

AP Physics 2 Practice Test 6

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 air trapped in a bicycle pump is initially at 120 kPa, occupies 6 L and is at 300 K. It is then compressed or expanded to 3 L and its temperature changes to 300 K. What is the final pressure of the gas?

- (A) 480 kPa
- (B) 120 kPa
- (C) 360 kPa
- (D) 240 kPa

Q2. 500 J of heat is added to a gas in a piston while the gas does 200 J of work on its surroundings. What is the change in internal energy of the gas?

- (A) 300 J
- (B) 700 J
- (C) -300 J
- (D) 500 J

Q3. A gas in a piston expands at a constant pressure of 200 kPa from 3 L to 7 L. How much work is done by the gas?

- (A) 1600 J
- (B) 400 J
- (C) 2000 J
- (D) 800 J

Q4. How much heat must be supplied to a 3 kg aluminium block of specific heat capacity 900 J/kg·K to raise its temperature by 25 K? (Assume no heat is lost to the surroundings.)

- (A) 135,000 J
- (B) 33,750 J
- (C) 67,500 J
- (D) 2,700 J

Q5. A heat engine does 300 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) 75%
- (B) 25%
- (C) 50%
- (D) 12.5%

Q6. An ideal Carnot engine operates between reservoirs at 600 K and 300 K. What is its maximum possible efficiency?

- (A) 25%
- (B) None of the other options
- (C) It cannot be determined from the data given
- (D) 50%

Q7. The root-mean-square speed of the molecules in a gas sample is 400 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) 1600 m/s
- (B) 400 m/s
- (C) 800 m/s
- (D) None of the other options

Q8. A block of ice melts in a warm room. What happens to the entropy of the ice as it melts?

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

Q9. What is the internal energy of 2 mol of a monatomic ideal gas at 300 K? (Use $R = 8.31 \text{ J/mol}\cdot\text{K}$.)

- (A) 7479 J
- (B) 14958 J
- (C) 3739.5 J
- (D) 4986 J

Unit 10: Electric Force, Field, and Potential

Q10. Two point charges of $2 \mu\text{C}$ and $3 \mu\text{C}$ 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) 0.43 N
- (B) 0.11 N
- (C) 0.86 N
- (D) 0.22 N

Q11. What is the magnitude of the electric field at a point 0.2 m from a point charge of $4 \mu\text{C}$? (Use $k = 9.0 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$.)

- (A) 1,800,000 N/C
- (B) 450,000 N/C
- (C) 3,600,000 N/C
- (D) 900,000 N/C

Q12. What is the electric potential at a point 0.5 m from a point charge of $5 \mu\text{C}$, 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) 180,000 V
- (C) 45,000 V
- (D) 22,500 V

Q13. A charge of $3\ \mu\text{C}$ is placed in a uniform electric field of $2000\ \text{N/C}$. What is the magnitude of the electric force on the charge?

- (A) $0.01\ \text{N}$
- (B) $0.06\ \text{N}$
- (C) $0\ \text{N}$
- (D) None of the other options

Q14. Two parallel metal plates are $0.06\ \text{m}$ apart and have a potential difference of $120\ \text{V}$ between them. What is the magnitude of the uniform electric field between the plates?

- (A) $4,000\ \text{V/m}$
- (B) $1,000\ \text{V/m}$
- (C) $7\ \text{V/m}$
- (D) $2,000\ \text{V/m}$

Q15. How much work is done by the electric field when a charge of $2\ \mu\text{C}$ moves through a potential drop of $500\ \text{V}$?

- (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 proton is placed in a uniform electric field pointing east. In which direction is the electric force on the proton?

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

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

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

Q18. A proton starting from rest is accelerated through a potential difference of $150\ \text{V}$. What kinetic energy does it gain, in electronvolts?

- (A) $300\ \text{eV}$
- (B) $150\ \text{eV}$
- (C) $75\ \text{eV}$
- (D) $600\ \text{eV}$

Unit 11: Electric Circuits

Q19. A resistor carries a current of $3\ \text{A}$ when a potential difference of $24\ \text{V}$ is applied across it. What is its resistance?

- (A) $72\ \Omega$
- (B) $0.125\ \Omega$
- (C) $8\ \Omega$
- (D) $27\ \Omega$

Q20. Three resistors of $4\ \Omega$, $6\ \Omega$ and $10\ \Omega$ are connected in series. What is their equivalent resistance?

