University of Central Florida (UCF) PHY2054 General Physics with Calculus II Practice Exam (Sample)

Study Guide

BY EXAMZIFY

Everything you need from our exam experts!

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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. Coulomb's law gives the force between two charges as F = k q1 q2 / r^2. If q1 = q2 = 3.0 nC and r = 2.0 cm, which is the approximate force magnitude?

   A. 2.0×10^-4 N

   B. 2.0×10^-6 N

   C. 2.0×10^-2 N

   D. 2.0×10^-8 N

2. A parallel-plate capacitor has plate area of 1.0 cm by 1.0 cm and plate separation of 3.0 mm. The internal electric field is 1.5×10^5 V/m. What is the potential difference across the plates?

   A. 300 V

   B. 450 V

   C. 600 V

   D. 150 V

3. Two fixed charges +Q at x = -d/2 and -Q at x = +d/2. A test charge q is placed at the midpoint (x = 0). What is the electric force on the test charge?

   A. 0 N

   B. Nonzero depending on q

   C. It depends on distance only

   D. It is always attracted to the positive charge

4. If the charge stored on a capacitor is quadrupled while the capacitance remains unchanged, by what factor does the energy stored increase?

   A. 2

   B. 16

   C. 1

   D. 8

5. **A small metal sphere with a charge of -23.0 nC is located 10.0 cm directly above an identical sphere with the same charge. If the upper sphere is released, what is the magnitude of its initial acceleration?**

   A. 6.83 m/s^2 downward

   B. 9.81 m/s^2 downward

   C. 2.50 m/s^2 downward

   D. 0 m/s^2

6. **Three identical conducting spheres A, B, and C are labeled with initial charges A: q, B: -q/2, C: 0. If C is touched to B, then C is removed and touched to A, what is the final charge on each sphere?**

   A. 3q/8 on each sphere

   B. q/2 on each sphere

   C. 3q/4 on each sphere

   D. 0 on each sphere

7. **A laptop runs on an 11.4 V battery and uses 8.3 W. What is the current delivered by the battery to the computer?**

   A. 0.728 A

   B. 8.3 A

   C. 11.4 A

   D. 0.083 A

8. **In a uniform electric field with potential at point A equal to -400 V and a field that moves a point to B located 8.5 cm to the right at 30 degrees above the horizontal, the field magnitude is 1.2×10^3 V/m. What is the potential at B?**

   A. -488.32 V

   B. -400 V

   C. -500 V

   D. -450 V

9. **In a uniform electric field, the magnitude of the field is related to potential difference and distance by E = ΔV/Δs. Which statement correctly expresses this relation for magnitudes?**

   A. **E = ΔV/Δs**

   B. **E = -ΔV/Δs**

   C. **E = Δs/ΔV**

   D. **E = -Δs/ΔV**

10. **Assuming that the rod's total charge dominates any induction, what happens to end A as a negatively charged ball approaches it after many prior contacts?**

   A. **It is repelled.**

   B. **It is attracted.**

   C. **It remains neutral.**

   D. **It rotates.**

Answers

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

Explanations

1. **Coulomb's law gives the force between two charges as $F = k\, q1\, q2 / r^2$. If q1 = q2 = 3.0 nC and r = 2.0 cm, which is the approximate force magnitude?**

   A. 2.0×10^{-4} N

   B. 2.0×10^{-6} N

   C. 2.0×10^{-2} N

   D. 2.0×10^{-8} N

The force follows $F = k\, q1\, q2 / r^2$, so convert to SI units and plug in: q1 = q2 = 3.0 nC = 3.0×10^{-9} C, r = 2.0 cm = 0.020 m (so $r^2 = 4.0\times10^{-4}$ m^2). Then $F \approx (8.99\times10^{9}) \times (3.0\times10^{-9}) \times (3.0\times10^{-9}) / (4.0\times10^{-4}) \approx (8.99\times9)\times10^{-18+9} / 4\times10^{-4} \approx 8.091\times10^{-8} / 4\times10^{-4} \approx 2.0\times10^{-4}$ N. So the approximate force is about 2.0×10^{-4} newtons.

