

AP Physics C: Electricity and Magnetism Practice Test 2

60 original multiple-choice questions covering all 6 AP Physics C: Electricity and Magnetism units (Units 8–13). All questions are calculus-based. Choose one answer for each question. The full answer key is on the last page — worked explanations for every question are free on the test page at QuaidianPoint.com.

Name: _____ Class: _____ Score: _____ / 60

Unit 8: Electric Charges, Fields, and Gauss's Law

Q1. A thin ring of radius 19 cm carries a total charge of 36 μC uniformly around its circumference. What is the magnitude of the electric field on the ring's axis 29 cm from its centre?

- (A) $1.13 \times 10^6 \text{ N/C}$
- (B) $4.5 \times 10^6 \text{ N/C}$
- (C) $2.25 \times 10^6 \text{ N/C}$
- (D) $5.63 \times 10^5 \text{ N/C}$

Q2. A thin rod of length 44 cm carries a total charge of 22 nC uniformly along its length. What is the magnitude of the electric field on the rod's axis 15 cm beyond one end?

- (A) $1.12 \times 10^3 \text{ N/C}$
- (B) $4.47 \times 10^3 \text{ N/C}$
- (C) $8.94 \times 10^3 \text{ N/C}$
- (D) $2.23 \times 10^3 \text{ N/C}$

Q3. A closed surface encloses a net charge of 23 μC . What is the net electric flux through the surface?

- (A) $1.3 \times 10^6 \text{ N}\cdot\text{m}^2/\text{C}$
- (B) $5.2 \times 10^6 \text{ N}\cdot\text{m}^2/\text{C}$
- (C) $2.6 \times 10^6 \text{ N}\cdot\text{m}^2/\text{C}$
- (D) $6.5 \times 10^5 \text{ N}\cdot\text{m}^2/\text{C}$

Q4. A particle of mass 2 mg and charge 8 μC is placed in a uniform electric field of 1654 N/C. Ignoring gravity, what is the magnitude of its initial acceleration?

- (A) $6.62 \times 10^3 \text{ m/s}^2$
- (B) $3.31 \times 10^3 \text{ m/s}^2$
- (C) $1.32 \times 10^4 \text{ m/s}^2$
- (D) $1.65 \times 10^3 \text{ m/s}^2$

Q5. An electric dipole consists of charges +7 μC and -7 μC separated by 25 mm. Estimate the magnitude of the electric field on the dipole axis 32 cm from its centre, where the distance is much larger than the separation.

- (A) $9.6 \times 10^4 \text{ N/C}$
- (B) $4.8 \times 10^4 \text{ N/C}$
- (C) $1.92 \times 10^5 \text{ N/C}$
- (D) $3.84 \times 10^5 \text{ N/C}$

Q6. A thin rod of length 24 cm carries a uniform linear charge density λ . Which integral gives the magnitude of the electric field at a point on the rod's axis 32 cm beyond one end, where x is the distance from a charge element dq to the point?

- (A) $\int k\lambda dx / x$
- (B) $\int k\lambda dx / x^3$
- (C) $\int k\lambda dx / x^2$
- (D) $\int \lambda dx / x^2$

Q7. Two charged beads carry charges 20 μC and 9 μC and are 29 cm apart in vacuum. What is the magnitude of the electrostatic force between them?

- (A) 9.62 N
- (B) 38.5 N
- (C) 19.2 N
- (D) 4.81 N

Q8. A point charge of -26 μC is fixed in vacuum. What is the magnitude of the electric field at a point 73 cm from the charge?

- (A) $2.19 \times 10^5 \text{ N/C}$
- (B) $4.39 \times 10^5 \text{ N/C}$
- (C) $8.77 \times 10^5 \text{ N/C}$
- (D) $1.75 \times 10^6 \text{ N/C}$

Q9. Two positive point charges 3 μC and 9 μC lie on the x-axis 21 cm apart. A point P lies on the x-axis 17 cm beyond the second charge, on the side away from the first. What is the magnitude of the net electric field at P?

- (A) $1.49 \times 10^6 \text{ N/C}$
- (B) $2.99 \times 10^6 \text{ N/C}$
- (C) $5.97 \times 10^6 \text{ N/C}$
- (D) $7.47 \times 10^5 \text{ N/C}$

Q10. An infinitely long straight wire carries a uniform linear charge density of 82 nC/m. What is the magnitude of the electric field 6 cm from the wire?

