

AP Physics 2 Practice Test 13

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 gas is heated at constant volume. Which quantity is zero for this process?

- (A) The work done by the gas
- (B) The heat transferred to the gas
- (C) The change in internal energy of the gas
- (D) The change in pressure of the gas

Q2. A rigid glass container holds 6 mol of an ideal gas at 400 K in a volume of 0.03 m^3 . What is the pressure of the gas? (Use $R = 8.31 \text{ J}/(\text{mol}\cdot\text{K})$.)

- (A) $1.6 \times 10^6 \text{ Pa}$
- (B) 398880 Pa
- (C) $2.39 \times 10^6 \text{ Pa}$
- (D) 797760 Pa

Q3. An ideal gas sample contains 4 mol at 350 K and a pressure of 400 kPa. What is its volume? (Use $R = 8.31 \text{ J}/(\text{mol}\cdot\text{K})$.)

- (A) 0.06 m^3
- (B) 0.03 m^3
- (C) 0.01 m^3
- (D) 0.09 m^3

Q4. A ideal gas in an insulated chamber absorbs 200 J of heat from its surroundings and does 50 J of work on its surroundings. What is the change in its internal energy?

- (A) 300 J
- (B) 75 J
- (C) 150 J
- (D) 450 J

Q5. A gas expands at a constant pressure of 200 kPa, increasing its volume by 0.08 m^3 . How much work does the gas do?

- (A) 32000 J
- (B) 16000 J
- (C) 8000 J
- (D) 48000 J

Q6. A 3 kg block of lead (specific heat capacity $240 \text{ J}/(\text{kg}\cdot\text{K})$) is heated so its temperature rises by 50 K. How much heat is supplied?

- (A) 72000 J
- (B) 36000 J
- (C) 18000 J
- (D) 108000 J

Q7. How much heat is needed to turn water at 100°C into steam (specific latent heat of vaporisation $2,260,000 \text{ J/kg}$) if the mass involved is 0.2 kg?

- (A) 904000 J
- (B) 226000 J
- (C) $1.36 \times 10^6 \text{ J}$
- (D) 452000 J

Q8. A reversible heat engine operates between a hot reservoir at 800 K and a cold reservoir at 400 K. What is its maximum possible efficiency?

- (A) 25 %
- (B) 50 %
- (C) 60 %
- (D) 40 %

Q9. A heat engine takes in 1000 J of heat in one cycle and does 250 J of useful work. How much heat does it reject to the cold reservoir?

- (A) 1500 J
- (B) 750 J
- (C) 375 J
- (D) 2250 J

Unit 10: Electric Force, Field, and Potential

Q10. The distance between two point charges is tripled, with both charges unchanged. By what factor does the electrostatic force between them change?

- (A) It becomes $1/3$ of its original value
- (B) It becomes $1/9$ of its original value
- (C) It becomes 3 times its original value
- (D) It becomes 9 times its original value

Q11. What is the magnitude of the electric field 0.5 m from a point charge of $4 \mu\text{C}$ in a vacuum? (Use $k = 9.0 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$.)

- (A) 288000 N/C
- (B) 72000 N/C
- (C) 144000 N/C
- (D) 432000 N/C

Q12. A small charge of $4 \mu\text{C}$ is placed in a uniform electric field of 2000 N/C. What is the magnitude of the electric force on the charge?

- (A) $8 \times 10^{-3} \text{ N}$
- (B) 0.02 N
- (C) $4 \times 10^{-3} \text{ N}$
- (D) 0.01 N

Q13. What is the electric potential 0.25 m from a point charge of 6 μC in a vacuum? (Use $k = 9.0 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$.)

- (A) 432000 V
- (B) 108000 V
- (C) 216000 V
- (D) 648000 V

Q14. Two point charges of 2 μC and 6 μC are 0.1 m apart in a vacuum. What is their electric potential energy? (Use $k = 9.0 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$.)

- (A) 2.16 J
- (B) 0.54 J
- (C) 3.24 J
- (D) 1.08 J

Q15. A charge of 4 μC is moved through a potential difference of 50 V. How much work is done by the electric field if the charge moves to a lower potential energy state by that full amount?

