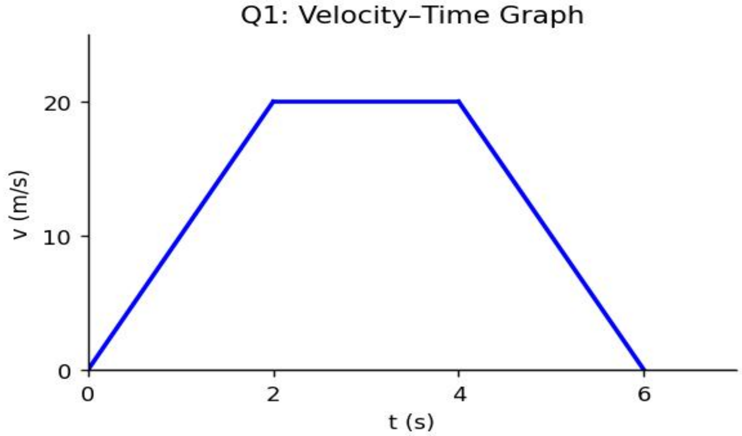
Physics Graphs — March 2026

Duration: 60 minutes | 48 Questions | Multiple Choice (Single Answer) | Total: 100 points

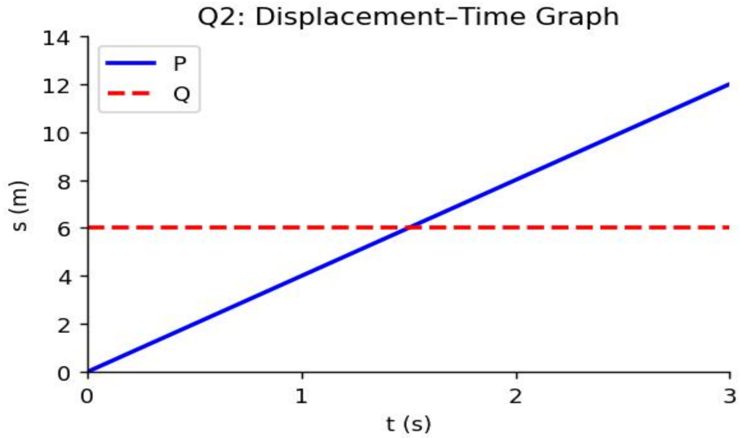
Instructions: Choose the single best answer for each question. Study the graph carefully before selecting your answer. If you are not a subcriber, you do not deserve this material. Subscribe, then solve. It will assist to my CV.

1. The velocity–time (v–t) graph below shows the motion of an object. Which statement correctly describes the motion?



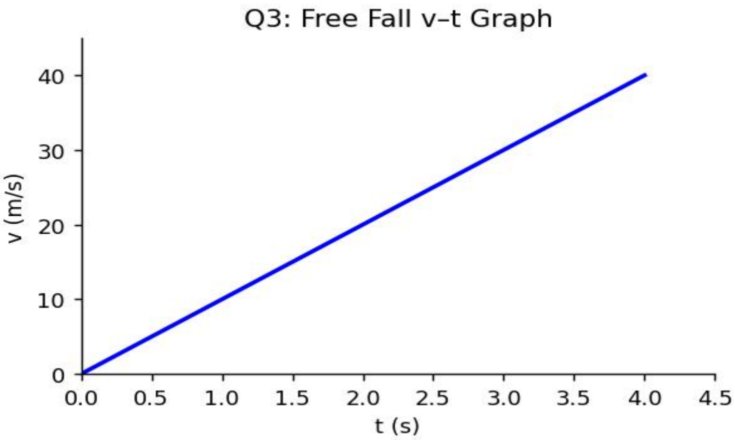
A) The object moves with constant velocity throughout.
B) The object first accelerates uniformly, then moves at constant velocity, then decelerates uniformly.
C) The object moves with continuously increasing acceleration.
D) The object is always at rest.

2. The displacement–time (s–t) graph shows objects P and Q. At what time do P and Q have the same displacement?



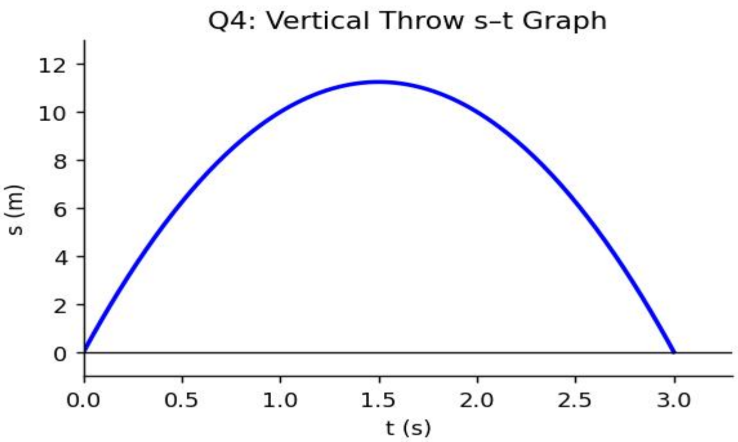
A) t = 1.0 s
B) t = 1.5 s
C) t = 2.0 s
D) They never have the same displacement.

3. An object is dropped from rest. The v–t graph shows its velocity during free fall. What is the acceleration due to gravity read from the gradient?



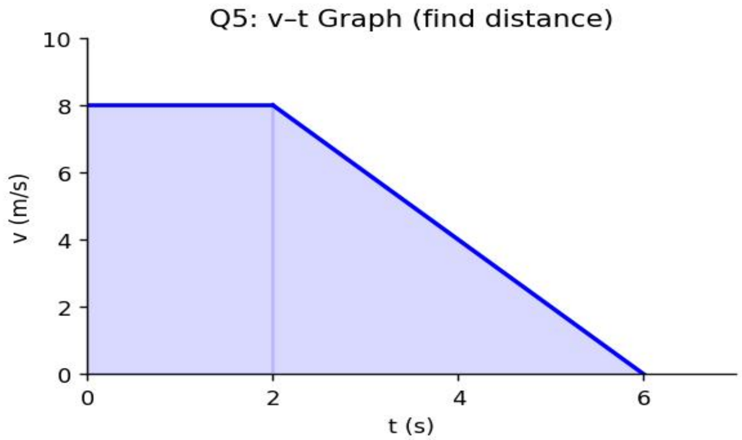
A) 5 m/s²
B) 10 m/s²
C) 20 m/s²
D) 40 m/s²

4. The s–t graph shows a ball thrown vertically upward. What physical event does the peak of the curve represent?



A) Maximum speed of the ball
B) Maximum height reached by the ball
C) The point where acceleration becomes zero
D) The moment the ball is released

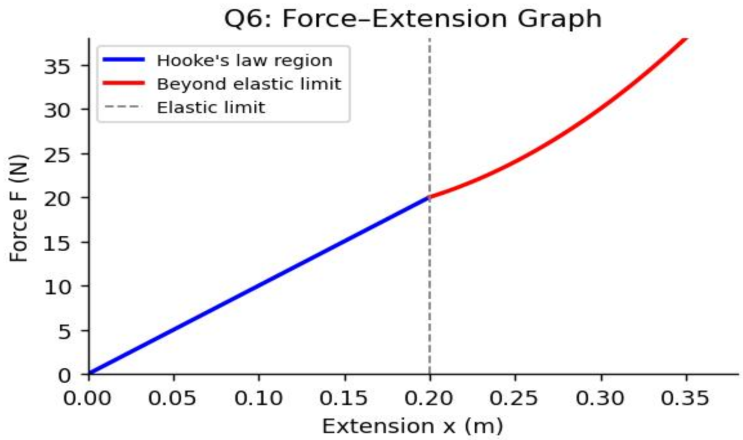
5. The v–t graph is shown. What is the total distance travelled between t = 0 and t = 6 s?



Note: Distance = area under v–t graph.

