

AP Physics 2 Practice Test 16

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 pressure chamber holds 3 mol of an ideal gas at 350 K in a volume of 0.02 m³. What is the pressure of the gas, in kPa? (Use $R = 8.31 \text{ J/mol}\cdot\text{K}$.)

- (A) 872.55 kPa
- (B) 436.27 kPa
- (C) 218.14 kPa
- (D) 654.41 kPa

Q2. 8 mol of an ideal gas at 350 K exerts a pressure of 200 kPa. What volume does the gas occupy? (Use $R = 8.31 \text{ J/mol}\cdot\text{K}$.)

- (A) 0.23 m³
- (B) 0.12 m³
- (C) 0.06 m³
- (D) 0.17 m³

Q3. An ideal gas sample of 3 mol in a 0.02 m³ container exerts a pressure of 120 kPa. What is its temperature? (Use $R = 8.31 \text{ J/mol}\cdot\text{K}$.)

- (A) 96.27 K
- (B) 192.54 K
- (C) 48.13 K
- (D) 144.4 K

Q4. A 1.2 kg brass disc with specific heat capacity 900 J/kg·K is heated through 40 K. How much thermal energy is transferred to it?

- (A) 86400 J
- (B) 21600 J
- (C) 43200 J
- (D) 64800 J

Q5. 300 J of heat is added to a gas in a piston while it does 200 J of work on its surroundings. What is the change in its internal energy?

- (A) 200 J
- (B) 100 J
- (C) 50 J
- (D) 150 J

Q6. A gas expands at a constant pressure of 80 kPa, increasing its volume by 0.02 m^3 . How much work does the gas do?

- (A) 3200 J
- (B) 1600 J
- (C) 800 J
- (D) 2400 J

Q7. A reversible heat engine operates between reservoirs at 600 K and 300 K. What is its maximum possible efficiency?

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

Q8. A heat engine takes in 1500 J of heat from a hot reservoir and rejects 300 J to a cold reservoir in one cycle. How much useful work does it do per cycle?

- (A) 2400 J
- (B) 600 J
- (C) 1800 J
- (D) 1200 J

Q9. The absolute temperature of a sample of nitrogen gas rises from 400 K to 1200 K, i.e. it is tripled. What happens to the average kinetic energy of its molecules?

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

Unit 10: Electric Force, Field, and Potential

Q10. A charge of $4 \text{ } \mu\text{C}$ is placed in a uniform electric field of 200 N/C . What is the magnitude of the force on the charge, in mN?

- (A) 1.6 mN
- (B) 0.4 mN
- (C) 1.2 mN
- (D) 0.8 mN

Q11. What is the electric potential 20 cm from a point charge of $4 \text{ } \mu\text{C}$ 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) 90000 V
- (C) 180000 V
- (D) 270000 V

Q12. How much work is done by an external agent moving a $5 \text{ } \mu\text{C}$ charge through a potential difference of 200 V at constant speed? Give the answer in mJ.

- (A) 10 mJ
- (B) 0.1 mJ
- (C) 2 mJ
- (D) 1 mJ

Q13. The potential difference between two parallel plates 2 mm apart is 300 V. What is the magnitude of the uniform electric field between the plates?

- (A) 300000 N/C
- (B) 150000 N/C
- (C) 75000 N/C
- (D) 225000 N/C

Q14. Two point charges of 5 μC and 3 μC are held 50 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) 0.27 J
- (B) 0.54 J
- (C) 0.13 J
- (D) 0.4 J

Q15. A positively charged oil drop is placed in an electric field. In which direction does the electric force on it act?

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

Q16. A alpha particle is moved slowly along an equipotential surface around a point charge. How much work is done by the electric field?

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

Q17. The distance between two point charges is halved 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 one-quarter as large
- (D) It becomes four times as large

Q18. Parallel plates 2 mm apart have a potential difference of 200 V. A 2 μC charge between them experiences what force magnitude?

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

Unit 11: Electric Circuits

Q19. A current of 3 A flows through a 25 Ω resistor. How much power is dissipated as heat in the resistor?