- (A) $4 \times 10^{-4} \text{ J}$
- (B) $1 \times 10^{-4} \text{ J}$
- (C) $6 \times 10^{-4} \text{ J}$
- (D) $2 \times 10^{-4} \text{ J}$

Q16. Two parallel plates are 0.1 m apart and have a potential difference of 240 V between them. What is the magnitude of the uniform electric field between the plates?

- (A) 4800 N/C
- (B) 2400 N/C
- (C) 1200 N/C
- (D) 7200 N/C

Q17. A charged particle moves along the direction of a uniform electric field. What happens to its electric potential?

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

Q18. A charge of 2 μC sits at a point where the electric potential is 500 V. What is its electric potential energy?

- (A) $2 \times 10^{-3} \text{ J}$
- (B) $5 \times 10^{-4} \text{ J}$
- (C) $3 \times 10^{-3} \text{ J}$
- (D) $1 \times 10^{-3} \text{ J}$

Unit 11: Electric Circuits

Q19. A current of 3 A flows through a $25\ \Omega$ resistor. What power is dissipated in the resistor?

- (A) 450 W
- (B) 112.5 W
- (C) 225 W
- (D) 675 W

Q20. Resistors of $12\ \Omega$ and $6\ \Omega$ are connected in parallel, and this combination is connected in series with a $3\ \Omega$ resistor. What is the equivalent resistance of the whole combination?

- (A) $14\ \Omega$
- (B) $3.5\ \Omega$
- (C) $21\ \Omega$
- (D) $7\ \Omega$

Q21. A capacitor of capacitance $4\ \mu\text{F}$ is connected across a 50 V battery. What charge is stored on the capacitor?

- (A) $400\ \mu\text{C}$
- (B) $100\ \mu\text{C}$
- (C) $200\ \mu\text{C}$
- (D) $600\ \mu\text{C}$

Q22. A $2\ \mu\text{F}$ capacitor is charged to 50 V. How much energy is stored in it, in millijoules?

- (A) 5 mJ
- (B) 1.25 mJ
- (C) 2.5 mJ
- (D) 7.5 mJ

Q23. Capacitors of $12\ \mu\text{F}$ and $4\ \mu\text{F}$ are connected in series. What is their equivalent capacitance?

- (A) $6\ \mu\text{F}$
- (B) $3\ \mu\text{F}$
- (C) $1.5\ \mu\text{F}$
- (D) $9\ \mu\text{F}$

Q24. A 60 V battery is connected across resistors of $8\ \Omega$ and $8\ \Omega$ in series. What is the potential difference across the $8\ \Omega$ resistor?

- (A) 60 V
- (B) 15 V
- (C) 30 V
- (D) 90 V

Q25. A resistor is added in series with a lamp in a circuit with a fixed battery voltage. What happens to the brightness of the lamp?

- (A) It increases
- (B) It decreases
- (C) It stays the same
- (D) It goes out completely

Q26. A potential difference of 24 V is applied across a resistor of 24 Ω . What current flows through it?

- (A) 2 A
- (B) 1 A
- (C) 0.5 A
- (D) 3 A

Q27. Resistors of 10 Ω , 15 Ω , and 20 Ω are connected in series. What is their equivalent resistance?

- (A) 90 Ω
- (B) 45 Ω
- (C) 22.5 Ω
- (D) 135 Ω

Unit 12: Magnetism and Electromagnetism

Q28. A coil with 20 turns experiences a change in magnetic flux of 0.1 Wb in 0.01 s. What is the magnitude of the induced emf in the coil?

- (A) 400 V
- (B) 100 V
- (C) 200 V
- (D) 600 V

Q29. A conducting rod of length 1.5 m moves at 5 m/s perpendicular to a uniform magnetic field of 0.2 T. What is the motional emf induced between its ends?

- (A) 3 V
- (B) 0.75 V
- (C) 4.5 V
- (D) 1.5 V

Q30. A rectangular coil with 50 turns, area 0.02 m², carries 2 A in a magnetic field of 0.2 T. The angle in the torque formula is 30°. What is the magnitude of the magnetic torque on the coil?

- (A) 0.4 N·m
- (B) 0.1 N·m
- (C) 0.6 N·m
- (D) 0.2 N·m

Q31. A bar magnet is pushed toward a coil. What happens to the induced emf if the magnet is pushed in twice as fast?

