

AP Physics 2 Practice Test 1

60 original multiple-choice questions covering all 7 AP Physics 2 units (Units 9–15). All questions are algebra-based (no calculus). 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 9: Thermodynamics

Q1. A sealed container holds 3 mol of helium in a volume of 40 L at a temperature of 360 K. What is the pressure of the gas? (Use $R = 8.31 \text{ J}/(\text{mol}\cdot\text{K})$.)

- (A) 448740 Pa
- (B) 112185 Pa
- (C) 224370 Pa
- (D) 336555 Pa

Q2. A weather balloon contains gas at constant pressure with an initial volume of 24 L at 360 K. The volume changes to 30 L. What is the new temperature of the gas?

- (A) 900 K
- (B) 450 K
- (C) 225 K
- (D) 675 K

Q3. A gas in a cylinder absorbs 1000 J of heat while doing 650 J of work on its surroundings. What is the change in internal energy of the gas?

- (A) 700 J
- (B) 175 J
- (C) 525 J
- (D) 350 J

Q4. A gas expands at a constant pressure of 80 kPa, increasing its volume by 10 L. How much work is done by the gas?

- (A) 1600 J
- (B) 400 J
- (C) 1200 J
- (D) 800 J

Q5. A iron plate of mass 1 kg is heated through a temperature rise of 10°C . The specific heat capacity of the material is $450 \text{ J}/(\text{kg}^\circ\text{C})$. How much heat is supplied?

- (A) 9000 J
- (B) 2250 J
- (C) 4500 J
- (D) 6750 J

Q6. A Carnot engine operates between a hot reservoir at 900 K and a cold reservoir at 250 K. What is its maximum possible efficiency?

- (A) 72.22 %
- (B) 108 %
- (C) 36.11 %
- (D) 27.78 %

Q7. A heat engine takes in 5000 J of heat in each cycle and rejects 1500 J to the cold reservoir. What is the efficiency of the engine?

- (A) 30 %
- (B) 35 %
- (C) 70 %
- (D) 77 %

Q8. A fixed volume of gas has a pressure of 80 kPa at 320 K. It is heated to 600 K at constant volume. What is its new pressure?

- (A) 300 kPa
- (B) 75 kPa
- (C) 150 kPa
- (D) 225 kPa

Q9. Two samples of the same liquid, of masses 1 kg at 80 °C and 1 kg at 30 °C, are mixed in an insulated container. What is the final temperature of the mixture? (Ignore heat loss.)

- (A) 60.5 °C
- (B) 50 °C
- (C) 55 °C
- (D) 82.5 °C

Unit 10: Electric Force, Field, and Potential

Q10. Two charged balls carry charges of 2 μC and 4 μC and are 25 cm apart in a vacuum. What is the magnitude of the electrostatic force between them? (Use $k = 9 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$.)

- (A) 2.304 N
- (B) 0.576 N
- (C) 1.152 N
- (D) 1.728 N

Q11. What is the magnitude of the electric field at a distance of 50 cm from a point charge of 4 μC in a vacuum? (Use $k = 9 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$.)

- (A) 288000 N/C
- (B) 72000 N/C
- (C) 144000 N/C
- (D) 216000 N/C

Q12. Two parallel plates are 4 mm apart with a potential difference of 480 V between them. What is the magnitude of the uniform electric field between the plates?

- (A) 240000 N/C
- (B) 60000 N/C
- (C) 180000 N/C
- (D) 120000 N/C

Q13. What is the electric potential at a distance of 40 cm from a point charge of 6 μC in a vacuum? (Use $k = 9 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$.)

- (A) 135000 V
- (B) 270000 V
- (C) 67500 V
- (D) 202500 V

Q14. A charge of 8 μC is placed at a point where the electric potential is 1000 V. What is its electric potential energy?

- (A) 0.016 J
- (B) 0.008 J
- (C) 0.004 J
- (D) 0.012 J

Q15. A charge of 3 μC is placed in a uniform electric field of strength 10000 N/C. What is the magnitude of the electric force on the charge?

- (A) 0.03 N
- (B) 0.06 N
- (C) 0.015 N
- (D) 0.045 N

Q16. A uniform electric field of 1200 N/C points along a straight path of length 15 cm. What is the potential difference between the ends of the path?