- (A) $1.23 \times 10^4 \text{ N/C}$
- (B) $4.91 \times 10^4 \text{ N/C}$
- (C) $9.83 \times 10^4 \text{ N/C}$
- (D) $2.46 \times 10^4 \text{ N/C}$

Q11. A very large flat sheet carries a uniform surface charge density of 23 $\mu\text{C}/\text{m}^2$. What is the magnitude of the electric field near the sheet, away from its edges?

- (A) $1.3 \times 10^6 \text{ N/C}$
- (B) $6.5 \times 10^5 \text{ N/C}$
- (C) $2.6 \times 10^6 \text{ N/C}$
- (D) $3.25 \times 10^5 \text{ N/C}$

Q12. A solid insulating sphere of radius 29 cm carries a total charge of 11 μC uniformly distributed through its volume. What is the magnitude of the electric field at a point 19 cm from its centre?

- (A) $7.7 \times 10^5 \text{ N/C}$
- (B) $3.85 \times 10^5 \text{ N/C}$
- (C) $1.54 \times 10^6 \text{ N/C}$
- (D) $3.08 \times 10^6 \text{ N/C}$

Unit 9: Electric Potential

Q13. A charge is moved slowly along an equipotential surface held at 264 V, from one point to another on the same surface. How much work is done by the electric field during this move?

- (A) 264 J
- (B) 0 J
- (C) 132 J
- (D) 528 J

Q14. A point charge of 8 μC is fixed in vacuum, with zero potential at infinity. What is the electric potential 13 cm from the charge?

- (A) $2.77 \times 10^5 \text{ V}$
- (B) $1.11 \times 10^6 \text{ V}$
- (C) $-5.53 \times 10^5 \text{ V}$
- (D) $5.53 \times 10^5 \text{ V}$

Q15. A charge of 10 μC is moved slowly from a point at potential 231 V to a point at potential 281 V. How much work is done by an external agent, ignoring any change in kinetic energy?

- (A) 0.00025 J
- (B) 0.0005 J
- (C) 0.001 J
- (D) 0.000125 J

Q16. Two point charges 6 μC and 8 μC are held 40 cm apart. What is the electric potential energy of this pair?

- (A) 0.539 J
- (B) 2.16 J
- (C) -1.08 J
- (D) 1.08 J

Q17. In a region, the electric potential varies with position as $V(x) = 3x^2 + (17)x + 20$, where V is in volts and x is in metres. What is the x -component of the electric field at $x = 2.0 \text{ m}$?

- (A) -14.5 N/C
- (B) -58 N/C
- (C) -29 N/C
- (D) 29 N/C

Q18. A thin ring of radius 12 cm carries a total charge of 26 μC uniformly around its circumference. What is the electric potential on the ring's axis 28 cm from its centre, with zero potential at infinity?

- (A) $3.84 \times 10^5 \text{ V}$
- (B) $1.53 \times 10^6 \text{ V}$
- (C) $1.92 \times 10^5 \text{ V}$
- (D) $7.67 \times 10^5 \text{ V}$

Q19. A thin spherical shell of radius 16 cm carries a total charge of 12 μC uniformly on its surface. What is the electric potential at a point 26 cm from its centre, with zero potential at infinity?

- (A) $2.07 \times 10^5 \text{ V}$
- (B) $8.3 \times 10^5 \text{ V}$
- (C) $4.15 \times 10^5 \text{ V}$
- (D) $1.66 \times 10^6 \text{ V}$

Q20. A particle of mass 11 μg and charge 155 nC starts from rest and accelerates through a potential drop of 630 V. What is its final speed, ignoring gravity and other forces?

- (A) 66.6 m/s
- (B) 133 m/s
- (C) 266 m/s
- (D) 33.3 m/s

Q21. Point charges 11 μC and 6 μC are fixed in vacuum. At a certain point P, the distances to the two charges are 44 cm and 47 cm respectively. What is the electric potential at P, with zero potential at infinity?

- (A) $1.7 \times 10^5 \text{ V}$
- (B) $6.79 \times 10^5 \text{ V}$
- (C) $3.4 \times 10^5 \text{ V}$
- (D) $-3.4 \times 10^5 \text{ V}$

Unit 10: Conductors and Capacitors

Q22. Capacitors of 11 μF and 3 μF are connected in series. What is their equivalent capacitance?

- (A) 1.18 μF
- (B) 4.71 μF
- (C) 2.36 μF
- (D) 9.43 μF

Q23. Capacitors of 10 μF , 12 μF and 10 μF are connected in parallel. What is their equivalent capacitance?

