

AP Physics 2 Practice Test 2

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 4 mol of helium in a volume of 60 L at a temperature of 349 K. What is the pressure of the gas? (Use $R = 8.31 \text{ J/(mol.K)}$.)

- (A) 386692 Pa
- (B) 96673 Pa
- (C) 193346 Pa
- (D) 290019 Pa

Q2. A piston chamber contains gas at constant pressure with an initial volume of 24 L at 240 K. The volume changes to 60 L. What is the new temperature of the gas?

- (A) 1200 K
- (B) 600 K
- (C) 300 K
- (D) 900 K

Q3. A air sample absorbs 950 J of heat while doing 450 J of work on its surroundings. What is the change in internal energy of the gas?

- (A) 1000 J
- (B) 500 J
- (C) 250 J
- (D) 750 J

Q4. A gas expands at a constant pressure of 90 kPa, increasing its volume by 4 L. How much work is done by the gas?

- (A) 720 J
- (B) 360 J
- (C) 180 J
- (D) 540 J

Q5. A aluminium block of mass 3 kg is heated through a temperature rise of 60 °C. The specific heat capacity of the material is 900 J/(kg°C). How much heat is supplied?

- (A) 324000 J
- (B) 81000 J
- (C) 162000 J
- (D) 243000 J

Q6. A Carnot engine operates between a hot reservoir at 900 K and a cold reservoir at 290 K. What is its maximum possible efficiency?

- (A) 102 %
- (B) 33.89 %
- (C) 67.78 %
- (D) 32.22 %

Q7. A heat engine takes in 3000 J of heat in each cycle and rejects 800 J to the cold reservoir. What is the efficiency of the engine?

- (A) 26.67 %
- (B) 73.33 %
- (C) 36.67 %
- (D) 80.663 %

Q8. A fixed volume of gas has a pressure of 100 kPa at 300 K. It is heated to 560 K at constant volume. What is its new pressure?

- (A) 373 kPa
- (B) 93.333 kPa
- (C) 187 kPa
- (D) 280 kPa

Q9. Two samples of the same liquid, of masses 3 kg at 100 °C and 1 kg at 10 °C, are mixed in an insulated container. What is the final temperature of the mixture? (Ignore heat loss.)

- (A) 55 °C
- (B) 90 °C
- (C) 77.5 °C
- (D) 116 °C

Unit 10: Electric Force, Field, and Potential

Q10. Two charged beads carry charges of 6 μC and 9 μC and are 40 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) 6.075 N
- (B) 1.519 N
- (C) 3.037 N
- (D) 4.556 N

Q11. What is the magnitude of the electric field at a distance of 20 cm from a point charge of 16 μC in a vacuum? (Use $k = 9 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$.)

- (A) 7200000 N/C
- (B) 1800000 N/C
- (C) 3600000 N/C
- (D) 5400000 N/C

Q12. Two parallel plates are 10 mm apart with a potential difference of 180 V between them. What is the magnitude of the uniform electric field between the plates?

- (A) 36000 N/C
- (B) 9000 N/C
- (C) 18000 N/C
- (D) 27000 N/C

Q13. What is the electric potential at a distance of 40 cm from a point charge of 18 μC in a vacuum? (Use $k = 9 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$.)

- (A) 405000 V
- (B) 810000 V
- (C) 202500 V
- (D) 607500 V

Q14. A charge of 4 μC is placed at a point where the electric potential is 300 V. What is its electric potential energy?

- (A) 0.0024 J
- (B) 0.0012 J
- (C) 0.0006 J
- (D) 0.0018 J

Q15. A charge of 2 μC is placed in a uniform electric field of strength 3000 N/C. What is the magnitude of the electric force on the charge?

- (A) 0.012 N
- (B) 0.003 N
- (C) 0.009 N
- (D) 0.006 N

Q16. A uniform electric field of 800 N/C points along a straight path of length 40 cm. What is the potential difference between the ends of the path?

- (A) 640 V
- (B) 160 V
- (C) 320 V
- (D) 480 V

Q17. A stationary charge of 1 μC is accelerated from rest through a potential difference of 800 V. What kinetic energy does it gain? (Ignore gravity.)

- (A) 0.0016 J
- (B) 0.0004 J
- (C) 0.0012 J
- (D) 0.0008 J

Q18. Two point charges exert a force of 48 N on each other. If one charge is doubled while everything else stays the same, what is the new force between them?

- (A) 96 N
- (B) 192 N
- (C) 48 N
- (D) 144 N

Unit 11: Electric Circuits

Q19. A resistor of resistance $4\ \Omega$ is connected across a $18\ \text{V}$ battery. What current flows through it? (Ignore internal resistance.)

- (A) $9\ \text{A}$
- (B) $4.5\ \text{A}$
- (C) $2.25\ \text{A}$
- (D) $6.75\ \text{A}$

Q20. Three resistors of $20\ \Omega$, $15\ \Omega$ and $30\ \Omega$ are connected in series. What is their combined resistance?