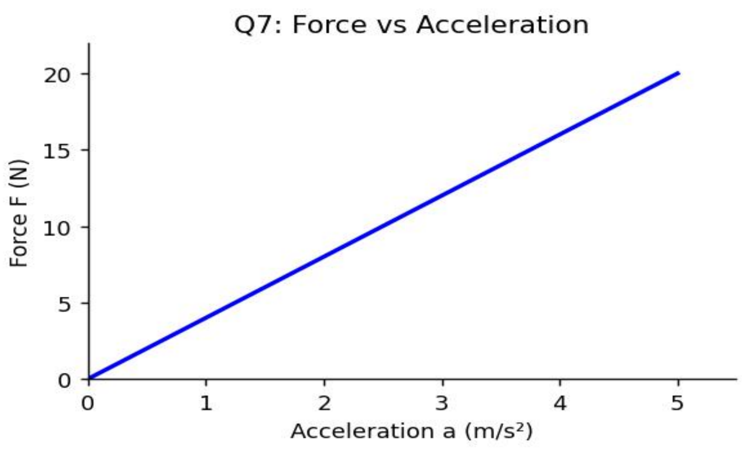
A) 8 m
B) 16 m
C) 24 m
D) 32 m

6. The force–extension graph for a spring is shown. In which region does the spring obey Hooke's Law?



A) The curved region beyond the elastic limit only
B) The straight-line region only
C) Both regions equally
D) Neither region

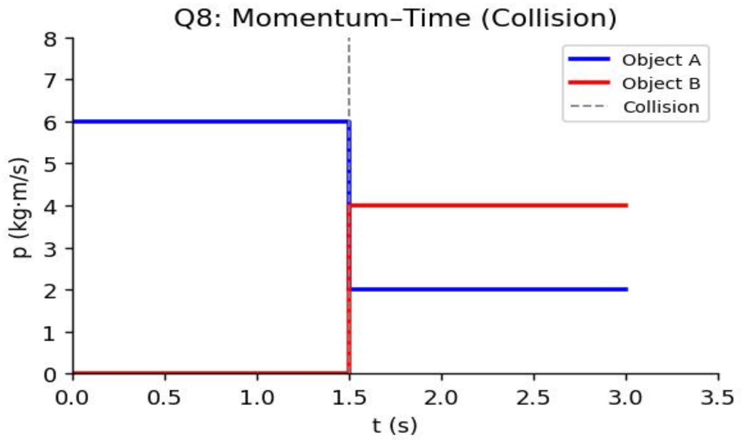
7. The graph shows force F against acceleration a for an object. What physical quantity does the gradient of this line represent?



Note: Newton's 2nd law: F = ma

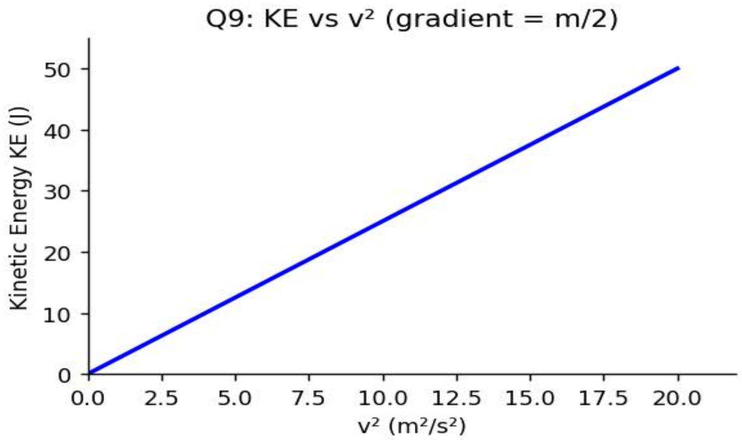
A) Velocity of the object
B) Displacement of the object
C) Mass of the object
D) Weight of the object

8. Two objects collide. Their individual momenta are shown against time. What principle does this graph demonstrate?



A) Momentum is not conserved during the collision.
B) The total momentum before and after the collision is equal (conservation of momentum).
C) Kinetic energy is fully conserved in the collision.
D) The collision must be perfectly elastic.

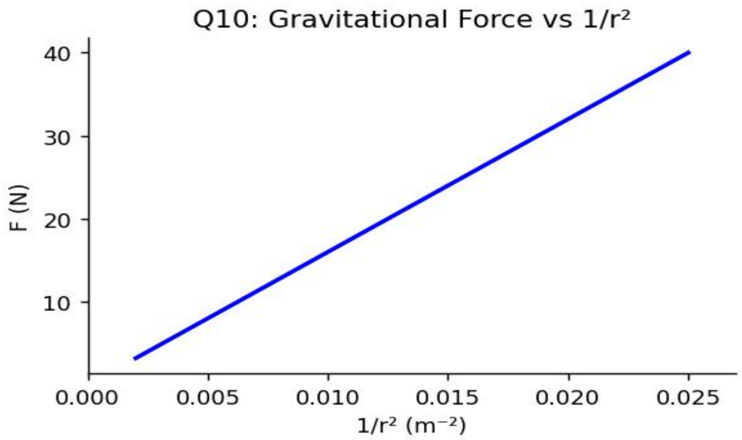
9. The graph shows kinetic energy (KE) plotted against v^2 for an object. What does the gradient of the graph represent?



Note: KE = ½mv², so gradient = m/2.

A) The velocity of the object
B) Half the mass of the object (m/2)
C) The weight of the object
D) The momentum of the object

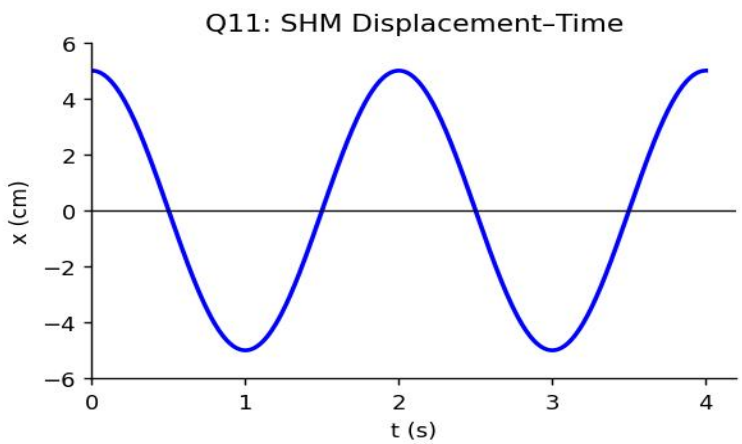
10. The graph shows gravitational force F against $1/r^2$, where r is the orbital radius of a satellite. What is the physical meaning of the gradient?



Note: Newton's law of gravitation: $F = Gm_1 m_2 / r^2$

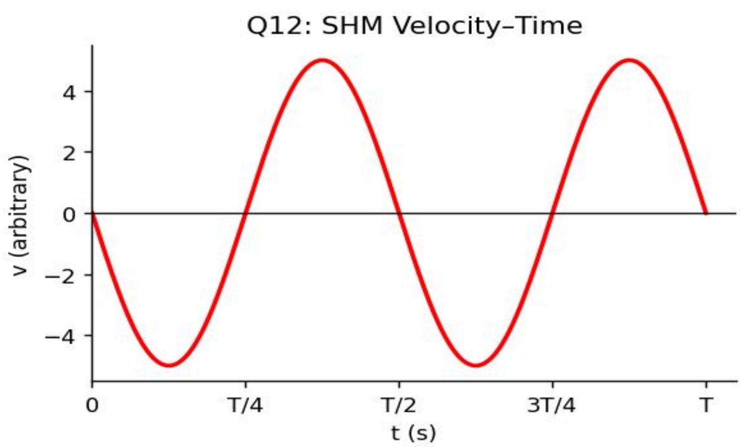
A) G × mass of the planet only
B) G × m_1 × m_2 (product of G and both masses)
C) The orbital speed of the satellite
D) The orbital period of the satellite

11. The displacement–time graph is shown for a simple harmonic oscillator. What is the period T of oscillation?



A) T = 0.5 s
B) T = 1.0 s
C) T = 2.0 s
D) T = 4.0 s

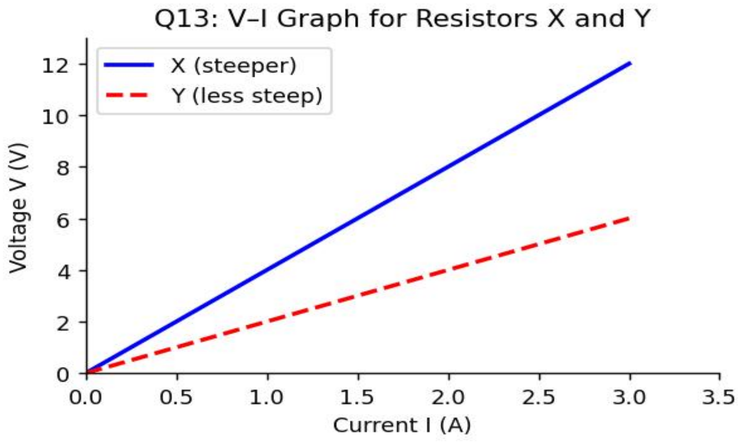
12. The velocity–time graph for a simple harmonic oscillator is shown. At which time(s) is the displacement of the oscillator zero?