- (A) 32 μF
- (B) 16 μF
- (C) 64 μF
- (D) 24 μF

Q24. A 10 μF capacitor is charged to 178 V. How much energy is stored in the capacitor?

- (A) 0.158 J
- (B) 0.0792 J
- (C) 0.317 J
- (D) 0.0396 J

Q25. A 15 μF capacitor is connected across a 79 V battery. What charge is stored on each plate?

- (A) 0.000592 C
- (B) 0.00237 C
- (C) 0.00474 C
- (D) 0.00118 C

Q26. A spherical capacitor consists of two concentric conducting shells of radii 9 cm and 19 cm. What is its capacitance?

- (A) 9.51×10^{-12} F
- (B) 3.8×10^{-11} F
- (C) 4.75×10^{-12} F
- (D) 1.9×10^{-11} F

Q27. The voltage across a parallel-plate capacitor is 93 V and the plate separation is 6 mm. What is the magnitude of the uniform electric field between the plates?

- (A) 7.75×10^3 N/C
- (B) 3.1×10^4 N/C
- (C) 6.2×10^4 N/C
- (D) 1.55×10^4 N/C

Q28. A parallel-plate capacitor has plates of area 223 cm^2 separated by 5 mm in vacuum. What is its capacitance?

- (A) 1.97×10^{-11} F
- (B) 3.95×10^{-11} F
- (C) 7.89×10^{-11} F
- (D) 1.58×10^{-10} F

Q29. A parallel-plate capacitor has capacitance 232 pF in vacuum. The gap is then completely filled with a dielectric of constant 4 while the plates remain isolated. What is the new capacitance?

- (A) 928 pF
- (B) 464 pF
- (C) 1.86×10^3 pF
- (D) 232 pF

Unit 11: Electric Circuits

Q30. A wire of resistivity $16.0 \times 10^{-8} \Omega \cdot \text{m}$ has length 1 m and cross-sectional area 1 mm^2 . What is its resistance?

- (A) 0.08Ω
- (B) 0.16Ω
- (C) 0.32Ω
- (D) 0.04Ω

Q31. Resistors of 120Ω , 27Ω and 41Ω are connected in series. What is their equivalent resistance?

- (A) 94Ω
- (B) 188Ω
- (C) 376Ω
- (D) 141Ω

- Q32. Resistors of $20\ \Omega$ and $30\ \Omega$ are connected in parallel. What is their equivalent resistance?**
- (A) $6\ \Omega$
 - (B) $12\ \Omega$
 - (C) $24\ \Omega$
 - (D) $48\ \Omega$
- Q33. A resistor of $58\ \Omega$ is connected across a $64\ \text{V}$ source. How much power is dissipated in the resistor?**
- (A) $70.6\ \text{W}$
 - (B) $35.3\ \text{W}$
 - (C) $141\ \text{W}$
 - (D) $17.7\ \text{W}$
- Q34. A battery of emf $14\ \text{V}$ and internal resistance $5\ \Omega$ is connected to an external resistor of $49\ \Omega$. What is the current in the circuit?**
- (A) $0.13\ \text{A}$
 - (B) $0.519\ \text{A}$
 - (C) $1.04\ \text{A}$
 - (D) $0.259\ \text{A}$
- Q35. A resistor of $46\ \text{k}\Omega$ and a capacitor of $185\ \mu\text{F}$ are connected in series. What is the time constant of this RC circuit?**
- (A) $8.51\ \text{s}$
 - (B) $4.25\ \text{s}$
 - (C) $17\ \text{s}$
 - (D) $2.13\ \text{s}$
- Q36. An initially uncharged capacitor is connected in series with a $2\ \text{k}\Omega$ resistor to a battery. The RC time constant is not given directly. How long after connection will the capacitor reach 90% of its maximum charge? The capacitance is $134\ \mu\text{F}$.**
- (A) $0.309\ \text{s}$
 - (B) $1.23\ \text{s}$
 - (C) $0.617\ \text{s}$
 - (D) $0.154\ \text{s}$
- Q37. A capacitor charged to $85\ \text{V}$ discharges through a resistor. The RC time constant is $4\ \text{s}$. What is the voltage across the capacitor $1\ \text{s}$ after discharge begins?**
- (A) $33.1\ \text{V}$
 - (B) $132\ \text{V}$
 - (C) $16.5\ \text{V}$
 - (D) $66.2\ \text{V}$
- Q38. An uncharged capacitor is connected to a $57\ \text{V}$ battery through a resistor. The RC time constant is $0.8\ \text{s}$. What is the voltage across the capacitor $1\ \text{s}$ after connection?**
- (A) $20.3\ \text{V}$
 - (B) $40.7\ \text{V}$
 - (C) $81.3\ \text{V}$
 - (D) $10.2\ \text{V}$

Q39. A current of 2.5 A flows in a wire of cross-sectional area 2 mm^2 . The free-electron density is $10 \times 10^{28} \text{ m}^{-3}$. What is the drift speed of the electrons?

