

AP Physics 2 Practice Test 10

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 sample of helium in a weather-balloon test chamber is initially at 240 kPa, occupies 4 L and is at 300 K. It is then compressed or expanded to 8 L and its temperature changes to 150 K. What is the final pressure of the gas?

- (A) 120 kPa
- (B) 30 kPa
- (C) 60 kPa
- (D) 90 kPa

Q2. 650 J of heat is added to a gas in a compressor while the gas has 250 J of work done on it. What is the change in internal energy of the gas?

- (A) 400 J
- (B) -900 J
- (C) 650 J
- (D) 900 J

Q3. A gas in a piston expands at a constant pressure of 250 kPa from 1 L to 5 L. How much work is done by the gas?

- (A) 1000 J
- (B) 2000 J
- (C) 500 J
- (D) 1500 J

Q4. How much heat must be supplied to a 2.5 kg jug of water of specific heat capacity 4200 J/kg·K to raise its temperature by 10 K? (Assume no heat is lost to the surroundings.)

- (A) 210,000 J
- (B) 52,500 J
- (C) 10,500 J
- (D) 105,000 J

Q5. A heat engine does 240 J of useful work in each cycle while absorbing 1200 J of heat from a hot reservoir. What is the efficiency of the engine?

- (A) 80%
- (B) 40%
- (C) 10%
- (D) 20%

Q6. An ideal Carnot engine operates between reservoirs at 1200 K and 300 K. What is its maximum possible efficiency?

- (A) 25%
- (B) 37.5%
- (C) 75%
- (D) None of the other options

Q7. The root-mean-square speed of the molecules in a gas sample is 350 m/s. If the absolute temperature of the gas is multiplied by 9 while the gas stays the same, what is the new root-mean-square speed?

- (A) 3150 m/s
- (B) 1050 m/s
- (C) 525 m/s
- (D) 350 m/s

Q8. A hot metal block is placed in cold water inside an insulated box and the two reach a common temperature. What happens to the total entropy of the block and water?

- (A) It decreases
- (B) It increases
- (C) It stays the same
- (D) It becomes zero

Q9. What is the internal energy of 3 mol of a monatomic ideal gas at 400 K? (Use $R = 8.31 \text{ J/mol}\cdot\text{K}$.)

- (A) 14958 J
- (B) 29916 J
- (C) 7479 J
- (D) 9972 J

Unit 10: Electric Force, Field, and Potential

Q10. Two point charges of $4 \mu\text{C}$ and $4 \mu\text{C}$ are placed 0.2 m apart. What is the magnitude of the electrostatic force between them? (Use $k = 9.0 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$.)

- (A) 3.6 N
- (B) 7.2 N
- (C) 1.8 N
- (D) 14.4 N

Q11. What is the magnitude of the electric field at a point 0.4 m from a point charge of $8 \mu\text{C}$? (Use $k = 9.0 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$.)

- (A) 450,000 N/C
- (B) 900,000 N/C
- (C) 225,000 N/C
- (D) 1,800,000 N/C

Q12. What is the electric potential at a point 0.3 m from a point charge of 9 μC , taking potential at infinity to be zero? (Use $k = 9.0 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$.)

- (A) 540,000 V
- (B) 135,000 V
- (C) 270,000 V
- (D) 67,500 V

Q13. A charge of 7 μC is placed in a uniform electric field of 2000 N/C. What is the magnitude of the electric force on the charge?

- (A) 0.14 N
- (B) 0 N
- (C) 0.01 N
- (D) 0.03 N

Q14. Two parallel metal plates are 0.04 m apart and have a potential difference of 96 V between them. What is the magnitude of the uniform electric field between the plates?

- (A) 4,800 V/m
- (B) 1,200 V/m
- (C) 2,400 V/m
- (D) 4 V/m

Q15. How much work is done by the electric field when a charge of 8 μC moves through a potential drop of 150 V?

- (A) 0.01 J
- (B) None of the other options
- (C) It cannot be determined from the data given
- (D) 0 J

Q16. An electron is released from rest in a uniform electric field pointing to the right. In which direction does it begin to accelerate?

- (A) To the right
- (B) To the left
- (C) Upward
- (D) It does not accelerate

Q17. Both point charges are doubled and the distance between them is also doubled. How does the electrostatic force between them change?