- (A) $10\ \Omega$
- (B) $20\ \Omega$
- (C) $12\ \Omega$
- (D) $30\ \Omega$

Q21. Two resistors of $6\ \Omega$ and $3\ \Omega$ are connected in parallel. What is their equivalent resistance?

- (A) $2\ \Omega$
- (B) $9\ \Omega$
- (C) $4\ \Omega$
- (D) $2.25\ \Omega$

Q22. A lamp operates at $12\ \text{V}$ and draws a current of $2\ \text{A}$. What power does it dissipate?

- (A) $6\ \text{W}$
- (B) $48\ \text{W}$
- (C) $24\ \text{W}$
- (D) $14\ \text{W}$

Q23. A battery of $30\ \text{V}$ is connected across two resistors of $6\ \Omega$ and $12\ \Omega$ in series. What is the potential difference across the $6\ \Omega$ resistor?

- (A) $20\ \text{V}$
- (B) $5\ \text{V}$
- (C) None of the other options
- (D) $10\ \text{V}$

Q24. A $12\ \text{V}$ battery is connected across two resistors in parallel. One branch has resistance $6\ \Omega$. What current flows in that branch?

- (A) $2\ \text{A}$
- (B) $4\ \text{A}$
- (C) $1\ \text{A}$
- (D) $18\ \text{A}$

Q25. A capacitor of capacitance $20\ \mu\text{F}$ is charged to $12\ \text{V}$. How much charge is stored on it?

- (A) $32\ \mu\text{C}$
- (B) $1.67\ \mu\text{C}$
- (C) $480\ \mu\text{C}$
- (D) $240\ \mu\text{C}$

Q26. Two capacitors of $6\ \mu\text{F}$ and $4\ \mu\text{F}$ are connected in parallel. What is their equivalent capacitance?

- (A) $10\ \mu\text{F}$
- (B) $2.4\ \mu\text{F}$
- (C) $24\ \mu\text{F}$
- (D) $5\ \mu\text{F}$

Q27. A cell of emf 12 V and internal resistance $1\ \Omega$ supplies a current of 2 A. What is the terminal potential difference of the cell?

- (A) 10 V
- (B) 12 V
- (C) 14 V
- (D) 5 V

Unit 12: Magnetism and Electromagnetism

Q28. A particle with charge $4\ \mu\text{C}$ moves at 3,000 m/s perpendicular to a uniform magnetic field of 0.5 T. What is the magnitude of the magnetic force on the particle?

- (A) 0.06 N
- (B) 0 N
- (C) 0.01 N
- (D) None of the other options

Q29. A straight wire of length 0.6 m carries a current of 3 A perpendicular to a uniform magnetic field of 0.5 T. What is the magnitude of the magnetic force on the wire?

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

Q30. What is the magnitude of the magnetic field at a distance of 0.12 m from a long straight wire carrying a current of 6 A?

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

Q31. A long solenoid has 800 turns per metre and carries a current of 2.5 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) 5.02 mT
- (B) 1.26 mT
- (C) 2.51 mT
- (D) 25.12 mT

Q32. A metal rod of length 0.4 m moves at 3 m/s perpendicular to a uniform magnetic field of 0.5 T, with the rod perpendicular to both the field and its motion. What emf is induced between the ends of the rod?

- (A) 0.6 V
- (B) 1.2 V
- (C) 0.3 V
- (D) 6 V

Q33. The magnetic flux through a coil of 100 turns changes by 0.02 Wb in 0.5 s. What is the magnitude of the average induced emf in the coil?

- (A) 8 V
- (B) 2 V
- (C) 4 V
- (D) 0.4 V

Q34. A flat loop of area 0.5 m^2 is placed in a uniform magnetic field of 0.4 T. The field makes an angle of 0° with the normal to the loop. What is the magnetic flux through the loop?

- (A) 0.4 Wb
- (B) 0.2 Wb
- (C) 0.1 Wb
- (D) None of the other options

Q35. A bar magnet with its north pole facing a closed loop is pushed toward the loop. What magnetic pole does the side of the loop facing the magnet become, according to Lenz's law?

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

Unit 13: Geometric Optics

Q36. An object is placed 30 cm in front of a concave shaving mirror of focal length 10 cm. How far from the mirror is the image formed?

- (A) 30 cm
- (B) 15 cm
- (C) 7.5 cm
- (D) 20 cm

Q37. An object is placed 36 cm in front of a converging lens of focal length 12 cm. How far from the lens is the image formed?

- (A) 36 cm
- (B) 9 cm
- (C) 18 cm
- (D) 48 cm

Q38. An object is 20 cm from a mirror and its image is formed 60 cm from the mirror. What is the lateral magnification of the image?