Note: Maximum |v| corresponds to zero displacement in SHM.

A) At t = T/4 and t = 3T/4 only
B) At t = 0, T/2, and T
C) At t = T/4, T/2, and 3T/4
D) At t = 0 and T only

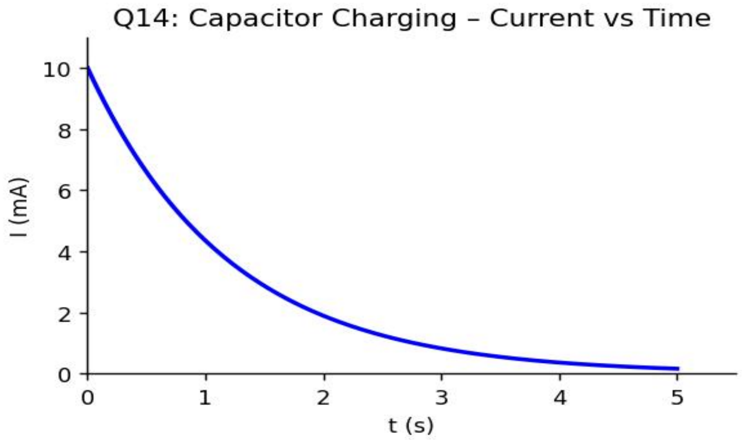
13. The V–I graph is shown for two resistors X and Y. Which resistor has the greater resistance, and why?



Note: R = V/I = gradient of V–I line.

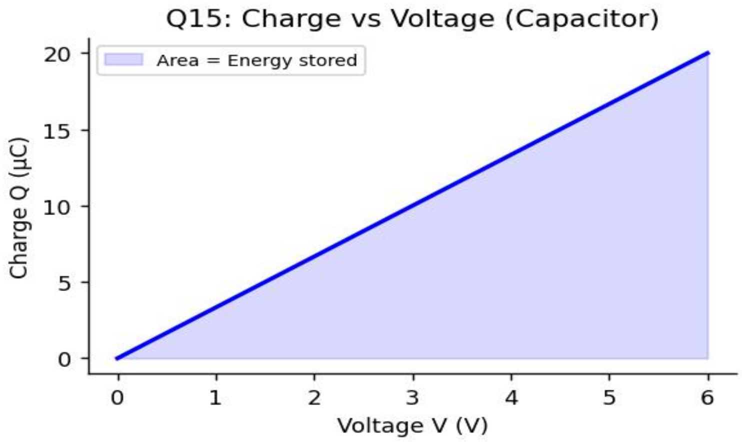
A) Resistor X, because its V–I line is steeper (larger gradient = larger R).
B) Resistor Y, because its V–I line is less steep.
C) Both have equal resistance.
D) Cannot be determined from the graph.

14. The graph shows the current I against time t as a capacitor charges through a resistor. What does the initial value of I at t = 0 represent?



A) The current when the capacitor is fully charged (I = 0).
B) The maximum current, equal to V/R.
C) The charge stored on the capacitor plates.
D) The capacitance of the capacitor.

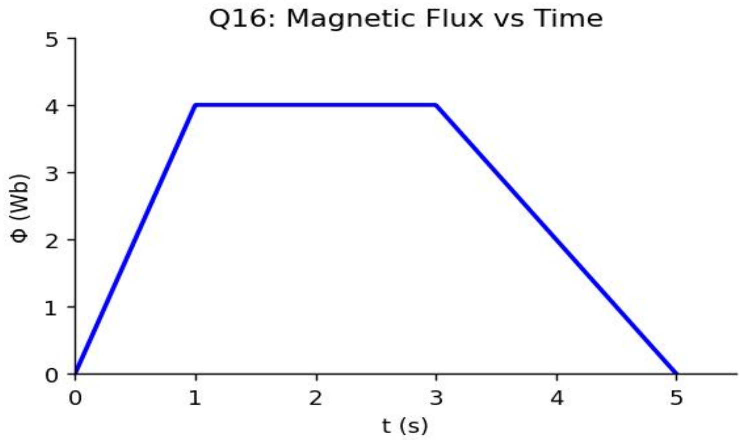
15. The graph shows charge Q against potential difference V for a capacitor. What does the area under the Q–V graph represent?



Note: Energy = ½QV = area of triangle under Q–V graph.

A) The capacitance C
B) The energy stored in the capacitor
C) The resistance of the circuit
D) The electric field strength between the plates

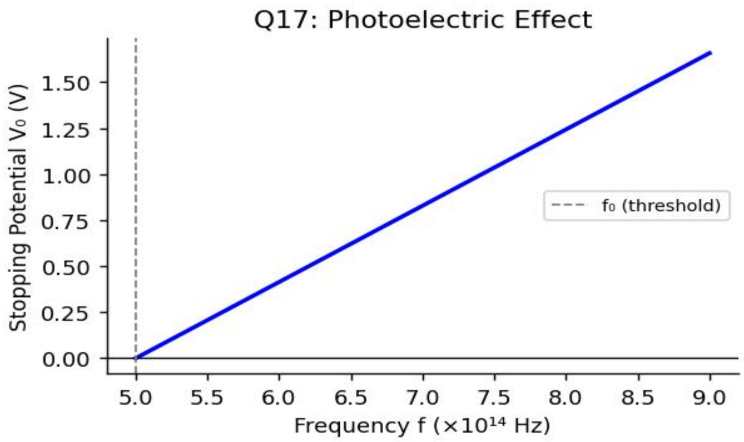
16. The graph shows magnetic flux Φ through a coil against time t. In which time interval is the magnitude of the induced EMF greatest?



Note: Faraday's law: $|\varepsilon| = |d\Phi/dt|$

A) Where the flux is changing most rapidly (steepest slope of Φ–t graph)
B) Where the flux is constant (flat region)
C) Where the flux is at its maximum value
D) The induced EMF is constant throughout.

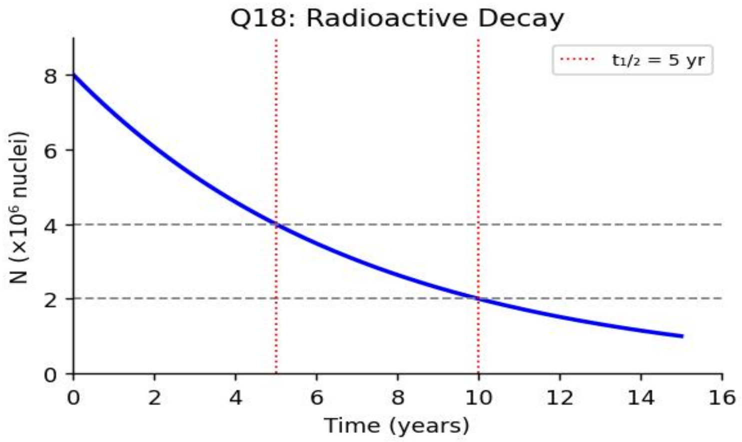
17. The graph shows stopping potential V_0 against frequency f for the photoelectric effect. What does the gradient of the straight line represent?



Note: $eV_0 = hf - \varphi$, so V_0 vs f has gradient h/e.

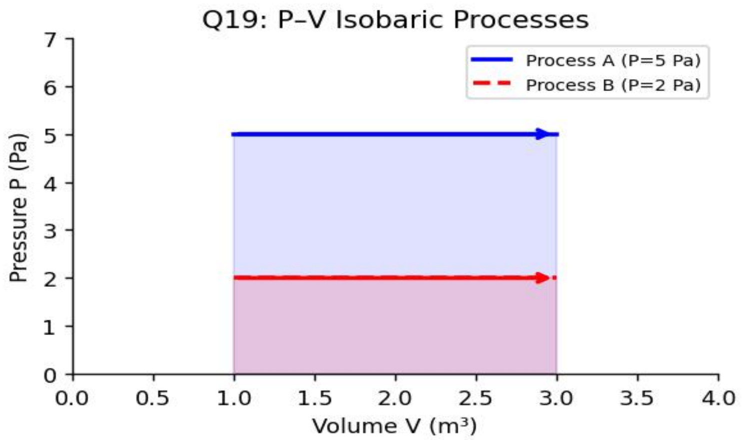
A) The work function φ of the metal
B) h/e (Planck's constant divided by the elementary charge)
C) The speed of light c
D) The threshold frequency f_0

18. The graph shows the number of undecayed nuclei N against time t for a radioactive sample. What is the half-life of the isotope?



