

AP Physics 2 Practice Test 19

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 helium expands quickly in an insulated cylinder so no heat enters or leaves. Which name describes this process?

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

Q2. How much energy is needed to melt 1.2 kg of wax at its melting point without changing its temperature? (Latent heat = 250000 J/kg.)

- (A) 600000 J
- (B) 150000 J
- (C) 300000 J
- (D) 450000 J

Q3. 13500 J of heat raises the temperature of a 2 kg sample by 10 K. What is the specific heat capacity of the sample material?

- (A) 675 J/kg·K
- (B) 1350 J/kg·K
- (C) 337.5 J/kg·K
- (D) 1012.5 J/kg·K

Q4. What is the internal energy of 1 mol of a monatomic ideal gas at 600 K? (Use $U = (3/2)nRT$ and $R = 8.31 \text{ J/mol}\cdot\text{K}$.)

- (A) 14958 J
- (B) 7479 J
- (C) 3739.5 J
- (D) 11218.5 J

Q5. A gas expands adiabatically and does 800 J of work on its surroundings. What is the change in its internal energy?

- (A) -800 J
- (B) -1600 J
- (C) -400 J
- (D) -1200 J

Q6. A laboratory flask holds 2 mol of an ideal gas at 300 K in a volume of 0.04 m^3 . What is the pressure of the gas, in kPa? (Use $R = 8.31 \text{ J/mol}\cdot\text{K}$.)

- (A) 249.3 kPa
- (B) 124.65 kPa
- (C) 62.33 kPa
- (D) 186.98 kPa

Q7. 4 mol of an ideal gas at 400 K exerts a pressure of 200 kPa. What volume does the gas occupy? (Use $R = 8.31 \text{ J/mol}\cdot\text{K}$.)

- (A) 0.13 m^3
- (B) 0.03 m^3
- (C) 0.1 m^3
- (D) 0.07 m^3

Q8. An ideal gas sample of 2 mol in a 0.04 m^3 container exerts a pressure of 120 kPa. What is its temperature? (Use $R = 8.31 \text{ J/mol}\cdot\text{K}$.)

- (A) 577.62 K
- (B) 288.81 K
- (C) 144.4 K
- (D) 433.21 K

Q9. A 0.6 kg copper rod with specific heat capacity $500 \text{ J/kg}\cdot\text{K}$ is heated through 25 K. How much thermal energy is transferred to it?

- (A) 15000 J
- (B) 3750 J
- (C) 11250 J
- (D) 7500 J

Unit 10: Electric Force, Field, and Potential

Q10. In a uniform field of 800 N/C , a charge moves 4 cm parallel to the field. What is the magnitude of the potential difference between its start and end points?

- (A) 64 V
- (B) 16 V
- (C) 32 V
- (D) 48 V

Q11. Two point charges of $3 \mu\text{C}$ and $6 \mu\text{C}$ are 25 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) 5.18 N
- (B) 2.59 N
- (C) 1.3 N
- (D) 3.89 N

Q12. What is the magnitude of the electric field 20 cm from a point charge of $5 \mu\text{C}$ in a vacuum? (Use $k = 9.0 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$.)

- (A) 2250000 N/C
- (B) 562500 N/C
- (C) 1687500 N/C
- (D) 1125000 N/C

Q13. A charge of $3\ \mu\text{C}$ is placed in a uniform electric field of $500\ \text{N/C}$. What is the magnitude of the force on the charge, in mN?

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

Q14. What is the electric potential 30 cm from a point charge of $12\ \mu\text{C}$ 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) 360000 V
- (B) 720000 V
- (C) 180000 V
- (D) 540000 V

Q15. How much work is done by an external agent moving a $5\ \mu\text{C}$ charge through a potential difference of 50 V at constant speed? Give the answer in mJ.

- (A) 2.5 mJ
- (B) 0.03 mJ
- (C) 0.25 mJ
- (D) 0.5 mJ

Q16. The potential difference between two parallel plates 2 mm apart is 100 V. What is the magnitude of the uniform electric field between the plates?

- (A) 100000 N/C
- (B) 25000 N/C
- (C) 50000 N/C
- (D) 75000 N/C

Q17. Two point charges of $2\ \mu\text{C}$ and $6\ \mu\text{C}$ are held 25 cm apart. What is their electric potential energy? (Use $k = 9.0 \times 10^9\ \text{N}\cdot\text{m}^2/\text{C}^2$, and take zero at infinity.)

- (A) 0.86 J
- (B) 0.22 J
- (C) 0.65 J
- (D) 0.43 J

Q18. A proton is placed in an electric field. In which direction does the electric force on it act?

- (A) Opposite to the field
- (B) Perpendicular to the field
- (C) In the direction of decreasing potential only
- (D) In the direction of the field

Unit 11: Electric Circuits

Q19. A total current of 6 A splits between parallel resistors of $3\ \Omega$ and $6\ \Omega$. What current flows through the $3\ \Omega$ resistor?