- (A) $130\ \Omega$
- (B) $65\ \Omega$
- (C) $32.5\ \Omega$
- (D) $97.5\ \Omega$

Q21. Resistors of $12\ \Omega$ and $4\ \Omega$ are connected in parallel. What is their combined resistance?

- (A) $3\ \Omega$
- (B) $6\ \Omega$
- (C) $1.5\ \Omega$
- (D) $4.5\ \Omega$

Q22. A lamp operates at $60\ \text{V}$ and draws a current of $1.5\ \text{A}$. What power does it use?

- (A) $180\ \text{W}$
- (B) $45\ \text{W}$
- (C) $90\ \text{W}$
- (D) $135\ \text{W}$

Q23. A washing machine rated at $1500\ \text{W}$ runs for $4\ \text{hours}$. How much electrical energy does it use, in kilowatt-hours?

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

Q24. A cell of emf $9\ \text{V}$ and internal resistance $2\ \Omega$ is connected to an external resistor of $5\ \Omega$. What current flows in the circuit?

- (A) $2.571\ \text{A}$
- (B) $1.286\ \text{A}$
- (C) $0.642857\ \text{A}$
- (D) $1.929\ \text{A}$

Q25. In a parallel circuit, one branch of resistance $12\ \Omega$ is connected across a $60\ \text{V}$ supply. What current flows through that branch?

- (A) $10\ \text{A}$
- (B) $2.5\ \text{A}$
- (C) $5\ \text{A}$
- (D) $7.5\ \text{A}$

Q26. A wire has a resistance of $40\ \Omega$. If its cross-sectional area is doubled while the material and temperature stay the same, what is its new resistance?

- (A) $40\ \Omega$
- (B) $10\ \Omega$
- (C) $20\ \Omega$
- (D) $30\ \Omega$

Q27. Resistors of $8\ \Omega$ and $8\ \Omega$ are connected in parallel, and this combination is connected in series with a $10\ \Omega$ resistor. What is the total resistance of the circuit?

- (A) $28\ \Omega$
- (B) $14\ \Omega$
- (C) $7\ \Omega$
- (D) $21\ \Omega$

Unit 12: Magnetism and Electromagnetism

Q28. A charge of $10\ \mu\text{C}$ moves at $4000\ \text{m/s}$ 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 $6\ \text{A}$ perpendicular to a uniform magnetic field of $0.6\ \text{T}$. What is the magnitude of the magnetic force on the wire?

- (A) $7.2\ \text{N}$
- (B) $14.4\ \text{N}$
- (C) $3.6\ \text{N}$
- (D) $10.8\ \text{N}$

Q30. A particle of mass $0.005\ \text{kg}$ and charge $2\ \text{C}$ moves at $30\ \text{m/s}$ perpendicular to a uniform magnetic field of $1.0\ \text{T}$. What is the radius of its circular path?

- (A) $0.15\ \text{m}$
- (B) $0.0375\ \text{m}$
- (C) $0.075\ \text{m}$
- (D) $0.1125\ \text{m}$

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

- (A) $0.00004\ \text{T}$
- (B) $0.00001\ \text{T}$
- (C) $0.00003\ \text{T}$
- (D) $0.00002\ \text{T}$

Q32. A solenoid has 400 turns per metre and carries a current of 5 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) 0.005027 T
- (B) 0.001257 T
- (C) 0.00377 T
- (D) 0.002513 T

Q33. A flat loop of area 0.25 m^2 sits in a uniform magnetic field of 1.0 T, with the field making an angle of 60° with the normal to the loop. What is the magnetic flux through the loop?

- (A) 0.25 Wb
- (B) 0.0625 Wb
- (C) 0.1875 Wb
- (D) 0.125 Wb

Q34. A coil of 500 turns and area 0.05 m^2 experiences a magnetic field change of 0.2 T in 0.25 s, with the field perpendicular to the coil. What is the magnitude of the induced emf in the coil?

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

Q35. A conducting rod of length 1 m moves at 4 m/s perpendicular to a uniform magnetic field of 0.2 T, sliding on rails as in a motional emf setup. What is the induced emf across the rod?

- (A) 0.8 V
- (B) 1.6 V
- (C) 0.4 V
- (D) 1.2 V

Unit 13: Geometric Optics

Q36. An object is placed 60 cm in front of a concave mirror of focal length 20 cm. What is the image distance? (A positive value means a real image in front of the mirror.)

- (A) 60 cm
- (B) 30 cm
- (C) 15 cm
- (D) 45 cm

Q37. An object placed 20 cm from a mirror forms an image 40 cm from the mirror. What is the lateral magnification?

- (A) -2
- (B) -4
- (C) -1
- (D) -3

Q38. An object is placed 24 cm in front of a converging lens of focal length 12 cm. What is the image distance? (A positive value means a real image on the opposite side of the lens.)

- (A) 24 cm
- (B) 48 cm
- (C) 12 cm
- (D) 36 cm

Q39. A light ray in air ($n = 1$) strikes a glass block at an angle of incidence of 45° and refracts at an angle of 30° to the normal. What is the refractive index of the glass? (Use $\sin 45^\circ = 0.707$ and $\sin 30^\circ = 0.5$.)

