

AP Physics 2 Practice Test 18

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 reversible heat engine operates between reservoirs at 700 K and 300 K. What is its maximum possible efficiency?

- (A) 114.29 %
- (B) 57.14 %
- (C) 28.57 %
- (D) 85.71 %

Q2. A heat engine takes in 1000 J of heat from a hot reservoir and rejects 800 J to a cold reservoir in one cycle. How much useful work does it do per cycle?

- (A) 400 J
- (B) 200 J
- (C) 100 J
- (D) 300 J

Q3. The absolute temperature of a sample of neon gas rises from 350 K to 175 K, i.e. it is halved. What happens to the average kinetic energy of its molecules?

- (A) doubles
- (B) triples
- (C) quadruples
- (D) halves

Q4. A sample of air expands slowly in a water bath so its temperature stays constant. Which name describes this process?

- (A) isobaric
- (B) isothermal
- (C) adiabatic
- (D) isovolumetric

Q5. How much energy is needed to melt 1.2 kg of ice at its melting point without changing its temperature? (Latent heat = 334000 J/kg.)

- (A) 400800 J
- (B) 801600 J
- (C) 200400 J
- (D) 601200 J

Q6. 9000 J of heat raises the temperature of a 1.5 kg sample by 20 K. What is the specific heat capacity of the sample material?

- (A) 600 J/kg·K
- (B) 150 J/kg·K
- (C) 450 J/kg·K
- (D) 300 J/kg·K

Q7. What is the internal energy of 1 mol of a monatomic ideal gas at 500 K? (Use $U = (3/2)nRT$ and $R = 8.31 \text{ J/mol}\cdot\text{K}$.)

- (A) 12465 J
- (B) 3116.25 J
- (C) 9348.75 J
- (D) 6232.5 J

Q8. A gas expands adiabatically and does 200 J of work on its surroundings. What is the change in its internal energy?

- (A) -400 J
- (B) -100 J
- (C) -300 J
- (D) -200 J

Q9. A storage cylinder holds 4.5 mol of an ideal gas at 450 K in a volume of 0.01 m³. What is the pressure of the gas, in kPa? (Use $R = 8.31 \text{ J/mol}\cdot\text{K}$.)

- (A) 1121.85 kPa
- (B) 2243.7 kPa
- (C) 560.92 kPa
- (D) 1682.77 kPa

Unit 10: Electric Force, Field, and Potential

Q10. A charge is moved slowly along an equipotential surface around a charged sphere. How much work is done by the electric field?

- (A) Zero
- (B) Positive
- (C) Negative
- (D) Cannot be determined without the charge

Q11. The distance between two point charges is doubled while both charges stay the same. By what factor does the electrostatic force between them change?

- (A) It doubles
- (B) It halves
- (C) It becomes four times as large
- (D) It becomes one-quarter as large

Q12. Parallel plates 8 mm apart have a potential difference of 300 V. A 3 μC charge between them experiences what force magnitude?

- (A) 0.23 N
- (B) 0.06 N
- (C) 0.11 N
- (D) 0.17 N

Q13. In a uniform field of 800 N/C, a charge moves 5 cm parallel to the field. What is the magnitude of the potential difference between its start and end points?

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

Q14. Two point charges of 8 μC and 8 μC are 20 cm apart in a vacuum. 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) 28.8 N
- (B) 7.2 N
- (C) 14.4 N
- (D) 21.6 N

Q15. What is the magnitude of the electric field 10 cm from a point charge of 2 μC in a vacuum? (Use $k = 9.0 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$.)

- (A) 3600000 N/C
- (B) 1800000 N/C
- (C) 900000 N/C
- (D) 2700000 N/C

Q16. A charge of 5 μC is placed in a uniform electric field of 500 N/C. What is the magnitude of the force on the charge, in mN?

- (A) 5 mN
- (B) 1.25 mN
- (C) 3.75 mN
- (D) 2.5 mN

Q17. What is the electric potential 10 cm from a point charge of 8 μC in a vacuum, taking potential at infinity as zero? (Use $k = 9.0 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$.)