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

Q20. A resistor of $4\ \Omega$ is connected across a $60\ \text{V}$ battery. What current flows through the resistor?

- (A) $30\ \text{A}$
- (B) $7.5\ \text{A}$
- (C) $22.5\ \text{A}$
- (D) $15\ \text{A}$

Q21. Resistors of $12\ \Omega$, $5\ \Omega$ and $8\ \Omega$ are connected in series across a $30\ \text{V}$ battery. What is the current in the circuit?

- (A) $2.4\ \text{A}$
- (B) $0.6\ \text{A}$
- (C) $1.8\ \text{A}$
- (D) $1.2\ \text{A}$

Q22. Resistors of $12\ \Omega$ and $6\ \Omega$ are connected in parallel across a $24\ \text{V}$ battery. What is the total current drawn from the battery?

- (A) $12\ \text{A}$
- (B) $3\ \text{A}$
- (C) $6\ \text{A}$
- (D) $9\ \text{A}$

Q23. A device operates at $12\ \text{V}$ and draws $6\ \text{A}$. At what rate does it dissipate energy?

- (A) $144\ \text{W}$
- (B) $36\ \text{W}$
- (C) $72\ \text{W}$
- (D) $108\ \text{W}$

Q24. A current of $4\ \text{A}$ flows through a $5\ \Omega$ resistor. How much power is dissipated as heat in the resistor?

- (A) $160\ \text{W}$
- (B) $80\ \text{W}$
- (C) $40\ \text{W}$
- (D) $120\ \text{W}$

Q25. A wire of length $20\ \text{m}$ and cross-sectional area $1\ \text{mm}^2$ is made of a material of resistivity $1.7 \times 10^{-8}\ \Omega\cdot\text{m}$. What is the resistance of the wire?

- (A) $0.68\ \Omega$
- (B) $0.17\ \Omega$
- (C) $0.51\ \Omega$
- (D) $0.34\ \Omega$

Q26. A $100\ \mu\text{F}$ capacitor is connected across a $30\ \text{V}$ battery. What charge is stored on each plate, in μC ?

- (A) $3000\ \mu\text{C}$
- (B) $6000\ \mu\text{C}$
- (C) $1500\ \mu\text{C}$
- (D) $4500\ \mu\text{C}$

Q27. A 50 μF capacitor charged to 40 V stores how much energy, in mJ?

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

Unit 12: Magnetism and Electromagnetism

Q28. A uniform magnetic field of 0.8 T passes through a flat loop of area 0.05 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) 40 mWb
- (B) 10 mWb
- (C) 30 mWb
- (D) 20 mWb

Q29. The magnetic flux through a single loop changes by 0.02 Wb in 0.5 s. What is the magnitude of the average induced emf in the loop?

- (A) 0.08 V
- (B) 0.02 V
- (C) 0.06 V
- (D) 0.04 V

Q30. A metal rod of length 0.5 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) 0.2 V
- (B) 0.4 V
- (C) 0.1 V
- (D) 0.3 V

Q31. A proton (mass $1.67 \times 10^{-27} \text{ kg}$, charge $1.6 \times 10^{-19} \text{ C}$) moves at $2 \times 10^5 \text{ m/s}$ perpendicular to a uniform magnetic field of 0.5 T. What is the radius of its circular path, in mm?

- (A) 8.35 mm
- (B) 2.09 mm
- (C) 6.26 mm
- (D) 4.18 mm

Q32. The magnetic flux through a closed metal coil 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

Q33. What is the magnetic field at the centre of a circular loop of radius 4 cm carrying a current of 5 A?

- (A) 78.54 μT
- (B) 157.08 μT
- (C) 39.27 μT
- (D) 117.81 μT

Q34. Two long parallel conductors carry currents in the opposite direction. The magnetic force between them is:

- (A) attractive
- (B) zero
- (C) repulsive
- (D) perpendicular to both wires

Q35. A $8\ \mu\text{C}$ particle moves at $6 \times 10^4\ \text{m/s}$ perpendicular to a magnetic field of 0.5 T. What is the magnitude of the magnetic force on it, in mN?

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

Unit 13: Geometric Optics

Q36. What is the critical angle for light travelling from a medium of refractive index 1.5 into air? (Use $\sin\theta_c = 1 \div n$.)

- (A) 83.6 degrees
- (B) 41.8 degrees
- (C) 20.9 degrees
- (D) 62.7 degrees

Q37. Light travels at $2.25 \times 10^8\ \text{m/s}$ in a plastic sample. What is the refractive index of the material? (Use $c = 3.0 \times 10^8\ \text{m/s}$.)

