

AP Physics 2 Practice Test 3

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 1 mol of oxygen in a volume of 80 L at a temperature of 332 K. What is the pressure of the gas? (Use $R = 8.31 \text{ J}/(\text{mol}\cdot\text{K})$.)

- (A) 68973 Pa
- (B) 34486 Pa
- (C) 17243 Pa
- (D) 51730 Pa

Q2. A gas syringe contains gas at constant pressure with an initial volume of 40 L at 360 K. The volume changes to 24 L. What is the new temperature of the gas?

- (A) 432 K
- (B) 216 K
- (C) 108 K
- (D) 324 K

Q3. A gas in a piston absorbs 1150 J of heat while doing 500 J of work on its surroundings. What is the change in internal energy of the gas?

- (A) 1300 J
- (B) 325 J
- (C) 975 J
- (D) 650 J

Q4. A gas expands at a constant pressure of 250 kPa, increasing its volume by 10 L. How much work is done by the gas?

- (A) 2500 J
- (B) 5000 J
- (C) 1250 J
- (D) 3750 J

Q5. A iron plate of mass 2.5 kg is heated through a temperature rise of 15 °C. The specific heat capacity of the material is 450 J/(kg°C). How much heat is supplied?

- (A) 16875 J
- (B) 33750 J
- (C) 8438 J
- (D) 25312 J

Q6. A Carnot engine operates between a hot reservoir at 750 K and a cold reservoir at 250 K. What is its maximum possible efficiency?

- (A) 100 %
- (B) 33.33 %
- (C) 66.67 %
- (D) 73.337 %

Q7. A heat engine takes in 1000 J of heat in each cycle and rejects 400 J to the cold reservoir. What is the efficiency of the engine?

- (A) 40 %
- (B) 30 %
- (C) 60 %
- (D) 66 %

Q8. A fixed volume of gas has a pressure of 240 kPa at 280 K. It is heated to 500 K at constant volume. What is its new pressure?

- (A) 857 kPa
- (B) 214 kPa
- (C) 429 kPa
- (D) 643 kPa

Q9. Two samples of the same liquid, of masses 4 kg at 90 °C and 2 kg at 30 °C, are mixed in an insulated container. What is the final temperature of the mixture? (Ignore heat loss.)

- (A) 60 °C
- (B) 77 °C
- (C) 70 °C
- (D) 105 °C

Unit 10: Electric Force, Field, and Potential

Q10. Two charged beads carry charges of 12 μC and 2 μC and are 15 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) 19.2 N
- (B) 4.8 N
- (C) 14.4 N
- (D) 9.6 N

Q11. What is the magnitude of the electric field at a distance of 20 cm from a point charge of 5 μC in a vacuum? (Use $k = 9 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$.)

- (A) 2250000 N/C
- (B) 1125000 N/C
- (C) 562500 N/C
- (D) 1687500 N/C

Q12. Two parallel plates are 4 mm apart with a potential difference of 300 V between them. What is the magnitude of the uniform electric field between the plates?

- (A) 150000 N/C
- (B) 37500 N/C
- (C) 75000 N/C
- (D) 112500 N/C

Q13. What is the electric potential at a distance of 20 cm from a point charge of 9 μC in a vacuum? (Use $k = 9 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$.)

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

Q14. A charge of 8 μC is placed at a point where the electric potential is 300 V. What is its electric potential energy?

- (A) 0.0024 J
- (B) 0.0048 J
- (C) 0.0012 J
- (D) 0.0036 J

Q15. A charge of 3 μC is placed in a uniform electric field of strength 2000 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 1200 N/C points along a straight path of length 20 cm. What is the potential difference between the ends of the path?

- (A) 480 V
- (B) 120 V
- (C) 360 V
- (D) 240 V

Q17. A stationary charge of 5 μC is accelerated from rest through a potential difference of 800 V. What kinetic energy does it gain? (Ignore gravity.)

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

Q18. Two point charges exert a force of 36 N on each other. If the distance between them is halved while everything else stays the same, what is the new force between them?

- (A) 288 N
- (B) 72 N
- (C) 216 N
- (D) 144 N

Unit 11: Electric Circuits

Q19. A motor of resistance $6\ \Omega$ is connected across a $36\ \text{V}$ battery. What current flows through it? (Ignore internal resistance.)

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

Q20. Three resistors of $20\ \Omega$, $5\ \Omega$ and $30\ \Omega$ are connected in series. What is their combined resistance?