- (A) 720000 V
- (B) 1440000 V
- (C) 360000 V
- (D) 1080000 V

Q18. How much work is done by an external agent moving a 5 μC charge through a potential difference of 250 V at constant speed? Give the answer in mJ.

- (A) 12.5 mJ
- (B) 0.12 mJ
- (C) 1.25 mJ
- (D) 2.5 mJ

Unit 11: Electric Circuits

Q19. A circuit contains a 100 k Ω resistor in series with a 50 μF capacitor. What is the time constant of the circuit?

- (A) 10 s
- (B) 5 s
- (C) 2.5 s
- (D) 7.5 s

Q20. A battery of emf 12 V and internal resistance $2\ \Omega$ delivers a current of 3 A. What is the terminal potential difference of the battery?

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

Q21. Two identical lamps are connected in series with a 12 V battery, then reconnected in parallel with the same battery. Compared with the series arrangement, each lamp in parallel is:

- (A) dimmer
- (B) the same brightness
- (C) brighter
- (D) off

Q22. A total current of 6 A splits between parallel resistors of $4\ \Omega$ and $4\ \Omega$. What current flows through the $4\ \Omega$ resistor?

- (A) 6 A
- (B) 1.5 A
- (C) 3 A
- (D) 4.5 A

Q23. A resistor of $6\ \Omega$ is connected across a 12 V battery. What current flows through the resistor?

- (A) 4 A
- (B) 1 A
- (C) 2 A
- (D) 3 A

Q24. Resistors of $12\ \Omega$, $2\ \Omega$ and $6\ \Omega$ are connected in series across a 30 V battery. What is the current in the circuit?

- (A) 1.5 A
- (B) 3 A
- (C) 0.75 A
- (D) 2.25 A

Q25. Resistors of $12\ \Omega$ and $6\ \Omega$ are connected in parallel across a 36 V battery. What is the total current drawn from the battery?

- (A) 18 A
- (B) 4.5 A
- (C) 13.5 A
- (D) 9 A

Q26. A device operates at 12 V and draws 3 A. At what rate does it dissipate energy?

- (A) 36 W
- (B) 72 W
- (C) 18 W
- (D) 54 W

Q27. A current of 5 A flows through a $5\ \Omega$ resistor. How much power is dissipated as heat in the resistor?

- (A) 250 W
- (B) 62.5 W
- (C) 187.5 W
- (D) 125 W

Unit 12: Magnetism and Electromagnetism

Q28. A straight wire of length 0.2 m carries a current of 6 A perpendicular to a uniform magnetic field of 0.2 T. What is the magnitude of the force on the wire?

- (A) 0.24 N
- (B) 0.48 N
- (C) 0.12 N
- (D) 0.36 N

Q29. What is the magnitude of the magnetic field 5 cm from a long straight wire carrying a current of 8 A?

- (A) $32\ \mu\text{T}$
- (B) $64\ \mu\text{T}$
- (C) $16\ \mu\text{T}$
- (D) $48\ \mu\text{T}$

Q30. A solenoid has 200 turns per metre and carries a current of 5 A. What is the magnetic field inside the solenoid, in mT? (Use $\mu_0 = 4\pi \times 10^{-7}\ \text{T}\cdot\text{m/A}$.)

- (A) 2.51 mT
- (B) 0.63 mT
- (C) 1.88 mT
- (D) 1.26 mT

Q31. A uniform magnetic field of 0.5 T passes through a flat loop of area $0.1\ \text{m}^2$. The field makes an angle of 60° with the normal to the loop. What is the magnetic flux through the loop, in mWb?

- (A) 25 mWb
- (B) 50 mWb
- (C) 12.5 mWb
- (D) 37.5 mWb

Q32. The magnetic flux through a single loop changes by 0.05 Wb in 0.1 s. What is the magnitude of the average induced emf in the loop?

