

Cambridge IGCSE™

PHYSICS**0625/41**

Paper 4 Theory (Extended)

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MARK SCHEME

Maximum Mark: 80

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This document consists of **12** printed pages.

Question	Answer	Marks
1(a)	(acceleration is) rate of change in velocity OR change in velocity per unit time OR ($a =$) $\Delta v / \Delta t$	B1
1(b)	0.021 N	A2
	$F = ma$ OR ($F =$) ma OR 0.0075×2.8	C1
1(c)(i)	any four from: • (acceleration) decreases • (acceleration decreases) to zero (at approximately 0.03 s) • resistive force increases / resistance increases (as speed / velocity increases) • resultant force (downwards) decreases • (until) terminal velocity / constant speed (is reached) • (when) resistive force = weight OR resultant force is zero OR forces are balanced	B4
1(c)(ii)	tangent drawn at $t = 0.010$ s	M1
	$1.2 \text{ m / s}^2 \leq \text{acceleration} \leq 1.8 \text{ m / s}^2$	A2
	($a =$) gradient of tangent OR ($a =$) $\{\Delta y / \Delta x\}$	C1

Question	Answer	Marks
2(a)(i)	0.16 m / s	A3
2(a)(ii)	conservation of momentum OR $m_P v_P = m_Q v_Q$ OR $2.7 \times v_P = 1.2 \times 0.36$ OR ($m_Q v_Q =$) 0.432 seen	C1
	($v_P =$) $m_Q v_Q / m_P$ OR $1.2 \times 0.36 / 2.7$	C1
	0.078 J	A3
2(b)	(k.e. =) $\frac{1}{2} m v^2$ OR (k.e. =) $\frac{1}{2} \times 1.2 \times 0.36^2$	C1
	(k.e. =) $\frac{1}{2} \times 1.2 \times 0.36^2$	C1
	(from) elastic (energy store in the compressed spring)	B1
	to kinetic (as final energy store of trolleys)	B1

Question	Answer	Marks
3(a)	(they / particles in ice) vibrate (about a fixed position) OR particles in water move throughout the liquid	B1
3(b)(i)	conduction	B1
3(b)(ii)	2.6×10^4 J	A2
3(b)(iii)	$c = (\Delta)E / m\Delta\theta$ OR ($\Delta E =$) $mc\Delta\theta$ OR $0.34 \times 4200 \times 18$ OR 2.6×10^N (J)	C1
	density (of water next to the ice) increases	B1
	cold(er) water sinks	B1
	warm(er) water replaces cold water OR warm(er) water rises OR making a convection <u>current</u>	B1

Question	Answer	Marks
3(b)(iv)	internal energy decreases AND (average) kinetic energy (of particles) decreases	A2
	kinetic energy decreases	C1

Question	Answer	Marks
4(a)(i)	(point on principal axis) where rays of light parallel (to the principal axis, incident on converging lens)	B1
	(rays) meet / converge after passing through lens / refraction	B1
4(a)(ii)	X marked between one of the focal points and the lens AND E marked on other side of lens	B1
4(a)(iii)	virtual AND upright	B1
4(b)(i)	$2.0 \times 10^8 \text{ m/s}$	A2
	$n = c / v_g$ OR ($v_g =$) c / n OR ($v_g =$) $3(.0) \times 10^8 / 1.5$	C1
4(b)(ii)	(wavelength) decreases	B1
4(c)	long-sightedness	B1
	it moves the image towards the lens / back of the eye / retina OR reduces / shortens focal length of (combined lens)	B1
	(converging lens) focuses image on back of eye / retina	B1

Question	Answer	Marks
5(a)	any two from: (longitudinal) vibration / oscillation in wave parallel to propagation direction / direction of travel - transverse wave vibrates / oscillates perpendicular to propagation direction / direction of travel (longitudinal) consists of compressions and rarefactions - transverse wave consists of crests / peaks and troughs (longitudinal) needs a medium (to travel)	B2
5(b)(i)	P-wave AND it is longitudinal	B1
5(b)(ii)	$1.8 \times 10^4 \text{ m}$ OR 18 km	A2
	1.5λ OR $1.5 \times 1.2 \times 10^4$ OR $1.8 \times 10^4 \text{ N}$	C1
5(b)(iii)	$v = f\lambda$ OR $v = \lambda / t$ OR λ / v OR $f = 4600 / 1.2 \times 10^4$ OR $(t / 5 =) 1.2 \times 10^4 / 4600$ OR $(t =) 6(0) \times 10^4 / 4600$	M1
	13 s	A2
	$t = 1 / f$ OR (time for one wave =) 2.6 (s)	C1

Question	Answer	Marks
6(a)(i)	(region) where (an electric) charge experiences a force OR (region) where a force acts on a (an electric) charge	B1
6(a)(ii)	at least four straight radial lines AND evenly spaced (by eye) surrounding sphere	B1
	four lines touching sphere AND no lines inside sphere	B1
	at least one arrowhead towards sphere AND no incorrect arrowheads	B1

Question	Answer	Marks
6(b)(i)	electrons move (through the wire) from the sphere OR electrons move (through the wire) to(towards) the Earth	A2
	electrons move (in the wire)	C1
6(b)(ii)	2.5 A	A3
	$I = Q / t$ OR ($I =$) Q / t OR $3.5 \times 10^{-10} / 1.4 \times 10^{-10}$	C1
	2.5×10^N	C1

Question	Answer	Marks
7(a)	(electrical) work done moving a unit charge around a (complete) circuit	A2
	work done AND moving a charge (in a circuit)	C1
7(b)(i)	correct symbols for five cells in series	B1
	correct symbols for variable resistor AND fixed resistor	B1
	cells, variable resistor and fixed resistor connected in series	B1
7(b)(ii)	<u>curve</u> with negative gradient of decreasing magnitude from 0Ω to 150Ω AND does not reach the x-axis	A2
	curve / line with negative gradient from 0Ω to 150Ω	C1
	y-axis labelled 0.25 where candidate's line meets the y-axis OR the mark on the y-axis labelled 0.25	A2
	$R = V / I$ OR ($I_{\max} =$) V / R OR $7.5 / 30$	C1

Question	Answer	Marks
8(a)(i)	${}^0_{-1}\beta$	B1
	${}^{208}_{82}\text{Pb}$	B1
	 ${}^{208}_{82}\text{Pb}$	B1
8(a)(ii)	γ -emission / it consists of waves / rays OR γ -emission has no mass / charge	B1
8(a)(iii)	(it contains) too many / excess of neutrons OR (nucleus is) <u>too</u> heavy	B1
8(b)	smooth curve (through magnetic field) AND labelled β	B1
	path towards bottom of page AND no upward component AND labelled β	B1
	(continuation of beam along) horizontal line through magnetic field AND labelled γ	B1

Question	Answer	Marks
9(a)	ultraviolet AND visible light AND infrared only	A2
	any two from: ultraviolet; visible light; infrared and no more than one incorrect addition	C1
9(b)	$1.5 \times 10^{11}\text{m}$	A2
	$v = s / t$ OR ($s =$) vt OR $3.0 \times 10^8 \times 500$ OR 1.5×10^9	C1
9(c)(i)	any two from: - cloud / nebula / it collapses - due to (internal) gravitational attraction (internal) temperature increases	B2



Question	Answer	Marks
9(c)(ii)	any three from: • (nuclear) fusion / nuclear reactions (in the star) • forces are balanced • gravitational force is inwards • outwards force is due to high temperature	B3