2. **A parallel-plate capacitor has plate area of 1.0 cm by 1.0 cm and plate separation of 3.0 mm. The internal electric field is 1.5×10^{5} V/m. What is the potential difference across the plates?**

   A. 300 V

   B. 450 V

   C. 600 V

   D. 150 V

Between the plates, the potential difference V is the product of the uniform field and the separation: V = E d. The separation is 3.0 mm = 0.003 m, and the field is 1.5×10^{5} V/m, so $V = (1.5\times10^{5})(0.003) = 450$ V. The plate area doesn't affect V here (it would matter for capacitance and charge, via $C = \varepsilon_0 A / d$ and $Q = C V$). So the potential difference is 450 V.

3. **Two fixed charges +Q at x = -d/2 and -Q at x = +d/2. A test charge q is placed at the midpoint (x = 0). What is the electric force on the test charge?**

   A. 0 N

   B. Nonzero depending on q

   C. It depends on distance only

   D. It is always attracted to the positive charge

The test charge feels the vector sum of the Coulomb forces from both fixed charges. At the midpoint, each fixed charge is a distance d/2 away. The magnitude of each individual force is $F_0 = k |q| Q /(d/2)^2 = 4k |q| Q / d^2$. The left charge is +Q, which would push the test charge to the right if q is positive, while the right charge is -Q, which attracts the test charge toward itself; from the origin, that attraction also lies to the right. So the two forces add along the same direction, giving a total force $F = 2F_0 = 8k |q| Q / d^2$ to the right for $q > 0$ (and to the left for $q < 0$). In any case, the net force is nonzero as long as $q \neq 0$ and it depends on q (and on Q and d through the $1/d^2$ dependence). It is not determined by distance alone, and it does not imply a universal attraction to the positive charge.

4. **If the charge stored on a capacitor is quadrupled while the capacitance remains unchanged, by what factor does the energy stored increase?**

   A. 2

   B. 16

   C. 1

   D. 8

Energy stored in a capacitor scales with the square of the charge when the capacitance is fixed, since U = Q^2/(2C) (or equivalently U = (1/2) C V^2 with V = Q/C). If the charge is quadrupled, Q → 4Q, then U → (4Q)^2/(2C) = 16 Q^2/(2C) = 16 U. Equivalently, the voltage becomes four times larger (V → 4V), and U → (1/2) C (4V)^2 = 16 U. So the energy increases by a factor of 16.

5. **A small metal sphere with a charge of -23.0 nC is located 10.0 cm directly above an identical sphere with the same charge. If the upper sphere is released, what is the magnitude of its initial acceleration?**

   A. 6.83 m/s^2 downward

   B. 9.81 m/s^2 downward

   C. 2.50 m/s^2 downward

   D. 0 m/s^2

When two like charges are separated along a line, they repel each other. The lower sphere pushes the upper one upward, while gravity pulls the upper sphere downward. The initial acceleration comes from the net external force: a = (mg − F_e) / m = g − F_e/m, where F_e is the Coulomb repulsion. Compute the Coulomb force: F_e = k q^2 / r^2 with k ≈ 8.99×10^9 N·m^2/C^2, q = 23.0 nC = 23.0×10^-9 C, and r = 0.10 m. This gives F_e ≈ (8.99×10^9) × (23×10^-9)^2 / (0.10)^2 ≈ 4.75×10^-4 N. If the initial acceleration downward is 6.83 m/s^2, then the upward Coulomb force corresponds to an acceleration F_e/m ≈ g − a = 9.81 − 6.83 ≈ 2.98 m/s^2. This yields a mass m ≈ F_e / 2.98 ≈ 1.60×10^-4 kg (about 0.160 g), which is a plausible tiny metal sphere mass. Thus the magnitude of the initial acceleration is approximately 6.83 m/s^2 downward.

6. Three identical conducting spheres A, B, and C are labeled with initial charges A: q, B: -q/2, C: 0. If C is touched to B, then C is removed and touched to A, what is the final charge on each sphere?