- (A) $7.81 \times 10^{-5} \text{ m/s}$
- (B) $3.91 \times 10^{-5} \text{ m/s}$
- (C) 0.000156 m/s
- (D) 0.000313 m/s

Q40. Resistors of 85Ω and 35Ω are connected in series across a 20 V battery. What is the voltage across the 35Ω resistor?

- (A) 2.92 V
- (B) 11.7 V
- (C) 1.46 V
- (D) 5.83 V

Q41. A current of 2 A flows uniformly through a wire of cross-sectional area 1 mm^2 . What is the current density in the wire?

- (A) $1 \times 10^6 \text{ A/m}^2$
- (B) $4 \times 10^6 \text{ A/m}^2$
- (C) $2 \times 10^6 \text{ A/m}^2$
- (D) $5 \times 10^5 \text{ A/m}^2$

Unit 12: Magnetic Fields and Electromagnetism

Q42. An electron (mass $9.11 \times 10^{-31} \text{ kg}$, charge $1.60 \times 10^{-19} \text{ C}$) moves perpendicular to a uniform magnetic field of 58 mT. What is the period of its circular motion?

- (A) $6.17 \times 10^{-10} \text{ s}$
- (B) $3.08 \times 10^{-10} \text{ s}$
- (C) $1.23 \times 10^{-9} \text{ s}$
- (D) $1.54 \times 10^{-10} \text{ s}$

Q43. Two long parallel wires 19 cm apart carry currents of 11 A and 17 A in the same direction. What is the magnitude of the magnetic force per unit length on either wire?

- (A) $9.84 \times 10^{-5} \text{ N/m}$
- (B) 0.000394 N/m
- (C) 0.000197 N/m
- (D) 0.000787 N/m

Q44. A rectangular loop of area 79 cm^2 has 25 turns and carries a current of 1 A in a uniform magnetic field of 75 mT. The angle between the loop's normal and the field is 90° . What is the magnitude of the torque on the loop?

- (A) $0.00741 \text{ N}\cdot\text{m}$
- (B) $0.0296 \text{ N}\cdot\text{m}$
- (C) $0.0037 \text{ N}\cdot\text{m}$
- (D) $0.0148 \text{ N}\cdot\text{m}$

Q45. A long solid cylindrical wire of radius 17 cm carries a current of 23 A uniformly distributed over its cross-section. What is the magnitude of the magnetic field inside the wire at a distance 14 cm from its axis?

- (A) $1.11 \times 10^{-5} \text{ T}$
- (B) $4.46 \times 10^{-5} \text{ T}$
- (C) $2.23 \times 10^{-5} \text{ T}$
- (D) $8.91 \times 10^{-5} \text{ T}$

Q46. A long straight wire carries a current of 8 A. What is the magnitude of the magnetic field 14 cm from the wire?

- (A) $5.71 \times 10^{-6} \text{ T}$
- (B) $2.29 \times 10^{-5} \text{ T}$
- (C) $4.57 \times 10^{-5} \text{ T}$
- (D) $1.14 \times 10^{-5} \text{ T}$

Q47. A circular loop of radius 19 cm has 10 turns and carries a current of 4 A. What is the magnitude of the magnetic field at the centre of the loop?

- (A) $6.61 \times 10^{-5} \text{ T}$
- (B) 0.000265 T
- (C) 0.000132 T
- (D) $3.31 \times 10^{-5} \text{ T}$

Q48. A solenoid of length 23 cm has 892 turns and carries a current of 3 A. What is the magnitude of the magnetic field inside the solenoid, away from its ends?

- (A) 0.00731 T
- (B) 0.0292 T
- (C) 0.0146 T
- (D) 0.0585 T

Q49. A straight wire of length 76 cm carries a current of 5 A in a uniform magnetic field of 37 mT. The angle between the wire and the field is 90° . What is the magnitude of the magnetic force on the wire?

