

AP Physics 1 2026-Style Full Practice Exam

2026-style revised-course practice exam

Original practice paper. Every question in this PDF was written for Salar Cafe. It does not reproduce official AP exam wording. Models the 2026 structure: 40 MCQs in 80 minutes and 4 FRQs in 100 minutes.

Section I	40 multiple-choice questions - 80 minutes - 50%
Section II	4 free-response questions - 100 minutes - 50%
Calculator	Scientific or graphing calculator may be used for this practice paper.
Scoring	MCQ answer key and explanations plus FRQ scoring guidance are included after the exam.
Use	Complete the exam first. Do not consult the answer key until both sections are finished.

Topic emphasis

Projectile motion + fluids; collision/momentum; friction experiment; rotational work-energy.

SECTION I - Multiple Choice

40 questions | 80 minutes | Choose the best answer for each question.

1. A ball rolls horizontally from a table 0.8 m high with speed 2.0 m/s. Neglect air resistance. Approximately how far from the table does it land?
 - A. 0.2 m
 - B. 0.6 m
 - C. 1.6 m
 - D. 0.8 m
2. Water flows steadily through a pipe. The radius decreases from 4.0 cm to 2.0 cm. If the speed in the wider section is 1.0 m/s, what is the speed in the narrower section?
 - A. 0.2 m/s
 - B. 4.0 m/s
 - C. 2.0 m/s
 - D. 1.0 m/s
3. A 0.5 kg cart moving at 5.0 m/s collides with and sticks to a stationary 0.5 kg cart. What is their common speed immediately after the collision?
 - A. 6.25 m/s
 - B. 5.00 m/s
 - C. 1.25 m/s
 - D. 2.50 m/s
4. A 0.30 kg ball changes velocity from -2.0 m/s to -3.0 m/s along the x-axis. What is the x-component of the impulse on the ball?
 - A. -3.3 N s
 - B. -0.3 N s
 - C. 0.3 J
 - D. -1.5 N s
5. A 1.0 kg block slides on a horizontal surface with coefficient of kinetic friction 0.35. What is the kinetic-friction force?
 - A. 0.35 N
 - B. 6.9 N
 - C. 9.8 N
 - D. 3.4 N
6. A 1.0 kg object starts from rest and drops through a vertical height of 1.2 m with negligible friction. What is its speed after the drop?
 - A. 3.4 m/s
 - B. 4.8 m/s
 - C. 23.5 m/s
 - D. 11.8 m/s

7. A force of 15 N is applied at radius 0.20 m from a pivot, making 90 degrees with the radius. What is the torque magnitude about the pivot?
- A. 0.0 N m
 - B. 3.8 N m
 - C. 3.0 N m
 - D. 75.0 N m
8. A rigid body with rotational inertia 0.30 kg m^2 experiences a net torque of 3.0 N m. What is its angular acceleration?
- A. 10.0 rad/s^2
 - B. 0.9 rad/s^2
 - C. 5.0 rad/s^2
 - D. 0.10 rad/s^2
9. An object rolls without slipping down an incline at 15 degrees. Its rotational inertia is $I = 0.67MR^2$. What is its center-of-mass acceleration?
- A. 2.54 m/s^2
 - B. 5.67 m/s^2
 - C. 1.52 m/s^2
 - D. 4.24 m/s^2
10. A cart starts from rest and reaches 12 m/s in 2 s with constant acceleration. What is the magnitude of its acceleration?
- A. 24.0 m/s^2
 - B. 14.0 m/s^2
 - C. 6.0 m/s^2
 - D. 3.0 m/s^2