- (A) It approximately doubles
- (B) It halves
- (C) It stays the same
- (D) It becomes four times larger

Q32. A particle with charge $4\ \mu\text{C}$ moves at $1000\ \text{m/s}$ perpendicular to a uniform magnetic field of $1\ \text{T}$. What is the magnitude of the magnetic force on the particle, in millinewtons?

- (A) $4\ \text{mN}$
- (B) $8\ \text{mN}$
- (C) $2\ \text{mN}$
- (D) $12\ \text{mN}$

Q33. A particle with charge $10\ \mu\text{C}$ moves at $1000\ \text{m/s}$ perpendicular to a uniform magnetic field of $0.4\ \text{T}$. What is the magnitude of the magnetic force on the particle, in millinewtons?

- (A) $4\ \text{mN}$
- (B) $8\ \text{mN}$
- (C) $2\ \text{mN}$
- (D) $12\ \text{mN}$

Q34. A straight wire of length $0.8\ \text{m}$ carries a current of $8\ \text{A}$ perpendicular to a uniform magnetic field of $0.2\ \text{T}$. What is the magnitude of the magnetic force on the wire?

- (A) $2.56\ \text{N}$
- (B) $1.28\ \text{N}$
- (C) $0.64\ \text{N}$
- (D) $3.84\ \text{N}$

Q35. A long solenoid has 1000 turns per metre and carries a current of $4\ \text{A}$. What is the magnetic field strength inside the solenoid, in millitesla? (Use $\mu_0 = 4\pi \times 10^{-7}\ \text{T}\cdot\text{m/A}$.)

- (A) $10.05\ \text{mT}$
- (B) $2.51\ \text{mT}$
- (C) $5.03\ \text{mT}$
- (D) $15.08\ \text{mT}$

Unit 13: Geometric Optics

Q36. A spherical mirror has a radius of curvature of $20\ \text{cm}$. What is its focal length?

- (A) $10\ \text{cm}$
- (B) $20\ \text{cm}$
- (C) $5\ \text{cm}$
- (D) $30\ \text{cm}$

Q37. A converging lens of focal length $20\ \text{cm}$ forms an image $60\ \text{cm}$ from the lens. How far from the lens is the object?

- (A) $60\ \text{cm}$
- (B) $30\ \text{cm}$
- (C) $15\ \text{cm}$
- (D) $90\ \text{cm}$

- Q38. An object is placed inside the focal length of a magnifying converging lens. What kind of image is seen?**
- (A) Real, inverted, and magnified
 - (B) Virtual, inverted, and diminished
 - (C) Real, upright, and diminished
 - (D) Virtual, upright, and magnified
- Q39. An object is placed 45 cm from a concave mirror of focal length 15 cm. What is the image distance?**
- (A) 45 cm
 - (B) 11.25 cm
 - (C) 67.5 cm
 - (D) 22.5 cm
- Q40. An object is 60 cm from a mirror and its image forms 60 cm from the mirror. What is the lateral magnification?**
- (A) -2
 - (B) -0.5
 - (C) -1
 - (D) -3
- Q41. An object is placed 30 cm from a converging lens of focal length 15 cm. What is the image distance?**
- (A) 60 cm
 - (B) 15 cm
 - (C) 90 cm
 - (D) 30 cm
- Q42. A ray travels from air (refractive index 1) into glass (refractive index 1.5) with sin of the angle of incidence equal to 0.6. What is sin of the angle of refraction?**
- (A) 0.4
 - (B) 0.6
 - (C) 0.8
 - (D) 0.5
- Q43. Light travels at 2.5×10^8 m/s in a sample of glass. What is the refractive index of the sample? (Use $c = 3.00 \times 10^8$ m/s.)**
- (A) 2.4
 - (B) 0.6
 - (C) 3.6
 - (D) 1.2

Unit 14: Waves, Sound, and Physical Optics

Q44. A pipe closed at one end has length 0.5 m and sound travels at 340 m/s inside it. What is the frequency of its third harmonic? (Only odd harmonics exist for this pipe.)

- (A) 510 Hz
- (B) 1020 Hz
- (C) 255 Hz
- (D) 1530 Hz

Q45. A sound wave travels at 400 m/s with frequency 170 Hz. What is its wavelength?

