Cambridge IGCSE™

PHYSICS **0625/43**

Paper 4 Extended Theory **October/November 2024**

MARK SCHEME

Maximum Mark: 80

Published

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Question	Answer	Marks
1(a)(i)	(scalar) does not have direction ***or*** vector has direction	**B1**
1(a)(ii)	(momentum =) mass × velocity	**B1**
1(b)(i)	43 m / s	**A3**
	$F\Delta t = \Delta(mv)$ ***OR*** $F = \Delta(mv) / \Delta t$ ***OR*** $F = ma$ ***OR*** $a = \Delta v / \Delta t$	C1
	$(u=)\ Ft / m$ ***OR*** $(u =)\ (27\,000 \times 1.5) / 950$	C1
1(b)(ii)	straight horizontal line from *y* axis extending to $t = 4.0$ s	**B1**
	straight line from $t = 4.0$ s with negative gradient meeting the x axis (less than half-way between 4.0 and the end of the time axis)	**B1**

Question	Answer	Marks
2(a)	hang mass / weight on the bottom of the spring	**B1**
	use a ruler / metre rule ***AND*** measure / calculate <u>extension</u>	**B1**
	use of $k = F / x$ to calculate the spring constant ***OR*** k is the gradient of load-extension graph	**B1**
	any **one** of: • repeat measurements using different masses / weights and plot a load against extension graph • measure final length and initial length of spring and subtract to obtain (magnitude of) extension / change in length • use a pointer on the bottom of spring to obtain more accurate measurements on ruler	**B1**
2(b)(i)	maximum load that can be applied when the extension is proportional to load ***OR*** the maximum force up to which the extension is proportional to the load	**B1**
2(b)(ii)	(extension of spring Q =) 15 cm or 0.15 m ***AND*** (extension of spring R =) 110 cm or 1.1 m	**B1**
2(b)(iii)	Q ***AND*** extension produced by Q is the right length to allow baby to just reach the floor with feet ***OR*** Q ***AND*** extension produced by R is too big (for gentle bounces in the space provided) ***OR*** R would make the baby collapse on floor (so unsafe) ***OR*** bouncer would have to be hung higher if R was used	**A1**

Question	Answer	Marks
3(a)(i)	good/better absorber (of radiation) ***OR*** bad / poor / worse reflector (of radiation)	**B1**
3(a)(ii)	doesn't work at night / in cloud cover / when there is no sun ***OR*** (sun has) variable output	**B1**
3(b)	any **two** from: • hydroelectric • tidal • wave • wind • geothermal • biofuels	**B2**
3(c)	9.2×10^6 J ***OR*** 9 200 000 J	**A4**
	(temperature rise =) 33 (°C) ***OR*** 43 – 10	C1
	$c = \Delta E / m\Delta\theta$ ***OR*** (E =) $m \times c \times \Delta\theta$ ***OR*** (E =) $40 \times 4200 \times (43 - 10)$ ***OR*** 5.5×10^6 (J)	C1
	$5.5 \times 10^6 \times (100 / 60)$ ***OR*** $5.5 \times 10^6 \times 1.667$ ***OR*** $5.5 \times 10^6 / 0.6$ ***OR*** efficiency $= \frac{\text{useful energy output}}{\text{total energy input}} \times 100\%$	C1

Question	Answer	Marks
4(a)(i)	any **two** correct = 1 mark all **three** correct = 2 marks • speed decreases / gets less / slower • wavelength decreases / gets smaller / shorter • frequency unchanged / stays the same / no effect	**B2**
4(a)(ii)	(n =) sin 45 / sin 30	**B1**
4(a)(iii)	46° ***OR*** 45°	**A1**
	n = 1 / sin c ***OR*** (c =) $\sin^{-1}$ (1 / n) ***OR*** (c =) $\sin^{-1}$ (1 / 1.4) ***OR*** sin c = 1 / n	**M1**
4(b)(i)	total internal reflection ***AND*** i = r for initial reflection	**B1**
	ray reaches end of fibre after a total of 2 or 3 reflections only	**B1**
4(b)(ii)	any **two** from: • internet transmission / (highspeed) broadband • telephone networks • cable TV } ***OR*** telecommunications • endoscope • lasers in surgery • microscopy • military aircraft wiring • imaging (cameras) in industry • inspection of pipes or other hard to reach places	**B2**

Question	Answer	Marks
5(a)(i)	four evenly spaced radial lines touching S ***AND*** no lines inside S	**B1**
	at least one arrow pointing towards S and none incorrect	**B1**
5 (a)(ii)	to the left ***OR*** away from the sphere / S	**B1**
5(a)(iii)	accelerates (due to a resultant force)	**B1**
	(moves) away from the (centre of the) sphere	**B1**
5(b)(i)	like charges repel	**B1**
5(b)(ii)	advantage: more even coat ***or*** less chance of paint particles clumping together ***or*** less chance of creating thicker patches	**B1**
	explain: positive / paint particles are attracted (by the same amount) to all parts of the negative sphere so they spread out ***or*** paint creates a fine mist so spreads out (over the surface)	**B1**
	OR advantage: more durable or better adhesion or cheaper ***or*** high transfer efficiency ***or*** less paint wasted or fewer drips or less paint sag ***or*** less overspray on floor / walls	**(B1)**
	explain: the positive/paint is attracted to the negative sphere / charges and forms a strong(er) bond	**(B1)**
	OR advantage: quicker to paint	**(B1)**
	explain: all surface is painted at the same time without having to turn the sphere / go around the other side owtte	**(B1)**