- (A) $110\ \Omega$
- (B) $27.5\ \Omega$
- (C) $55\ \Omega$
- (D) $82.5\ \Omega$

Q21. Resistors of $20\ \Omega$ and $5\ \Omega$ are connected in parallel. What is their combined resistance?

- (A) $4\ \Omega$
- (B) $8\ \Omega$
- (C) $2\ \Omega$
- (D) $6\ \Omega$

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

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

Q23. A washing machine rated at $750\ \text{W}$ runs for $5\ \text{hours}$. How much electrical energy does it use, in kilowatt-hours?

- (A) $7.5\ \text{kWh}$
- (B) $3.75\ \text{kWh}$
- (C) $1.875\ \text{kWh}$
- (D) $5.625\ \text{kWh}$

Q24. A cell of emf $24\ \text{V}$ and internal resistance $3\ \Omega$ is connected to an external resistor of $14\ \Omega$. What current flows in the circuit?

- (A) $2.824\ \text{A}$
- (B) $1.412\ \text{A}$
- (C) $0.705882\ \text{A}$
- (D) $2.118\ \text{A}$

Q25. In a parallel circuit, one branch of resistance $4\ \Omega$ is connected across a $48\ \text{V}$ supply. What current flows through that branch?

- (A) $24\ \text{A}$
- (B) $12\ \text{A}$
- (C) $6\ \text{A}$
- (D) $18\ \text{A}$

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

- (A) $80\ \Omega$
- (B) $20\ \Omega$
- (C) $60\ \Omega$
- (D) $40\ \Omega$

Q27. Resistors of $20\ \Omega$ and $5\ \Omega$ 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) $10\ \Omega$
- (C) $5\ \Omega$
- (D) $15\ \Omega$

Unit 12: Magnetism and Electromagnetism

Q28. A charge of $4\ \mu\text{C}$ moves at $4000\ \text{m/s}$ perpendicular to a uniform magnetic field of $0.8\ \text{T}$. What is the magnitude of the magnetic force on the charge?

- (A) $0.0128\ \text{N}$
- (B) $0.0256\ \text{N}$
- (C) $0.0064\ \text{N}$
- (D) $0.0192\ \text{N}$

Q29. A straight wire of length $0.5\ \text{m}$ carries a current of $3\ \text{A}$ perpendicular to a uniform magnetic field of $0.4\ \text{T}$. What is the magnitude of the magnetic force on the wire?

- (A) $1.2\ \text{N}$
- (B) $0.3\ \text{N}$
- (C) $0.9\ \text{N}$
- (D) $0.6\ \text{N}$

Q30. A particle of mass $0.04\ \text{kg}$ and charge $2\ \text{C}$ moves at $20\ \text{m/s}$ perpendicular to a uniform magnetic field of $0.5\ \text{T}$. What is the radius of its circular path?

- (A) $1.6\ \text{m}$
- (B) $0.4\ \text{m}$
- (C) $0.8\ \text{m}$
- (D) $1.2\ \text{m}$

Q31. A long straight wire carries a current of $12\ \text{A}$. What is the magnitude of the magnetic field at a distance of $20\ \text{cm}$ from the wire?

- (A) $0.000024\ \text{T}$
- (B) $0.000006\ \text{T}$
- (C) $0.000012\ \text{T}$
- (D) $0.000018\ \text{T}$

Q32. A solenoid has 500 turns per metre and carries a current of 4 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) 0.002513 T
- (C) 0.001257 T
- (D) 0.00377 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 0° with the normal to the loop. What is the magnetic flux through the loop?

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

Q34. A coil of 200 turns and area 0.05 m^2 experiences a magnetic field change of 0.5 T in 0.5 s, with the field perpendicular to the coil. What is the magnitude of the induced emf in the coil?

- (A) 10 V
- (B) 20 V
- (C) 5 V
- (D) 15 V

Q35. A conducting rod of length 0.5 m moves at 8 m/s perpendicular to a uniform magnetic field of 0.5 T, sliding on rails as in a motional emf setup. What is the induced emf across the rod?

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

Unit 13: Geometric Optics

Q36. An object is placed 36 cm in front of a concave mirror of focal length 12 cm. What is the image distance? (A positive value means a real image in front of the mirror.)

- (A) 36 cm
- (B) 18 cm
- (C) 9 cm
- (D) 27 cm

Q37. An object placed 30 cm from a mirror forms an image 30 cm from the mirror. What is the lateral magnification?

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

Q38. An object is placed 100 cm in front of a converging lens of focal length 25 cm. What is the image distance? (A positive value means a real image on the opposite side of the lens.)

