

AP Physics 2 Practice Test 9

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 gas stored in a small steel cylinder is initially at 100 kPa, occupies 12 L and is at 600 K. It is then compressed or expanded to 4 L and its temperature changes to 300 K. What is the final pressure of the gas?

- (A) 300 kPa
- (B) 150 kPa
- (C) 75 kPa
- (D) 225 kPa

Q2. 1200 J of heat is added to air in an engine cylinder while the gas does 700 J of work on its surroundings. What is the change in internal energy of the gas?

- (A) 1900 J
- (B) 500 J
- (C) -500 J
- (D) 1200 J

Q3. A gas in a expansion chamber expands at a constant pressure of 120 kPa from 4 L to 12 L. How much work is done by the gas?

- (A) 960 J
- (B) 1920 J
- (C) 480 J
- (D) None of the other options

Q4. How much heat must be supplied to a 4 kg aluminium cooking pan of specific heat capacity 900 J/kg·K to raise its temperature by 15 K? (Assume no heat is lost to the surroundings.)

- (A) 54,000 J
- (B) 108,000 J
- (C) 27,000 J
- (D) 3,600 J

Q5. A heat engine does 700 J of useful work in each cycle while absorbing 2000 J of heat from a hot reservoir. What is the efficiency of the engine?

- (A) 65%
- (B) 35%
- (C) 70%
- (D) 17.5%

Q6. An ideal Carnot engine operates between reservoirs at 600 K and 240 K. What is its maximum possible efficiency?

- (A) 40%
- (B) 30%
- (C) 60%
- (D) None of the other options

Q7. The root-mean-square speed of the molecules in a gas sample is 600 m/s. If the absolute temperature of the gas is multiplied by 2.25 while the gas stays the same, what is the new root-mean-square speed?

- (A) 1350 m/s
- (B) 450 m/s
- (C) 900 m/s
- (D) 600 m/s

Q8. Liquid water freezes into ice in a freezer. What happens to the entropy of the water itself?

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

Q9. What is the internal energy of 5 mol of a monatomic ideal gas at 300 K? (Use $R = 8.31 \text{ J/mol}\cdot\text{K}$.)

- (A) 37395 J
- (B) 18697.5 J
- (C) 9348.75 J
- (D) 12465 J

Unit 10: Electric Force, Field, and Potential

Q10. Two point charges of $6 \mu\text{C}$ and $2 \mu\text{C}$ are placed 0.6 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) 0.6 N
- (B) 0.15 N
- (C) 1.2 N
- (D) 0.3 N

Q11. What is the magnitude of the electric field at a point 0.6 m from a point charge of $3 \mu\text{C}$? (Use $k = 9.0 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$.)

- (A) 150,000 N/C
- (B) 37,500 N/C
- (C) 75,000 N/C
- (D) 300,000 N/C

Q12. What is the electric potential at a point 0.4 m from a point charge of $2 \mu\text{C}$, taking potential at infinity to be zero? (Use $k = 9.0 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$.)

- (A) 90,000 V
- (B) 22,500 V
- (C) 11,250 V
- (D) 45,000 V

Q13. A charge of $6\ \mu\text{C}$ is placed in a uniform electric field of $3000\ \text{N/C}$. What is the magnitude of the electric force on the charge?

- (A) $0.18\ \text{N}$
- (B) $0.02\ \text{N}$
- (C) $0\ \text{N}$
- (D) $0.04\ \text{N}$

Q14. Two parallel metal plates are $0.1\ \text{m}$ apart and have a potential difference of $150\ \text{V}$ between them. What is the magnitude of the uniform electric field between the plates?

- (A) $3,000\ \text{V/m}$
- (B) $750\ \text{V/m}$
- (C) $1,500\ \text{V/m}$
- (D) $15\ \text{V/m}$

Q15. How much work is done by the electric field when a charge of $2\ \mu\text{C}$ moves through a potential drop of $600\ \text{V}$?

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

Q16. Between two parallel plates, the upper plate is positive and the lower plate is negative. In which direction does the electric field between the plates point?

- (A) From the lower plate toward the upper plate
- (B) Parallel to the plates
- (C) It is zero between the plates
- (D) From the upper plate toward the lower plate

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

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

Q18. A alpha particle starting from rest is accelerated through a potential difference of $100\ \text{V}$. What kinetic energy does it gain, in electronvolts?

- (A) $400\ \text{eV}$
- (B) $100\ \text{eV}$
- (C) $200\ \text{eV}$
- (D) $800\ \text{eV}$

Unit 11: Electric Circuits

Q19. A resistor carries a current of $4\ \text{A}$ when a potential difference of $48\ \text{V}$ is applied across it. What is its resistance?

- (A) $12\ \Omega$
- (B) $192\ \Omega$
- (C) $0.083\ \Omega$
- (D) $52\ \Omega$

Q20. Three resistors of $3\ \Omega$, $9\ \Omega$ and $6\ \Omega$ are connected in series. What is their equivalent resistance?

- (A) $9\ \Omega$
- (B) $28\ \Omega$
- (C) None of the other options
- (D) $18\ \Omega$

Q21. Two resistors of $8\ \Omega$ and $8\ \Omega$ are connected in parallel. What is their equivalent resistance?

