CARDIAC ELECTROPHYSIOLOGY PRACTICE TEST (SAMPLE)

STUDY GUIDE



SAMPLE STUDY GUIDE WITH LIMITED QUESTIONS

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Table of Contents

Copyright 1

Table of Contents 2

Introduction 3

How to Use This Guide 4

Questions 5

Answers 8

Explanations 10

Next Steps 15

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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.

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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!

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Questions

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1. Which statement best describes the action potential of pacemaker cells?

A. Rapid depolarization with a plateau

B. Spontaneous depolarization and repolarization

C. Resting membrane potential around -90 mV

D. Sustained depolarization without repolarization

2. Which factor shortens ERP by sympathetic activation?

A. Sympathetic activation

B. Parasympathetic activation

C. Ischemia

D. Exercise

3. Sodium channel activation in fast response cardiac cells occurs during which phase of the action potential?

A. Phase 0

B. Phase 1

C. Phase 2

D. Phase 3

4. Third degree AV block is described as

A. Complete dissociation between atrial and ventricular depolarizations and contractions, ventricular bradycardia

B. Prolonged PR interval with dropped beats

C. Widened QRS with regular rhythm

D. Normal conduction with atrial tachycardia

5. Removal of overdrive suppression can permit these cells to display slow spontaneous action potentials that can drive ventricular rate. Which option best describes these potentials?

A. Rapid depolarizations

B. Slow spontaneous action potentials

C. Prolonged refractoriness

D. Hyperpolarization

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6. Which factors regulate SAN pacemaker activity and conduction velocity?

A. Autonomic nerves, hormones, electrolytes

B. Autonomic nerves only

C. Hormones only

D. Temperature and pH

7. Severe hyperkalemia affects conduction by causing what change in cell resting state?

A. Hyperpolarization

B. Depolarization

C. No change

D. Hyperexcitability

8. 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

9. Low resistance gap junctions allow for what crucial phenomenon in cardiac tissue?

A. Current leakage

B. Active transport of ions

C. Electrical isolation of cells

D. No conduction across cells

10. Which cells are pacemaker cells?

A. Sinoatrial and atrioventricular nodes

B. Atrial and ventricular contracting myocytes

C. Purkinje fibers

D. Bundle of His

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Answers

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

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Explanations

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1. Which statement best describes the action potential of pacemaker cells?

A. Rapid depolarization with a plateau

B. Spontaneous depolarization and repolarization

C. Resting membrane potential around -90 mV

D. Sustained depolarization without repolarization

Pacemaker cells are automatic: they undergo spontaneous depolarization during the resting phase (diastolic depolarization) until they reach threshold, triggering an action potential, and then they repolarize to reset. This automaticity means there isn't a stable, very negative resting potential, and the upstroke is driven mainly by calcium influx rather than a rapid, Na+-mediated spike. After the spike, repolarization returns the membrane toward a negative value, preparing for the next cycle. That's why spontaneous depolarization and repolarization best describe their action potential. The other descriptions don't fit: a rapid depolarization with a plateau reflects contractile cells with a plateau phase; a resting potential around -90 mV implies a true resting state like ventricular cells; sustained depolarization without repolarization would mean no resetting, which doesn't occur in pacemaker activity.

2. Which factor shortens ERP by sympathetic activation?

A. Sympathetic activation

B. Parasympathetic activation

C. Ischemia

D. Exercise

ERP is the period after an action potential during which the tissue cannot be re-excited. When sympathetic activation kicks in, ERP shortens because the fight-or-flight drive speeds up repolarization. Norepinephrine acting on β-adrenergic receptors raises cAMP and activates PKA, which enhances repolarizing potassium currents (IKs, and to a degree IKr) and also increases calcium handling that together shorten the action potential duration. With a shorter action potential, the refractory period ends sooner, so the tissue can respond again more quickly. This effect is part of what happens during exercise or stress, where sympathetic tone is high. In contrast, parasympathetic activation tends to slow conduction and can prolong refractoriness in some tissues, and ischemia tends to alter refractoriness in a way that can be destabilizing rather than simply shortening it.

3. Sodium channel activation in fast response cardiac cells occurs during which phase of the action potential?

A. Phase 0

B. Phase 1

C. Phase 2

D. Phase 3

Activation of the voltage-gated sodium channels drives the rapid upstroke of the action potential in fast response cardiac cells. When the membrane depolarizes toward threshold, these channels quickly open, allowing a large inward Na+ current that shifts the voltage rapidly from resting levels toward positive values. This swift, steep depolarization is the phase 0 upstroke. The channels then quickly inactivate, leading into the brief notch of phase 1 and the subsequent plateau and repolarization phases. So the opening of the sodium channels—their activation—occurs during the rapid depolarization phase.

