

AP Physics 2 Practice Test 5

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 1.5 mol of oxygen in a volume of 50 L at a temperature of 290 K. What is the pressure of the gas? (Use $R = 8.31 \text{ J}/(\text{mol}\cdot\text{K})$.)

- (A) 144594 Pa
- (B) 72297 Pa
- (C) 36148 Pa
- (D) 108446 Pa

Q2. A piston chamber contains gas at constant pressure with an initial volume of 15 L at 240 K. The volume changes to 36 L. What is the new temperature of the gas?

- (A) 1152 K
- (B) 288 K
- (C) 576 K
- (D) 864 K

Q3. A gas in a cylinder absorbs 1000 J of heat while doing 450 J of work on its surroundings. What is the change in internal energy of the gas?

- (A) 550 J
- (B) 1100 J
- (C) 275 J
- (D) 825 J

Q4. A gas expands at a constant pressure of 90 kPa, increasing its volume by 12 L. How much work is done by the gas?

- (A) 1080 J
- (B) 2160 J
- (C) 540 J
- (D) 1620 J

Q5. A lead sphere of mass 1 kg is heated through a temperature rise of 50 °C. The specific heat capacity of the material is 128 J/(kg°C). How much heat is supplied?

- (A) 6400 J
- (B) 12800 J
- (C) 3200 J
- (D) 9600 J

Q6. A Carnot engine operates between a hot reservoir at 900 K and a cold reservoir at 270 K. What is its maximum possible efficiency?

- (A) 70 %
- (B) 105 %
- (C) 35 %
- (D) 30 %

Q7. A heat engine takes in 4000 J of heat in each cycle and rejects 400 J to the cold reservoir. What is the efficiency of the engine?

- (A) 10 %
- (B) 90 %
- (C) 45 %
- (D) 99 %

Q8. A fixed volume of gas has a pressure of 150 kPa at 320 K. It is heated to 600 K at constant volume. What is its new pressure?

- (A) 562 kPa
- (B) 141 kPa
- (C) 281 kPa
- (D) 422 kPa

Q9. Two samples of the same liquid, of masses 4 kg at 80 °C and 3 kg at 10 °C, are mixed in an insulated container. What is the final temperature of the mixture? (Ignore heat loss.)

- (A) 45 °C
- (B) 70 °C
- (C) 50 °C
- (D) 75 °C

Unit 10: Electric Force, Field, and Potential

Q10. Two charged balls carry charges of 6 μC and 5 μC and are 50 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) 2.16 N
- (B) 0.54 N
- (C) 1.62 N
- (D) 1.08 N

Q11. What is the magnitude of the electric field at a distance of 25 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) 1728000 N/C
- (B) 864000 N/C
- (C) 432000 N/C
- (D) 1296000 N/C

Q12. Two parallel plates are 3 mm apart with a potential difference of 300 V between them. What is the magnitude of the uniform electric field between the plates?

- (A) 200000 N/C
- (B) 50000 N/C
- (C) 100000 N/C
- (D) 150000 N/C

Q13. What is the electric potential at a distance of 60 cm from a point charge of 12 μC in a vacuum? (Use $k = 9 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$.)

- (A) 360000 V
- (B) 180000 V
- (C) 90000 V
- (D) 270000 V

Q14. A charge of 10 μC is placed at a point where the electric potential is 250 V. What is its electric potential energy?

- (A) 0.005 J
- (B) 0.00125 J
- (C) 0.0025 J
- (D) 0.00375 J

Q15. A charge of 5 μC is placed in a uniform electric field of strength 8000 N/C. What is the magnitude of the electric force on the charge?

- (A) 0.08 N
- (B) 0.02 N
- (C) 0.04 N
- (D) 0.06 N

Q16. A uniform electric field of 500 N/C points along a straight path of length 10 cm. What is the potential difference between the ends of the path?

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

Q17. A stationary charge of 4 μC is accelerated from rest through a potential difference of 600 V. What kinetic energy does it gain? (Ignore gravity.)

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

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

- (A) 36 N
- (B) 72 N
- (C) 18 N
- (D) 54 N

Unit 11: Electric Circuits

Q19. A motor of resistance $4\ \Omega$ is connected across a $36\ \text{V}$ battery. What current flows through it? (Ignore internal resistance.)

- (A) $9\ \text{A}$
- (B) $18\ \text{A}$
- (C) $4.5\ \text{A}$
- (D) $13.5\ \text{A}$

Q20. Three resistors of $10\ \Omega$, $5\ \Omega$ and $10\ \Omega$ are connected in series. What is their combined resistance?

