

Cambridge IGCSE™

PHYSICS**0625/42**

Paper 4 Extended Theory

February/March 2024

MARK SCHEME

Maximum Mark: 80

Published

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Question	Answer	Marks
1(a)	constant speed	B1
	constant / uniform deceleration	B1
	stationary	B1
1(b)(i)	$7.1 \times 10^5 \text{ J}$ OR $710\,000 \text{ J}$ OR 710 kJ	A2
1(b)(ii)	$E_k = \frac{1}{2}mv^2$ OR ($E_k =$) $\frac{1}{2}mv^2$ OR $\frac{1}{2} \times 18\,000 \times (8.9)^2$	(C1)
	$31\,000 \text{ N}$ OR 31 kN	A3
	$W = Fd$ OR ($F =$) W / d OR $710\,000 / 23$	(C1)
	$F = 710\,000 / 23$	(C1)

Question	Answer	Marks
2(a)	(Impulse $\Rightarrow$) force $\times$ time (for which force acts)	B1
2(b)(i)	$F\Delta t = \Delta\{mv\}$ OR ($F =$) $\Delta\{mv\} / \Delta t$ OR ($F =$) $\Delta p / t$	M1
2(b)(ii)	$\{2800 \times 1400\} (/ 1) = 3\,920\,000 \text{ N}$ OR $\{2800 \times 1400\} (/ 1) = 3920 \text{ kN}$	A1
	$4.0 \times 10^5 \text{ kg}$ OR $400\,000 \text{ kg}$	A3
	(at maximum mass) force = weight of rocket OR $F = mg$	(C1)
	($m =$) F / g OR $3.9 \times 10^6 / 9.8$ OR $4(.0) \times 10^N (\text{kg})$	(C1)

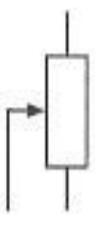
Question	Answer	Marks
3(a)(i)	$2.0 \times 10^5 \text{ Pa}$ OR $200\,000 \text{ Pa}$ OR 200 kPa	A2
	$(P =) F / A$ OR $13\,000 / (0.016 \times 4)$	(C1)
3(a)(ii)	Any four from: - friction between road and tyre - temperature of air / tyre increases - particles (of air in tyre) move faster - particles (of air) collide harder with the <u>walls</u> (of the tyre) OR particles (of air) collide more frequently with the <u>walls</u> (of the tyre) - force (on the tyre wall) increases, AND <u>area</u> (of tyre) is constant (so tyre pressure increases)	B4
3(b)	(maximum number =) 34	A3
	$pV = \text{constant}$ OR $\{2.0 \times 10^6 \times 0.026\} = 1.0 \times 10^5 \times V_2$	(C1)
	$V_2 = 0.52 \text{ (m}^3\text{)}$ OR $(V_2 =) \{2.0 \times 10^6 \times 0.026\} / 1.0 \times 10^5$ OR (number of balloons =) $\{2.0 \times 10^6 \times 0.026\} / \{1.0 \times 10^5 \times 0.015\}$	(C1)

Question	Answer	Marks
4(a)	energy transferred per unit mass per unit temperature change	A2
	(thermal) energy (transferred) per unit temperature change	(C1)
4(b)(i)	$(m =) 2.2 \text{ kg}$	A2
	$m = \rho V$ in any form OR 910×0.0024	(C1)
4(b)(ii)	$7.0 \times 10^5 \text{ J}$ OR $700\,000 \text{ J}$	A2
	$c = \Delta E / \{ m \Delta \theta \}$ OR $(\Delta E =) mc \Delta \theta$ OR $2.2 \times 2000 \times 160$ OR $2.184 \times 2000 \times 160$	(C1)

Question	Answer	Marks
4(b)(iii)	1700 W	A2
	$(P =) E / t$ OR $700\,000 / 7 \times 60$ OR $704\,000 / 7 \times 60$ OR $698\,880 / 7 \times 60$	(C1)