- (A) 180 V
- (B) 360 V
- (C) 90 V
- (D) 270 V

Q17. A stationary charge of 4 μC is accelerated from rest through a potential difference of 500 V. What kinetic energy does it gain? (Ignore gravity.)

- (A) 0.004 J
- (B) 0.001 J
- (C) 0.003 J
- (D) 0.002 J

Q18. Two point charges exert a force of 18 N on each other. If the distance between them is doubled while everything else stays the same, what is the new force between them?

- (A) 4.5 N
- (B) 9 N
- (C) 2.25 N
- (D) 6.75 N

Unit 11: Electric Circuits

Q19. A motor of resistance $10\ \Omega$ is connected across a $30\ \text{V}$ battery. What current flows through it? (Ignore internal resistance.)

- (A) $6\ \text{A}$
- (B) $3\ \text{A}$
- (C) $1.5\ \text{A}$
- (D) $4.5\ \text{A}$

Q20. Three resistors of $15\ \Omega$, $5\ \Omega$ and $30\ \Omega$ are connected in series. What is their combined resistance?

- (A) $50\ \Omega$
- (B) $100\ \Omega$
- (C) $25\ \Omega$
- (D) $75\ \Omega$

Q21. Resistors of $30\ \Omega$ and $10\ \Omega$ are connected in parallel. What is their combined resistance?

- (A) $15\ \Omega$
- (B) $3.75\ \Omega$
- (C) $11.25\ \Omega$
- (D) $7.5\ \Omega$

Q22. A kettle operates at $24\ \text{V}$ and draws a current of $2\ \text{A}$. What power does it use?

- (A) $96\ \text{W}$
- (B) $24\ \text{W}$
- (C) $48\ \text{W}$
- (D) $72\ \text{W}$

Q23. A washing machine rated at $2000\ \text{W}$ runs for 3 hours. How much electrical energy does it use, in kilowatt-hours?

- (A) $12\ \text{kWh}$
- (B) $6\ \text{kWh}$
- (C) $3\ \text{kWh}$
- (D) $9\ \text{kWh}$

Q24. A cell of emf $36\ \text{V}$ and internal resistance $3\ \Omega$ is connected to an external resistor of $14\ \Omega$. What current flows in the circuit?

- (A) $2.118\ \text{A}$
- (B) $4.235\ \text{A}$
- (C) $1.059\ \text{A}$
- (D) $3.176\ \text{A}$

Q25. In a parallel circuit, one branch of resistance $4\ \Omega$ is connected across a $24\ \text{V}$ supply. What current flows through that branch?

- (A) $12\ \text{A}$
- (B) $3\ \text{A}$
- (C) $9\ \text{A}$
- (D) $6\ \text{A}$

Q26. A wire has a resistance of $20\ \Omega$. If its length is halved while the material and temperature stay the same, what is its new resistance?

- (A) $20\ \Omega$
- (B) $5\ \Omega$
- (C) $10\ \Omega$
- (D) $15\ \Omega$

Q27. Resistors of $8\ \Omega$ and $8\ \Omega$ are connected in parallel, and this combination is connected in series with a $6\ \Omega$ resistor. What is the total resistance of the circuit?

- (A) $20\ \Omega$
- (B) $5\ \Omega$
- (C) $10\ \Omega$
- (D) $15\ \Omega$

Unit 12: Magnetism and Electromagnetism

Q28. A charge of $8\ \mu\text{C}$ moves at $5000\ \text{m/s}$ perpendicular to a uniform magnetic field of $0.4\ \text{T}$. What is the magnitude of the magnetic force on the charge?

- (A) $0.016\ \text{N}$
- (B) $0.032\ \text{N}$
- (C) $0.008\ \text{N}$
- (D) $0.024\ \text{N}$

Q29. A straight wire of length $2\ \text{m}$ carries a current of $3\ \text{A}$ perpendicular to a uniform magnetic field of $0.2\ \text{T}$. What is the magnitude of the magnetic force on the wire?

- (A) $2.4\ \text{N}$
- (B) $0.6\ \text{N}$
- (C) $1.8\ \text{N}$
- (D) $1.2\ \text{N}$

Q30. A particle of mass $0.01\ \text{kg}$ and charge $0.25\ \text{C}$ moves at $40\ \text{m/s}$ perpendicular to a uniform magnetic field of $0.4\ \text{T}$. What is the radius of its circular path?