- (A) $50\ \Omega$
- (B) $12.5\ \Omega$
- (C) $37.5\ \Omega$
- (D) $25\ \Omega$

Q21. Resistors of $12\ \Omega$ and $6\ \Omega$ are connected in parallel. What is their combined resistance?

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

Q22. A heater operates at $36\ \text{V}$ and draws a current of $4\ \text{A}$. What power does it use?

- (A) $144\ \text{W}$
- (B) $288\ \text{W}$
- (C) $72\ \text{W}$
- (D) $216\ \text{W}$

Q23. A water heater rated at $250\ \text{W}$ runs for $3\ \text{hours}$. How much electrical energy does it use, in kilowatt-hours?

- (A) $1.5\ \text{kWh}$
- (B) $0.375\ \text{kWh}$
- (C) $1.125\ \text{kWh}$
- (D) $0.75\ \text{kWh}$

Q24. A cell of emf $12\ \text{V}$ and internal resistance $1\ \Omega$ is connected to an external resistor of $11\ \Omega$. What current flows in the circuit?

- (A) $1\ \text{A}$
- (B) $2\ \text{A}$
- (C) $0.5\ \text{A}$
- (D) $1.5\ \text{A}$

Q25. In a parallel circuit, one branch of resistance $4\ \Omega$ is connected across a $12\ \text{V}$ supply. What current flows through that branch?

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

Q26. A wire has a resistance of $12\ \Omega$. If its cross-sectional area is doubled while the material and temperature stay the same, what is its new resistance?

- (A) $12\ \Omega$
- (B) $6\ \Omega$
- (C) $3\ \Omega$
- (D) $9\ \Omega$

Q27. Resistors of $6\ \Omega$ and $3\ \Omega$ are connected in parallel, and this combination is connected in series with a $4\ \Omega$ resistor. What is the total resistance of the circuit?

- (A) $12\ \Omega$
- (B) $3\ \Omega$
- (C) $6\ \Omega$
- (D) $9\ \Omega$

Unit 12: Magnetism and Electromagnetism

Q28. A charge of $2\ \mu\text{C}$ moves at $5000\ \text{m/s}$ perpendicular to a uniform magnetic field of $1.0\ \text{T}$. What is the magnitude of the magnetic force on the charge?

- (A) $0.02\ \text{N}$
- (B) $0.01\ \text{N}$
- (C) $0.005\ \text{N}$
- (D) $0.015\ \text{N}$

Q29. A straight wire of length $1.5\ \text{m}$ carries a current of $5\ \text{A}$ perpendicular to a uniform magnetic field of $1.2\ \text{T}$. What is the magnitude of the magnetic force on the wire?

- (A) $18\ \text{N}$
- (B) $9\ \text{N}$
- (C) $4.5\ \text{N}$
- (D) $13.5\ \text{N}$

Q30. A particle of mass $0.02\ \text{kg}$ and charge $2\ \text{C}$ moves at $10\ \text{m/s}$ perpendicular to a uniform magnetic field of $0.4\ \text{T}$. What is the radius of its circular path?

- (A) $0.5\ \text{m}$
- (B) $0.25\ \text{m}$
- (C) $0.125\ \text{m}$
- (D) $0.375\ \text{m}$

Q31. A long straight wire carries a current of $2\ \text{A}$. What is the magnitude of the magnetic field at a distance of $10\ \text{cm}$ from the wire?

- (A) $0.000008\ \text{T}$
- (B) $0.000004\ \text{T}$
- (C) $0.000002\ \text{T}$
- (D) $0.000006\ \text{T}$

Q32. A solenoid has 800 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) 0.008042 T
- (B) 0.004021 T
- (C) 0.002011 T
- (D) 0.006032 T

Q33. A flat loop of area 0.05 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) 0.02 Wb
- (B) 0.005 Wb
- (C) 0.015 Wb
- (D) 0.01 Wb

Q34. A coil of 500 turns and area 0.04 m^2 experiences a magnetic field change of 0.5 T in 0.1 s, with the field perpendicular to the coil. What is the magnitude of the induced emf in the coil?

- (A) 100 V
- (B) 200 V
- (C) 50 V
- (D) 150 V

Q35. A conducting rod of length 2 m moves at 4 m/s perpendicular to a uniform magnetic field of 0.8 T, sliding on rails as in a motional emf setup. What is the induced emf across the rod?

