

AP Physics 2 Practice Test 8

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 a sample of gas in a flexible balloon is initially at 180 kPa, occupies 8 L and is at 300 K. It is then compressed or expanded to 2 L and its temperature changes to 450 K. What is the final pressure of the gas?

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

Q2. 400 J of heat is removed from gas in a refrigerator coil while the gas does 150 J of work on its surroundings. What is the change in internal energy of the gas?

- (A) -550 J
- (B) -250 J
- (C) 550 J
- (D) -400 J

Q3. A gas in a cylinder expands at a constant pressure of 300 kPa from 5 L to 6 L. How much work is done by the gas?

- (A) 600 J
- (B) 150 J
- (C) 300 J
- (D) 3300 J

Q4. How much heat must be supplied to a 5 kg iron plate of specific heat capacity 450 J/kg·K to raise its temperature by 12 K? (Assume no heat is lost to the surroundings.)

- (A) 27,000 J
- (B) 54,000 J
- (C) 13,500 J
- (D) 2,250 J

Q5. A heat engine does 280 J of useful work in each cycle while absorbing 700 J of heat from a hot reservoir. What is the efficiency of the engine?

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

Q6. An ideal Carnot engine operates between reservoirs at 900 K and 300 K. What is its maximum possible efficiency?

- (A) 33.33%
- (B) None of the other options
- (C) 66.67%
- (D) It cannot be determined from the data given

Q7. The root-mean-square speed of the molecules in a gas sample is 500 m/s. If the absolute temperature of the gas is multiplied by 4 while the gas stays the same, what is the new root-mean-square speed?

- (A) 2000 m/s
- (B) 500 m/s
- (C) 1000 m/s
- (D) None of the other options

Q8. Two different gases are allowed to mix in a sealed container. What happens to the total entropy of the gases?

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

Q9. What is the internal energy of 1 mol of a monatomic ideal gas at 500 K? (Use $R = 8.31 \text{ J/mol}\cdot\text{K}$.)

- (A) 12465 J
- (B) 3116.25 J
- (C) 6232.5 J
- (D) 4155 J

Unit 10: Electric Force, Field, and Potential

Q10. Two point charges of $3 \mu\text{C}$ and $5 \mu\text{C}$ are placed 0.5 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) 1.08 N
- (B) 0.54 N
- (C) 0.27 N
- (D) 2.16 N

Q11. What is the magnitude of the electric field at a point 0.3 m from a point charge of $6 \mu\text{C}$? (Use $k = 9.0 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$.)

- (A) 1,200,000 N/C
- (B) 300,000 N/C
- (C) 2,400,000 N/C
- (D) 600,000 N/C

Q12. What is the electric potential at a point 0.5 m from a point charge of $6 \mu\text{C}$, taking potential at infinity to be zero? (Use $k = 9.0 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$.)

- (A) 216,000 V
- (B) 108,000 V
- (C) 54,000 V
- (D) 27,000 V

Q13. A charge of $2\ \mu\text{C}$ is placed in a uniform electric field of $1500\ \text{N/C}$. What is the magnitude of the electric force on the charge?

- (A) $0.03\ \text{N}$
- (B) $0.01\ \text{N}$
- (C) $0\ \text{N}$
- (D) None of the other options

Q14. Two parallel metal plates are $0.03\ \text{m}$ apart and have a potential difference of $90\ \text{V}$ between them. What is the magnitude of the uniform electric field between the plates?

- (A) $6,000\ \text{V/m}$
- (B) $1,500\ \text{V/m}$
- (C) $3,000\ \text{V/m}$
- (D) $3\ \text{V/m}$

Q15. How much work is done by the electric field when a charge of $6\ \mu\text{C}$ moves through a potential drop of $250\ \text{V}$?

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

Q16. A point P lies near an isolated negative point charge. In which direction does the electric field at P point?

- (A) Toward the negative charge
- (B) Away from the negative charge
- (C) Perpendicular to the line joining P to the charge
- (D) It is zero at P

Q17. One of two point charges is tripled, with the distance unchanged. How does the electrostatic force between them change?

- (A) It becomes $1/3$ of the original force
- (B) It becomes 9 times the original force
- (C) It stays the same
- (D) It becomes 3 times the original force

Q18. A proton starting from rest is accelerated through a potential difference of $400\ \text{V}$. What kinetic energy does it gain, in electronvolts?

- (A) $800\ \text{eV}$
- (B) $200\ \text{eV}$
- (C) $1600\ \text{eV}$
- (D) $400\ \text{eV}$

Unit 11: Electric Circuits

Q19. A current of $2.5\ \text{A}$ flows through a $20\ \Omega$ resistor. What is the potential difference across the resistor?