A) $t_{1/2}$ = 3 years
B) $t_{1/2}$ = 5 years
C) $t_{1/2}$ = 8 years
D) $t_{1/2}$ = 10 years

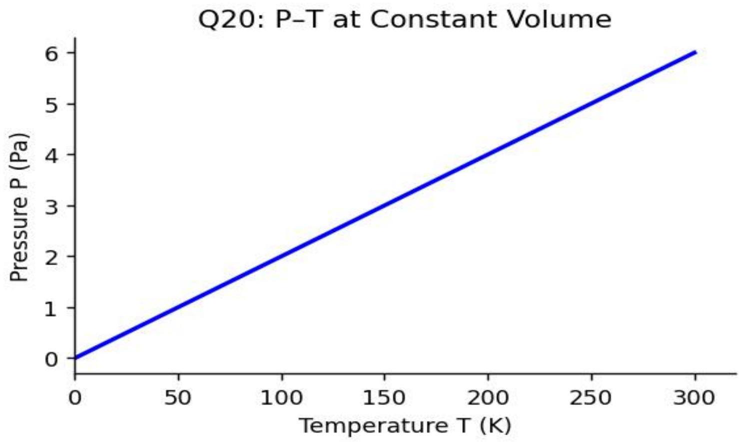
19. The P–V graph shows two isobaric (constant-pressure) processes A and B for an ideal gas. Which process involves greater work done BY the gas?



Note: W = PΔV; compare area under each process.

A) Process A, because it occurs at higher pressure.
B) Process B, because it occurs at lower pressure.
C) Both processes involve equal work done by the gas.
D) Neither process involves work done by the gas.

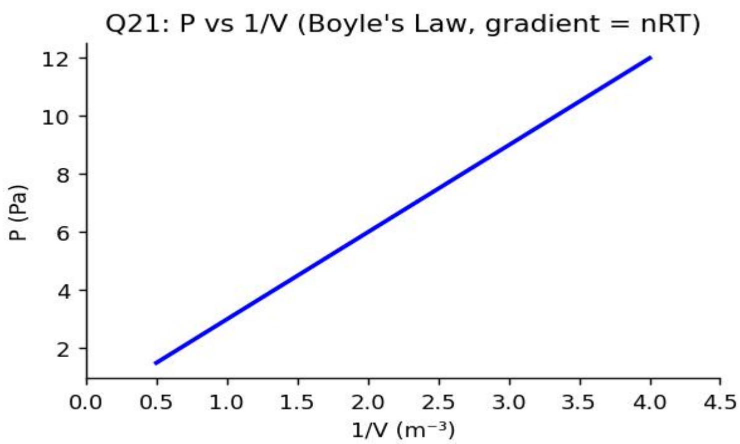
20. The graph shows pressure P against absolute temperature T for a fixed mass of ideal gas at constant volume. What does the y-intercept of the extrapolated line represent?



Note: Gay-Lussac's Law: P ∝ T at constant V.

A) Absolute zero — where pressure extrapolates to zero
B) Atmospheric pressure
C) The critical temperature of the gas
D) The Boltzmann constant

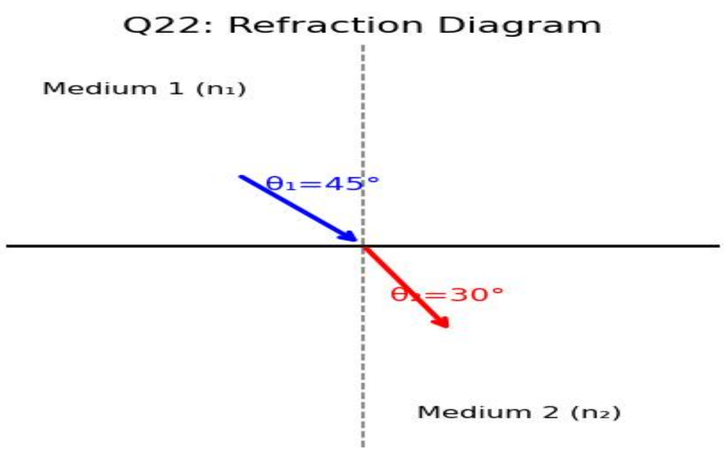
21. The graph shows pressure P plotted against 1/V for an ideal gas at constant temperature. What is the physical meaning of the gradient?



Note: Boyle's Law: $P = nRT \times (1/V)$, so gradient = nRT.

A) The volume of the gas
B) nRT (amount × gas constant × temperature)
C) The density of the gas
D) The molar mass of the gas

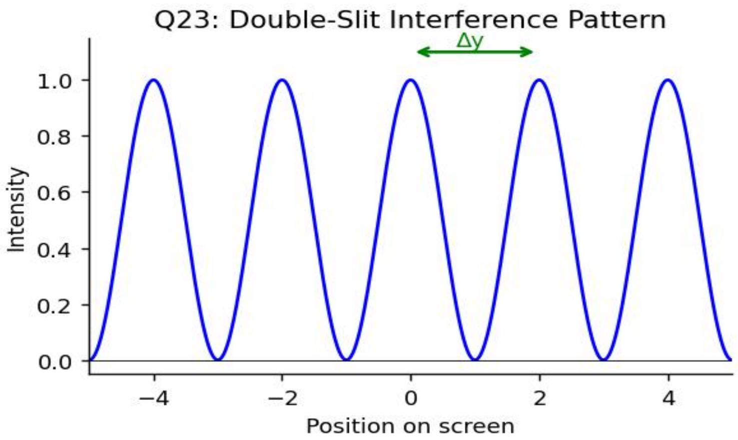
22. The diagram shows a ray of light refracting at an interface between two media. With $\theta_1 = 45°$ and $\theta_2 = 30°$, what is the refractive index n_{21} (medium 2 relative to medium 1)?



Note: Snell's law: $n_1 \sin\theta_1 = n_2 \sin\theta_2$

A) $n_{21} = \sin 30° / \sin 45° \approx 0.71$
B) $n_{21} = \sin 45° / \sin 30° \approx 1.41$
C) $n_{21} = \tan 45° / \tan 30° \approx 1.73$
D) $n_{21} = 1.00$ (no refraction)

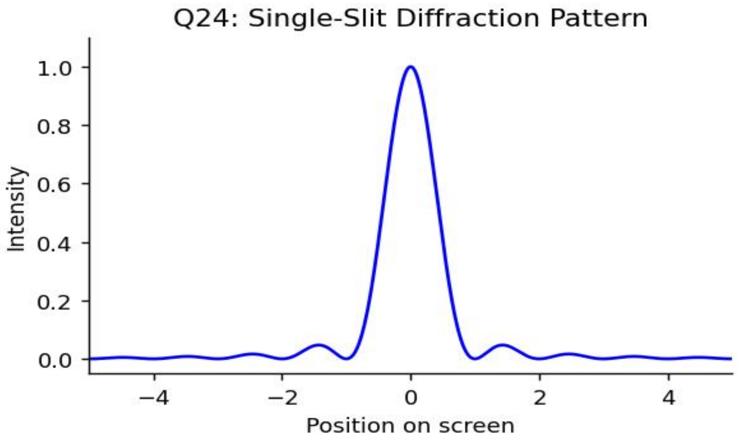
23. The graph shows the intensity pattern from double-slit interference. Which formula correctly gives the fringe spacing Δy?



Note: a = slit separation, λ = wavelength, D = screen distance.

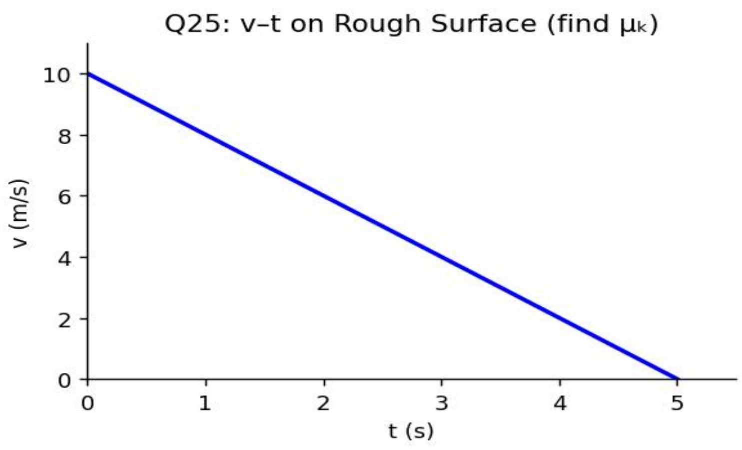
A) $\Delta y = a\lambda/D$
B) $\Delta y = \lambda D/a$
C) $\Delta y = \lambda a/D$
D) $\Delta y = D/(a\lambda)$

24. The graph shows the single-slit diffraction intensity pattern. How does increasing the slit width affect the central maximum?



