

AP Physics 2 Practice Test 7

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 sealed inside a laboratory syringe is initially at 200 kPa, occupies 5 L and is at 300 K. It is then compressed or expanded to 5 L and its temperature changes to 600 K. What is the final pressure of the gas?

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

Q2. 800 J of heat is added to steam in a turbine chamber while the gas does 350 J of work on its surroundings. What is the change in internal energy of the gas?

- (A) 450 J
- (B) 1150 J
- (C) -450 J
- (D) 800 J

Q3. A gas in a syringe expands at a constant pressure of 150 kPa from 2 L to 9 L. How much work is done by the gas?

- (A) 2100 J
- (B) 525 J
- (C) 1050 J
- (D) 1650 J

Q4. How much heat must be supplied to a 2 kg copper rod of specific heat capacity 385 J/kg·K to raise its temperature by 40 K? (Assume no heat is lost to the surroundings.)

- (A) 61,600 J
- (B) 30,800 J
- (C) 15,400 J
- (D) 770 J

Q5. A heat engine does 450 J of useful work in each cycle while absorbing 1500 J of heat from a hot reservoir. What is the efficiency of the engine?

- (A) 70%
- (B) 60%
- (C) 15%
- (D) 30%

Q6. An ideal Carnot engine operates between reservoirs at 800 K and 320 K. What is its maximum possible efficiency?

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

Q7. The root-mean-square speed of the molecules in a gas sample is 300 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) 900 m/s
- (B) 2700 m/s
- (C) 450 m/s
- (D) 300 m/s

Q8. A gas is compressed slowly at constant temperature. What happens to the entropy of the gas?

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

Q9. What is the internal energy of 4 mol of a monatomic ideal gas at 250 K? (Use $R = 8.31 \text{ J/mol}\cdot\text{K}$.)

- (A) 24930 J
- (B) 12465 J
- (C) 6232.5 J
- (D) 8310 J

Unit 10: Electric Force, Field, and Potential

Q10. Two point charges of $4 \mu\text{C}$ and $2 \mu\text{C}$ are placed 0.4 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) 0.45 N
- (B) 0.9 N
- (C) 0.22 N
- (D) 1.8 N

Q11. What is the magnitude of the electric field at a point 0.5 m from a point charge of $2 \mu\text{C}$? (Use $k = 9.0 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$.)

- (A) 72,000 N/C
- (B) 144,000 N/C
- (C) 36,000 N/C
- (D) 288,000 N/C

Q12. What is the electric potential at a point 0.2 m from a point charge of $4 \mu\text{C}$, taking potential at infinity to be zero? (Use $k = 9.0 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$.)

- (A) 360,000 V
- (B) 90,000 V
- (C) 180,000 V
- (D) 45,000 V

Q13. A charge of $5\ \mu\text{C}$ is placed in a uniform electric field of $4000\ \text{N/C}$. What is the magnitude of the electric force on the charge?

- (A) $0.02\ \text{N}$
- (B) $0.2\ \text{N}$
- (C) $0\ \text{N}$
- (D) $0.04\ \text{N}$

Q14. Two parallel metal plates are $0.05\ \text{m}$ apart and have a potential difference of $200\ \text{V}$ between them. What is the magnitude of the uniform electric field between the plates?

- (A) $8,000\ \text{V/m}$
- (B) $2,000\ \text{V/m}$
- (C) $10\ \text{V/m}$
- (D) $4,000\ \text{V/m}$

Q15. How much work is done by the electric field when a charge of $4\ \mu\text{C}$ moves through a potential drop of $300\ \text{V}$?

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

Q16. An electron is placed in a uniform electric field pointing north. In which direction is the electric force on the electron?

- (A) North
- (B) East
- (C) West
- (D) South

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

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

Q18. A electron starting from rest is accelerated through a potential difference of $250\ \text{V}$. What kinetic energy does it gain, in electronvolts?

- (A) $500\ \text{eV}$
- (B) $250\ \text{eV}$
- (C) $125\ \text{eV}$
- (D) $1000\ \text{eV}$

Unit 11: Electric Circuits

Q19. A potential difference of $36\ \text{V}$ is applied across a $12\ \Omega$ resistor. What current flows through it?

- (A) $0.33\ \text{A}$
- (B) $432\ \text{A}$
- (C) $48\ \text{A}$
- (D) $3\ \text{A}$

Q20. Three resistors of $5\ \Omega$, $15\ \Omega$ and $2\ \Omega$ are connected in series. What is their equivalent resistance?

- (A) $11\ \Omega$
- (B) $22\ \Omega$
- (C) $6.82\ \Omega$
- (D) $32\ \Omega$

Q21. Two resistors of $12\ \Omega$ and $4\ \Omega$ are connected in parallel. What is their equivalent resistance?

- (A) $16\ \Omega$
- (B) $6\ \Omega$
- (C) $3\ \Omega$
- (D) $4\ \Omega$

Q22. A current of $3\ \text{A}$ flows through a $10\ \Omega$ heating element. What power is dissipated in the element?

