

CIE A-Level Physics 9702 Paper 1 Practice

Paper (Multiple Choice) - ANSWERS

Total: 40 marks · 1 h 15 min · 40 multiple-choice questions

Q	Answer	Reasoning	marks
1	A	$J = N\ m = (kg\ m\ s^{-2})(m) = kg\ m^2\ s^{-2}$.	1
2	C	$a = 30/6.0 = 5.0\ m\ s^{-2}$; $s = 0.5 \times 5.0 \times 36 = 90\ m$.	1
3	C	$v^2 = u^2 - 2gh$ with $v = 0$ at the top, so $h = u^2/2g = 400/19.62 = 20.4\ m$.	1
4	B	$t = \sqrt{2h/g} = 2.02\ s$; range = $15 \times t = 30.3\ m$.	1
5	C	$a = F/m = 8.0/2.0 = 4.0\ m\ s^{-2}$.	1
6	D	$F = \text{change in } p / \text{time} = (1,200 \times 15)/0.40 = 4.5 \times 10^4\ N$.	1
7	A	Momentum: $4.0v = 12$ so $v = 3.0\ m\ s^{-1}$; loss = $0.5 \times 3.0 \times 16 - 0.5 \times 4.0 \times 3.02 = 6.0\ J$.	1
8	B	$P = mgh/t = 25 \times 9.81 \times 8.0/4.0 = 490\ W$.	1
9	D	Efficiency = $1.8/2.4 \times 100\% = 75\%$.	1
10	B	Moments: $4.0 \times 0.30 = W \times 0.70$ so $W = 1.71\ N$.	1
11	A	Torque = $F \times d = 6.0 \times 0.25 = 1.5\ N\ m$.	1
12	B	$E = 0.5kx^2 = 0.5 \times 40 \times 0.15^2 = 0.45\ J$.	1
13	D	$A = \pi r^2 = \pi(0.20 \times 10^{-3})^2 = 1.26 \times 10^{-7}\ m^2$; stress = $50/A = 4 \times 10^8\ Pa$.	1
14	A	Strain = $1.2 \times 10^{-3}/2.0 = 6.0 \times 10^{-4}$; $E = \text{stress}/\text{strain} = 6.6 \times 10^{11}\ Pa$.	1
15	B	Upthrust = $\rho V g = 1,000 \times 0.20 \times 9.81 = 1962\ N$.	1
16	B	$p = \rho g h = 1,000 \times 9.81 \times 2.5 = 24525\ Pa$, about $2.5 \times 10^4\ Pa$.	1
17	D	$\lambda = v/f = 340/512 = 0.66\ m$.	1
18	D	$f = 1/0.20 = 5.0\ Hz$; $v = f \lambda = 5.0 \times 0.80 = 4.0\ m\ s^{-1}$.	1
19	B	Only transverse waves can be polarised, because their oscillations are perpendicular to the direction of travel and can be confined to one plane.	1

20	C	$n = \sin i / \sin r$ so $\sin r = \sin 30 / 1.50 = 0.333$ and $r = 19.5$ degrees.	1
21	D	$\sin c = 1/n = 1/1.50 = 0.667$ so $c = 41.8$ degrees.	1
22	D	At the n th order maximum the path difference is $n \lambda$; with $n = 2$ it is $2 \times 0.60 = 1.2$ m.	1
23	A	For the second harmonic $\lambda = L = 1.2$ m, so $f = 240/1.2 = 200$ Hz.	1
24	B	$d = 1/500$ mm $= 2.0 \times 10^{-6}$ m; $\sin \theta = \lambda/d = 0.30$ so $\theta = 17.5$ degrees.	1
25	A	With a phase difference of 180 degrees the waves cancel exactly (complete destructive superposition) and the resultant amplitude is zero.	1
26	C	$Q = It = 2.0 \times 300 = 600$ C; $N = Q/e = 3.8 \times 10^{21}$.	1
27	B	$I = nAve$ so $v = 2.0 / (8.5 \times 10^{28} \times 1.0 \times 10^{-6} \times 1.6 \times 10^{-19}) = 0.00015$ m s ⁻¹ .	1
28	D	$R = \rho L / A = (1.7 \times 10^{-8} \times 2.0) / 1.0 \times 10^{-6} = 0.034$ ohm.	1
29	B	Parallel pair = 2.0 ohm, total = 6.0 ohm, $I = 2.0$ A, p.d. across the pair = 4.0 V, so I in 6 ohm = 0.67 A.	1
30	C	$P = V^2/R$ so $R = 230^2 / 2,000 = 26.4$ ohm.	1
31	A	$I = 9.0/4.50 = 2.0$ A; terminal p.d. = $IR = 2.0 \times 4.0 = 8.0$ V.	1
32	C	Potential divider: $V = 12 \times 6.0/8.0 = 9.0$ V.	1
33	C	The junction rule states that the total current into a junction equals the total out, because charge does not accumulate there: conservation of charge.	1
34	B	A proton is uud (charge $+2/3 + 2/3 - 1/3 = +1$); a neutron is udd.	1
35	D	Leptons do not feel the strong force: the electron, muon and neutrinos are leptons, while protons, neutrons and pions are hadrons.	1
36	A	In beta-minus decay $d \rightarrow u + e^- + \text{antineutrino}$: a neutron (udd) becomes a proton (uud), emitting an electron and an antineutrino.	1
37	B	$A = \text{protons} + \text{neutrons} = 6 + 8 = 14$ while the proton number $Z = 6$.	1
38	B	Percentage uncertainty = $0.2/12.0 \times 100\% = 1.7\%$.	1
39	A	A scalar has magnitude only: kinetic energy is a scalar, whereas velocity, acceleration and momentum are vectors.	1
40	B	Averaging repeated readings cancels random scatter in both directions, but a systematic error such as a zero error must be removed by calibration.	1