the AV node slows. Mechanistically, acetylcholine acting on M2 receptors opens GIRK (I_KACh) channels and reduces L-type calcium current, hyperpolarizing the cells and slowing conduction. This lengthens the time before the node can be re-excited, which is exactly what the ERP reflects in AV nodal tissue. In contrast, sympathetic activation raises cAMP, enhances calcium entry, and speeds conduction, effectively shortening the ERP. Exercise, which boosts sympathetic drive, would do the opposite of increasing ERP. Ischemia can disrupt conduction and refractoriness in a variable way, but it does not specifically and reliably increase AV nodal ERP like vagal activation does. So, the stimulus that increases AV nodal ERP is vagal (parasympathetic) activation.

5. Which ion movement contributes to more negative charges on the inside during resting membrane potential?

A. Na+ entering the cell

B. K+ leaving the cell

C. Ca++ entering the cell

D. Cl- leaving the cell

Potassium leak out of the cell sets the resting membrane potential to be negative. The membrane is more permeable to K+ at rest, so K+ ions move down their concentration gradient from inside to outside. As positive charge leaves, the inside becomes more negative. Moving positively charged ions into the cell, like sodium or calcium, would depolarize and make the inside less negative, while removing chloride from inside would reduce the negative charge inside. The Na+/K+-ATPase helps maintain gradients but its direct electrogenic effect is smaller than the continuous K+ leak. Therefore, the outflow of potassium is the main driver of the more negative interior at rest.

6. Which ion concentration is higher inside the cell under resting conditions?

A. Na+

B. K+

C. Ca++

D. Cl-

Potassium is higher inside the cell at rest. This large intracellular K+ pool is actively maintained by the Na+/K+ ATPase, which pumps K+ into the cell (and Na+ out), creating a strong gradient. The resting membrane is more permeable to K+ than to other ions, so K+ tends to leak out, but the pump keeps a high intracellular concentration. This K+ gradient largely establishes the negative resting membrane potential, with the potassium equilibrium potential around -90 mV, pulling the membrane toward that value. By contrast, sodium is much more abundant outside the cell, calcium is kept very low inside by pumps and exchangers, and chloride is typically higher outside or variable, so none of those have a higher intracellular concentration at rest.

7. Calcium-activated channels open in response to

A. Decreased intracellular Ca++

B. Increased intracellular Ca++

C. Decreased Na+

D. Voltage-dependent gating only

Calcium-activated channels open when intracellular calcium rises. Calcium ions bind to the channel or its regulatory subunits and cause a conformational change that shifts the channel from closed to open, allowing ion flow. This direct Ca2+ binding links intracellular Ca2+ signals to changes in membrane conductance, which is why the trigger is an increase in intracellular Ca2+. A decrease in Ca2+ would not promote opening, and choices invoking Na+ changes or gating driven only by voltage describe different mechanisms (though some channels can be both voltage- and Ca2+-dependent, the Ca2+-trigger is the defining feature here).

8. Sympathetic stimulation increases pacemaker rate by enhancing which channels?

A. If (funny) channels

B. Voltage-gated sodium channels in atrial myocytes

C. Potassium leak channels

D. Chloride channels

Sympathetic stimulation raises pacemaker rate by increasing the funny current (If) in sinoatrial node cells. Beta-adrenergic activity raises cAMP, which enhances the opening of the If channels (HCN channels). This increases the slope of diastolic depolarization, so the pacemaker reaches threshold faster and fires more quickly. The other options don't primarily set the pacing rate: voltage-gated sodium channels in atrial myocytes drive rapid depolarization in working atrial tissue, potassium leak channels mainly set resting potential, and chloride channels do not control SA node rate.

9. SA nodal firing rate is primarily controlled by which autonomic inputs?

A. Sympathetic and parasympathetic nerves

B. Only sympathetic nerves

C. Only parasympathetic nerves

D. Intrinsic rate only

Firing rate of the SA node is determined by how fast the pacemaker cells depolarize during phase 4, and this pace is set by autonomic tone. Sympathetic input speeds up the rate: norepinephrine acting on beta-1 receptors raises cAMP, enhances the funny current and calcium currents, and quickens diastolic depolarization, so the SA node fires more rapidly. Parasympathetic input slows the rate: acetylcholine on muscarinic receptors lowers cAMP, increases potassium efflux, and reduces the depolarization slope, so the SA node fires more slowly. In normal life, both arms of the autonomic nervous system shape the heart rate; the intrinsic rate of SA nodal cells provides a baseline, but it's the balance of sympathetic and parasympathetic influence that primarily sets the actual firing rate.

10. Sodium channel activation is triggered by which event?

A. Rapid depolarization to threshold

B. Hyperpolarization

C. Maximum diastolic potential

D. Plateau onset

Activation of fast voltage-gated sodium channels occurs when the membrane rapidly depolarizes to threshold. As the cell moves from its resting potential and crosses about -60 to -50 mV, the activation gates open and sodium ions flood in, producing the rapid upstroke of the action potential. Hyperpolarization and the maximum diastolic potential describe the resting state or a return toward rest, not the trigger for opening these channels. The plateau onset happens later, driven mainly by calcium entry, after the initial sodium-driven upstroke has occurred. So the key trigger is rapid depolarization to threshold.

Next Steps

Congratulations on reaching the final section of this guide. You've taken a meaningful step toward passing your certification exam and advancing your career.

As you continue preparing, remember that consistent practice, review, and self-reflection are key to success. Make time to revisit difficult topics, simulate exam conditions, and track your progress along the way.

If you need help, have suggestions, or want to share feedback, we'd love to hear from you. Reach out to our team at hello@examzify.com.

Or visit your dedicated course page for more study tools and resources:

https://cardiacelectrophysio.examzify.com

We wish you the very best on your exam journey. You've got this!