- (A) $50\ \text{V}$
- (B) $8\ \text{V}$
- (C) $22.5\ \text{V}$
- (D) $125\ \text{V}$

- Q20. Three resistors of $12\ \Omega$, $8\ \Omega$ and $20\ \Omega$ are connected in series. What is their equivalent resistance?**
- (A) $40\ \Omega$
 - (B) $20\ \Omega$
 - (C) $48\ \Omega$
 - (D) $50\ \Omega$
- Q21. Two resistors of $10\ \Omega$ and $10\ \Omega$ are connected in parallel. What is their equivalent resistance?**
- (A) $5\ \Omega$
 - (B) $20\ \Omega$
 - (C) $10\ \Omega$
 - (D) None of the other options
- Q22. A potential difference of $20\ \text{V}$ is applied across an $8\ \Omega$ resistor. What power is dissipated?**
- (A) $2.5\ \text{W}$
 - (B) $160\ \text{W}$
 - (C) $50\ \text{W}$
 - (D) $12\ \text{W}$
- Q23. A battery of $36\ \text{V}$ is connected across two resistors of $9\ \Omega$ and $3\ \Omega$ in series. What is the potential difference across the $9\ \Omega$ resistor?**
- (A) $27\ \text{V}$
 - (B) $9\ \text{V}$
 - (C) $54\ \text{V}$
 - (D) $13.5\ \text{V}$
- Q24. A $18\ \text{V}$ battery is connected across two resistors in parallel. One branch has resistance $3\ \Omega$. What current flows in that branch?**
- (A) $12\ \text{A}$
 - (B) $6\ \text{A}$
 - (C) $3\ \text{A}$
 - (D) $21\ \text{A}$
- Q25. A capacitor of capacitance $50\ \mu\text{F}$ is charged to $8\ \text{V}$. How much charge is stored on it?**
- (A) $58\ \mu\text{C}$
 - (B) $6.25\ \mu\text{C}$
 - (C) $400\ \mu\text{C}$
 - (D) $800\ \mu\text{C}$
- Q26. Two capacitors of $12\ \mu\text{F}$ and $8\ \mu\text{F}$ are connected in parallel. What is their equivalent capacitance?**
- (A) $4.8\ \mu\text{F}$
 - (B) $20\ \mu\text{F}$
 - (C) $96\ \mu\text{F}$
 - (D) $10\ \mu\text{F}$

Q27. A cell of emf 6 V and internal resistance $4\ \Omega$ supplies a current of 0.5 A. What is the terminal potential difference of the cell?

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

Unit 12: Magnetism and Electromagnetism

Q28. A particle with charge $6\ \mu\text{C}$ moves at 10,000 m/s perpendicular to a uniform magnetic field of 0.2 T. What is the magnitude of the magnetic force on the particle?

- (A) 0.12 N
- (B) 0 N
- (C) 0.02 N
- (D) 0.01 N

Q29. A straight wire of length 0.5 m carries a current of 6 A perpendicular to a uniform magnetic field of 0.5 T. What is the magnitude of the magnetic force on the wire?

- (A) 3 N
- (B) 1.5 N
- (C) 0.75 N
- (D) 15 N

Q30. What is the magnitude of the magnetic field at a distance of 0.25 m from a long straight wire carrying a current of 5 A?

- (A) $8\ \mu\text{T}$
- (B) $2\ \mu\text{T}$
- (C) $4\ \mu\text{T}$
- (D) $40\ \mu\text{T}$

Q31. A long solenoid has 1000 turns per metre and carries a current of 3 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) 7.54 mT
- (B) 3.77 mT
- (C) 1.88 mT
- (D) 37.68 mT

Q32. A metal rod of length 1 m moves at 4 m/s perpendicular to a uniform magnetic field of 0.3 T, with the rod perpendicular to both the field and its motion. What emf is induced between the ends of the rod?

- (A) 2.4 V
- (B) 0.6 V
- (C) 12 V
- (D) 1.2 V

Q33. The magnetic flux through a coil of 200 turns changes by 0.01 Wb in 0.4 s. What is the magnitude of the average induced emf in the coil?

- (A) 5 V
- (B) 10 V
- (C) 2.5 V
- (D) 0.5 V

Q34. A flat loop of area 0.8 m^2 is placed in a uniform magnetic field of 0.5 T. The field makes an angle of 0° with the normal to the loop. What is the magnetic flux through the loop?

- (A) 0.8 Wb
- (B) 0.2 Wb
- (C) None of the other options
- (D) 0.4 Wb

Q35. A circular loop in a magnetic field pointing into the page shrinks, so the flux into the page through it decreases. In which direction does the induced current flow, viewed from the front?

- (A) Counterclockwise, to try to maintain flux into the page
- (B) Clockwise, to try to reduce the flux further
- (C) Clockwise, to try to maintain flux into the page
- (D) No current is induced

Unit 13: Geometric Optics

Q36. An object is placed 45 cm in front of a concave makeup mirror of focal length 15 cm. How far from the mirror is the image formed?

- (A) 22.5 cm
- (B) 45 cm
- (C) 11.25 cm
- (D) 30 cm

Q37. An object is placed 30 cm in front of a converging lens of focal length 15 cm. How far from the lens is the image formed?

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

Q38. An object is 40 cm from a mirror and its image is formed 10 cm from the mirror. What is the lateral magnification of the image?

- (A) 0.25
- (B) -0.5
- (C) -0.25
- (D) -0.12

Q39. A ray of light travels from a medium of refractive index 1.5 into a medium of refractive index 1 at an angle of incidence of 30° . What is the angle of refraction, to the nearest 0.1° ?