- (A) 33.333 cm
- (B) 66.667 cm
- (C) 16.667 cm
- (D) 50 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 45° to the normal. What is the refractive index of the glass? (Use $\sin 60^\circ = 0.866$ and $\sin 45^\circ = 0.707$.)

- (A) 1.84
- (B) 0.82
- (C) 1.22
- (D) 0.61

Q40. Light inside a material of refractive index 1.36 strikes the boundary with air. What is the critical angle for total internal reflection?

- (A) 42.7°
- (B) 47.3°
- (C) 23.7°
- (D) 71°

Q41. Light travels at 225000000 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) 2.667
- (B) 0.666667
- (C) 1.333
- (D) 2

Q42. A spherical mirror has a radius of curvature of 60 cm. What is its focal length?

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

Q43. An object is placed 5 cm in front of a converging lens of focal length 10 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) 10 cm
- (B) -20 cm
- (C) -10 cm
- (D) -5 cm

Unit 14: Waves, Sound, and Physical Optics

Q44. A wave has a frequency of 100 Hz and a wavelength of 0.5 m. What is its speed?

- (A) 100 m/s
- (B) 25 m/s
- (C) 75 m/s
- (D) 50 m/s

Q45. An oscillator completes one full cycle in 0.02 s. What is its frequency?

- (A) 50 Hz
- (B) 100 Hz
- (C) 25 Hz
- (D) 75 Hz

Q46. A sound source radiates 10 W uniformly in all directions. What is the sound intensity at a distance of 5 m from the source? (Use $\pi = 3.14$.)

- (A) 0.063662 W/m²
- (B) 0.015915 W/m²
- (C) 0.047746 W/m²
- (D) 0.031831 W/m²

Q47. A string of length 0.5 m, fixed at both ends, supports waves travelling at 400 m/s. What is the frequency of its 1th harmonic?

- (A) 800 Hz
- (B) 400 Hz
- (C) 200 Hz
- (D) 600 Hz

Q48. An air column of length 1.7 m, closed at one end, has a fundamental frequency given by $v \div 4L$ with $v = 343$ m/s. What is its fundamental frequency?

- (A) 101 Hz
- (B) 50.441 Hz
- (C) 25.221 Hz
- (D) 75.662 Hz

Q49. Two tuning forks of frequencies 256 Hz and 260 Hz sound together. What is the beat frequency heard?

- (A) 8 Hz
- (B) 2 Hz
- (C) 4 Hz
- (D) 6 Hz

Q50. In a double-slit experiment, light of wavelength 650 nm passes through slits 0.1 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) 1.95 cm
- (B) 0.4875 cm
- (C) 0.975 cm
- (D) 1.462 cm

- Q51. A siren emitting 800 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) 681 Hz
 - (B) 970 Hz
 - (C) 800 Hz
 - (D) 1164 Hz

Unit 15: Modern Physics

- Q52. What is the energy, in electron-volts, of an orange photon of wavelength 600 nm? (Use $hc = 1240 \text{ eV}\cdot\text{nm}$.)**

- (A) 4.13 eV
- (B) 2.07 eV
- (C) 1.03 eV
- (D) 3.1 eV

- Q53. Light of photon energy 2.5 eV strikes a zinc 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 500000 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) 2.912 nm
- (C) 0.728 nm
- (D) 2.184 nm

- Q55. What is the energy of a hydrogen atom in the $n = 1$ energy level? (Ground-state energy is -13.6 eV.)**

- (A) -13.6 eV
- (B) -14.96 eV
- (C) 13.6 eV
- (D) -16.728 eV

- Q56. A hydrogen atom drops from the $n = 5$ level to the $n = 2$ level. What is the energy of the photon emitted?**

- (A) 1.43 eV
- (B) 5.71 eV
- (C) 10.74 eV
- (D) 2.86 eV

- Q57. A nucleus has a mass defect of 0.1 u. What is its total binding energy in MeV? (1 u corresponds to 931.5 MeV.)**

- (A) 93.15 MeV
- (B) 186 MeV
- (C) 46.575 MeV
- (D) 140 MeV

Q58. An carbon-14 sample of mass 160 g decays through 3 half-lives. What mass remains?

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

Q59. A clock moving at $0.8c$ relative to an observer ticks with a proper time interval of 6 s between two events. What time interval does the stationary observer measure?

- (A) 3.6 s
- (B) 6 s
- (C) 15 s
- (D) 10 s

Q60. A rod of proper length 50 m moves at $0.6c$ relative to an observer. What length does the observer measure?

- (A) 40 m
- (B) 62.5 m
- (C) 50 m
- (D) 20 m

Answer Key

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

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