

AP Physics 2 Practice Test 11

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 expands at a constant pressure of 500 kPa, increasing its volume by 0.03 m^3 . How much work does the gas do?

- (A) 30000 J
- (B) 7500 J
- (C) 15000 J
- (D) 45000 J

Q2. A 2.5 kg block of aluminium (specific heat capacity $900 \text{ J}/(\text{kg}\cdot\text{K})$) is heated so its temperature rises by 10 K. How much heat is supplied?

- (A) 22500 J
- (B) 45000 J
- (C) 11250 J
- (D) 67500 J

Q3. 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 1.5 kg?

- (A) $6.78 \times 10^6 \text{ J}$
- (B) $1.7 \times 10^6 \text{ J}$
- (C) $3.39 \times 10^6 \text{ J}$
- (D) $1.02 \times 10^7 \text{ J}$

Q4. A reversible heat engine operates between a hot reservoir at 1200 K and a cold reservoir at 400 K. What is its maximum possible efficiency?

- (A) 33.33 %
- (B) 66.67 %
- (C) 76.67 %
- (D) 56.67 %

Q5. A heat engine takes in 10000 J of heat in one cycle and does 200 J of useful work. How much heat does it reject to the cold reservoir?

- (A) 19600 J
- (B) 4900 J
- (C) 29400 J
- (D) 9800 J

Q6. A gas at 100 kPa occupies 5 L at 600 K. Its pressure changes to 200 kPa and its volume changes to 2.5 L. What is its new temperature?

- (A) 600 K
- (B) 1200 K
- (C) 300 K
- (D) 1800 K

Q7. An ideal gas expands adiabatically (no heat transfer) and does work on its surroundings. What happens to its internal energy and temperature?

- (A) Internal energy increases and temperature increases
- (B) Internal energy decreases and temperature decreases
- (C) Internal energy stays constant and temperature stays constant
- (D) Internal energy decreases and temperature increases

Q8. A pressurised storage vessel holds 1 mol of an ideal gas at 350 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) 116340 Pa
- (B) 232680 Pa
- (C) 58170 Pa
- (D) 349020 Pa

Q9. An ideal gas sample contains 3 mol at 400 K and a pressure of 150 kPa. What is its volume? (Use $R = 8.31 \text{ J}/(\text{mol}\cdot\text{K})$.)

- (A) 0.07 m^3
- (B) 0.13 m^3
- (C) 0.03 m^3
- (D) 0.2 m^3

Unit 10: Electric Force, Field, and Potential

Q10. Two point charges of $2 \text{ }\mu\text{C}$ and $4 \text{ }\mu\text{C}$ are 0.5 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) 0.14 J
- (B) 0.29 J
- (C) 0.07 J
- (D) 0.43 J

Q11. A charge of $5 \text{ }\mu\text{C}$ is moved through a potential difference of 200 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) $2 \times 10^{-3} \text{ J}$
- (B) $1 \times 10^{-3} \text{ J}$
- (C) $5 \times 10^{-4} \text{ J}$
- (D) $3 \times 10^{-3} \text{ J}$

Q12. Two parallel plates are 0.1 m apart and have a potential difference of 600 V between them. What is the magnitude of the uniform electric field between the plates?

- (A) 12000 N/C
- (B) 3000 N/C
- (C) 18000 N/C
- (D) 6000 N/C

Q13. Which quantity is the same at every point on an equipotential surface?

- (A) Electric field strength
- (B) Electric force on a test charge
- (C) Electric potential
- (D) Electric potential energy of any charge regardless of its sign

Q14. A charge of 5 μC sits at a point where the electric potential is 1000 V. What is its electric potential energy?

- (A) 1×10^{-2} J
- (B) 5×10^{-3} J
- (C) 2.5×10^{-3} J
- (D) 0.01 J

Q15. Two small charged spheres carry charges of 10 μC and 3 μC and are 0.25 m 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) 4.32 N
- (B) 8.64 N
- (C) 2.16 N
- (D) 12.96 N

Q16. One of two point charges is doubled and the distance between them is halved. By what factor does the electrostatic force change?