- (A) $16\ \Omega$
- (B) $4\ \Omega$
- (C) $8\ \Omega$
- (D) None of the other options

Q22. A small motor operates at $9\ \text{V}$ and draws $0.5\ \text{A}$. What power does it use?

- (A) $18\ \text{W}$
- (B) $9.5\ \text{W}$
- (C) $4.5\ \text{W}$
- (D) $0.056\ \text{W}$

Q23. A battery of $20\ \text{V}$ is connected across two resistors of $15\ \Omega$ and $5\ \Omega$ in series. What is the potential difference across the $15\ \Omega$ resistor?

- (A) $5\ \text{V}$
- (B) $30\ \text{V}$
- (C) $7.5\ \text{V}$
- (D) $15\ \text{V}$

Q24. A $45\ \text{V}$ battery is connected across two resistors in parallel. One branch has resistance $9\ \Omega$. What current flows in that branch?

- (A) $10\ \text{A}$
- (B) $2.5\ \text{A}$
- (C) $54\ \text{A}$
- (D) $5\ \text{A}$

Q25. A capacitor of capacitance $20\ \mu\text{F}$ is charged to $30\ \text{V}$. How much energy is stored in it?

- (A) $0.009\ \text{J}$
- (B) $0.018\ \text{J}$
- (C) $0.0045\ \text{J}$
- (D) $0.9\ \text{J}$

Q26. Two capacitors of $10\ \mu\text{F}$ and $10\ \mu\text{F}$ are connected in series. What is their equivalent capacitance?

- (A) $20\ \mu\text{F}$
- (B) $100\ \mu\text{F}$
- (C) $10\ \mu\text{F}$
- (D) $5\ \mu\text{F}$

Q27. A cell of emf 15 V and internal resistance $1.5\ \Omega$ supplies a current of 3 A. What is the terminal potential difference of the cell?

- (A) 15 V
- (B) 19.5 V
- (C) 10.5 V
- (D) 5.25 V

Unit 12: Magnetism and Electromagnetism

Q28. A particle with charge $10\ \mu\text{C}$ moves at 3,000 m/s perpendicular to a uniform magnetic field of 0.4 T. What is the magnitude of the magnetic force on the particle?

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

Q29. A straight wire of length 1.2 m carries a current of 3 A perpendicular to a uniform magnetic field of 0.2 T. What is the magnitude of the magnetic force on the wire?

- (A) 1.44 N
- (B) 0.36 N
- (C) 0.72 N
- (D) 7.2 N

Q30. What is the magnitude of the magnetic field at a distance of 0.3 m from a long straight wire carrying a current of 9 A?

- (A) $6\ \mu\text{T}$
- (B) $12\ \mu\text{T}$
- (C) $3\ \mu\text{T}$
- (D) $60\ \mu\text{T}$

Q31. A long solenoid has 400 turns per metre and carries a current of 2 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) 1 mT
- (B) 2.01 mT
- (C) 0.5 mT
- (D) 10.05 mT

Q32. A metal rod of length 0.75 m moves at 2 m/s perpendicular to a uniform magnetic field of 0.6 T, with the rod perpendicular to both the field and its motion. What emf is induced between the ends of the rod?

- (A) 1.8 V
- (B) 0.45 V
- (C) 0.9 V
- (D) 9 V

Q33. The magnetic flux through a coil of 80 turns changes by 0.05 Wb in 0.2 s. What is the magnitude of the average induced emf in the coil?

- (A) 40 V
- (B) 10 V
- (C) 2 V
- (D) 20 V

Q34. A flat loop of area 0.25 m^2 is placed in a uniform magnetic field of 0.8 T. The field makes an angle of 60° with the normal to the loop. What is the magnetic flux through the loop?

- (A) 0.1 Wb
- (B) 0.2 Wb
- (C) 0.05 Wb
- (D) None of the other options

Q35. A bar magnet with its south pole facing a closed loop is pushed toward the loop. What magnetic pole does the side of the loop facing the magnet become?

- (A) A south pole, so that it repels the approaching magnet
- (B) A north pole, so that it attracts the approaching magnet
- (C) It does not become a pole at all
- (D) A south pole, so that it attracts the approaching magnet

Unit 13: Geometric Optics

Q36. An object is placed 36 cm in front of a concave dentist's mirror of focal length 12 cm. How far from the mirror is the image formed?

- (A) 36 cm
- (B) 9 cm
- (C) 24 cm
- (D) 18 cm

Q37. An object is placed 40 cm in front of a converging lens of focal length 20 cm. How far from the lens is the image formed?

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

Q38. An object is 50 cm from a mirror and its image is formed 25 cm from the mirror. What is the lateral magnification of the image?

- (A) 0.5
- (B) -0.5
- (C) -1
- (D) -0.25

Q39. A ray of light travels from a medium of refractive index 1.33 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) 51.7°
- (B) 41.7°
- (C) 31.7°
- (D) 48.3°

Q40. What is the critical angle for light travelling from a plastic of refractive index 1.25 into air, to the nearest 0.1° ?