- (A) It becomes 2 times the original force
- (B) It becomes 4 times the original force
- (C) It becomes 1/4 of the original force
- (D) It stays the same

Q18. A electron starting from rest is accelerated through a potential difference of 600 V. What kinetic energy does it gain, in electronvolts?

- (A) 1200 eV
- (B) 300 eV
- (C) 600 eV
- (D) 2400 eV

Unit 11: Electric Circuits

Q19. A current of 0.5 A flows through a $40\ \Omega$ resistor. What is the potential difference across the resistor?

- (A) 80 V
- (B) 40.5 V
- (C) 20 V
- (D) 0.0125 V

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

- (A) $12.5\ \Omega$
- (B) $20\ \Omega$
- (C) $35\ \Omega$
- (D) $25\ \Omega$

Q21. Two resistors of $20\ \Omega$ and $5\ \Omega$ are connected in parallel. What is their equivalent resistance?

- (A) $25\ \Omega$
- (B) $4\ \Omega$
- (C) $8\ \Omega$
- (D) $6.25\ \Omega$

Q22. A current of 4 A flows through a $5\ \Omega$ resistor. What power is dissipated?

- (A) 80 W
- (B) 20 W
- (C) 100 W
- (D) 0.8 W

Q23. A battery of 48 V is connected across two resistors of $10\ \Omega$ and $30\ \Omega$ in series. What is the potential difference across the $10\ \Omega$ resistor?

- (A) 12 V
- (B) 36 V
- (C) 24 V
- (D) 6 V

Q24. A 36 V battery is connected across two resistors in parallel. One branch has resistance $12\ \Omega$. What current flows in that branch?

- (A) 6 A
- (B) 1.5 A
- (C) 48 A
- (D) 3 A

Q25. A capacitor of capacitance $100\ \mu\text{F}$ is charged to 6 V. How much charge is stored on it?

- (A) $106\ \mu\text{C}$
- (B) $600\ \mu\text{C}$
- (C) $16.7\ \mu\text{C}$
- (D) $1200\ \mu\text{C}$

Q26. Two capacitors of $12\ \mu\text{F}$ and $4\ \mu\text{F}$ are connected in series. What is their equivalent capacitance?

- (A) $16\ \mu\text{F}$
- (B) $48\ \mu\text{F}$
- (C) $8\ \mu\text{F}$
- (D) $3\ \mu\text{F}$

Q27. A cell of emf $24\ \text{V}$ and internal resistance $2\ \Omega$ supplies a current of $4\ \text{A}$. What is the terminal potential difference of the cell?

- (A) $24\ \text{V}$
- (B) $16\ \text{V}$
- (C) $32\ \text{V}$
- (D) $8\ \text{V}$

Unit 12: Magnetism and Electromagnetism

Q28. A particle with charge $5\ \mu\text{C}$ moves at $6,000\ \text{m/s}$ perpendicular to a uniform magnetic field of $0.5\ \text{T}$. What is the magnitude of the magnetic force on the particle?

- (A) $0.15\ \text{N}$
- (B) $0\ \text{N}$
- (C) $0.03\ \text{N}$
- (D) $0.01\ \text{N}$

Q29. A straight wire of length $0.25\ \text{m}$ carries a current of $8\ \text{A}$ perpendicular to a uniform magnetic field of $0.6\ \text{T}$. What is the magnitude of the magnetic force on the wire?

- (A) $2.4\ \text{N}$
- (B) $0.6\ \text{N}$
- (C) $1.2\ \text{N}$
- (D) $12\ \text{N}$

Q30. What is the magnitude of the magnetic field at a distance of $0.25\ \text{m}$ from a long straight wire carrying a current of $15\ \text{A}$?

- (A) $24\ \mu\text{T}$
- (B) $12\ \mu\text{T}$
- (C) $6\ \mu\text{T}$
- (D) $120\ \mu\text{T}$

Q31. A long solenoid has 900 turns per metre and carries a current of $4\ \text{A}$. What is the magnitude of the magnetic field inside the solenoid? (Use $\mu_0 = 4\pi \times 10^{-7}\ \text{T}\cdot\text{m/A}$ and $\pi = 3.14$.)