- (A) It becomes 2 times its original value
- (B) It becomes 4 times its original value
- (C) It becomes 1/4 of its original value
- (D) It becomes 8 times its original value

Q17. What is the magnitude of the electric field 0.25 m 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) 576000 N/C
- (B) 288000 N/C
- (C) 144000 N/C
- (D) 864000 N/C

Q18. A small charge of 3 μC is placed in a uniform electric field of 1000 N/C. What is the magnitude of the electric force on the charge?

- (A) 3×10^{-3} N
- (B) 6×10^{-3} N
- (C) 1.5×10^{-3} N
- (D) 9×10^{-3} N

Unit 11: Electric Circuits

- Q19. Capacitors of $6\ \mu\text{F}$ and $3\ \mu\text{F}$ are connected in series. What is their equivalent capacitance?**
- (A) $2\ \mu\text{F}$
 - (B) $4\ \mu\text{F}$
 - (C) $1\ \mu\text{F}$
 - (D) $6\ \mu\text{F}$
- Q20. A $36\ \text{V}$ battery is connected across resistors of $12\ \Omega$ and $4\ \Omega$ in series. What is the potential difference across the $12\ \Omega$ resistor?**
- (A) $54\ \text{V}$
 - (B) $27\ \text{V}$
 - (C) $13.5\ \text{V}$
 - (D) $81\ \text{V}$
- Q21. Two identical lamps are connected in parallel across a battery, then a third identical lamp is added in parallel. What happens to the total current drawn from the battery?**
- (A) It decreases
 - (B) It increases
 - (C) It stays the same
 - (D) It becomes zero
- Q22. A potential difference of $12\ \text{V}$ drives a current of $6\ \text{A}$ through a resistor. What is its resistance?**
- (A) $4\ \Omega$
 - (B) $2\ \Omega$
 - (C) $1\ \Omega$
 - (D) $6\ \Omega$
- Q23. Resistors of $3\ \Omega$, $5\ \Omega$, and $10\ \Omega$ are connected in series. What is their equivalent resistance?**
- (A) $36\ \Omega$
 - (B) $18\ \Omega$
 - (C) $9\ \Omega$
 - (D) $54\ \Omega$
- Q24. Resistors of $20\ \Omega$ and $5\ \Omega$ are connected in parallel. What is their equivalent resistance?**
- (A) $8\ \Omega$
 - (B) $2\ \Omega$
 - (C) $12\ \Omega$
 - (D) $4\ \Omega$
- Q25. A current of $4\ \text{A}$ flows through a $20\ \Omega$ resistor. What power is dissipated in the resistor?**
- (A) $640\ \text{W}$
 - (B) $320\ \text{W}$
 - (C) $160\ \text{W}$
 - (D) $960\ \text{W}$

Q26. Resistors of $10\ \Omega$ and $10\ \Omega$ are connected in parallel, and this combination is connected in series with a $2\ \Omega$ resistor. What is the equivalent resistance of the whole combination?

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

Q27. A capacitor of capacitance $10\ \mu\text{F}$ is connected across a $30\ \text{V}$ battery. What charge is stored on the capacitor?

- (A) $300\ \mu\text{C}$
- (B) $600\ \mu\text{C}$
- (C) $150\ \mu\text{C}$
- (D) $900\ \mu\text{C}$

Unit 12: Magnetism and Electromagnetism

Q28. The current in a straight wire is tripled and its length in a magnetic field is halved. By what factor does the magnetic force on the wire change?

- (A) It becomes 3 times its original value
- (B) It becomes 6 times its original value
- (C) It stays the same
- (D) It becomes 1.5 times its original value

Q29. A particle with charge $4\ \mu\text{C}$ moves at $8000\ \text{m/s}$ perpendicular to a uniform magnetic field of $0.5\ \text{T}$. What is the magnitude of the magnetic force on the particle, in millinewtons?