- (A) 1.41
- (B) 2.12
- (C) 0.71
- (D) 1.551

Q40. Light inside a material of refractive index 1.33 strikes the boundary with air. What is the critical angle for total internal reflection?

- (A) 48.8°
- (B) 41.2°
- (C) 24.4°
- (D) 73.1°

Q41. Light travels at 150000000 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) 4
- (B) 1
- (C) 3
- (D) 2

Q42. A spherical mirror has a radius of curvature of 80 cm. What is its focal length?

- (A) 80 cm
- (B) 40 cm
- (C) 20 cm
- (D) 60 cm

Q43. An object is placed 15 cm in front of a converging lens of focal length 30 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) 30 cm
- (B) -30 cm
- (C) -60 cm
- (D) -15 cm

Unit 14: Waves, Sound, and Physical Optics

Q44. A wave has a frequency of 120 Hz and a wavelength of 1 m. What is its speed?

- (A) 240 m/s
- (B) 60 m/s
- (C) 180 m/s
- (D) 120 m/s

Q45. An oscillator completes one full cycle in 2.5 s. What is its frequency?

- (A) 0.4 Hz
- (B) 1 Hz
- (C) 0.25 Hz
- (D) 0.75 Hz

Q46. A sound source radiates 50 W uniformly in all directions. What is the sound intensity at a distance of 1 m from the source? (Use $\pi = 3.14$.)

- (A) 7.958 W/m²
- (B) 1.989 W/m²
- (C) 5.968 W/m²
- (D) 3.979 W/m²

Q47. A string of length 0.75 m, fixed at both ends, supports waves travelling at 400 m/s. What is the frequency of its 2th harmonic?

- (A) 1067 Hz
- (B) 267 Hz
- (C) 533 Hz
- (D) 800 Hz

Q48. An air column of length 1.7 m, open at both ends, has a fundamental frequency given by $v \div 2L$ with $v = 343$ m/s. What is its fundamental frequency?

- (A) 202 Hz
- (B) 101 Hz
- (C) 50.441 Hz
- (D) 151 Hz

Q49. Two tuning forks of frequencies 800 Hz and 805 Hz sound together. What is the beat frequency heard?

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

Q50. In a double-slit experiment, light of wavelength 500 nm passes through slits 0.25 mm apart, with a screen 1.5 m away. What is the distance from the central bright fringe to the first bright fringe on the screen?

- (A) 0.6 cm
- (B) 0.15 cm
- (C) 0.45 cm
- (D) 0.3 cm

- Q51. A siren emitting 600 Hz moves toward a stationary observer at 30 m/s. Taking the speed of sound as 343 m/s, what frequency does the observer hear?**
- (A) 658 Hz
 - (B) 552 Hz
 - (C) 600 Hz
 - (D) 789 Hz

Unit 15: Modern Physics

- Q52. What is the energy, in electron-volts, of a blue photon of wavelength 450 nm? (Use $hc = 1240 \text{ eV}\cdot\text{nm}$.)**

- (A) 5.51 eV
- (B) 1.38 eV
- (C) 4.13 eV
- (D) 2.76 eV

- Q53. Light of photon energy 2.5 eV strikes a sodium surface whose work function is 1.5 eV. What is the maximum kinetic energy of an emitted photoelectron?**

- (A) 2 eV
- (B) 0.5 eV
- (C) 1.5 eV
- (D) 1 eV

- Q54. An electron of mass $9.11 \times 10^{-31} \text{ kg}$ moves at 1500000 m/s. What is its de Broglie wavelength? (Use $h = 6.63 \times 10^{-34} \text{ J}\cdot\text{s}$.)**

- (A) 0.97 nm
- (B) 0.2425 nm
- (C) 0.7275 nm
- (D) 0.485 nm

- Q55. What is the energy of a hydrogen atom in the $n = 5$ energy level? (Ground-state energy is -13.6 eV.)**

- (A) -68 eV
- (B) -0.544 eV
- (C) 0.54 eV
- (D) -2.72 eV

- Q56. A hydrogen atom drops from the $n = 3$ level to the $n = 1$ level. What is the energy of the photon emitted?**

- (A) 12.09 eV
- (B) 6.04 eV
- (C) 24.18 eV
- (D) 1.51 eV

- Q57. A nucleus has a mass defect of 0.05 u. What is its total binding energy in MeV? (1 u corresponds to 931.5 MeV.)**

- (A) 93.15 MeV
- (B) 23.288 MeV
- (C) 69.863 MeV
- (D) 46.575 MeV

Q58. An iodine-131 sample of mass 160 g decays through 3 half-lives. What mass remains?

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

Q59. A clock moving at $0.6c$ relative to an observer ticks with a proper time interval of 4 s between two events. What time interval does the stationary observer measure?

- (A) 3.2 s
- (B) 5 s
- (C) 4 s
- (D) 7.5 s

Q60. A rod of proper length 40 m moves at $0.8c$ relative to an observer. What length does the observer measure?

- (A) 24 m
- (B) 66.67 m
- (C) 40 m
- (D) 12 m

Answer Key

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

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