- 11.** A ball rolls horizontally from a table 1.8 m high with speed 4.0 m/s. Neglect air resistance. Approximately how far from the table does it land?
- A. 2.4 m
 - B. 0.7 m
 - C. 1.7 m
 - D. 4.8 m
- 12.** A velocity-time graph is a straight line from 2 m/s at $t = 0$ to 2 m/s at $t = 5$ s. What is the displacement during the interval?
- A. 10.0 m
 - B. 12.5 m
 - C. -1.0 m
 - D. 0.0 m
- 13.** A net horizontal force of 6 N acts on a 2.5 kg object. What is the object's acceleration?
- A. 0.42 m/s^2
 - B. -7.4 m/s^2
 - C. 15.0 m/s^2
 - D. 2.4 m/s^2
- 14.** A 1.5 kg block slides on a horizontal surface with coefficient of kinetic friction 0.20. What is the kinetic-friction force?
- A. 5.9 N
 - B. 2.9 N
 - C. 14.7 N
 - D. 0.30 N
- 15.** A 0.50 kg object moves in a horizontal circle of radius 0.8 m at speed 4.0 m/s. What is the required inward net force?
- A. 2.5 N
 - B. 10.0 N
 - C. 0.03 N
 - D. 1.6 N
- 16.** A spring with $k = 40 \text{ N/m}$ is stretched 0.05 m from equilibrium. Which best describes the spring force on the attached object?
- A. 800.0 N opposite the displacement
 - B. 2.0 N in the direction of displacement
 - C. 0.1 N opposite the displacement
 - D. 2.0 N opposite the displacement

- 17.** A 1.0 kg object starts from rest and drops through a vertical height of 0.8 m with negligible friction. What is its speed after the drop?
- A. 15.7 m/s
 - B. 2.8 m/s
 - C. 4.0 m/s
 - D. 7.8 m/s
- 18.** A constant force of 10 N pulls an object 4.0 m. The force makes an angle of 0 degrees with the displacement. How much work does the force do?
- A. 0.0 J
 - B. 2.5 J
 - C. 50.0 J
 - D. 40.0 J
- 19.** A motor does 180 J of work in 2.0 s. What is its average power output?
- A. 0.011 W
 - B. 45.0 W
 - C. 90.0 W
 - D. 360.0 W
- 20.** A spring of constant 40 N/m is compressed by 0.20 m. How much elastic potential energy is stored?
- A. 1.60 J
 - B. 4.00 J
 - C. 8.00 J
 - D. 0.80 J

- 21.** A 2.0 kg cart moving at 4.0 m/s collides with and sticks to a stationary 0.5 kg cart. What is their common speed immediately after the collision?
- A. 3.20 m/s
 - B. 4.00 m/s
 - C. 1.60 m/s
 - D. 6.40 m/s
- 22.** A 0.40 kg ball changes velocity from -4.0 m/s to -5.0 m/s along the x-axis. What is the x-component of the impulse on the ball?
- A. -3.6 N s
 - B. 0.4 J
 - C. -0.4 N s
 - D. -2.5 N s
- 23.** A constant force of 25 N acts for 0.50 s. What impulse is delivered?
- A. 12.5 N s
 - B. 50.0 N s
 - C. 6.2 N s
 - D. 25.5 N s
- 24.** A force of 15 N is applied at radius 0.40 m from a pivot, making 90 degrees with the radius. What is the torque magnitude about the pivot?
- A. 6.0 N m
 - B. 0.0 N m
 - C. 7.5 N m
 - D. 37.5 N m
- 25.** A rigid body with rotational inertia 0.30 kg m^2 experiences a net torque of 2.0 N m. What is its angular acceleration?
- A. 3.3 rad/s^2
 - B. 6.7 rad/s^2
 - C. 0.6 rad/s^2
 - D. 0.15 rad/s^2
- 26.** An object rolls without slipping down an incline at 20 degrees. Its rotational inertia is $I = 0.40MR^2$. What is its center-of-mass acceleration?
- A. 4.69 m/s^2
 - B. 6.58 m/s^2
 - C. 3.35 m/s^2
 - D. 2.39 m/s^2

27. A wheel starts from rest with constant angular acceleration 2.0 rad/s^2 . What is its angular speed after 4.0 s ?
- A. 8.0 rad/s
 - B. 16.0 rad/s
 - C. 32.0 rad/s
 - D. 0.5 rad/s
28. A 0.50 kg mass oscillates on an ideal spring with $k = 25 \text{ N/m}$. What is the period?
- A. 0.14 s
 - B. 0.13 s
 - C. 0.89 s
 - D. 44.43 s
29. An ideal spring-mass oscillator has spring constant 20 N/m and amplitude 0.15 m . What is the total mechanical energy?
- A. 3.00 J
 - B. 1.50 J
 - C. 0.45 J
 - D. 0.22 J
30. An ideal small-angle pendulum is moved to a planet where gravitational field strength is 0.25 times Earth's value. Its length is unchanged. What is the new period relative to its Earth period?
- A. 0.50 times the Earth period
 - B. 0.25 times the Earth period
 - C. 4.00 times the Earth period
 - D. 2.00 times the Earth period