- (A) $9.04\ \text{mT}$
- (B) $2.26\ \text{mT}$
- (C) $4.52\ \text{mT}$
- (D) $45.22\ \text{mT}$

Q32. A metal rod of length 1.5 m moves at 5 m/s perpendicular to a uniform magnetic field of 0.4 T, with the rod perpendicular to both the field and its motion. What emf is induced between the ends of the rod?

- (A) 6 V
- (B) 1.5 V
- (C) 30 V
- (D) 3 V

Q33. The magnetic flux through a coil of 120 turns changes by 0.03 Wb in 0.6 s. What is the magnitude of the average induced emf in the coil?

- (A) 12 V
- (B) 3 V
- (C) 6 V
- (D) 0.6 V

Q34. A flat loop of area 1 m^2 is placed in a uniform magnetic field of 0.3 T. The field makes an angle of 0° with the normal to the loop. What is the magnetic flux through the loop?

- (A) 0.6 Wb
- (B) 0.3 Wb
- (C) 0.15 Wb
- (D) None of the other options

Q35. A magnet is dropped through a vertical copper tube. Compared with free fall, what happens to the magnet's fall?

- (A) It falls more slowly, because induced currents oppose its motion
- (B) It falls faster, because induced currents assist its motion
- (C) It falls at exactly the same rate as in free fall
- (D) It stops and hangs in the tube

Unit 13: Geometric Optics

Q36. An object is placed 24 cm in front of a concave headlight reflector of focal length 8 cm. How far from the mirror is the image formed?

- (A) 24 cm
- (B) 6 cm
- (C) 12 cm
- (D) 16 cm

Q37. An object is placed 18 cm in front of a converging lens of focal length 6 cm. How far from the lens is the image formed?

- (A) 18 cm
- (B) 4.5 cm
- (C) 24 cm
- (D) 9 cm

Q38. An object is 18 cm from a mirror and its image is formed 54 cm from the mirror. What is the lateral magnification of the image?

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

Q39. A ray of light travels from a medium of refractive index 1 into a medium of refractive index 2.42 at an angle of incidence of 45° . What is the angle of refraction, to the nearest 0.1° ?

- (A) 27.0°
- (B) 17.0°
- (C) 7.0°
- (D) 73.0°

Q40. What is the critical angle for light travelling from diamond of refractive index 2.42 into air, to the nearest 0.1° ?

- (A) 34.4°
- (B) 14.4°
- (C) 65.6°
- (D) 24.4°

Q41. Light travels at 1.2×10^8 m/s in a transparent material. What is the refractive index of the material? (Take $c = 3.00 \times 10^8$ m/s.)

- (A) 2.5
- (B) 5
- (C) 1.25
- (D) 1.8

Q42. Light of wavelength 720 nm in air enters a medium of refractive index 1.2. What is its wavelength in the medium?

- (A) 600 nm
- (B) 720 nm
- (C) 1200 nm
- (D) 300 nm

Q43. An object is placed in front of a diverging lens. Which description always fits the image formed?

- (A) Real, inverted and magnified
- (B) Virtual, upright and diminished
- (C) Virtual, upright and magnified
- (D) Real, inverted and diminished

Unit 14: Waves, Sound, and Physical Optics

Q44. A wave has frequency 8 Hz and wavelength 12.5 m. What is its speed?

- (A) 200 m/s
- (B) 50 m/s
- (C) 20.5 m/s
- (D) 100 m/s

Q45. A string of length 1.8 m is fixed at both ends. Waves travel along it at 360 m/s. What is the frequency of its second harmonic?

- (A) 200 Hz
- (B) 400 Hz
- (C) 100 Hz
- (D) None of the other options

Q46. An air column of length 0.68 m is open at both ends. Taking the speed of sound as 340 m/s, what is its fundamental frequency?

- (A) 250 Hz
- (B) 500 Hz
- (C) 125 Hz
- (D) 1000 Hz

Q47. Two tuning forks of frequencies 1024 Hz and 1015 Hz are sounded together. What is the beat frequency heard?