- (A) $30\ \text{W}$
- (B) $3.33\ \text{W}$
- (C) $900\ \text{W}$
- (D) $90\ \text{W}$

Q23. A battery of $24\ \text{V}$ is connected across two resistors of $4\ \Omega$ and $8\ \Omega$ in series. What is the potential difference across the $4\ \Omega$ resistor?

- (A) $16\ \text{V}$
- (B) $8\ \text{V}$
- (C) $4\ \text{V}$
- (D) None of the other options

Q24. A $24\ \text{V}$ battery is connected across two resistors in parallel. One branch has resistance $8\ \Omega$. What current flows in that branch?

- (A) $3\ \text{A}$
- (B) $6\ \text{A}$
- (C) $1.5\ \text{A}$
- (D) $32\ \text{A}$

Q25. A capacitor of capacitance $10\ \mu\text{F}$ is charged to $20\ \text{V}$. How much energy is stored in it?

- (A) $0.004\ \text{J}$
- (B) $0.001\ \text{J}$
- (C) $0.2\ \text{J}$
- (D) $0.002\ \text{J}$

Q26. Two capacitors of $6\ \mu\text{F}$ and $3\ \mu\text{F}$ are connected in series. What is their equivalent capacitance?

- (A) $2\ \mu\text{F}$
- (B) $9\ \mu\text{F}$
- (C) $18\ \mu\text{F}$
- (D) $4.5\ \mu\text{F}$

Q27. A cell of emf 9 V and internal resistance $2\ \Omega$ supplies a current of 1.5 A. What is the terminal potential difference of the cell?

- (A) 9 V
- (B) 6 V
- (C) 12 V
- (D) 3 V

Unit 12: Magnetism and Electromagnetism

Q28. A particle with charge $2\ \mu\text{C}$ moves at 5,000 m/s perpendicular to a uniform magnetic field of 0.4 T. What is the magnitude of the magnetic force on the particle?

- (A) 0.04 N
- (B) 0.01 N
- (C) 0 N
- (D) None of the other options

Q29. A straight wire of length 0.8 m carries a current of 2 A perpendicular to a uniform magnetic field of 0.5 T. What is the magnitude of the magnetic force on the wire?

- (A) 1.6 N
- (B) 0.4 N
- (C) 0.8 N
- (D) 8 N

Q30. What is the magnitude of the magnetic field at a distance of 0.1 m from a long straight wire carrying a current of 8 A?

- (A) $32\ \mu\text{T}$
- (B) $16\ \mu\text{T}$
- (C) $8\ \mu\text{T}$
- (D) $160\ \mu\text{T}$

Q31. A long solenoid has 1200 turns per metre and carries a current of 1.5 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) 4.52 mT
- (B) 2.26 mT
- (C) 1.13 mT
- (D) 22.61 mT

Q32. A metal rod of length 0.5 m moves at 2 m/s perpendicular to a uniform magnetic field of 0.8 T, with the rod perpendicular to both the field and its motion. What emf is induced between the ends of the rod?

- (A) 1.6 V
- (B) 0.4 V
- (C) 8 V
- (D) 0.8 V

Q33. The magnetic flux through a coil of 50 turns changes by 0.06 Wb in 0.3 s. What is the magnitude of the average induced emf in the coil?

- (A) 20 V
- (B) 5 V
- (C) 10 V
- (D) 1 V

Q34. A flat loop of area 0.4 m^2 is placed in a uniform magnetic field of 0.6 T. The field makes an angle of 60° with the normal to the loop. What is the magnetic flux through the loop?

- (A) 0.24 Wb
- (B) 0.06 Wb
- (C) 0.12 Wb
- (D) None of the other options

Q35. A bar magnet with its north pole facing a closed loop is pulled away from the loop. What magnetic pole does the side of the loop facing the magnet become?

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

Unit 13: Geometric Optics

Q36. An object is placed 60 cm in front of a concave telescope mirror of focal length 20 cm. How far from the mirror is the image formed?

- (A) 60 cm
- (B) 30 cm
- (C) 15 cm
- (D) 40 cm

Q37. An object is placed 30 cm in front of a converging lens of focal length 10 cm. How far from the lens is the image formed?

- (A) 30 cm
- (B) 7.5 cm
- (C) 40 cm
- (D) 15 cm

Q38. An object is 30 cm from a mirror and its image is formed 10 cm from the mirror. What is the lateral magnification of the image?

- (A) -0.33
- (B) 0.33
- (C) -0.67
- (D) -0.17

Q39. A ray of light travels from a medium of refractive index 1 into a medium of refractive index 1.33 at an angle of incidence of 45° . What is the angle of refraction, to the nearest 0.1° ?

- (A) 42.1°
- (B) 22.1°
- (C) 57.9°
- (D) 32.1°

Q40. What is the critical angle for light travelling from water of refractive index 1.33 into air, to the nearest 0.1° ?