- 31.** In a liquid of density 1000 kg/m^3 , what is the gauge-pressure increase 1.0 m below the surface?
- A. 12.2 kPa
 - B. 1.0 kPa
 - C. 9.8 kPa
 - D. 0.01 kPa
- 32.** An object displaces 0.0015 m^3 of a fluid with density 800 kg/m^3 . What buoyant force acts on it?
- A. 5226666.7 N
 - B. 1.2 N
 - C. 0.015 N
 - D. 11.8 N
- 33.** Water flows steadily through a pipe. The radius decreases from 3.0 cm to 2.0 cm. If the speed in the wider section is 2.0 m/s, what is the speed in the narrower section?
- A. 0.9 m/s
 - B. 4.5 m/s
 - C. 2.0 m/s
 - D. 3.0 m/s
- 34.** A sample has mass 0.50 kg and volume 200 cm^3 . What is its density in SI units?
- A. 0.003 kg/m^3
 - B. 2.50 kg/m^3
 - C. 25000 kg/m^3
 - D. 2500 kg/m^3
- 35.** The distance from a planet's center to a satellite is increased from r to $2r$ while the planet mass stays fixed. How does the gravitational force magnitude change?
- A. one-half as large
 - B. four times as large
 - C. one-fourth as large
 - D. twice as large
- 36.** A ball rolls horizontally from a table 0.8 m high with speed 5.0 m/s. Neglect air resistance. Approximately how far from the table does it land?
- A. 4.0 m
 - B. 1.4 m
 - C. 0.4 m
 - D. 2.0 m

37. Water flows steadily through a pipe. The radius decreases from 4.0 cm to 2.0 cm. If the speed in the wider section is 1.0 m/s, what is the speed in the narrower section?
- A. 0.2 m/s
 - B. 4.0 m/s
 - C. 2.0 m/s
 - D. 1.0 m/s
38. A 1.0 kg cart moving at 5.0 m/s collides with and sticks to a stationary 1.5 kg cart. What is their common speed immediately after the collision?
- A. 2.00 m/s
 - B. 1.00 m/s
 - C. 4.00 m/s
 - D. 5.00 m/s
39. A 0.20 kg ball changes velocity from 3.0 m/s to -5.0 m/s along the x-axis. What is the x-component of the impulse on the ball?
- A. -0.4 N s
 - B. 1.6 J
 - C. -40.0 N s
 - D. -1.6 N s
40. A 2.5 kg block slides on a horizontal surface with coefficient of kinetic friction 0.15. What is the kinetic-friction force?
- A. 24.5 N
 - B. 7.4 N
 - C. 0.38 N
 - D. 3.7 N

SECTION II - Free Response

4 questions | 100 minutes | Show reasoning, equations, units, graphs, and experimental logic when requested.

Question types: Mathematical Routines; Translation Between Representations; Experimental Design and Analysis; Qualitative/Quantitative Translation.

Question 1 - Mathematical Routines: Fountain projectile and fluid flow (10 points)

A. A fountain nozzle points vertically upward. Water leaves the nozzle with speed v_0 . Starting from a fundamental kinematics relation, derive an expression for the maximum rise height of a water element above the nozzle in terms of v_0 and g .

B. The nozzle radius is reduced from R to $R/2$ while the volume flow rate remains constant. Determine the factor by which the exit speed changes and justify using continuity.

C. A droplet leaves a second horizontal nozzle at speed u from height H . Derive the horizontal range before the droplet reaches the ground.

D. Explain one assumption in your derivation that would make the measured range smaller than the predicted value.

Question 2 - Translation Between Representations: Collision and momentum (12 points)

A. Disk A of mass m moves right with speed v and collides inelastically with stationary disk B of mass $2m$. Draw a momentum-vector representation for the two-disk system before and after the collision.

B. Determine the common speed immediately after the collision.

C. Sketch the x-component of total system momentum versus time across the collision when external horizontal force is negligible.