- (A) 18 Hz
- (B) 9 Hz
- (C) 11 Hz
- (D) 2039 Hz

Q48. In a double-slit experiment, light of wavelength 700 nm passes through slits 0.2 mm apart and forms fringes on a screen 1 m away. How far from the central bright fringe is the first bright fringe, in millimetres?

- (A) 7 mm
- (B) 3.5 mm
- (C) 1.75 mm
- (D) 35 mm

Q49. A sound source emitting 700 Hz moves at 51 m/s toward a stationary observer. Taking the speed of sound as 340 m/s, what frequency does the observer hear, to the nearest hertz?

- (A) 864 Hz
- (B) 784 Hz
- (C) 700 Hz
- (D) 824 Hz

Q50. The power output of a point source of sound is doubled, with the listener staying at the same distance. How does the sound intensity at the listener change?

- (A) It becomes 2 times the original intensity
- (B) It becomes 4 times the original intensity
- (C) It becomes 1/2 of the original intensity
- (D) It stays the same

Q51. A diffraction grating has 500 lines per millimetre. Light of wavelength 700 nm is incident normally on it. What is the angle of the first-order maximum, to the nearest 0.1°?

- (A) 30.5°
- (B) 10.5°
- (C) 20.5°
- (D) 69.5°

Unit 15: Modern Physics

Q52. What is the energy, in electronvolts, of a photon of wavelength 775 nm? (Use $hc = 1240 \text{ eV}\cdot\text{nm}$.)

- (A) 3.2 eV
- (B) 0.8 eV
- (C) 1.6 eV
- (D) 2.4 eV

Q53. Light of photon energy 7 eV falls on a metal surface whose work function is 4.2 eV. What is the maximum kinetic energy of the emitted photoelectrons?

- (A) 2.8 eV
- (B) 11.2 eV
- (C) 7 eV
- (D) 5.6 eV

Q54. A metal has a work function of 4 eV. What is its threshold frequency, to two decimal places in units of 10^{14} Hz ? (Use $h = 6.63 \times 10^{-34} \text{ J}\cdot\text{s}$ and $1 \text{ eV} = 1.60 \times 10^{-19} \text{ J}$.)

- (A) $9.65 \times 10^{14} \text{ Hz}$
- (B) $19.31 \times 10^{14} \text{ Hz}$
- (C) $4.83 \times 10^{14} \text{ Hz}$
- (D) $14.48 \times 10^{14} \text{ Hz}$

Q55. An electron moves at $2.5 \times 10^6 \text{ m/s}$. What is its de Broglie wavelength, in nanometres? (Use $h = 6.63 \times 10^{-34} \text{ J}\cdot\text{s}$ and electron mass $9.11 \times 10^{-31} \text{ kg}$.)

- (A) 0.58 nm
- (B) 0.15 nm
- (C) 2.91 nm
- (D) 0.29 nm

Q56. A hydrogen atom makes a transition from energy level $n = 4$ to $n = 1$. How much energy is released as a photon, in electronvolts? (Use $E_n = -13.6 \div n^2 \text{ eV}$.)

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

Q57. A radioactive sample initially contains 96 g of an isotope. After 5 half-lives, how much of the isotope remains?

- (A) 6 g
- (B) 3 g
- (C) 1.5 g
- (D) 93 g

Q58. In a nuclear reaction the total mass decreases by 0.08 u. How much energy is released? (Use $1 \text{ u} = 931.5 \text{ MeV}/c^2$.)

- (A) 149.04 MeV
- (B) 74.52 MeV
- (C) 37.26 MeV
- (D) 745.2 MeV

Q59. A clock on a spacecraft moving at $0.6c$ ticks 4 s as measured in the spacecraft frame. How much time passes on Earth while the spacecraft clock ticks 4 s?

- (A) 4 s
- (B) 5 s
- (C) 10 s
- (D) 8 s

Q60. A spacecraft of proper length 60 m travels past Earth at $0.6c$. What length does an observer on Earth measure for the spacecraft?

- (A) 60 m
- (B) 96 m
- (C) 48 m
- (D) 30 m

Answer Key

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

Worked explanations for all 60 questions: quaidianpoint.com/ap-physics-2-practice-test-10/ — plus 80 free AP Physics practice tests at [QuaidianPoint.com](https://quaidianpoint.com).