Question	Answer		Marks
5(a)(i)	application	region of electromagnetic spectrum	B3
	cancer treatment	gamma rays	
	bluetooth	radio waves	
	optical fibres	infrared	
	security marking	ultraviolet	
	sterilising food	gamma rays	
	wireless internet	Microwaves	
5(a)(ii)	3.0 × 10 ⁸ (m / s) OR 300 000 000 (m / s)		B1
5(b)(i)	three crests parallel to the barrier		B1
	same wavelength as wave after the gap		B1
5(b)(ii)	central part of crest (parallel to the (gap in the) barrier) is straight		B1
	crests have curved ends		B1

Question	Answer	Marks
6(a)	ray from top of object to tip of image	M1
6(b)	line labelled L drawn perpendicular to principal axis at its intersection with previous ray ray from top of O parallel to principal axis to lens AND ray from lens to tip of I OR ray from tip of I parallel to principal axis to lens AND ray from lens to top of O	A1 B1
6(c)	2.1 cm	B1
	virtual	B1
	upright	B1

Question	Answer	Marks
7(a)		B1
7(b)(i)	1.5 V $V_{\text{out}} / V_R = R_{\text{out}} / R$ OR $V_R = 3 V_{\text{out}}$	A2 (C1)
7(b)(ii)	0.51 C $I = Q / t$ OR $(Q =) It$ OR $1.7 \times 10^{-3} \times 300$	A2 (C1)

Question	Answer	Marks
8(a)(i)	three concentric circles centred on X	B1
	second and third circles further apart than first and second circles	
	direction of arrows clockwise	
8(a)(ii)	strength of magnetic field increases	B1
	its direction reverses	B1
8(b)	any three from: • $P = I^2 R$ OR power (loss) = $I^2 R$ • (high voltage allows) low current (so at same power output, less power / energy lost) • thin wires have high resistance (so more power / energy lost) • (low) current has a greater effect (on efficiency) than (high) resistance (of the thin wires)	B3

Question	Answer	Marks
9(a)(i)	most of the atom is empty space	B1
9(a)(ii)	any two from: 1 the nucleus is very small 2 mass of gold nucleus is much greater than mass of alpha particle 3 the nucleus is positively charged	B2
	corresponding explanation to conclusion: 1 not many alpha particles pass close to the nucleus / owtte 2 large force between alpha and nucleus (has bigger effect on small mass of alpha) 3 alpha particles are positively charged, AND force is repulsive	
9(b)(i)	(in the nucleus a) neutron is changed into a proton (and an electron which is the emitted β -particle)	B1

Question	Answer	Marks
9(b)(ii)	22 μg	A3
	(87 years is) three half-lives OR $25 / 8$ OR $87 / 29 = 3$ (half lives)	(C1)
	1 / 8th (of the strontium remains) OR $25 / 8$ (decays) OR 3.125 seen	(C1)

Question	Answer	Marks
10(a)(i)	position A and / or E	B1
	position G	B1
10(a)(ii)	1 month	B1
10(b)(i)	110 000 (km/h)	A3
	$(v =)2\pi r / T$	(C1)
	$T = 365 \times 24\text{h}$ OR $2\pi \times 1.5 \times 10^8 / 365 \times 24$	(C1)
10(b)(ii)	500 s	A2
	$v = s / t$ OR $(t =) s / v$ OR $1.5 \times 10^{11} / 3.0 \times 10^8$	(C1)

Question	Answer	Marks
11(a)	inward force / force of gravitational attraction, is balanced by an outward force / force due to fusion reactions	B1
11(b)(i)	ratio of the speed at which the galaxy is moving away from the Earth/observer to its distance (from the Earth/observer)	A2
	ratio of speed (of a galaxy) to distance (away from observer)	(C1)

Question	Answer	Marks
11(b)(ii)	(age of universe $\Rightarrow d/v = 1/H_0$ OR age (of universe) $= 1/H_0$	B1
11(b)(iii)	4.5×10^{17} (s)	B1