D. Compare the total kinetic energy before and after the collision and explain the result physically.

Question 3 - Experimental Design and Analysis: Kinetic friction (10 points)

A. Design an experiment using a block, force sensor, balance and added masses to determine the coefficient of kinetic friction between the block and a horizontal surface.

B. Identify the independent variable and dependent variable and describe at least two controls.

C. State what graph should be plotted and how the coefficient is determined from the graph.

D. Describe one way to reduce random uncertainty in the measured friction force.

Question 4 - Qualitative/Quantitative Translation: Rotational work-energy (8 points)

A. A constant tangential force F acts at radius R on a rigid object with rotational inertia I through angular displacement θ . Derive an expression for its angular speed if it starts from rest.

B. A second object has a larger rotational inertia but experiences the same F , R and θ . Is its final angular speed greater, less, or equal? Justify without only citing your equation.

C. Explain how your qualitative reasoning is consistent with your derived expression.

ANSWER KEY - Section I

1. D - Kinematics Fall time is $\sqrt{2h/g} = 0.40$ s, so horizontal range is $v_x t = 0.8$ m.	2. B - Fluids Continuity gives $A_1 v_1 = A_2 v_2$. Because area is proportional to r^2 , $v_2 = v_1(r_1/r_2)^2 = 4.0$ m/s.
3. D - Momentum Momentum conservation gives $m_1 v_1 = (m_1 + m_2) v_f$, so $v_f = 2.50$ m/s.	4. B - Momentum Impulse equals change in momentum: $J_x = m(v_f - v_i) = -0.3$ N s.
5. D - Forces $F_k = \mu_k N = \mu_k mg = 0.35(1.0)(9.8) = 3.4$ N.	6. B - Energy Conservation of energy: $mgh = \frac{1}{2} mv^2$, so $v = \sqrt{2gh} = 4.8$ m/s. Mass cancels.
7. C - Rotation Torque magnitude is $\tau = rF \sin(\theta) = 3.0$ N m.	8. A - Rotation Rotational Newton second law: $\tau_{\text{net}} = I \alpha$, so $\alpha = \tau/I = 10.0$ rad/s ² .
9. C - Rotation For rolling without slipping, $a = g \sin(\theta)/(1 + \beta) = 1.52$ m/s ² .	10. C - Kinematics For constant acceleration, $a = \Delta v / \Delta t = 12/2 = 6.0$ m/s ² .
11. A - Kinematics Fall time is $\sqrt{2h/g} = 0.61$ s, so horizontal range is $v_x t = 2.4$ m.	12. A - Kinematics Displacement equals area under v-t graph: average velocity times time = $(2+2)/2 \times 5 = 10.0$ m.
13. D - Forces Newton second law gives $a = F_{\text{net}}/m = 6/2.5 = 2.4$ m/s ² .	14. B - Forces $F_k = \mu_k N = \mu_k mg = 0.20(1.5)(9.8) = 2.9$ N.
15. B - Forces $F_c = mv^2/r = 10.0$ N.	16. D - Forces Hooke law gives $F_s = -kx$. Magnitude is $40(0.05) = 2.0$ N and direction is toward equilibrium.
17. C - Energy Conservation of energy: $mgh = \frac{1}{2} mv^2$, so $v = \sqrt{2gh} = 4.0$ m/s. Mass cancels.	18. D - Energy $W = Fd \cos(\theta) = 10(4.0)\cos(0) = 40.0$ J.
19. C - Energy Average power is work divided by time: $P = W/t = 90.0$ W.	20. D - Energy $U_s = \frac{1}{2} kx^2 = 0.80$ J.
21. A - Momentum Momentum conservation gives $m_1 v_1 = (m_1 + m_2) v_f$, so $v_f = 3.20$ m/s.	22. C - Momentum Impulse equals change in momentum: $J_x = m(v_f - v_i) = -0.4$ N s.
23. A - Momentum The area under a force-time graph is impulse. For constant force, $J = F \Delta t = 12.5$ N s.	24. A - Rotation Torque magnitude is $\tau = rF \sin(\theta) = 6.0$ N m.
25. B - Rotation Rotational Newton second law: $\tau_{\text{net}} = I \alpha$, so $\alpha = \tau/I = 6.7$ rad/s ² .	26. D - Rotation For rolling without slipping, $a = g \sin(\theta)/(1 + \beta) = 2.39$ m/s ² .
27. A - Rotation $\omega = \omega_0 + \alpha t = 8.0$ rad/s.	28. C - Oscillations $T = 2\pi \sqrt{m/k} = 0.89$ s.
29. D - Oscillations At maximum displacement all energy is spring potential: $E = \frac{1}{2} kA^2 = 0.22$ J.	30. D - Oscillations T is proportional to $1/\sqrt{g}$, so $T_{\text{new}}/T_E = 1/\sqrt{0.25} = 2.00$.

