

CIE A-Level Physics 9702 Paper 2 Practice

Paper (AS)

Total: 60 marks · 1 hour 15 minutes · 6 questions · 23 parts

Q 1 · Kinematics [10]

- (a) Distinguish between a scalar quantity and a vector quantity, giving one physics example of each. [2]
- (b) A car accelerates uniformly from 8.0 m/s to 26.0 m/s in 6.0 s. Calculate its acceleration and the distance travelled. [3]
- (c) A ball is released from rest and falls 45 m ($g = 9.81 \text{ m/s}^2$, air resistance negligible). Calculate the time of fall and the speed on landing. [3]
- (d) A velocity-time graph rises uniformly from 0 to 12 m/s in 4.0 s, then stays at 12 m/s until $t = 10.0 \text{ s}$. Find the total displacement. [2]

Q 2 · Forces and momentum [10]

- (a) State Newton's second law and give the condition under which $F = ma$ applies. [2]
- (b) A car of mass 1200 kg experiences a resultant force of 3.6 kN. Calculate its acceleration. [2]
- (c) Trolley A (2.0 kg) moving at 3.0 m/s collides with stationary trolley B (1.0 kg) and they move off together. Find the common velocity and the kinetic energy lost. [4]
- (d) Explain why kinetic energy is not conserved in part (c). [2]

Q 3 · Work, energy and materials [10]

- (a) A pump raises 250 kg of water through 12 m in 20 s. If the efficiency is 70%, calculate the output power and the input power ($g = 9.81 \text{ m/s}^2$). [4]
- (b) A spring extends 0.060 m under a force of 12 N (within the elastic limit). Find its spring constant and the energy stored. [3]
- (c) A wire of length 2.50 m and diameter 0.40 mm extends by 1.2 mm under a load of 8.0 N. Calculate the Young modulus. [3]

Q 4 · Waves [10]

- (a) A sound wave has frequency 512 Hz and speed 340 m/s. Calculate its wavelength. [2]
- (b) Describe the difference between a transverse wave and a longitudinal wave, with one example of each. [2]
- (c) Two coherent microwave sources are 0.12 m apart, wavelength 0.030 m, screen 2.0 m away. Calculate the fringe spacing. [3]
- (d) A string of length 0.80 m has a fundamental frequency of 250 Hz. Find the frequency and wavelength of the third harmonic. [3]

Q 5 · Electricity and d.c. circuits [12]

- (a) Distinguish between electromotive force (e.m.f.) and potential difference (p.d.). [2]
- (b) A wire of length 1.5 m and cross-sectional area $2.0 \times 10^{-7} \text{ m}^2$ has resistance 0.90 ohm. Calculate its resistivity. [2]
- (c) A cell of e.m.f. 6.0 V and internal resistance 0.50 ohm is connected to a 2.5 ohm resistor. Find the current, terminal p.d., power in the external resistor and power dissipated internally. [4]
- (d) A 12 V supply is in series with a 4.0 kohm fixed resistor and a thermistor; the output is taken across the thermistor. At 20 C the thermistor is 2.0 kohm. Find the output voltage and state how it changes when temperature rises. [4]

Q 6 · Particle physics [8]

- (a) Give the quark composition of a proton and of a neutron. [2]
- (b) Write the equation for beta-minus decay and state the quark change involved. [2]
- (c) Show that C-14 decaying to N-14 plus an electron and an antineutrino conserves charge and nucleon number. [2]
- (d) Calculate the energy of a photon of wavelength 520 nm in J and in eV. $h = 6.63 \times 10^{-34} \text{ J s}$, $c = 3.00 \times 10^8 \text{ m/s}$. [2]