- (A) 1 V
- (B) 0.25 V
- (C) 0.75 V
- (D) 0.5 V

Q33. A metal rod of length 0.4 m moves at 2 m/s perpendicular to a uniform magnetic field of 0.2 T, with its length perpendicular to both motion and field. What motional emf is induced between its ends?

- (A) 0.32 V
- (B) 0.08 V
- (C) 0.16 V
- (D) 0.24 V

Q34. A proton (mass 1.67×10^{-27} kg, charge 1.6×10^{-19} C) moves at 2×10^5 m/s perpendicular to a uniform magnetic field of 0.8 T. What is the radius of its circular path, in mm?

- (A) 2.61 mm
- (B) 5.22 mm
- (C) 1.3 mm
- (D) 3.91 mm

Q35. The magnetic flux through a closed copper loop decreases. According to Lenz's law, the induced current in the loop creates a magnetic field that:

- (A) opposes the increase in flux
- (B) reinforces the change in flux
- (C) opposes the decrease in flux
- (D) is zero

Unit 13: Geometric Optics

Q36. An object is placed 62.5 cm in front of a converging lens of focal length 25 cm. How far from the lens is the image formed?

- (A) 83.33 cm
- (B) 20.83 cm
- (C) 41.67 cm
- (D) 62.5 cm

Q37. A concave mirror has a radius of curvature of 18 cm. What is its focal length?

- (A) 18 cm
- (B) 4.5 cm
- (C) 9 cm
- (D) 13.5 cm

Q38. A ray in air enters a transparent block at an angle of incidence of 60° and refracts at 45° to the normal. Using $\sin 60^\circ = 0.866$ and $\sin 45^\circ = 0.707$, what is the refractive index of the block?

- (A) 2.44
- (B) 1.22
- (C) 0.61
- (D) 1.83

Q39. What is the critical angle for light travelling from a medium of refractive index 1.52 into air? (Use $\sin\theta_c = 1 \div n$.)

- (A) 82.2 degrees
- (B) 41.1 degrees
- (C) 20.55 degrees
- (D) 61.65 degrees

Q40. Light travels at 2.4×10^8 m/s in a plastic sample. What is the refractive index of the material? (Use $c = 3.0 \times 10^8$ m/s.)

- (A) 2.5
- (B) 1.25
- (C) 0.62
- (D) 1.88

Q41. An object is placed 10 cm from a converging lens of focal length 20 cm, so it is inside the focal length. The image formed is:

- (A) real, inverted and diminished
- (B) virtual, upright and magnified
- (C) real, upright and magnified
- (D) virtual, inverted and diminished

Q42. Total internal reflection between diamond and air can occur only when light travels:

- (A) from air to diamond
- (B) at normal incidence
- (C) from diamond to air at an angle above the critical angle
- (D) from diamond to air at any angle

Q43. An candle stands 1.2 m in front of a plane mirror. How far behind the mirror does its image appear to be?

- (A) 2.4 m
- (B) 0.6 m
- (C) 1.2 m
- (D) 1.8 m

Unit 14: Waves, Sound, and Physical Optics

Q44. Two tuning forks of frequencies 320 Hz and 330 Hz sound together. What is the beat frequency heard?

- (A) 20 Hz
- (B) 5 Hz
- (C) 10 Hz
- (D) 15 Hz

Q45. A source emitting 500 Hz moves towards a stationary observer at 68 m/s. Sound travels at 340 m/s. What frequency does the observer hear?

- (A) 625 Hz
- (B) 1250 Hz
- (C) 312.5 Hz
- (D) 937.5 Hz

Q46. In a double-slit experiment, light of wavelength 600 nm passes through slits 0.5 mm apart, with a screen 2 m away. How far from the central maximum is the 1th bright fringe, in mm?

- (A) 4.8 mm
- (B) 1.2 mm
- (C) 3.6 mm
- (D) 2.4 mm

Q47. A point source radiates 80 W of sound uniformly in all directions. What is the intensity at a distance of 4 m? (Use $\pi = 3.14$.)

