



Cambridge IGCSE™

PHYSICS**0625/41**

Paper 4 Extended Theory

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MARK SCHEME

Maximum Mark: 80

Published

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

Question	Answer	Marks
1(a)	negative acceleration or decrease in velocity	B1
	<u>change</u> in velocity per unit time or rate of <u>change</u> of velocity	B1
1(b)	delay in applying brakes or (human) reaction time or foot not removed from accelerator	B1
1(c)(i)	gradient or slope	B1
1(c)(ii)	20.5 m / s $\leq$ answer $\leq$ 23.5 m / s	A2
	the coordinates at one point on curve (e.g. (0.50, 11)) and (upper) time coordinate $\leq$ 1.0 s	C1
1(d)(i)	air resistance / air friction acts on the car	B1
1(d)(ii)	air resistance / resultant / resistive force decreases and as speed decreases / car decelerates	A2
	air resistance / resultant / resistive force decreases / changes	C1

Question	Answer	Marks
2(a)	gravitational potential energy	B1
2(b)(i)	1.6×10^6 Pa	A3
	($p =$) $h\rho g$ (in any form) or $150 \times 1000 \times 10$ or 1.5×10^6	C1
	1.5×10^6 or $1.0 \times 10^5 + \{150 \times 1000 \times 10\}$ or $1.0 \times 10^5 + 1.5 \times 10^6$ or 1.6×10^6	C1
2(b)(ii)	5.6×10^6 N	A2
	($F =$) pA (in any form) or $1.6 \times 10^6 \times 3.5$	C1

Question	Answer	Marks
2(c)	speed (of water) remains constant	B1
	otherwise density would decrease or gaps would appear in the water or volume / density does not change or liquids incompressible or water enters / leaves at constant rate or quantity of water remains constant	B1

Question	Answer	Marks
3(a)	fast(er) / high(er) speed / (more) energetic molecules escape (into air)	B1
	<u>average speed</u> / <u>average kinetic energy</u> of molecules decreases	B1
	temperature related to speed / energy of molecules or slow(er) / low(er) speed / less energetic molecules remain (in water)	B1
3(b)	any three from: atoms / ions vibrate (vibrating) atoms / ions hit electrons electrons propelled / travelling through metal / moving through metal electrons hit (distant) atoms <u>free</u> electrons / <u>delocalised</u> electrons mentioned	B3

Question	Answer	Marks
4(a)(i)	two / three wires of at least two different metals	B1
	one junction in sulfur	B1
	the other junction in ice-water mixture / at room temperature and one of the wires must be from the first junction	B1
	labelled voltmeter / voltmeter symbol correctly connected	B1

Question	Answer	Marks
4(a)(ii)	measure e.m.f.	B1
	how to find temperature from e.m.f. (e.g. use calibration graph or calculation or table)	B1
4(b)	measures high temperatures / wires do not melt / rapid response / robust / small heat capacity / electrical output / (can be) remote from observer / direct input to computer	B1

Question	Answer	Marks
5(a)	<u>temperature</u> at which liquid becomes a gas or liquid and gas exist together	B1
5(b)(i)	$1.8 \times 10^5 \text{ J}$ $(E =) VIt$ (in any form) or $230 \times 13 \times 60$ or $230 \times 13 \times 3000$	A2 C1
5(b)(ii)	$9.1 \times 10^{-3} \text{ kg / s}$ $(\Delta T =) 100 - 22$ or 78 or $(\Delta T =) 100 - 22$ or 78 or (rate =) $P / c\Delta T$ (in any form) or $m = E / c\Delta T$ and $E = Pt$	A4 C1 C1
	$1.8 \times 10^5 / (4200 \times 78 \times 60)$ or 5.5×10^N or $9.1 / 9.2 \times 10^N$ or $3000 / (4200 \times 78)$ or $230 \times 13 / (4200 \times 78)$ or $9.1 / 9.2 \times 10^N$	C1
5(c)	1 if the tap becomes live or if the (live) cable touches the (metal) tap there is a current to earth / in the earth wire (which blows the fuse)	B1
	2 the current (in earth wire) is large and fuse melts / blows / stops current / breaks circuit	B1 B1

Question	Answer	Marks
6(a)	any three from: radiation light / infrared / electromagnetic (radiation) travel through space / vacuum absorbed by road	B3
6(b)	road / black surfaces are good absorbers (of radiation) or sea is a poor absorber (of radiation)	B1
6(c)(i)	they / molecules speed up or gain <u>kinetic</u> energy	B1
	they / molecules move further apart	B1
6(c)(ii)	density (of air above road) decreases or density (of hot air) decreases	B1
	air (above land / road) rises or air (that is hot) rises	B1
	air (above road) replaced by cool air / air from above sea	B1

Question	Answer	Marks
7(a)	(all the light) meets (at a point) or is focused or intersects	A2
	(all the light) travels towards a point	C1
	it then diverges or spreads out (from that point) or point of convergence is on XY / at F / the focal point / principal focus / 3.0 cm from lens	B1
7(b)	two marked points on XY 3.0 cm from centre of lens and one on left and one on right and each labelled F	B1

Question	Answer	Marks
7(c)(i)	two of these rays from tip of N drawn: ray (that seems to come) from left-hand principal focus and emerges from lens paraxially paraxial ray to lens and then towards right-hand principal focus ray towards / through centre of lens	M2
7(c)(ii)	two rays traced back to intersection and line from intersection to axis and line labelled I	A1
7(c)(iii)	virtual and light / rays do not pass through I or virtual and light / rays only seem to come from I or virtual and produced by diverging rays virtual and (real) rays do not meet magnifying glass	B1

Question	Answer	Marks
8(a)	0.27 J ($v =$) at (in any form) or 10×0.67 or 6.7 (m / s) 6.7 (m / s) ($KE =$) $\frac{1}{2}mv^2$ (in any form) or $\frac{1}{2} \times 0.012 \times (10 \times 0.67)^2$ or $\frac{1}{2} \times 0.012 \times 6.7^2$	A4 C1 C1 C1
8(b)(i)	<u>magnetic field</u> / <u>magnetic field</u> lines cut the copper / tube / it (or vv.) electromagnetic <u>induction</u> occurs or e.m.f. <u>induced</u>	B1 B1

Question	Answer	Marks
8(b)(ii)	(upwards / opposing) force on magnet force / magnetic field / e.m.f. / current opposes the change (producing it) / opposes motion or force on magnet due to <u>magnetic field</u> caused by <u>current</u> in tube	B1 B1

Question	Answer	Marks
9(a)	digital (signal) consists of 1(s) and 0(s) / high value and low analogue (signal) is (continuously) variable (in magnitude)	B1 B1
9(b)	NOR (gate) and 	B1
9(c)	  (i.e. NOR gate symbol with two inputs joined seen)	A2 C1

Question	Answer	Marks
10(a)(i)	same number of protons / both have one proton	B1
10(a)(ii)	it / hydrogen-3 / ${}^3_1\text{H}$ has one more neutron different number of neutrons / nucleons	A2 C1

Question	Answer	Marks
10(b)(i)	(high temperature produces) high (kinetic) energy / momentum / speed / ability to do large quantity of work	B1
	they repel each other	B1
	are positively charged / have like charges or need to come close together	B1
10(b)(ii)	${}^4_2\text{X}$ or ${}^4_2\text{He}$ or ${}^4_2\alpha$	B1
	${}^1_0\text{n}$ and no other particle	B1