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4. Third degree AV block is described as

A. Complete dissociation between atrial and ventricular depolarizations and contractions, ventricular bradycardia

B. Prolonged PR interval with dropped beats

C. Widened QRS with regular rhythm

D. Normal conduction with atrial tachycardia

In third-degree AV block there is complete failure of conduction from the atria to the ventricles, so atrial and ventricular activity occur independently. The atria beat at their own rate, while the ventricles rely on a secondary pacemaker below the block, producing a slow, regular escape rhythm. Because no atrial impulse reaches the ventricles, you see AV dissociation: P waves and QRS complexes have no fixed relationship. The resulting bradycardia comes from the slow ventricular escape rhythm. The QRS morphology can be narrow or wide depending on whether the escape focus is near the AV node (narrow) or in the ventricles (wide). This description captures the key features of complete AV block.

5. Removal of overdrive suppression can permit these cells to display slow spontaneous action potentials that can drive ventricular rate. Which option best describes these potentials?

A. Rapid depolarizations

B. Slow spontaneous action potentials

C. Prolonged refractoriness

D. Hyperpolarization

Removing overdrive suppression lets latent ventricular pacemaker cells regain automaticity. These cells, such as Purkinje fibers under certain conditions, emit slow diastolic depolarizations (phase 4) that gradually reach threshold and trigger action potentials. Because their intrinsic rate is slow, they can drive the ventricular rhythm if the dominant faster pacemaker (like the SA node) is not pacing effectively. This is exactly what "slow spontaneous action potentials" describes. Rapid depolarizations, prolonged refractoriness, or hyperpolarization don't capture this automatic, diastolic-depolarization process that underlies ectopic ventricular pacing.

6. Which factors regulate SAN pacemaker activity and conduction velocity?

A. Autonomic nerves, hormones, electrolytes

B. Autonomic nerves only

C. Hormones only

D. Temperature and pH

The factors regulating SAN pacemaker activity and conduction velocity come from three broad influences: autonomic nerves, hormones, and electrolytes. Autonomic input rapidly tunes heart rate and nodal conduction: sympathetic stimulation raises cAMP, increases the funny current (If) and L-type Ca2+ currents, and speeds diastolic depolarization, increasing heart rate; parasympathetic signaling lowers cAMP, enhances certain potassium currents, and slows diastolic depolarization, decreasing heart rate and slowing conduction through the nodal tissue. Hormones in the bloodstream produce similar effects in a sustained way, with catecholamines acting on beta-adrenergic receptors to raise rate and excitability, and thyroid hormone increasing overall adrenergic responsiveness over time. The ionic environment—electrolytes like calcium, potassium, and magnesium—directly shapes the pacemaker currents and the action potential upstroke, influencing both pacing rate and the speed of conduction. Temperature and pH can modulate ion-channel behavior and excitability, but the principal regulators in normal physiology are autonomic nerves, hormones, and electrolytes.

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7. Severe hyperkalemia affects conduction by causing what change in cell resting state?

A. Hyperpolarization

B. Depolarization

C. No change

D. Hyperexcitability

Severe hyperkalemia depolarizes the resting membrane potential. When extracellular potassium rises, the potassium equilibrium potential becomes less negative. Since the resting state of cardiac cells is largely governed by the K+ equilibrium potential, the cell membrane potential moves toward zero (less negative). This depolarization reduces the availability of voltage-gated sodium channels, which slows the upstroke of the action potential and slows conduction through the atrioventricular node, His-Purkinje system, and ventricles. Clinically, this manifests as slower conduction and characteristic ECG changes as potassium levels climb higher.

8. 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.

9. Low resistance gap junctions allow for what crucial phenomenon in cardiac tissue?

A. Current leakage

B. Active transport of ions

C. Electrical isolation of cells

D. No conduction across cells

Low resistance gap junctions create direct electrical coupling between neighboring cardiomyocytes. This means ions can flow freely from one cell to the next, so when one cell depolarizes, current leaks through these junctions into its neighbor and triggers rapid depolarization there as well. This electrotonic spread allows the action potential to propagate quickly and synchronously through the heart muscle. Active transport of ions requires pumps and occurs across the cell membrane, not directly between cells. Electrical isolation or no conduction across cells would imply high resistance or closed junctions, which is the opposite of what low-resistance gap junctions provide.

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10. Which cells are pacemaker cells?

A. Sinoatrial and atrioventricular nodes

B. Atrial and ventricular contracting myocytes

C. Purkinje fibers

D. Bundle of His

Automaticity in cardiac tissue is what creates the heart's rhythm. The cells in the sinoatrial node act as the primary natural pacemaker, spontaneously depolarizing and setting the heart rate. The atrioventricular node also has automaticity and can take over if the SA node fails, though at a slower intrinsic rate. These nodal cells are different from contracting myocytes, which are the atrial and ventricular muscle cells that produce force but don't pace the heart on their own. Purkinje fibers and the bundle of His are fast-conducting pathways that quickly relay impulses to the ventricles; they don't normally set the rhythm. So the pacemaker cells are the ones in the SA node and the AV node.

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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!

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