- (A) 48.8°
- (B) 58.8°
- (C) 38.8°
- (D) 41.2°

Q41. Light travels at 2.25×10^8 m/s in a transparent material. What is the refractive index of the material? (Take $c = 3.00 \times 10^8$ m/s.)

- (A) 2.66
- (B) 1.33
- (C) 0.67
- (D) 0.75

Q42. Light of wavelength 660 nm in air enters a medium of refractive index 1.5. What is its wavelength in the medium?

- (A) 660 nm
- (B) 880 nm
- (C) 440 nm
- (D) 220 nm

Q43. An object is placed between the focal point and a concave mirror. Which description best fits the image formed?

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

Unit 14: Waves, Sound, and Physical Optics

Q44. A wave has frequency 10 Hz and wavelength 8 m. What is its speed?

- (A) 160 m/s
- (B) 80 m/s
- (C) 40 m/s
- (D) 18 m/s

Q45. A string of length 1.5 m is fixed at both ends. Waves travel along it at 300 m/s. What is the frequency of its second harmonic?

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

Q46. An air column of length 0.85 m is closed at one end. Taking the speed of sound as 340 m/s, what is its fundamental frequency?

- (A) 100 Hz
- (B) 200 Hz
- (C) 50 Hz
- (D) 400 Hz

Q47. Two tuning forks of frequencies 440 Hz and 436 Hz are sounded together. What is the beat frequency heard?

- (A) 4 Hz
- (B) 8 Hz
- (C) 6 Hz
- (D) 876 Hz

Q48. In a double-slit experiment, light of wavelength 500 nm passes through slits 0.2 mm apart and forms fringes on a screen 1.5 m away. How far from the central bright fringe is the first bright fringe, in millimetres?

- (A) 3.75 mm
- (B) 7.5 mm
- (C) 1.88 mm
- (D) 37.5 mm

Q49. A sound source emitting 600 Hz moves at 34 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) 585 Hz
- (B) 505 Hz
- (C) 545 Hz
- (D) 600 Hz

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

- (A) It becomes $\frac{1}{3}$ of the original intensity
- (B) It becomes $\frac{1}{9}$ of the original intensity
- (C) It becomes 3 times the original intensity
- (D) It becomes $\frac{1}{4}$ of the original intensity

Q51. A diffraction grating has 400 lines per millimetre. Light of wavelength 500 nm is incident normally on it. What is the angle of the first-order maximum, to the nearest 0.1° ?

- (A) 21.5°
- (B) 1.5°
- (C) 78.5°
- (D) 11.5°

Unit 15: Modern Physics

- Q52. What is the energy, in electronvolts, of a photon of wavelength 500 nm? (Use $hc = 1240 \text{ eV}\cdot\text{nm}$.)**
- (A) 2.48 eV
 - (B) 4.96 eV
 - (C) 1.24 eV
 - (D) 3.72 eV
- Q53. Light of photon energy 5 eV falls on a metal surface whose work function is 2 eV. What is the maximum kinetic energy of the emitted photoelectrons?**
- (A) 7 eV
 - (B) 5 eV
 - (C) 3 eV
 - (D) 6 eV
- Q54. A metal has a work function of 2.5 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) $12.07 \times 10^{14} \text{ Hz}$
 - (B) $6.03 \times 10^{14} \text{ Hz}$
 - (C) $3.02 \times 10^{14} \text{ Hz}$
 - (D) $9.05 \times 10^{14} \text{ Hz}$
- Q55. An electron moves at $2 \times 10^6 \text{ m/s}$. 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) 0.36 nm
 - (B) 0.73 nm
 - (C) 0.18 nm
 - (D) 3.64 nm
- Q56. A hydrogen atom makes a transition from energy level $n = 4$ to $n = 2$. How much energy is released as a photon, in electronvolts? (Use $E_n = -13.6 \div n^2 \text{ eV}$.)**
- (A) 5.1 eV
 - (B) 1.27 eV
 - (C) 11.05 eV
 - (D) 2.55 eV
- Q57. A radioactive sample initially contains 120 g of an isotope. After 2 half-lives, how much of the isotope remains?**
- (A) 60 g
 - (B) 30 g
 - (C) 15 g
 - (D) 90 g
- Q58. In a nuclear reaction the total mass decreases by 0.05 u. How much energy is released? (Use $1 \text{ u} = 931.5 \text{ MeV}/c^2$.)**
- (A) 93.15 MeV
 - (B) 23.29 MeV
 - (C) 465.75 MeV
 - (D) 46.58 MeV

Q59. A clock on a spacecraft moving at $0.8c$ ticks 9 s as measured in the spacecraft frame. How much time passes on Earth while the spacecraft clock ticks 9 s?

- (A) 9 s
- (B) 15 s
- (C) 30 s
- (D) 18 s

Q60. A spacecraft of proper length 150 m travels past Earth at $0.8c$. What length does an observer on Earth measure for the spacecraft?

- (A) 150 m
- (B) 180 m
- (C) 90 m
- (D) 75 m

Answer Key

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

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