- (A) 12.8 V
- (B) 3.2 V
- (C) 9.6 V
- (D) 6.4 V

Unit 13: Geometric Optics

Q36. An object is placed 30 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) 120 cm
- (B) 30 cm
- (C) 90 cm
- (D) 60 cm

Q37. An object placed 60 cm from a mirror forms an image 30 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 15 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) 60 cm
- (B) 15 cm
- (C) 45 cm
- (D) 30 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 60° to the normal. What is the refractive index of the glass? (Use $\sin 45^\circ = 0.707$ and $\sin 60^\circ = 0.866$.)

- (A) 1.22
- (B) 0.902
- (C) 0.41
- (D) 0.82

Q40. Light inside a material of refractive index 2.0 strikes the boundary with air. What is the critical angle for total internal reflection?

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

Q41. Light travels at 250000000 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) 2.4
- (B) 1.2
- (C) 0.6
- (D) 1.8

Q42. A spherical mirror has a radius of curvature of 40 cm. What is its focal length?

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

Q43. An object is placed 10 cm in front of a converging lens of focal length 15 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 100 Hz and a wavelength of 2 m. What is its speed?

- (A) 400 m/s
- (B) 100 m/s
- (C) 300 m/s
- (D) 200 m/s

Q45. An oscillator completes one full cycle in 0.2 s. What is its frequency?

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

Q46. A sound source radiates 100 W uniformly in all directions. What is the sound intensity at a distance of 1 m from the source? (Use $\pi = 3.14$.)

- (A) 15.915 W/m²
- (B) 3.979 W/m²
- (C) 7.958 W/m²
- (D) 11.937 W/m²

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 1th harmonic?

- (A) 133 Hz
- (B) 33.333 Hz
- (C) 100 Hz
- (D) 66.667 Hz

Q48. An air column of length 0.5 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) 172 Hz
- (B) 343 Hz
- (C) 85.75 Hz
- (D) 257 Hz

Q49. Two tuning forks of frequencies 512 Hz and 515 Hz sound together. What is the beat frequency heard?

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

Q50. In a double-slit experiment, light of wavelength 600 nm passes through slits 0.5 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) 0.48 cm
- (B) 0.12 cm
- (C) 0.24 cm
- (D) 0.36 cm

- Q51. A siren emitting 500 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) 426 Hz
 - (B) 500 Hz
 - (C) 606 Hz
 - (D) 727 Hz

Unit 15: Modern Physics

- Q52. What is the energy, in electron-volts, of a blue photon of wavelength 480 nm? (Use $hc = 1240 \text{ eV}\cdot\text{nm}$.)**

- (A) 2.58 eV
- (B) 5.17 eV
- (C) 1.29 eV
- (D) 3.88 eV

- Q53. Light of photon energy 5 eV strikes a potassium surface whose work function is 1.5 eV. What is the maximum kinetic energy of an emitted photoelectron?**

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

- Q54. An electron of mass $9.11 \times 10^{-31} \text{ kg}$ moves at 3000000 m/s. What is its de Broglie wavelength? (Use $h = 6.63 \times 10^{-34} \text{ J}\cdot\text{s}$.)**

- (A) 0.243 nm
- (B) 0.486 nm
- (C) 0.1215 nm
- (D) 0.3645 nm

- Q55. What is the energy of a hydrogen atom in the $n = 2$ energy level? (Ground-state energy is -13.6 eV.)**

- (A) -27.2 eV
- (B) 3.4 eV
- (C) -6.8 eV
- (D) -3.4 eV

- Q56. A hydrogen atom drops from the $n = 4$ level to the $n = 1$ level. What is the energy of the photon emitted?**

- (A) 6.38 eV
- (B) 25.5 eV
- (C) 12.75 eV
- (D) 0.85 eV

- Q57. A nucleus has a mass defect of 0.02 u. What is its total binding energy in MeV? (1 u corresponds to 931.5 MeV.)**

- (A) 37.26 MeV
- (B) 9.315 MeV
- (C) 27.945 MeV
- (D) 18.63 MeV

Q58. An radon sample of mass 80 g decays through 3 half-lives. What mass remains?

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

Q59. A clock moving at $0.8c$ relative to an observer ticks with a proper time interval of 8 s between two events. What time interval does the stationary observer measure?

- (A) 4.8 s
- (B) 8 s
- (C) 20 s
- (D) 13.33 s

Q60. A rod of proper length 40 m moves at $0.6c$ relative to an observer. What length does the observer measure?

- (A) 50 m
- (B) 40 m
- (C) 32 m
- (D) 16 m

Answer Key

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

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