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

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

- (A) 29.5°
- (B) 19.5°
- (C) 9.5°
- (D) 70.5°

Q40. What is the critical angle for light travelling from glass of refractive index 1.5 into air, to the nearest 0.1° ?

- (A) 41.8°
- (B) 51.8°
- (C) 31.8°
- (D) 48.2°

Q41. Light travels at 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) 3
- (B) 0.75
- (C) 1.5
- (D) 1

Q42. Light of wavelength 600 nm in air enters a medium of refractive index 1.5. What is its wavelength in the medium?

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

Q43. An object is placed beyond the centre of curvature of a concave mirror. Which description best fits the image formed?

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

Unit 14: Waves, Sound, and Physical Optics

Q44. A wave has frequency 5 Hz and wavelength 20 m. What is its speed?

- (A) 200 m/s
- (B) 50 m/s
- (C) 25 m/s
- (D) 100 m/s

Q45. A string of length 2 m is fixed at both ends. Waves travel along it at 240 m/s. What is the frequency of its fundamental?

- (A) 120 Hz
- (B) 30 Hz
- (C) None of the other options
- (D) 60 Hz

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

- (A) 400 Hz
- (B) 200 Hz
- (C) 100 Hz
- (D) 800 Hz

Q47. Two tuning forks of frequencies 512 Hz and 506 Hz are sounded together. What is the beat frequency heard?

- (A) 12 Hz
- (B) 6 Hz
- (C) 8 Hz
- (D) 1018 Hz

Q48. In a double-slit experiment, light of wavelength 600 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) 9.6 mm
- (B) 4.8 mm
- (C) 2.4 mm
- (D) 48 mm

Q49. A sound source emitting 500 Hz moves at 34 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) 596 Hz
- (B) 516 Hz
- (C) 556 Hz
- (D) 500 Hz

Q50. A listener moves to twice the original distance from a point source of sound, with no other change. How does the sound intensity at the listener change?

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

Q51. A diffraction grating has 500 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) 27.5°
- (B) 17.5°
- (C) 7.5°
- (D) 72.5°

Unit 15: Modern Physics

- Q52. What is the energy, in electronvolts, of a photon of wavelength 620 nm? (Use $hc = 1240 \text{ eV}\cdot\text{nm}$.)**
- (A) 2 eV
 - (B) 4 eV
 - (C) 1 eV
 - (D) 3 eV
- Q53. Light of photon energy 4 eV falls on a metal surface whose work function is 2.3 eV. What is the maximum kinetic energy of the emitted photoelectrons?**
- (A) 1.7 eV
 - (B) 6.3 eV
 - (C) 4 eV
 - (D) 3.4 eV
- Q54. A metal has a work function of 2 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) $2.41 \times 10^{14} \text{ Hz}$
 - (C) $7.24 \times 10^{14} \text{ Hz}$
 - (D) $4.83 \times 10^{14} \text{ Hz}$
- Q55. An electron moves at $1 \times 10^6 \text{ m/s}$. 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) 1.46 nm
 - (B) 0.36 nm
 - (C) 7.28 nm
 - (D) 0.73 nm
- Q56. A hydrogen atom makes a transition from energy level $n = 3$ to $n = 2$. How much energy is released as a photon, in electronvolts? (Use $E_n = -13.6 \div n^2 \text{ eV}$.)**
- (A) 3.78 eV
 - (B) 0.94 eV
 - (C) 11.71 eV
 - (D) 1.89 eV
- Q57. A radioactive sample initially contains 80 g of an isotope. After 3 half-lives, how much of the isotope remains?**
- (A) 20 g
 - (B) 10 g
 - (C) 5 g
 - (D) 70 g
- Q58. In a nuclear reaction the total mass decreases by 0.02 u. How much energy is released? (Use $1 \text{ u} = 931.5 \text{ MeV}/c^2$.)**
- (A) 18.63 MeV
 - (B) 37.26 MeV
 - (C) 9.31 MeV
 - (D) 186.3 MeV

Q59. A clock on a spacecraft moving at $0.6c$ ticks 8 s as measured in the spacecraft frame. How much time passes on Earth while the spacecraft clock ticks 8 s?

- (A) 8 s
- (B) 20 s
- (C) 10 s
- (D) 16 s

Q60. A spacecraft of proper length 100 m travels past Earth at $0.6c$. What length does an observer on Earth measure for the spacecraft?

- (A) 100 m
- (B) 160 m
- (C) 50 m
- (D) 80 m

Answer Key

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

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