- (A) $32\ \text{mN}$
- (B) $16\ \text{mN}$
- (C) $8\ \text{mN}$
- (D) $48\ \text{mN}$

Q30. A straight wire of length $0.4\ \text{m}$ carries a current of $4\ \text{A}$ perpendicular to a uniform magnetic field of $0.1\ \text{T}$. What is the magnitude of the magnetic force on the wire?

- (A) $0.32\ \text{N}$
- (B) $0.08\ \text{N}$
- (C) $0.48\ \text{N}$
- (D) $0.16\ \text{N}$

Q31. A long solenoid has 400 turns per metre and carries a current of $3\ \text{A}$. 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) $3.02\ \text{mT}$
- (B) $0.75\ \text{mT}$
- (C) $4.52\ \text{mT}$
- (D) $1.51\ \text{mT}$

Q32. A long straight wire carries a current of 5 A. What is the magnetic field strength at a distance of 0.05 m from the wire, in microtesla? (Use $\mu_0 = 4\pi \times 10^{-7} \text{ T}\cdot\text{m/A}$.)

- (A) 40 μT
- (B) 10 μT
- (C) 20 μT
- (D) 60 μT

Q33. A flat coil of area 0.05 m^2 sits in a uniform magnetic field of 2 T. The field makes an angle of 0° with the normal to the coil. What is the magnetic flux through the coil?

- (A) 0.2 Wb
- (B) 0.05 Wb
- (C) 0.1 Wb
- (D) 0.3 Wb

Q34. A coil with 50 turns experiences a change in magnetic flux of 0.02 Wb in 0.02 s. What is the magnitude of the induced emf in the coil?

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

Q35. A conducting rod of length 0.5 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) 1 V
- (B) 0.5 V
- (C) 0.25 V
- (D) 1.5 V

Unit 13: Geometric Optics

Q36. An object is 30 cm from a mirror and its image forms 10 cm from the mirror. What is the lateral magnification?

- (A) -0.67
- (B) -0.17
- (C) -1
- (D) -0.33

Q37. An object is placed 90 cm from a converging lens of focal length 30 cm. What is the image distance?

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

Q38. A ray travels from air (refractive index 1) into glass (refractive index 1.5) with $\sin$ of the angle of incidence equal to 0.9. What is $\sin$ of the angle of refraction?

- (A) 0.9
- (B) 0.3
- (C) 0.4
- (D) 0.6

Q39. Light travels at 1×10^8 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) 6
- (B) 1.5
- (C) 3
- (D) 9

Q40. A transparent material has refractive index 1.33. At what speed does light travel in it, in units of 10^8 m/s? (Use $c = 3.00 \times 10^8$ m/s.)

- (A) 4.51×10^8 m/s
- (B) 1.13×10^8 m/s
- (C) 6.77×10^8 m/s
- (D) 2.26×10^8 m/s

Q41. Light in a medium of refractive index 1.5 strikes the boundary with a medium of refractive index 1. What is $\sin$ of the critical angle for total internal reflection?

- (A) 0.33
- (B) 0.87
- (C) 0.77
- (D) 0.67

Q42. A spherical mirror has a radius of curvature of 44 cm. What is its focal length?

- (A) 44 cm
- (B) 11 cm
- (C) 66 cm
- (D) 22 cm

Q43. A converging lens of focal length 10 cm forms an image 30 cm from the lens. How far from the lens is the object?

- (A) 30 cm
- (B) 7.5 cm
- (C) 15 cm
- (D) 45 cm

Unit 14: Waves, Sound, and Physical Optics

Q44. Two tuning forks of frequencies 600 Hz and 605 Hz sound together. What is the beat frequency heard?