- (A) $8\ \text{m}$
- (B) $4\ \text{m}$
- (C) $2\ \text{m}$
- (D) $6\ \text{m}$

Q31. A long straight wire carries a current of $10\ \text{A}$. What is the magnitude of the magnetic field at a distance of $5\ \text{cm}$ from the wire?

- (A) $0.00008\ \text{T}$
- (B) $0.00002\ \text{T}$
- (C) $0.00004\ \text{T}$
- (D) $0.00006\ \text{T}$

Q32. A solenoid has 800 turns per metre and carries a current of 3 A. What is the magnetic field strength inside the solenoid, far from its ends? (Use $\mu_0 = 4\pi \times 10^{-7} \text{ T}\cdot\text{m/A}$.)

- (A) 0.006032 T
- (B) 0.001508 T
- (C) 0.003016 T
- (D) 0.004524 T

Q33. A flat loop of area 0.02 m^2 sits in a uniform magnetic field of 0.4 T, with the field making an angle of 60° with the normal to the loop. What is the magnetic flux through the loop?

- (A) 0.008 Wb
- (B) 0.002 Wb
- (C) 0.006 Wb
- (D) 0.004 Wb

Q34. A coil of 250 turns and area 0.02 m^2 experiences a magnetic field change of 0.8 T in 0.25 s, with the field perpendicular to the coil. What is the magnitude of the induced emf in the coil?

- (A) 16 V
- (B) 32 V
- (C) 8 V
- (D) 24 V

Q35. A conducting rod of length 0.5 m moves at 2 m/s perpendicular to a uniform magnetic field of 0.4 T, sliding on rails as in a motional emf setup. What is the induced emf across the rod?

- (A) 0.8 V
- (B) 0.4 V
- (C) 0.2 V
- (D) 0.6 V

Unit 13: Geometric Optics

Q36. An object is placed 30 cm in front of a concave mirror of focal length 10 cm. What is the image distance? (A positive value means a real image in front of the mirror.)

- (A) 30 cm
- (B) 15 cm
- (C) 7.5 cm
- (D) 22.5 cm

Q37. An object placed 45 cm from a mirror forms an image 22.5 cm from the mirror. What is the lateral magnification?

- (A) -1
- (B) -0.25
- (C) -0.5
- (D) -0.75

Q38. An object is placed 20 cm in front of a converging lens of focal length 10 cm. What is the image distance? (A positive value means a real image on the opposite side of the lens.)

- (A) 20 cm
- (B) 40 cm
- (C) 10 cm
- (D) 30 cm

Q39. A light ray in air ($n = 1$) strikes a glass block at an angle of incidence of 60° and refracts at an angle of 30° to the normal. What is the refractive index of the glass? (Use $\sin 60^\circ = 0.866$ and $\sin 30^\circ = 0.5$.)

- (A) 2.6
- (B) 0.58
- (C) 1.73
- (D) 0.87

Q40. Light inside a material of refractive index 2.42 strikes the boundary with air. What is the critical angle for total internal reflection?

- (A) 65.6°
- (B) 12.2°
- (C) 36.6°
- (D) 24.4°

Q41. Light travels at 120000000 m/s in a transparent solid. Taking the speed of light in a vacuum as 3×10^8 m/s, what is the refractive index of the solid?

- (A) 5
- (B) 2.5
- (C) 1.25
- (D) 3.75

Q42. A spherical mirror has a radius of curvature of 50 cm. What is its focal length?

- (A) 50 cm
- (B) 12.5 cm
- (C) 37.5 cm
- (D) 25 cm

Q43. An object is placed 10 cm in front of a converging lens of focal length 20 cm, inside the focal point. What is the image distance? (A negative value means a virtual image on the same side as the object.)

- (A) 20 cm
- (B) -20 cm
- (C) -40 cm
- (D) -10 cm

Unit 14: Waves, Sound, and Physical Optics

Q44. A wave has a frequency of 200 Hz and a wavelength of 1.5 m. What is its speed?

- (A) 600 m/s
- (B) 300 m/s
- (C) 150 m/s
- (D) 450 m/s

Q45. An oscillator completes one full cycle in 0.4 s. What is its frequency?