- (A) 0.8 W/m^2
- (B) 0.2 W/m^2
- (C) 0.6 W/m^2
- (D) 0.4 W/m^2

Q48. In a single-slit diffraction pattern, using a shorter wavelength while keeping the other factors fixed causes the central maximum to become:

- (A) wider
- (B) narrower
- (C) unchanged in width
- (D) brighter but the same width

Q49. An oil film in air appears bright for a certain wavelength in reflected light. Which condition on its thickness t best describes this, for the thinnest such film case?

- (A) $2t = m$ times the wavelength in the film
- (B) $2t = (m + 1/2)$ times the wavelength in the film
- (C) $t =$ the wavelength in the film
- (D) $2t =$ one-quarter times the wavelength in the film

Q50. A wave has frequency 100 Hz and wavelength 4 m. What is its speed?

- (A) 800 m/s
- (B) 400 m/s
- (C) 200 m/s
- (D) 600 m/s

Q51. A oscillator completes one oscillation in 5 s. What is its frequency?

- (A) 0.4 Hz
- (B) 0.1 Hz
- (C) 0.3 Hz
- (D) 0.2 Hz

Unit 15: Modern Physics

Q52. A radioactive decay has a mass defect of 0.02 u. How much energy is released? (Use $1 \text{ u} = 931.5 \text{ MeV}/c^2$.)

- (A) 37.26 MeV
- (B) 9.31 MeV
- (C) 27.95 MeV
- (D) 18.63 MeV

Q53. A zinc surface has work function 4.5 eV. What is its threshold frequency, in units of 10^{14} Hz? (Use $h = 6.63 \times 10^{-34}$ J·s and $1 \text{ eV} = 1.6 \times 10^{-19}$ J.)

- (A) 21.72×10^{14} Hz
- (B) 10.86×10^{14} Hz
- (C) 5.43×10^{14} Hz
- (D) 16.29×10^{14} Hz

Q54. The Compton scattering is best explained if light behaves as:

- (A) particles (photons)
- (B) waves only
- (C) a continuous fluid
- (D) a magnetic field only

Q55. According to the Heisenberg uncertainty principle, measuring a electron's momentum more precisely necessarily:

- (A) increases the uncertainty in its momentum
- (B) increases the uncertainty in its position
- (C) decreases the uncertainty in the other quantity
- (D) leaves the other uncertainty unchanged

Q56. What is the energy, in units of 10^{-19} J, of a photon of frequency 4×10^{14} Hz? (Use $h = 6.63 \times 10^{-34}$ J·s.)

- (A) 5.3×10^{-19} J
- (B) 1.33×10^{-19} J
- (C) 2.65×10^{-19} J
- (D) 3.98×10^{-19} J

Q57. Light photons of energy 5 eV strike a metal with work function 2.5 eV. What is the maximum kinetic energy of the emitted photoelectrons, in eV?

- (A) 5 eV
- (B) 1.25 eV
- (C) 3.75 eV
- (D) 2.5 eV

Q58. Photoelectrons are emitted with maximum kinetic energy 1.2 eV. What stopping potential is needed to bring the fastest electrons to rest?

- (A) 2.4 V
- (B) 1.2 V
- (C) 0.6 V
- (D) 1.8 V

Q59. An electron (mass 9.11×10^{-31} kg) moves at 1×10^6 m/s. What is its de Broglie wavelength, in pm? (Use $h = 6.63 \times 10^{-34}$ J·s.)

- (A) 1455.54 pm
- (B) 363.89 pm
- (C) 727.77 pm
- (D) 1091.66 pm

Q60. A hydrogen atom transitions from energy level $n = 5$ to $n = 4$. What is the energy of the photon emitted, in eV? (Levels: $E_n = -13.6 \div n^2$ eV.)

- (A) 0.31 eV
- (B) 0.62 eV
- (C) 0.15 eV
- (D) 0.46 eV

Answer Key

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

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