- (A) 63.1°
- (B) 43.1°
- (C) 36.9°
- (D) 53.1°

Q41. Light travels at 2.4×10^8 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) 1.25
- (C) 0.62
- (D) 0.6

Q42. Light of wavelength 625 nm in air enters a medium of refractive index 1.25. What is its wavelength in the medium?

- (A) 500 nm
- (B) 625 nm
- (C) 1000 nm
- (D) 250 nm

Q43. An object is placed beyond twice the focal length of a converging lens. Which description best fits the image formed?

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

Unit 14: Waves, Sound, and Physical Optics

Q44. A wave has frequency 15 Hz and wavelength 10 m. What is its speed?

- (A) 300 m/s
- (B) 75 m/s
- (C) 25 m/s
- (D) 150 m/s

Q45. A string of length 2.5 m is fixed at both ends. Waves travel along it at 200 m/s. What is the frequency of its fundamental?

- (A) 80 Hz
- (B) 20 Hz
- (C) 40 Hz
- (D) None of the other options

Q46. An air column of length 1.7 m is closed at one end. Taking the speed of sound as 340 m/s, what is its fundamental frequency?

- (A) 100 Hz
- (B) 50 Hz
- (C) 25 Hz
- (D) 200 Hz

Q47. Two tuning forks of frequencies 300 Hz and 293 Hz are sounded together. What is the beat frequency heard?

- (A) 7 Hz
- (B) 14 Hz
- (C) 9 Hz
- (D) 593 Hz

Q48. In a double-slit experiment, light of wavelength 550 nm passes through slits 0.25 mm apart and forms fringes on a screen 2 m away. How far from the central bright fringe is the first bright fringe, in millimetres?

- (A) 8.8 mm
- (B) 2.2 mm
- (C) 4.4 mm
- (D) 44 mm

Q49. A sound source emitting 400 Hz moves at 68 m/s away from a stationary observer. Taking the speed of sound as 340 m/s, what frequency does the observer hear, to the nearest hertz?

- (A) 333 Hz
- (B) 373 Hz
- (C) 293 Hz
- (D) 400 Hz

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

- (A) It becomes 1/4 of the original intensity
- (B) It becomes 1/8 of the original intensity
- (C) It becomes 1/16 of the original intensity
- (D) It stays the same

Q51. A diffraction grating has 300 lines per millimetre. Light of wavelength 600 nm is incident normally on it. What is the angle of the first-order maximum, to the nearest 0.1°?

- (A) 20.4°
- (B) 0.4°
- (C) 10.4°
- (D) 79.6°

Unit 15: Modern Physics

- Q52. What is the energy, in electronvolts, of a photon of wavelength 310 nm? (Use $hc = 1240 \text{ eV}\cdot\text{nm}$.)**
- (A) 8 eV
 - (B) 2 eV
 - (C) 6 eV
 - (D) 4 eV
- Q53. Light of photon energy 4.5 eV falls on a metal surface whose work function is 3.1 eV. What is the maximum kinetic energy of the emitted photoelectrons?**
- (A) 1.4 eV
 - (B) 7.6 eV
 - (C) 4.5 eV
 - (D) 2.8 eV
- Q54. A metal has a work function of 1.5 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) $7.24 \times 10^{14} \text{ Hz}$
 - (B) $1.81 \times 10^{14} \text{ Hz}$
 - (C) $5.43 \times 10^{14} \text{ Hz}$
 - (D) $3.62 \times 10^{14} \text{ Hz}$
- Q55. An electron moves at $1.5 \times 10^6 \text{ m/s}$. 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) 0.97 nm
 - (B) 0.49 nm
 - (C) 0.24 nm
 - (D) 4.85 nm
- Q56. A hydrogen atom makes a transition from energy level $n = 3$ to $n = 1$. How much energy is released as a photon, in electronvolts? (Use $E_n = -13.6 \div n^2 \text{ eV}$.)**
- (A) 24.18 eV
 - (B) 12.09 eV
 - (C) 6.04 eV
 - (D) 1.51 eV
- Q57. A radioactive sample initially contains 200 g of an isotope. After 3 half-lives, how much of the isotope remains?**
- (A) 50 g
 - (B) 25 g
 - (C) 12.5 g
 - (D) 175 g
- Q58. In a nuclear reaction the total mass decreases by 0.03 u. How much energy is released? (Use $1 \text{ u} = 931.5 \text{ MeV}/c^2$.)**
- (A) 55.89 MeV
 - (B) 27.95 MeV
 - (C) 13.97 MeV
 - (D) 279.45 MeV

Q59. A clock on a spacecraft moving at $0.6c$ ticks 20 s as measured in the spacecraft frame. How much time passes on Earth while the spacecraft clock ticks 20 s?

- (A) 20 s
- (B) 50 s
- (C) 25 s
- (D) 40 s

Q60. A spacecraft of proper length 90 m travels past Earth at $0.8c$. What length does an observer on Earth measure for the spacecraft?

- (A) 54 m
- (B) 90 m
- (C) 108 m
- (D) 45 m

Answer Key

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

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