- (A) 4.71 m
- (B) 2.35 m
- (C) 1.18 m
- (D) 7.06 m

Q46. A string of length 0.6 m is fixed at both ends. Waves travel along it at 400 m/s. What is the frequency of its first harmonic?

- (A) 666.67 Hz
- (B) 166.67 Hz
- (C) 333.33 Hz
- (D) 1000 Hz

Q47. A pipe closed at one end has length 1.7 m. Sound travels at 340 m/s in the air inside it. What is its fundamental frequency?

- (A) 50 Hz
- (B) 100 Hz
- (C) 25 Hz
- (D) 150 Hz

Q48. Two tuning forks of frequencies 600 Hz and 606 Hz sound together. What is the beat frequency heard?

- (A) 6 Hz
- (B) 12 Hz
- (C) 3 Hz
- (D) 18 Hz

Q49. In a double-slit experiment, light of wavelength 650 nm passes through slits 0.25 mm apart and falls on a screen 1.5 m away. How far from the central maximum is the second bright fringe, in millimetres?

- (A) 7.8 mm
- (B) 15.6 mm
- (C) 3.9 mm
- (D) 23.4 mm

Q50. Light of wavelength 450 nm passes through double slits 0.15 mm apart onto a screen 1 m away. What is the spacing between adjacent bright fringes, in millimetres?

- (A) 6 mm
- (B) 1.5 mm
- (C) 3 mm
- (D) 9 mm

Q51. A source emitting 300 Hz moves toward a stationary observer at 85 m/s. The speed of sound is 340 m/s. What frequency does the observer hear?

- (A) 800 Hz
- (B) 200 Hz
- (C) 1200 Hz
- (D) 400 Hz

Unit 15: Modern Physics

Q52. What is the energy of a photon of wavelength 500 nm? (Use $h = 6.63 \times 10^{-34}$ J·s and $c = 3.00 \times 10^8$ m/s.)

- (A) 7.96×10^{-19} J
- (B) 1.99×10^{-19} J
- (C) 1.19×10^{-18} J
- (D) 3.98×10^{-19} J

Q53. Light of photon energy 5.6 eV falls on a metal with work function 2.8 eV. What is the maximum kinetic energy of the emitted photoelectrons?

- (A) 2.8 eV
- (B) 5.6 eV
- (C) 1.4 eV
- (D) 8.4 eV

Q54. A particle has momentum 6.63×10^{-24} kg·m/s. What is its de Broglie wavelength, in units of 10^{-10} m? (Use $h = 6.63 \times 10^{-34}$ J·s.)

- (A) 1
- (B) 2
- (C) 0.5
- (D) 3

Q55. In the Bohr model, the energy of level n is $E_n = -13.6 \div n^2$ eV. What is the energy of level $n = 3$?

- (A) -1.51 eV
- (B) -3.02 eV
- (C) -0.76 eV
- (D) -4.53 eV

Q56. An electron in a hydrogen atom drops from level $n = 3$ to level $n = 1$. What is the energy of the photon emitted?

- (A) 12.09 eV
- (B) 24.18 eV
- (C) 6.04 eV
- (D) 36.27 eV

Q57. A radioactive sample initially has mass 120 g. After 4 half-lives, what mass remains undecayed?

- (A) 15 g
- (B) 3.75 g
- (C) 7.5 g
- (D) 22.5 g

Q58. How much energy is equivalent to a mass of 0.5 kg? (Use $c = 3.00 \times 10^8$ m/s.)

- (A) 9×10^{16} J
- (B) 2.25×10^{16} J
- (C) 4.5×10^{16} J
- (D) 1.35×10^{17} J

Q59. A photon has energy 3.31×10^{-19} J. What is its frequency, in units of 10^{14} Hz? (Use $h = 6.63 \times 10^{-34}$ J·s.)

- (A) 10×10^{14} Hz
- (B) 2.5×10^{14} Hz
- (C) 15×10^{14} Hz
- (D) 5×10^{14} Hz

Q60. Increasing the intensity of light falling on a metal surface, without changing its frequency, increases which quantity in the photoelectric effect?

- (A) The maximum kinetic energy of each photoelectron
- (B) The number of photoelectrons emitted per second
- (C) The work function of the metal
- (D) The threshold frequency of the metal

Answer Key

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

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