- (A) 48.6°
- (B) 58.6°
- (C) 38.6°
- (D) 41.4°

Q40. What is the critical angle for light travelling from a dense glass of refractive index 2 into air, to the nearest 0.1° ?

- (A) 30.0°
- (B) 40.0°
- (C) 20.0°
- (D) 60.0°

Q41. Light travels at 1.5×10^8 m/s in a transparent material. What is the refractive index of the material? (Take $c = 3.00 \times 10^8$ m/s.)

- (A) 4
- (B) 1
- (C) 2
- (D) 1.5

Q42. Light of wavelength 750 nm in air enters a medium of refractive index 1.5. What is its wavelength in the medium?

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

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

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

Unit 14: Waves, Sound, and Physical Optics

Q44. A wave has frequency 20 Hz and wavelength 6 m. What is its speed?

- (A) 240 m/s
- (B) 120 m/s
- (C) 60 m/s
- (D) 26 m/s

Q45. A string of length 1.2 m is fixed at both ends. Waves travel along it at 180 m/s. What is the frequency of its third harmonic?

- (A) 450 Hz
- (B) 225 Hz
- (C) 112.5 Hz
- (D) 150 Hz

Q46. An air column of length 0.42 m is open at both ends. Taking the speed of sound as 340 m/s, what is its fundamental frequency?

- (A) 800 Hz
- (B) 400 Hz
- (C) 200 Hz
- (D) 1600 Hz

Q47. Two tuning forks of frequencies 660 Hz and 652 Hz are sounded together. What is the beat frequency heard?

- (A) 16 Hz
- (B) 10 Hz
- (C) 1312 Hz
- (D) 8 Hz

Q48. In a double-slit experiment, light of wavelength 650 nm passes through slits 0.5 mm apart and forms fringes on a screen 2 m away. How far from the central bright fringe is the second bright fringe, in millimetres?

- (A) 10.4 mm
- (B) 5.2 mm
- (C) 2.6 mm
- (D) 52 mm

Q49. A sound source emitting 800 Hz moves at 68 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) 1040 Hz
- (B) 960 Hz
- (C) 1000 Hz
- (D) 800 Hz

Q50. A listener moves to half the original distance from a point source of sound. How does the sound intensity change?

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

Q51. A diffraction grating has 600 lines per millimetre. Light of wavelength 650 nm is incident normally on it. What is the angle of the first-order maximum, to the nearest 0.1°?

- (A) 33.0°
- (B) 13.0°
- (C) 67.0°
- (D) 23.0°

Unit 15: Modern Physics

- Q52. What is the energy, in electronvolts, of a photon of wavelength 400 nm? (Use $hc = 1240 \text{ eV}\cdot\text{nm}$.)**
- (A) 6.2 eV
 - (B) 1.55 eV
 - (C) 4.65 eV
 - (D) 3.1 eV
- Q53. Light of photon energy 6.2 eV falls on a metal surface whose work function is 2.7 eV. What is the maximum kinetic energy of the emitted photoelectrons?**
- (A) 8.9 eV
 - (B) 6.2 eV
 - (C) 7 eV
 - (D) 3.5 eV
- Q54. A metal has a work function of 3 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) $14.48 \times 10^{14} \text{ Hz}$
 - (B) $3.62 \times 10^{14} \text{ Hz}$
 - (C) $10.86 \times 10^{14} \text{ Hz}$
 - (D) $7.24 \times 10^{14} \text{ Hz}$
- Q55. An electron moves at $0.5 \times 10^6 \text{ m/s}$. 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) 2.91 nm
 - (B) 1.46 nm
 - (C) 0.73 nm
 - (D) 14.56 nm
- Q56. A hydrogen atom makes a transition from energy level $n = 2$ to $n = 1$. How much energy is released as a photon, in electronvolts? (Use $E_n = -13.6 \div n^2 \text{ eV}$.)**
- (A) 20.4 eV
 - (B) 5.1 eV
 - (C) 3.4 eV
 - (D) 10.2 eV
- Q57. A radioactive sample initially contains 64 g of an isotope. After 4 half-lives, how much of the isotope remains?**
- (A) 8 g
 - (B) 4 g
 - (C) 2 g
 - (D) 60 g
- Q58. In a nuclear reaction the total mass decreases by 0.1 u. How much energy is released? (Use $1 \text{ u} = 931.5 \text{ MeV}/c^2$.)**
- (A) 93.15 MeV
 - (B) 186.3 MeV
 - (C) 46.58 MeV
 - (D) 931.5 MeV

Q59. A clock on a spacecraft moving at $0.8c$ ticks 12 s as measured in the spacecraft frame. How much time passes on Earth while the spacecraft clock ticks 12 s?

- (A) 12 s
- (B) 40 s
- (C) 24 s
- (D) 20 s

Q60. A spacecraft of proper length 200 m travels past Earth at $0.6c$. What length does an observer on Earth measure for the spacecraft?

- (A) 200 m
- (B) 320 m
- (C) 100 m
- (D) 160 m

Answer Key

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

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