Question	Answer	Marks
6(a)(i)	any **two** from: • if one resistor fails / breaks the others will still work • each resistor gets the full voltage / 12 V or lower (total) resistance or higher current • higher power	**B2**
6(a)(ii)	any **two** from: • evaporation / water evaporates • energy (from heater) transfers to particles ***OR*** particles gain energy (from the heater) • more energetic particles escape (from water / droplet) • particles leave from the surface (of the water / droplet)	**B2**
6(b)(i)	0.17 A	**A2**
	$R = V / I$ ***OR*** $(I =) V / R$ ***OR*** $(I =) 12 / 70$	C1
6(b)(ii)	610 J ***OR*** 620 J	**A3**
	$E = I \times V \times t$ ***OR*** $(E =) V \times I \times t$ ***OR*** $(E =) 12 \times 0.17 \times 300$	C1
	300 (s) ***OR*** 5×60	C1
6(b)(iii)	chemical	**A1**
6(b)(iv)	39 Ω	**A2**
	$1 / R_T = 1 / R_1 + 1 / R_2$ ***OR*** $1 / R_T = 1 / 90 + 1 / 70$ ***OR*** $(R_T =) 1 / (1 / R_1 + 1 / R_2)$ ***OR*** $(R_T =) 1 / (1 / 90 + 1 / 70)$	C1

Question	Answer	Marks
7(a)(i)	100 (Nm)	**B1**
7(a)(ii)	0.44 m ***OR*** 0.45 m	**A3**
	total clockwise moment = total anticlockwise moment	C1
	(d =) 100 / 225 ***OR*** (d =) 100 / (23 × 9.8) ***OR*** 100 / (23 × g × d)	C1
7(b)(i)	(barrier arm) rotates anticlockwise ***OR*** (RHS of barrier arm) moves upwards	**B1**
	(when the switch is closed) coil produces a magnetic field ***OR*** coil / core becomes an (electro)magnet	**B1**
	(coil/core/electromagnet) attracts (iron) bar (downwards)	**B1**
7(b)(ii)	statement: (barrier arm) moves slower / goes up (more) slowly	**B1**
	explanation: decreases strength of (magnetic) field / smaller force / smaller moment	**B1**
7(b)(iii)	steel would become permanently magnetised	**B1**
	(so when switch is opened) barrier would stay up ***or*** bar A will stay attracted (to soft iron core)	**B1**

Question	Answer	Marks
8(a)(i)	fission is splitting of <u>nuclei</u> ***OR*** fusion is the joining of <u>nuclei</u>	**B1**
8(a)(ii)	$^{10}_{5}B + {}^{1}_{0}n \rightarrow {}^{7}_{3}Li + {}^{4}_{2}\alpha$	
	B: proton number 5 and nucleon number 10	**B1**
	Li: proton number 3 and nucleon number 7	**B1**
	α: proton number 2 and nucleon number 4	**B1**
8(b)	alpha is less penetrating / has shorter range (than gamma)	**B1**
	alpha more easily absorbed / stopped by cancer / tumour cells ***or*** won't travel beyond cancer cells ***or*** so won't damage other / healthy cells	**B1**
	OR	
	alpha highly ionising (than gamma)	**(B1)**
	will destroy / damage cancer cells more easily	**(B1)**
8(c)	any **one** from: • reduce exposure time • increase distance between source and living tissue ***or*** stand in another room whilst radiation is emitted • use shielding ***or*** wear a <u>lead</u> apron ***or*** stand behind a glass partition / lead barrier	**B1**

Question	Answer	Marks
9(a)	Q and V	**B1**
9(b)	red shift	**B1**
	(galaxy) moving away / receding (from Earth/us)	**B1**
9(c)	galaxies further away (are receding) with higher speed ***OR*** galaxies further away have greater redshift	**B1**
	Universe is expanding	**B1**

Question	Answer	Marks
10(a)	any **two** from: • (most of the) hydrogen has been converted to helium ***or*** hydrogen begins to run out • (star expands and) forms a red supergiant • (red supergiant) explodes as a supernova (forming a nebula)	**B2**
	core (of red supergiant collapses and) forms black hole ***OR*** a black hole forms at the centre (of the supernova/nebula)	**B1**
10(b)(i)	the distance travelled (in the vacuum of space) by light in one year	**B1**
10(b)(ii)	7.4×10^{16} km	**A2**
	9.5×10^{15} (m) or 9.5×10^{12} (km)	C1