- (A) 1.33
- (B) 2.67
- (C) 0.67
- (D) 2

Q38. An object is placed 15 cm from a converging lens of focal length 30 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

Q39. Total internal reflection at a glass-air boundary can occur only when light travels:

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

Q40. An candle stands 1.4 m in front of a plane mirror. How far behind the mirror does its image appear to be?

- (A) 1.4 m
- (B) 2.8 m
- (C) 0.7 m
- (D) 2.1 m

Q41. A diverging lens of focal length -20 cm always forms an image that is:

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

Q42. A ray strikes a plane mirror at 30° to the normal. At what angle to the normal is the reflected ray?

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

Q43. An object is placed 36 cm in front of a concave mirror of focal length 18 cm. How far from the mirror is the image formed?

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

Unit 14: Waves, Sound, and Physical Optics

Q44. A point source radiates 120 W of sound uniformly in all directions. What is the intensity at a distance of 2 m? (Use $\pi = 3.14$.)

- (A) 4.77 W/m^2
- (B) 2.39 W/m^2
- (C) 1.19 W/m^2
- (D) 3.58 W/m^2

Q45. In a single-slit diffraction pattern, using a longer wavelength while keeping the other factors fixed causes the central maximum to become:

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

Q46. A soap 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) $t =$ the wavelength in the film
- (C) $2t = (m + 1/2)$ times the wavelength in the film
- (D) $2t =$ one-quarter times the wavelength in the film

Q47. A wave has frequency 50 Hz and wavelength 6.8 m. What is its speed?

- (A) 680 m/s
- (B) 170 m/s
- (C) 340 m/s
- (D) 510 m/s

Q48. A wave completes one oscillation in 2.5 s. What is its frequency?

- (A) 0.4 Hz
- (B) 0.8 Hz
- (C) 0.2 Hz
- (D) 0.6 Hz

Q49. A string of length 1 m fixed at both ends supports waves travelling at 100 m/s. What is its fundamental frequency?

- (A) 50 Hz
- (B) 100 Hz
- (C) 25 Hz
- (D) 75 Hz

Q50. An open pipe of length 0.425 m resonates with sound waves travelling at 340 m/s. What is its fundamental frequency?

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

Q51. A pipe closed at one end has length 0.75 m. Sound travels at 340 m/s. What is its fundamental frequency?

- (A) 113.33 Hz
- (B) 226.67 Hz
- (C) 56.67 Hz
- (D) 170 Hz

Unit 15: Modern Physics

Q52. According to the Heisenberg uncertainty principle, measuring a particle's momentum more precisely necessarily:

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

Q53. What is the energy, in units of 10^{-19} J, of a photon of frequency 7×10^{14} Hz? (Use $h = 6.63 \times 10^{-34}$ J·s.)

- (A) 4.64×10^{-19} J
- (B) 9.28×10^{-19} J
- (C) 2.32×10^{-19} J
- (D) 6.96×10^{-19} J

- Q54. Light photons of energy 6.5 eV strike a metal with work function 4 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
- Q55. Photoelectrons are emitted with maximum kinetic energy 2 eV. What stopping potential is needed to bring the fastest electrons to rest?**
- (A) 4 V
 - (B) 1 V
 - (C) 2 V
 - (D) 3 V
- Q56. An electron (mass 9.11×10^{-31} kg) moves at 2×10^6 m/s. What is its de Broglie wavelength, in pm? (Use $h = 6.63 \times 10^{-34}$ J·s.)**
- (A) 727.77 pm
 - (B) 363.89 pm
 - (C) 181.94 pm
 - (D) 545.83 pm
- Q57. A hydrogen atom transitions from energy level $n = 5$ to $n = 2$. What is the energy of the photon emitted, in eV? (Levels: $E_n = -13.6 \div n^2$ eV.)**
- (A) 5.72 eV
 - (B) 2.86 eV
 - (C) 1.43 eV
 - (D) 4.29 eV
- Q58. What is the energy of a hydrogen atom in level $n = 2$, in eV? (Use $E_n = -13.6 \div n^2$ eV.)**
- (A) -6.8 eV
 - (B) -3.4 eV
 - (C) -1.7 eV
 - (D) 6.8 eV
- Q59. A radioactive sample of mass 80 g has a half-life of one hour. How much of it remains undecayed after 3 hours?**
- (A) 20 g
 - (B) 10 g
 - (C) 5 g
 - (D) 15 g
- Q60. A fusion reaction has a mass defect of 0.2 u. How much energy is released? (Use $1 \text{ u} = 931.5 \text{ MeV}/c^2$.)**
- (A) 372.6 MeV
 - (B) 186.3 MeV
 - (C) 93.15 MeV
 - (D) 279.45 MeV

Answer Key

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

Worked explanations for all 60 questions: quaidianpoint.com/ap-physics-2-practice-test-19/ — plus 80 free AP Physics practice tests at [QuaidianPoint.com](https://quaidianpoint.com).