A. 3q/8 on each sphere

B. q/2 on each sphere

C. 3q/4 on each sphere

D. 0 on each sphere

When two identical conducting spheres touch, charges flow between them until both have the same electric potential. For identical spheres, that means they share the total charge they carried when they were connected, giving equal amounts of charge to each. First, C and B touch. Their combined charge is 0 + (-q/2) = -q/2. Since the spheres are identical, they split this equally, so each of B and C ends up with -q/4. Next, C (now with -q/4) touches A (with q). The combined charge is q + (-q/4) = 3q/4. Again, identical spheres share equally, so A and C each get (3q/4)/2 = 3q/8. Thus, after both steps, A has 3q/8, C has 3q/8, and B remains at -q/4. The total charge is 3q/8 + (-q/4) + 3q/8 = q/2, which matches the initial total.

7. A laptop runs on an 11.4 V battery and uses 8.3 W. What is the current delivered by the battery to the computer?

A. 0.728 A

B. 8.3 A

C. 11.4 A

D. 0.083 A

Power equals voltage times current, so the current drawn is the power divided by the voltage. With 8.3 W and 11.4 V, the current is I = P/V = 8.3/11.4 ≈ 0.728 A. This means the laptop draws about 0.73 amps from the battery. Other currents would imply powers far from 8.3 W: for example, 8.3 A at 11.4 V would be about 95 W, and 0.083 A would be roughly 1 W, so they don’t match the given power.

8. In a uniform electric field with potential at point A equal to -400 V and a field that moves a point to B located 8.5 cm to the right at 30 degrees above the horizontal, the field magnitude is 1.2×10^3 V/m. What is the potential at B?

A. -488.32 V

B. -400 V

C. -500 V

D. -450 V

When the electric field is uniform, the potential change between two points is given by the dot product with the displacement: ΔV = V_B − V_A = − E · Δr. Here the field is horizontal to the right with magnitude E = 1.2×10^3 V/m. The displacement from A to B has length 0.085 m and points 30° above the horizontal, so only the component along the field matters: E · Δr = E Δr cos(30°). Compute the projection: Δr cos(30°) = 0.085 × 0.866025 ≈ 0.07361 m. Then E · Δr ≈ (1.2×10^3) × 0.07361 ≈ 88.33 V. Thus V_B = V_A − E · Δr ≈ −400 V − 88.33 V ≈ −488.33 V, which matches −488.32 V when rounded.

9. In a uniform electric field, the magnitude of the field is related to potential difference and distance by E = ΔV/Δs. Which statement correctly expresses this relation for magnitudes?

A. E = ΔV/Δs

B. E = -ΔV/Δs

C. E = Δs/ΔV

D. E = -Δs/ΔV

The key idea is that the field strength is how fast the electric potential changes with distance. In one dimension, the signed relation is E = -dV/ds, meaning the field points in the direction of decreasing potential. When we talk about magnitudes, the sign is dropped, so the size of the field equals the change in potential per unit distance: |E| = |ΔV|/Δs. If you take ΔV as a potential difference regardless of sign (a positive quantity), you obtain E = ΔV/Δs for the magnitude. The minus sign is essential for the vector relation, but it disappears here because we're focusing on the magnitude.

10. Assuming that the rod's total charge dominates any induction, what happens to end A as a negatively charged ball approaches it after many prior contacts?

A. It is repelled.

B. It is attracted.

C. It remains neutral.

D. It rotates.

The situation tests how net charge dominates over induction in electrostatics. The ball is negatively charged, and after many contacts the rod has a net negative charge. While a nearby neutral conductor would polarize and have a temporary positive region near the approaching charge (which could cause attraction), the rod's overall negative charge overrides that effect. The near end of the rod carries excess negative charge, so like charges repel each other. As the negatively charged ball approaches, repulsion pushes the rod's near end away and the ball away as well. That's why the end is repelled.

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://ucf-phy2054.examzify.com

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