- (A) 4 Hz
- (B) 2.5 Hz
- (C) 1 Hz
- (D) 3 Hz

Q46. A sound source radiates 100 W uniformly in all directions. What is the sound intensity at a distance of 5 m from the source? (Use $\pi = 3.14$.)

- (A) 0.63662 W/m^2
- (B) 0.159155 W/m^2
- (C) 0.477465 W/m^2
- (D) 0.31831 W/m^2

Q47. A string of length 1.5 m, fixed at both ends, supports waves travelling at 200 m/s. What is the frequency of its 3th harmonic?

- (A) 400 Hz
- (B) 100 Hz
- (C) 300 Hz
- (D) 200 Hz

Q48. An air column of length 0.85 m, open at both ends, has a fundamental frequency given by $v \div 2L$ with $v = 343 \text{ m/s}$. What is its fundamental frequency?

- (A) 404 Hz
- (B) 101 Hz
- (C) 303 Hz
- (D) 202 Hz

Q49. Two tuning forks of frequencies 600 Hz and 603 Hz sound together. What is the beat frequency heard?

- (A) 3 Hz
- (B) 6 Hz
- (C) 1.5 Hz
- (D) 4.5 Hz

Q50. In a double-slit experiment, light of wavelength 450 nm passes through slits 0.2 mm apart, with a screen 2 m away. What is the distance from the central bright fringe to the first bright fringe on the screen?

- (A) 0.45 cm
- (B) 0.9 cm
- (C) 0.225 cm
- (D) 0.675 cm

- Q51. A siren emitting 400 Hz moves toward a stationary observer at 60 m/s. Taking the speed of sound as 343 m/s, what frequency does the observer hear?**
- (A) 340 Hz
 - (B) 485 Hz
 - (C) 400 Hz
 - (D) 582 Hz

Unit 15: Modern Physics

- Q52. What is the energy, in electron-volts, of a red photon of wavelength 650 nm? (Use $hc = 1240 \text{ eV}\cdot\text{nm}$.)**

- (A) 1.91 eV
- (B) 3.82 eV
- (C) 0.95 eV
- (D) 2.86 eV

- Q53. Light of photon energy 4.5 eV strikes a sodium surface whose work function is 1 eV. What is the maximum kinetic energy of an emitted photoelectron?**

- (A) 7 eV
- (B) 1.75 eV
- (C) 3.5 eV
- (D) 5.25 eV

- Q54. An electron of mass $9.11 \times 10^{-31} \text{ kg}$ moves at 1000000 m/s. What is its de Broglie wavelength? (Use $h = 6.63 \times 10^{-34} \text{ J}\cdot\text{s}$.)**

- (A) 1.456 nm
- (B) 0.364 nm
- (C) 1.092 nm
- (D) 0.728 nm

- Q55. What is the energy of a hydrogen atom in the $n = 3$ energy level? (Ground-state energy is -13.6 eV.)**

- (A) -40.8 eV
- (B) -1.511 eV
- (C) 1.51 eV
- (D) -4.53 eV

- Q56. A hydrogen atom drops from the $n = 4$ level to the $n = 2$ level. What is the energy of the photon emitted?**

- (A) 1.27 eV
- (B) 2.55 eV
- (C) 5.1 eV
- (D) 11.05 eV

- Q57. A nucleus has a mass defect of 0.005 u. What is its total binding energy in MeV? (1 u corresponds to 931.5 MeV.)**

- (A) 9.315 MeV
- (B) 2.329 MeV
- (C) 6.986 MeV
- (D) 4.657 MeV

Q58. An radon sample of mass 80 g decays through 4 half-lives. What mass remains?

- (A) 5 g
- (B) 10 g
- (C) 2.5 g
- (D) 7.5 g

Q59. A clock moving at $0.8c$ relative to an observer ticks with a proper time interval of 10 s between two events. What time interval does the stationary observer measure?

- (A) 16.67 s
- (B) 6 s
- (C) 10 s
- (D) 25 s

Q60. A rod of proper length 10 m moves at $0.8c$ relative to an observer. What length does the observer measure?

- (A) 16.67 m
- (B) 6 m
- (C) 10 m
- (D) 3 m

Answer Key

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

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