31. C - Fluids $\Delta P = \rho g h = 9.8 \text{ kPa}$.	32. D - Fluids Archimedes principle: $F_B = \rho g V = 11.8 \text{ N}$.
33. B - Fluids Continuity gives $A_1 v_1 = A_2 v_2$. Because area is proportional to r^2 , $v_2 = v_1(r_1/r_2)^2 = 4.5 \text{ m/s}$.	34. D - Fluids Convert volume: $200 \text{ cm}^3 = 0.000200 \text{ m}^3$. Then $\rho = m/V = 2500 \text{ kg/m}^3$.
35. C - Forces Gravitational force varies as $1/r^2$, so doubling r makes the force $1/4$ as large.	36. D - Kinematics Fall time is $\sqrt{2h/g} = 0.40 \text{ s}$, so horizontal range is $v_x t = 2.0 \text{ m}$.
37. B - Fluids Continuity gives $A_1 v_1 = A_2 v_2$. Because area is proportional to r^2 , $v_2 = v_1(r_1/r_2)^2 = 4.0 \text{ m/s}$.	38. A - Momentum Momentum conservation gives $m_1 v_1 = (m_1 + m_2) v_f$, so $v_f = 2.00 \text{ m/s}$.
39. D - Momentum Impulse equals change in momentum: $J_x = m(v_f - v_i) = -1.6 \text{ N s}$.	40. D - Forces $F_k = \mu_k N = \mu_k mg = 0.15(2.5)(9.8) = 3.7 \text{ N}$.

SCORING GUIDE - Section II

This compact rubric emphasizes the evidence a strong AP-style response should contain. Equivalent correct reasoning should receive credit.

Question 1 - Mathematical Routines: Fountain projectile and fluid flow - 10 points

- 3 points:** Uses $v^2 = v_0^2 + 2a \Delta y$ with final vertical speed zero; $h = v_0^2/(2g)$.
- 3 points:** Uses $Q = Av$ and A proportional to R^2 ; halving R makes area one-fourth, so speed becomes $4v$.
- 2 points:** Uses fall time $\sqrt{2H/g}$ and $x = u \sqrt{2H/g}$.
- 2 points:** Identifies a physically relevant nonideal effect such as air drag or nonhorizontal launch.

Question 2 - Translation Between Representations: Collision and momentum - 12 points

- 3 points:** Before: only A has rightward momentum mv ; after: combined momentum remains mv to the right.
- 3 points:** Momentum conservation gives $v_f = v/3$.
- 3 points:** A nonzero horizontal line across the collision.
- 3 points:** Kinetic energy decreases in an inelastic collision; some mechanical energy becomes internal energy/deformation.

Question 3 - Experimental Design and Analysis: Kinetic friction - 10 points

- 3 points:** Measures mass/normal force and steady kinetic pulling force for several loads.
- 3 points:** Independent: normal force or total mass; dependent: kinetic-friction force; controls include same surface, same block face, approximately constant speed.
- 2 points:** Plot F_k versus N ; slope is μ_k .
- 2 points:** Repeat trials and average steady-force readings or use sensor averaging over a steady interval.

Question 4 - Qualitative/Quantitative Translation: Rotational work-energy - 8 points

- 3 points:** Work is $FR\theta = \Delta K_{\text{rot}} = \frac{1}{2} I \omega^2$, so $\omega = \sqrt{2FR\theta/I}$.

3 points: Less; the same work is distributed into rotational kinetic energy of an object that requires more energy per ω^2 when I is larger.

2 points: Expression has ω proportional to $1/\sqrt{I}$, matching the qualitative claim.

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