- (A) 450 W
- (B) 112.5 W
- (C) 337.5 W
- (D) 225 W

- Q20. A wire of length 20 m and cross-sectional area 2 mm^2 is made of a material of resistivity $5 \times 10^{-8} \Omega \cdot \text{m}$. What is the resistance of the wire?**
- (A) 1Ω
 - (B) 0.25Ω
 - (C) 0.75Ω
 - (D) 0.5Ω
- Q21. A $50 \mu\text{F}$ capacitor is connected across a 12 V battery. What charge is stored on each plate, in μC ?**
- (A) $1200 \mu\text{C}$
 - (B) $300 \mu\text{C}$
 - (C) $600 \mu\text{C}$
 - (D) $900 \mu\text{C}$
- Q22. A $50 \mu\text{F}$ capacitor charged to 30 V stores how much energy, in mJ?**
- (A) 45 mJ
 - (B) 11.25 mJ
 - (C) 22.5 mJ
 - (D) 33.75 mJ
- Q23. Capacitors of $10 \mu\text{F}$ and $40 \mu\text{F}$ are connected in parallel across a 24 V battery. What total charge is stored, in μC ?**
- (A) $2400 \mu\text{C}$
 - (B) $600 \mu\text{C}$
 - (C) $1800 \mu\text{C}$
 - (D) $1200 \mu\text{C}$
- Q24. Capacitors of $20 \mu\text{F}$ and $20 \mu\text{F}$ are connected in series across a 12 V battery. What charge is stored on each capacitor, in μC ?**
- (A) $240 \mu\text{C}$
 - (B) $120 \mu\text{C}$
 - (C) $60 \mu\text{C}$
 - (D) $180 \mu\text{C}$
- Q25. A circuit contains a $20 \text{ k}\Omega$ resistor in series with a $20 \mu\text{F}$ capacitor. What is the time constant of the circuit?**
- (A) 0.8 s
 - (B) 0.2 s
 - (C) 0.6 s
 - (D) 0.4 s
- Q26. A battery of emf 24 V and internal resistance 1Ω delivers a current of 2 A. What is the terminal potential difference of the battery?**
- (A) 44 V
 - (B) 11 V
 - (C) 22 V
 - (D) 33 V

Q27. Two identical bulbs are connected in series with a 24 V battery, then reconnected in parallel with the same battery. Compared with the series arrangement, each bulb in parallel is:

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

Unit 12: Magnetism and Electromagnetism

Q28. A metal rod of length 0.5 m moves at 2 m/s perpendicular to a uniform magnetic field of 0.5 T, with its length perpendicular to both motion and field. What motional emf is induced between its ends?

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

Q29. A proton (mass 1.67×10^{-27} kg, charge 1.6×10^{-19} C) moves at 3×10^5 m/s perpendicular to a uniform magnetic field of 0.5 T. What is the radius of its circular path, in mm?

- (A) 6.26 mm
- (B) 12.53 mm
- (C) 3.13 mm
- (D) 9.39 mm

Q30. The magnetic flux through a closed aluminium loop increases. According to Lenz's law, the induced current in the loop creates a magnetic field that:

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

Q31. What is the magnetic field at the centre of a circular loop of radius 8 cm carrying a current of 8 A?

- (A) 62.83 μT
- (B) 125.66 μT
- (C) 31.42 μT
- (D) 94.25 μT

Q32. Two long parallel metal rods carry currents in the opposite direction. The magnetic force between them is:

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

Q33. A $4\ \mu\text{C}$ particle moves at $4 \times 10^4\ \text{m/s}$ perpendicular to a magnetic field of $0.5\ \text{T}$. What is the magnitude of the magnetic force on it, in mN?

- (A) 80 mN
- (B) 160 mN
- (C) 40 mN
- (D) 120 mN

Q34. A straight wire of length $0.4\ \text{m}$ carries a current of $2\ \text{A}$ perpendicular to a uniform magnetic field of $1.5\ \text{T}$. What is the magnitude of the force on the wire?

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

Q35. What is the magnitude of the magnetic field $40\ \text{cm}$ from a long straight wire carrying a current of $10\ \text{A}$?

- (A) $5\ \mu\text{T}$
- (B) $10\ \mu\text{T}$
- (C) $2.5\ \mu\text{T}$
- (D) $7.5\ \mu\text{T}$

Unit 13: Geometric Optics

Q36. Total internal reflection between water and air can occur only when light travels:

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

Q37. An candle stands $6\ \text{m}$ in front of a plane mirror. How far behind the mirror does its image appear to be?

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

Q38. A concave lens of focal length $-30\ \text{cm}$ always forms an image that is:

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

Q39. A ray strikes a plane mirror at 70° to the normal. At what angle to the normal is the reflected ray?