A) It becomes wider and brighter.
B) It becomes narrower and brighter.
C) It becomes narrower with the same brightness.
D) Width is unaffected; only brightness changes.

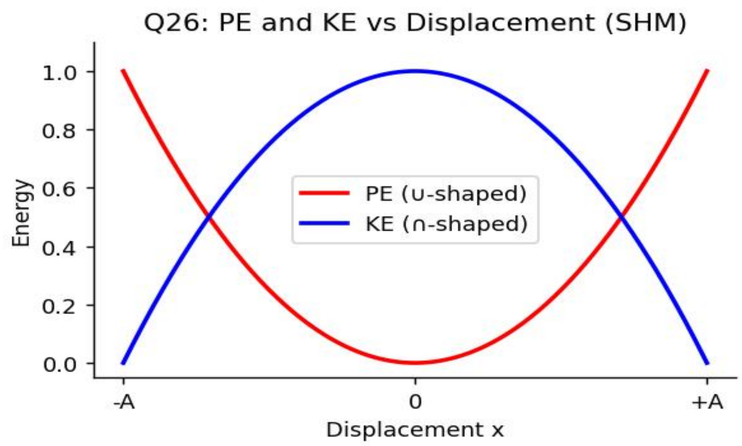
25. The v–t graph shows an object of mass 2 kg decelerating on a rough horizontal surface ($g = 10$ m/s²). What is the coefficient of kinetic friction μ_k ?



Note: Read deceleration from graph: $a = \Delta v/\Delta t$. Then $\mu_k = a/g$.

A) $\mu_k = 0.10$
B) $\mu_k = 0.20$
C) $\mu_k = 0.50$
D) $\mu_k = 1.00$

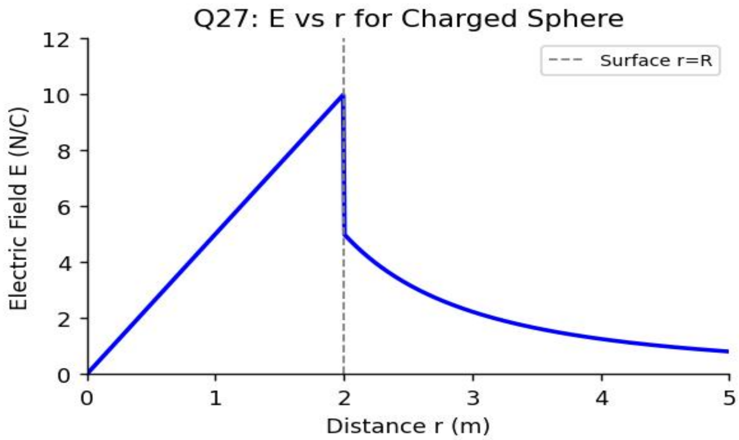
26. The graph shows potential energy (PE) and kinetic energy (KE) against displacement x from equilibrium for a simple pendulum. Which curve is KE?



Note: At x = 0 (equilibrium), KE is maximum and PE is minimum.

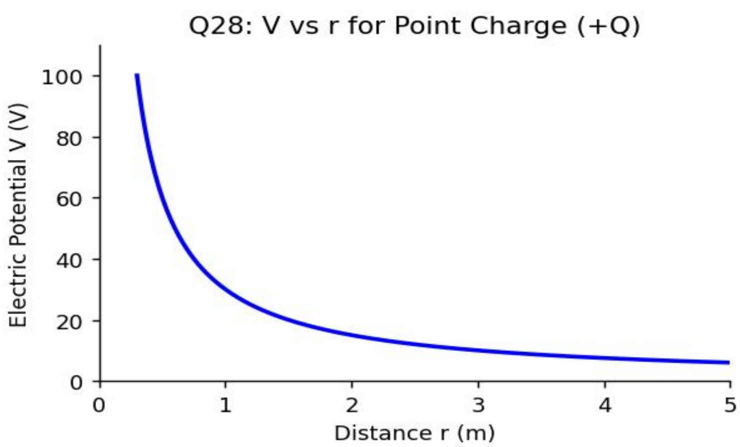
A) The ∩-shaped (inverted parabola) curve is KE; the ∪-shaped curve is PE.
B) The ∪-shaped curve is KE; the ∩-shaped curve is PE.
C) Both curves represent PE at different amplitudes.
D) Both curves represent KE at different amplitudes.

27. The graph shows electric field strength E against distance r from the centre of a uniformly charged solid sphere of radius R. In which region does $E \propto r$?



A) Inside the sphere only (r < R)
B) Outside the sphere only (r > R)
C) At the surface only (r = R)
D) E is constant everywhere

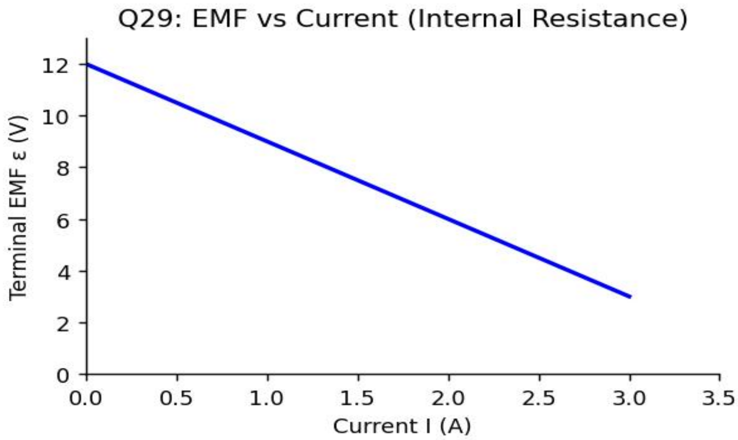
28. The graph shows electric potential V against distance r from a positive point charge +Q. Which mathematical relationship does the graph show?



Note: Coulomb: V = kQ/r

A) $V \propto r$
B) $V \propto 1/r$
C) $V \propto r^2$
D) $V \propto 1/r^2$

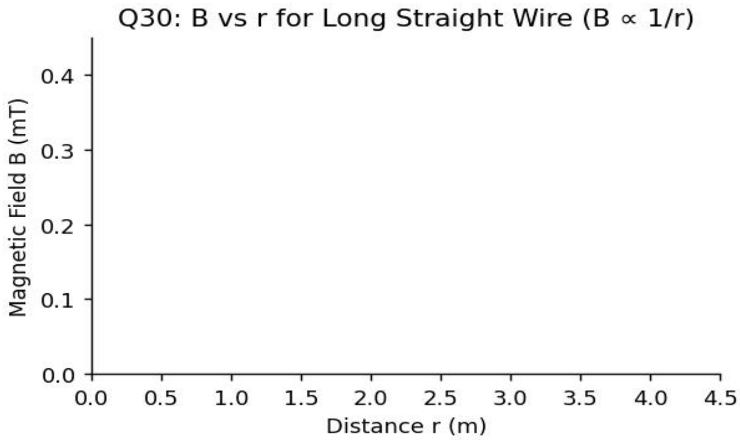
29. The graph shows how the terminal EMF ε of a battery varies with the current I drawn from it. What does the magnitude of the gradient represent?



Note: $\varepsilon = E - Ir$, so terminal voltage decreases linearly with I; gradient = r.