- (A) 5 Hz
- (B) 10 Hz
- (C) 2.5 Hz
- (D) 15 Hz

Q45. In a double-slit experiment, light of wavelength 500 nm passes through slits 0.1 mm apart and falls on a screen 1 m away. How far from the central maximum is the second bright fringe, in millimetres?

- (A) 20 mm
- (B) 10 mm
- (C) 5 mm
- (D) 30 mm

Q46. Light of wavelength 650 nm passes through double slits 0.26 mm apart onto a screen 2 m away. What is the spacing between adjacent bright fringes, in millimetres?

- (A) 5 mm
- (B) 10 mm
- (C) 2.5 mm
- (D) 15 mm

Q47. A source emitting 400 Hz moves away from a stationary observer at 68 m/s. The speed of sound is 340 m/s. What frequency does the observer hear?

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

Q48. A wave completes one full oscillation in 0.5 s. What is its frequency?

- (A) 2 Hz
- (B) 4 Hz
- (C) 1 Hz
- (D) 6 Hz

Q49. In a standing wave on a string fixed at both ends, what is true at a node?

- (A) The displacement is always maximum
- (B) The string moves fastest there
- (C) The displacement is always zero
- (D) The wavelength is zero there

Q50. A pipe closed at one end has length 0.85 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) 600 Hz
- (B) 150 Hz
- (C) 300 Hz
- (D) 900 Hz

Q51. A sound wave travels at 400 m/s with frequency 1000 Hz. What is its wavelength?

- (A) 0.8 m
- (B) 0.2 m
- (C) 1.2 m
- (D) 0.4 m

Unit 15: Modern Physics

- Q52. An electron in a hydrogen atom drops from level $n = 5$ to level $n = 2$. What is the energy of the photon emitted?**
- (A) 2.86 eV
 - (B) 5.72 eV
 - (C) 1.43 eV
 - (D) 8.58 eV
- Q53. A radioactive sample initially has mass 200 g. After 4 half-lives, what mass remains undecayed?**
- (A) 25 g
 - (B) 6.25 g
 - (C) 12.5 g
 - (D) 37.5 g
- Q54. How much energy is equivalent to a mass of 0.25 kg? (Use $c = 3.00 \times 10^8$ m/s.)**
- (A) 4.5×10^{16} J
 - (B) 1.12×10^{16} J
 - (C) 6.75×10^{16} J
 - (D) 2.25×10^{16} J
- Q55. A photon has energy 4.64×10^{-19} J. What is its frequency, in units of 10^{14} Hz? (Use $h = 6.63 \times 10^{-34}$ J·s.)**
- (A) 7×10^{14} Hz
 - (B) 14×10^{14} Hz
 - (C) 3.5×10^{14} Hz
 - (D) 21×10^{14} Hz
- Q56. A radioactive sample has a half-life of 10 days. After 20 days, what fraction of the original nuclei remains undecayed?**
- (A) $1/2$
 - (B) $1/8$
 - (C) $1/4$
 - (D) $3/4$
- Q57. A photon has frequency 5×10^{14} Hz. What is its energy? (Use $h = 6.63 \times 10^{-34}$ J·s.)**
- (A) 6.63×10^{-19} J
 - (B) 1.66×10^{-19} J
 - (C) 9.95×10^{-19} J
 - (D) 3.31×10^{-19} J
- Q58. What is the energy of a photon of wavelength 400 nm? (Use $h = 6.63 \times 10^{-34}$ J·s and $c = 3.00 \times 10^8$ m/s.)**
- (A) 9.94×10^{-19} J
 - (B) 2.49×10^{-19} J
 - (C) 4.97×10^{-19} J
 - (D) 1.49×10^{-18} J

Q59. Light of photon energy 4.2 eV falls on a metal with work function 1.4 eV. What is the maximum kinetic energy of the emitted photoelectrons?

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

Q60. A particle has momentum 19.89×10^{-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) 0.67
- (B) 0.17
- (C) 0.33
- (D) 1

Answer Key

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

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