- (A) 140 degrees
- (B) 35 degrees
- (C) 70 degrees
- (D) 105 degrees

Q40. An object is placed 54 cm in front of a concave mirror of focal length 18 cm. How far from the mirror is the image formed?

- (A) 27 cm
- (B) 54 cm
- (C) 13.5 cm
- (D) 40.5 cm

Q41. An object 27 cm in front of a concave mirror forms an image 54 cm from the mirror. What is the lateral magnification?

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

Q42. An object is placed 27 cm in front of a converging lens of focal length 18 cm. How far from the lens is the image formed?

- (A) 54 cm
- (B) 108 cm
- (C) 27 cm
- (D) 81 cm

Q43. A concave mirror has a radius of curvature of 22 cm. What is its focal length?

- (A) 22 cm
- (B) 5.5 cm
- (C) 11 cm
- (D) 16.5 cm

Unit 14: Waves, Sound, and Physical Optics

Q44. An oil film in air appears dark for a certain wavelength in reflected light. Which condition on its thickness t best describes this, for the thinnest such film case?

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

Q45. A wave has frequency 200 Hz and wavelength 6.8 m. What is its speed?

- (A) 2720 m/s
- (B) 680 m/s
- (C) 2040 m/s
- (D) 1360 m/s

Q46. A oscillator completes one oscillation in 2 s. What is its frequency?

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

Q47. A string of length 1.2 m fixed at both ends supports waves travelling at 120 m/s. What is its fundamental frequency?

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

Q48. An open pipe of length 1.1 m resonates with sound waves travelling at 340 m/s. What is its fundamental frequency?

- (A) 154.55 Hz
- (B) 309.09 Hz
- (C) 77.27 Hz
- (D) 231.82 Hz

Q49. A pipe closed at one end has length 0.5 m. Sound travels at 340 m/s. What is its fundamental frequency?

- (A) 340 Hz
- (B) 85 Hz
- (C) 255 Hz
- (D) 170 Hz

Q50. Two tuning forks of frequencies 480 Hz and 490 Hz sound together. What is the beat frequency heard?

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

Q51. A source emitting 850 Hz moves towards a stationary observer at 68 m/s. Sound travels at 340 m/s. What frequency does the observer hear?

- (A) 2125 Hz
- (B) 1062.5 Hz
- (C) 531.25 Hz
- (D) 1593.75 Hz

Unit 15: Modern Physics

Q52. Light photons of energy 6 eV strike a metal with work function 2 eV. What is the maximum kinetic energy of the emitted photoelectrons, in eV?

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

Q53. Photoelectrons are emitted with maximum kinetic energy 1.5 eV. What stopping potential is needed to bring the fastest electrons to rest?

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

Q54. An electron (mass 9.11×10^{-31} kg) moves at 3×10^6 m/s. What is its de Broglie wavelength, in pm? (Use $h = 6.63 \times 10^{-34}$ J·s.)

- (A) 485.18 pm
- (B) 242.59 pm
- (C) 121.3 pm
- (D) 363.89 pm

Q55. A hydrogen atom drops from energy level $n = 4$ to $n = 3$. What is the energy of the photon emitted, in eV? (Levels: $E_n = -13.6 \div n^2$ eV.)

- (A) 1.32 eV
- (B) 0.66 eV
- (C) 0.33 eV
- (D) 0.99 eV

Q56. Calculate the energy of a hydrogen atom in level $n = 3$, in units of 10^{-19} J? (Use $E_n = -13.6 \div n^2$ eV and $1 \text{ eV} = 1.6 \times 10^{-19}$ J.)

- (A) -4.84×10^{-19} J
- (B) -1.21×10^{-19} J
- (C) 4.84×10^{-19} J
- (D) -2.42×10^{-19} J

Q57. A radioactive sample of mass 80 g has a half-life of one hour. How much of it remains undecayed after 2 hours?

- (A) 20 g
- (B) 40 g
- (C) 10 g
- (D) 30 g

Q58. A nuclear reaction has a mass defect of 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) 46.58 MeV
- (D) 69.86 MeV

Q59. A caesium surface has work function 2 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) 9.65×10^{14} Hz
- (B) 2.41×10^{14} Hz
- (C) 4.83×10^{14} Hz
- (D) 7.24×10^{14} Hz

Q60. The photoelectric effect shows that light behaves as:

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

Answer Key

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

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