A) The external resistance of the circuit
B) The internal resistance r of the battery
C) The maximum power output of the battery
D) The total charge stored in the battery

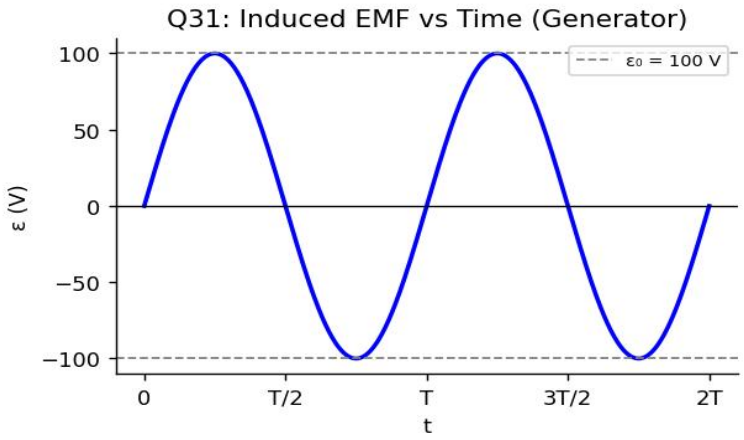
30. The graph shows magnetic flux density B against distance r from a long straight current-carrying wire. What is the mathematical relationship?



Note: $B = \mu_0 I/(2\pi r)$

A) $B \propto r$
B) $B \propto 1/r$
C) $B \propto r^2$
D) $B \propto 1/r^2$

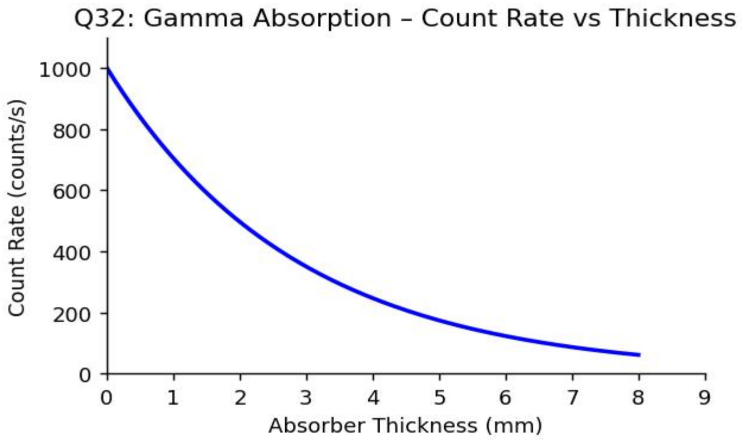
31. The graph shows the induced EMF ε against time t for a coil rotating in a magnetic field (N = 100, A = 0.01 m², B = 0.5 T, ω = 200 rad/s). What is the peak EMF ε_0 ?



Note: $\varepsilon_0 = NBA\omega$

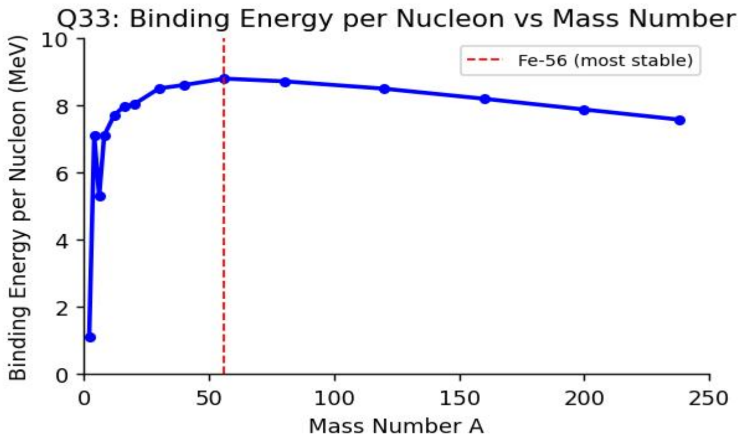
A) $\varepsilon_0 = 10$ V
B) $\varepsilon_0 = 100$ V
C) $\varepsilon_0 = 500$ V
D) $\varepsilon_0 = 1000$ V

32. The graph shows count rate against absorber thickness for gamma radiation. What type of mathematical relationship describes this absorption?



A) Linear (arithmetic) decrease
B) Exponential decrease
C) Power-law decrease
D) Step-function decrease

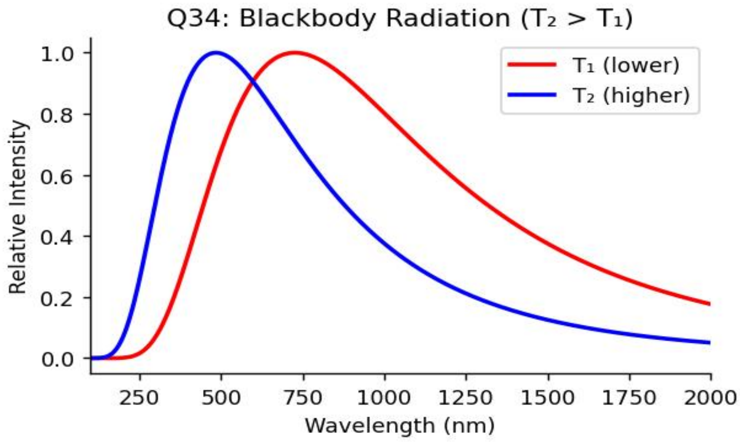
33. The graph shows binding energy per nucleon against mass number A. At which mass number is the nucleus most stable?



Note: Maximum binding energy per nucleon = maximum stability.

A) A ≈ 4 (helium)
B) A ≈ 56 (iron)
C) A ≈ 120 (tin)
D) A ≈ 238 (uranium)

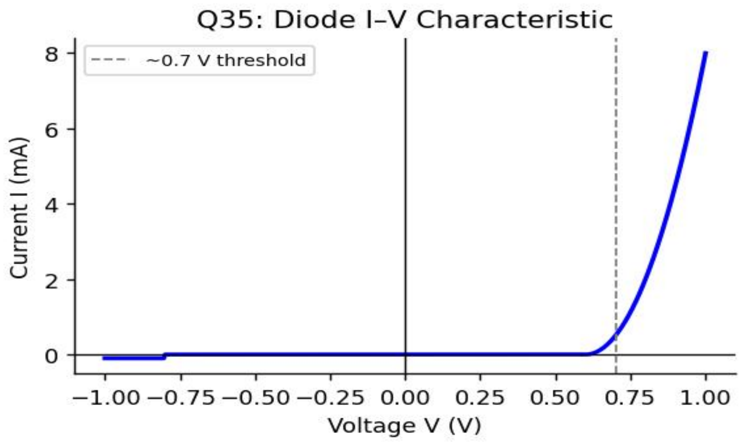
34. The graph shows blackbody radiation intensity against wavelength for two temperatures T_1 and T_2 ($T_2 > T_1$). Which statement is correct?



Note: Wien's displacement law and Stefan–Boltzmann law.

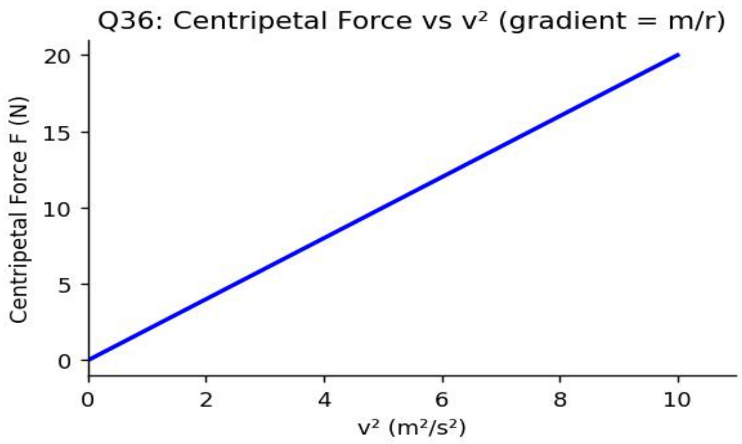
A) T_2 has a lower peak frequency and lower total intensity than T_1.
B) T_2 has a higher total intensity and its peak shifts to shorter wavelengths.
C) Both temperatures emit the same total power.
D) The peak wavelength increases as temperature increases.

35. The graph shows current I against voltage V for a semiconductor diode. Above what approximate voltage does the diode begin to conduct significantly?



A) V > 0.0 V (conducts immediately for any positive voltage)
B) V > 0.7 V (typical forward-bias threshold)
C) V > 1.5 V
D) The diode always conducts regardless of applied voltage.