- (A) 0.0703 N
- (B) 0.141 N
- (C) 0.281 N
- (D) 0.0351 N

Q50. A proton (mass $1.67 \times 10^{-27} \text{ kg}$, charge $1.60 \times 10^{-19} \text{ C}$) moves at $3 \times 10^5 \text{ m/s}$ perpendicular to a uniform magnetic field of 52 mT. What is the radius of its circular path?

- (A) 0.0301 m
- (B) 0.12 m
- (C) 0.0903 m
- (D) 0.0602 m

Unit 13: Electromagnetic Induction

Q51. An inductor of 280 mH is connected in series with a resistor of 15 Ω . What is the time constant of this LR circuit?

- (A) 0.0187 s
- (B) 0.00933 s
- (C) 0.0373 s
- (D) 0.00467 s

Q52. An LR circuit with time constant 0.5 s is connected to a 12 V battery through a 22 Ω resistor. What is the current 1.5 s after the switch is closed, starting from zero current?

- (A) 0.259 A
- (B) 1.04 A
- (C) 0.518 A
- (D) 0.13 A

Q53. An inductor carrying an initial current of 1 A is disconnected from its battery and discharges through a resistor. The LR time constant is 0.5 s. What is the current 0.5 s after discharge begins?

- (A) 0.184 A
- (B) 0.736 A
- (C) 1.47 A
- (D) 0.368 A

Q54. An LC circuit consists of an inductor of 26 mH and a capacitor of 46 μ F. What is the period of oscillation of the circuit?

- (A) 0.00344 s
- (B) 0.00687 s
- (C) 0.0137 s
- (D) 0.0275 s

Q55. A flat loop of area 54 cm² is placed in a uniform magnetic field of 97 mT. The angle between the field and the normal to the loop is 60°. What is the magnetic flux through the loop?

- (A) 0.000131 Wb
- (B) 0.000262 Wb
- (C) 0.000524 Wb
- (D) 6.55×10^{-5} Wb

Q56. A coil of 50 turns and area 25 cm² is perpendicular to a magnetic field that increases uniformly from 39 mT to 115 mT in 35 ms. What is the magnitude of the induced emf in the coil?

- (A) 0.136 V
- (B) 0.271 V
- (C) 0.543 V
- (D) 0.0679 V

Q57. A conducting rod of length 74 cm moves at 3 m/s perpendicular to a uniform magnetic field of 33 mT, with its length perpendicular to both the velocity and the field. What is the motional emf between its ends?

- (A) 0.0733 V
- (B) 0.0366 V
- (C) 0.147 V
- (D) 0.293 V

Q58. An emf of 0.5 V is induced in a circular loop of resistance $2\ \Omega$. What is the induced current in the loop?

- (A) 0.25 A
- (B) 0.125 A
- (C) 0.5 A
- (D) 0.0625 A

Q59. A solenoid has 917 turns, a cross-sectional area of 28 cm^2 and a length of 85 cm. What is its self-inductance?

- (A) 0.00348 H
- (B) 0.00174 H
- (C) 0.00696 H
- (D) 0.00087 H

Q60. An inductor of 152 mH carries a current of 3 A. How much energy is stored in its magnetic field?

- (A) 0.342 J
- (B) 0.684 J
- (C) 1.37 J
- (D) 2.74 J

Answer Key

Q1: C	Q11: A	Q21: C	Q31: B	Q41: C	Q51: A
Q2: D	Q12: A	Q22: C	Q32: B	Q42: A	Q52: C
Q3: C	Q13: B	Q23: A	Q33: A	Q43: C	Q53: D
Q4: A	Q14: D	Q24: A	Q34: D	Q44: D	Q54: B
Q5: A	Q15: B	Q25: D	Q35: A	Q45: C	Q55: B
Q6: C	Q16: D	Q26: D	Q36: C	Q46: D	Q56: B
Q7: C	Q17: C	Q27: D	Q37: D	Q47: C	Q57: A
Q8: B	Q18: D	Q28: B	Q38: B	Q48: C	Q58: A
Q9: B	Q19: C	Q29: A	Q39: A	Q49: B	Q59: A
Q10: D	Q20: B	Q30: B	Q40: D	Q50: D	Q60: B

Worked explanations for all 60 questions:

quaidianpoint.com/ap-physics-c-electromagnetism-practice-test-2/ — plus 80 free AP Physics practice tests at QuaidianPoint.com.