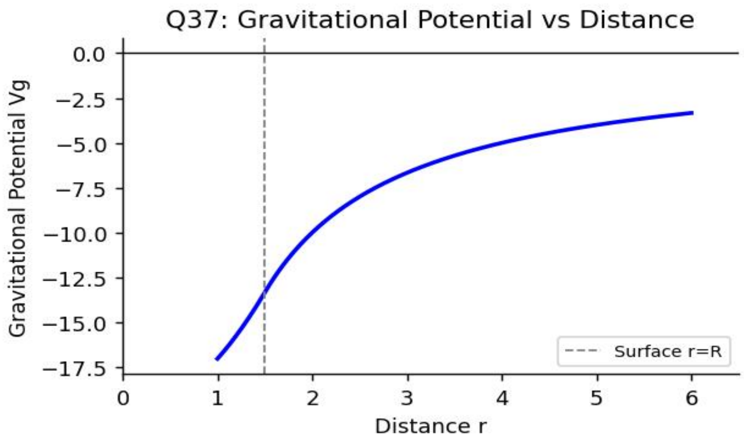
36. An object moves in a circle. The graph shows centripetal force F against v^2 for constant radius r. What does the gradient of this graph represent?



Note: $F = mv^2/r$, so F vs v^2 has gradient m/r.

A) The radius of the circular path r
B) The mass divided by radius (m/r)
C) The angular velocity ω
D) The period T of the motion

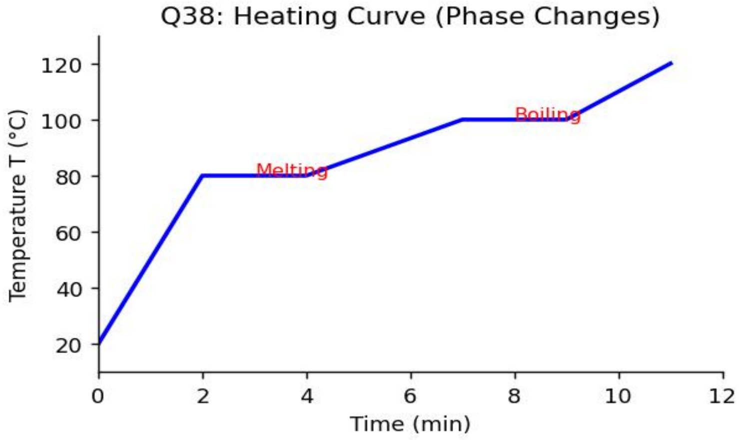
37. The graph shows gravitational potential Vg against distance r from a planet's centre (radius R). What is the correct description of the curve for r > R?



Note: Vg = −GM/r for r > R.

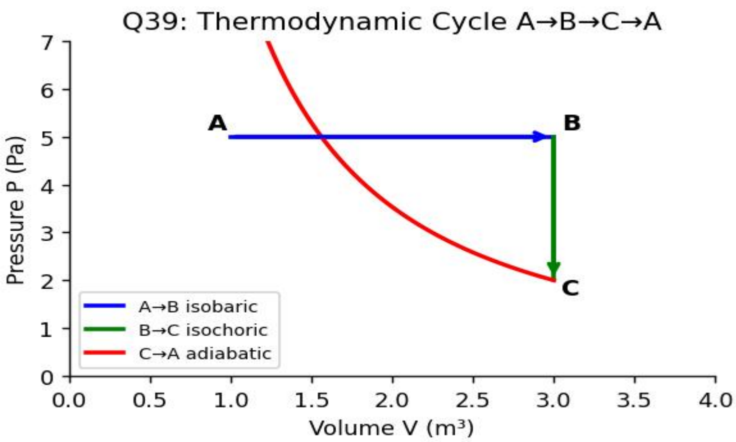
A) Vg ∝ −r (linear decrease)
B) Vg ∝ −1/r (becomes less negative as r increases)
C) Vg ∝ $-r^2$ (parabolic decrease)
D) Vg is constant for r > R

38. The graph shows temperature T against time t when a substance is heated at constant power. What is happening during each flat (plateau) region?



A) The substance is cooling down.
B) A phase change is occurring at constant temperature.
C) The heating power has been switched off.
D) The substance has reached its critical point.

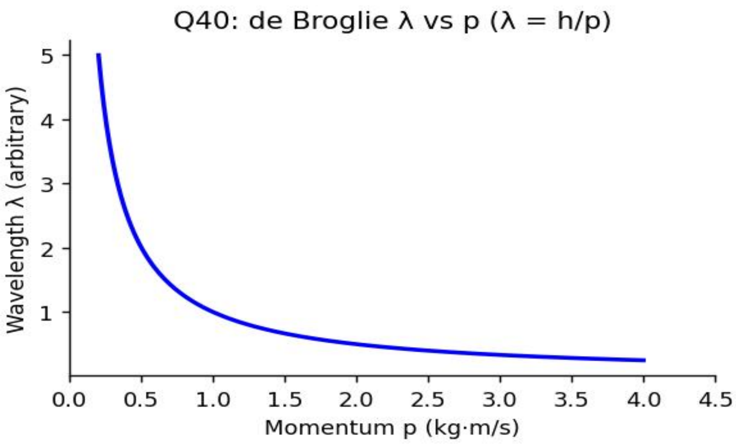
39. The P–V diagram shows a thermodynamic cycle A → B → C → A. In which process is work done ON the gas?



Note: Work done ON gas requires compression (V decreases).

A) A → B (isobaric expansion — gas does work on surroundings)
B) B → C (isochoric — no volume change, no work done)
C) C → A (adiabatic compression — work is done ON the gas)
D) Work is never done on the gas in any part of this cycle.

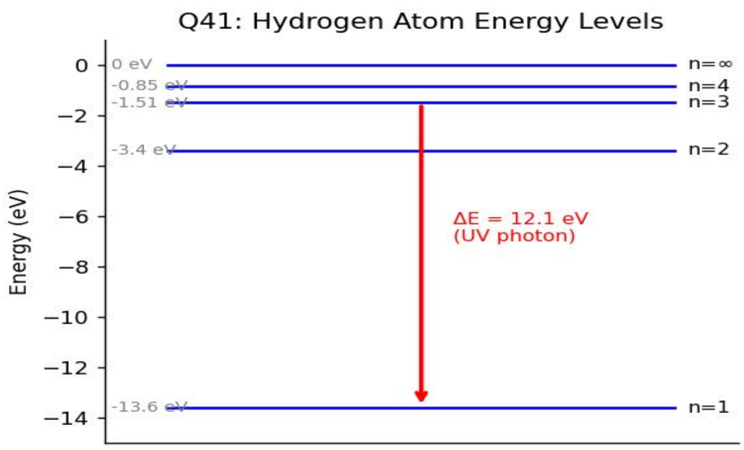
40. The graph shows de Broglie wavelength λ against momentum p for a particle. What does the gradient of the graph represent?



Note: λ = h/p, so λ vs 1/p has gradient h (or λ vs p: gradient = −h/p²… but for λ vs p, gradient ≠ constant). The graph shows λ ∝ 1/p, confirming gradient = h when plotting λ vs 1/p.

A) The mass of the particle
B) The speed of light c
C) Planck's constant h
D) The kinetic energy of the particle

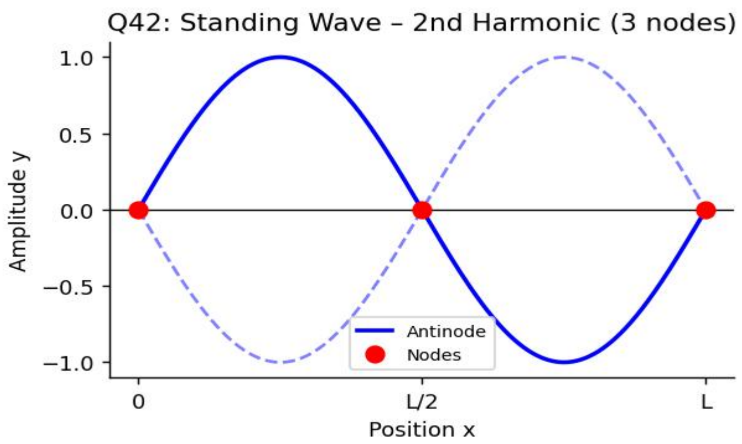
41. The diagram shows the energy levels of the hydrogen atom. An electron falls from n = 3 to n = 1. What is the energy of the emitted photon?



Note: $\Delta E = |E_3 - E_1| = |-1.51 - (-13.6)| = 12.09$ eV

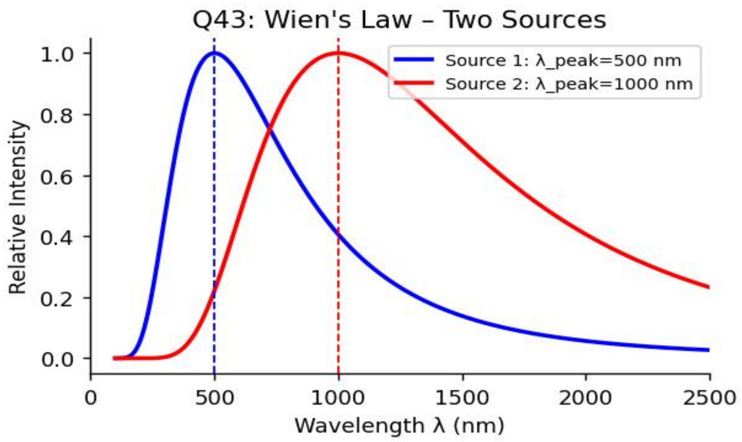
A) 1.89 eV
B) 3.40 eV
C) 12.09 eV
D) 13.60 eV

42. The diagram shows a standing wave on a string fixed at both ends. How many nodes does the pattern have (including the fixed endpoints)?



A) 2 nodes
B) 3 nodes
C) 4 nodes
D) 5 nodes

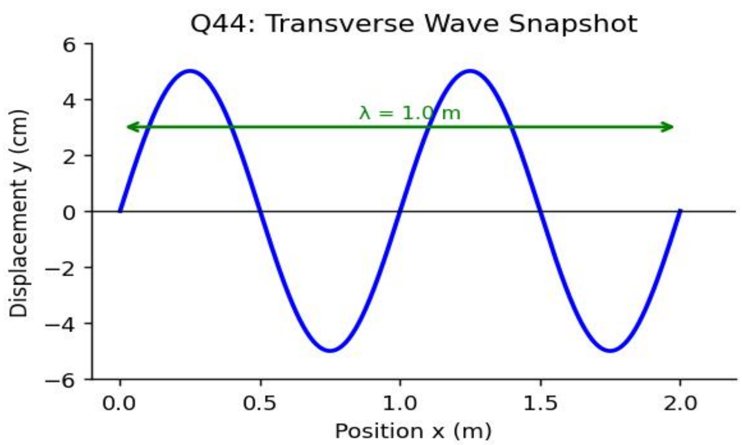
43. Two light sources have blackbody spectra peaking at λ_1 = 500 nm and λ_2 = 1000 nm respectively. What is the ratio of their temperatures T_1/T_2 ?



Note: Wien's law: λT = constant, so $T_1/T_2 = \lambda_2/\lambda_1$ = 1000/500 = 2.

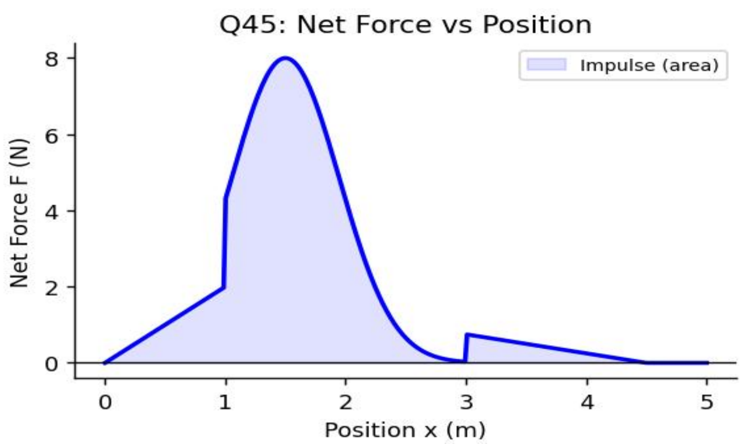
A) $T_1/T_2 = 0.5$
B) $T_1/T_2 = 1.0$
C) $T_1/T_2 = 2.0$
D) $T_1/T_2 = 4.0$

44. The graph shows a snapshot of a transverse wave. What is the wavelength of the wave?



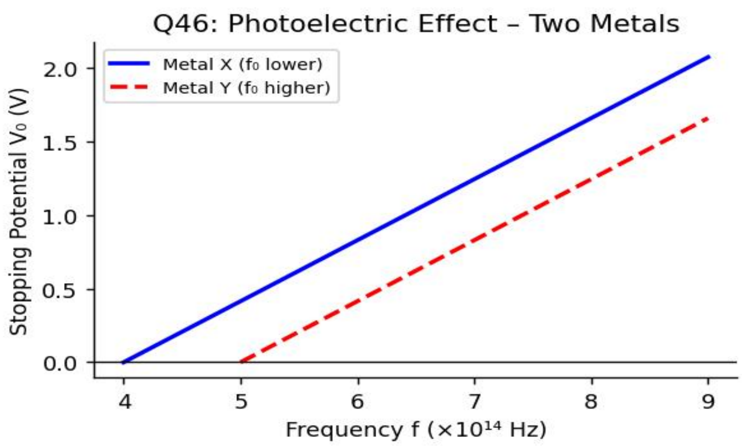
A) λ = 0.5 m
B) λ = 1.0 m
C) λ = 1.5 m
D) λ = 2.0 m

45. The graph shows the net force F on a charged particle against its position x. The particle starts from rest at x = 0. What happens to the particle's speed as it moves from x = 0 to x = 5 m?



A) Speed decreases uniformly.
B) Speed first increases (while net force > 0), then remains constant after the force returns to zero.
C) Speed increases continuously throughout and never decreases.
D) Speed remains constant because the average force over the path is zero.

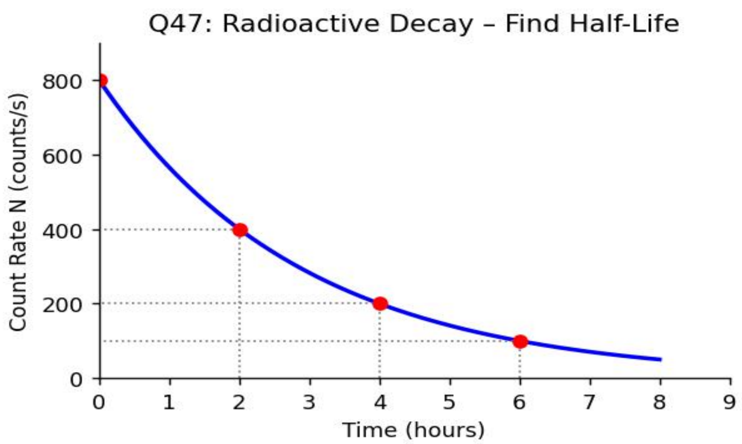
46. The graph shows stopping potential V_0 against frequency f for two metals X and Y. What can be concluded about their work functions φX and φY?



Note: $eV_0 = hf - \varphi$. The x-intercept gives $f_0 = \varphi/h$.

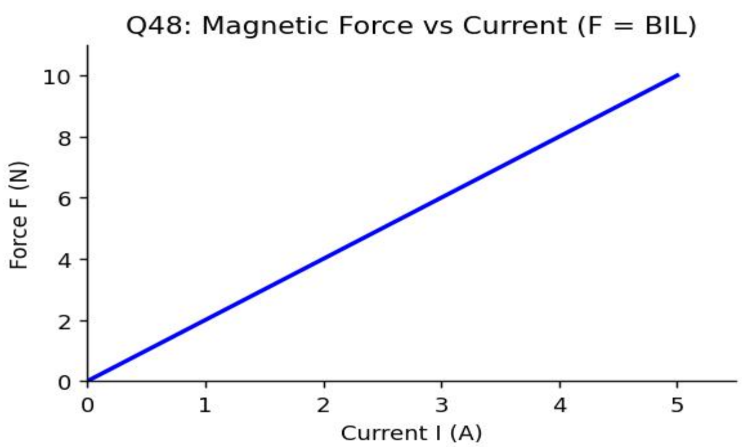
A) φX < φY, because metal X has a lower threshold frequency.
B) φX > φY, because metal X has a lower threshold frequency.
C) φX = φY, because both lines have the same gradient.
D) The work function cannot be determined from this type of graph.

47. The graph shows count rate N against time t for a radioactive source. What is the half-life?



A) $t_{1/2}$ = 1 hour
B) $t_{1/2}$ = 2 hours
C) $t_{1/2}$ = 4 hours
D) $t_{1/2}$ = 8 hours

48. The graph shows the magnetic force F on a current-carrying conductor (length L = 0.5 m) against current I in a uniform magnetic field B. What is the value of B?



Note: F = BIL, so gradient = BL. Read gradient from graph.

A) B = 0.5 T
B) B = 1.0 T
C) B = 2.0 T
D) B = 4.0 T

— End of Examination —