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Cambridge International General Certificate of Secondary Education

PHYSICS **0625/42**

Paper 4 Extended Theory **October/November 2017**

MARK SCHEME

Maximum Mark: 80

Published

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Question	Answer	Marks
1(a)	$\rho = m / V$ in any form OR (m =) ρV OR *(m =)* 9000 × 7.5 × 10^{-5}	**C1**
	(m =) 0.68 kg **accept** 680 g	**A1**
1(b)(i)	$W = m g$ in any form or (W =) $m g$ OR (W =) 0. 68 × 10	**C1**
	(W =) 6.8 N	**A1**
1(b)(ii)	any **one** of: weight has direction / mass does not weight is a vector / mass is not weight varies / mass does not mass is amount of matter weight is a force / mass is not	**B1**
1(c)(i)	$\rho = h \rho g$ in any form OR (ρ =) $\rho / h g$ OR (ρ =) 560 / (0.027 × 10)	**C1**
	(ρ =) 2.1 × 10^3 kg / m^3	**A1**
1(c)(ii)	explains why there is a resultant downward force	**B1**

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Question	Answer	Marks
2(a)	accelerate / increase speed OR decelerate / decrease speed OR stop	**B1**
	change direction / move in a curve o.w.t.t.e.	**B1**
2(b)	change of shape OR size	**B1**
2(c)(i)	$F = ma$ in any form OR (a =) F / m OR (a =) 3500 / 1400	**C1**
	(a =) 2.5 m / s^2	**A1**
2(c)(ii)	$a = (v - u) / t$ in any form OR (t =) $(v - u) / a$ OR (t =) (30 – 0) / 2.5 OR 30 / 2.5	**C1**
	(t =) 12 s	**A1**
2(c)(iii)	friction / air resistance / drag	**B1**

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Question	Answer	Marks
3(a)	suitable fuel for a power station	**B1**
	any **three** from five: • thermal energy / heat (from fuel) • water / steam / gas heated OR steam produced • (steam / gas) turns / moves / drives turbine • (turbine) turns / moves / drives generator • 2 correct energy transfers	**B3**
3(b)	sun is energy source for plants / living matter (to grow) o.w.t.t.e.	**B1**
	plant / animal (remains compressed) into fuel OR carbon / chemical energy stored / trapped in plant / animal (remains)	**B1**
3(c)	not renewable (as fuel is consumed)	**M1**
	could only be replaced over very long time period (e.g. clearly > 50 years)	**A1**

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Question	Answer	Marks
4(a)(i)	any **one** of these six: • <u>evaporation</u>: at <u>surface</u> OR no bubbles form) pair 1 • <u>boiling</u>: throughout liquid OR bubbles form) • <u>evaporation</u>: at any temperature OR no heat needed) pair 2 • <u>boiling</u>: at specific temperature OR heat needed) • <u>evaporation</u>: affected by draught / surface area) pair 3 • <u>boiling</u>: not affected by draught / surface area)	**B1**
	any **one** pair of points	**B1**
4(a)(ii)	(it / rate) increases AND {more molecules have enough energy to escape OR break bonds}	**B1**
4(b)(i)	remains constant	**B1**
4(b)(ii)	$E = m\,l$ in any form OR (E =) $m\,l$	**C1**
	P = energy / t in any form OR (P =) energy / t	**C1**
	($P = 0.095 \times 2.3 \times 10^6 / (12 \times 60)$ =) 300 W	**A1**

Question	Answer	Marks
5(a)	any **three** of these five: • any sensible mention of the sun (as source of energy) • (thermal / heat / *IR* / electromagnetic) radiation • white (or clearly implied) surfaces absorb less or don't absorb • white (or clearly implied) surfaces reflect more • to keep house cooler OR to reduce thermal energy / heat transferred to house	**B3**
5(b)	decreases	**B1**

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Question	Answer	Marks
6(a)(i)	diffraction	**B1**
6(a)(ii)	4 arcs between dashed lines centred vertically at centre of gap	**B1**
	any 3 wavelengths same as incident wavelengths including wavelength from wavefront in gap	**B1**
6(b)(i)	wavefronts have smaller angular width OR do not extend as far as dashed lines OR less (angular) spread	**B1**
6(b)(ii)	increased wavelength OR more spreading	**B1**
	use of $v=f\lambda$ OR increased wavelength	**B1**

Question	Answer	Marks
7(a)	real (answers in any order for **7(a)**)	**B1**
	enlarged OR magnified	**B1**
	Inverted OR upside down	**B1**
7(b)(i)	1st straight incident ray from close to point object to mirror correctly reflected, $i = r$	**M1**
	2nd straight incident ray <u>from point object</u> to mirror correctly reflected, $i = r$	**A1**
7(b)(ii)	BOTH reflected rays extended back to intersect behind mirror	**M1**
	BOTH reflected rays extended back <u>in straight lines</u> AND I in correct position AND {labelled OR clearly indicated}	**A1**

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Question	Answer	Marks
8(a)	$R_S = R_A + R_B$ in any form OR (R_S =) $R_A + R_B$ OR (R_S =) 4 + 8	**C1**
	(R_S =)12 (Ω)	**C1**
	(R_P =)1 / (1 / R_S + 1 / R_C) in any form OR (R_P =) $R_S R_C$ / (R_S + R_C) OR (R_P =) 1 / (1 / 12 + 1 / 6) OR (R_P =) (6 × 12) / 18	**C1**
	(R_P =) 4.0 Ω	**A1**
8(b)	V_8 = supply V × (8 / 12) OR = 24 × (8 / 12)	**C1**
	(V_8 =) 16 V	**A1**
	OR alternative route	
	I_8 = supply V / 12 OR = 24 / 12 OR = 2 (A)	**(C1)**
	(V_8 = 2 × 8 =) 16 V	**(A1)**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td rowspan="3">9(a)(i)</td><td>A (fixed)resistor
B thermistor
C L.E.D. OR light emitting diode</td><td></td></tr>
<tr><td>2 correct</td><td>B1</td></tr>
<tr><td>3 correct</td><td>B1</td></tr>
<tr><td>9(a)(ii)</td><td>any four from six:
• if cold / hot resistance of thermistor high / low
• if cold / hot voltage (across) thermistor high / low
• if cold / hot voltage of input to LED high / low
• if cold / hot there is current / no current in LED
• if cold LED lights / brighter
• if hot LED does not light / dimmer</td><td>B1</td></tr>
<tr><td rowspan="4">9(b)</td><td><table>
<tr><th>Row</th><th>A</th><th>B</th><th>C</th><th>(output of AND)</th><th>X</th></tr>
<tr><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>2</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>4</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>5</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>6</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>7</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>8</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
</table></td><td></td></tr>
<tr><td>row 1 of X correct – answer 0</td><td>B1</td></tr>
<tr><td>rows 2 AND 3 of X correct – both answers 0</td><td>B1</td></tr>
<tr><td>rows 4–8 of X correct – all answers 1</td><td>B1</td></tr>
</table>

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Question	Answer	Marks
10(a)(i)	clockwise arrows on at least 3 circles	**B1**
10(a)(ii)	(magnetic) field becomes weaker / decreases (as distance from wire increases)	**B1**
10(b)(i)	any **four** from these six: • charge flows OR current in solenoid / wire / circuit • solenoid becomes magnet / magnetised • bolt becomes magnet / magnetised • (such that) unlike poles (of solenoid and bolt are) facing o.w.t.t.e. • bolt is attracted • bolt moves / (door) locks / spring stretched	**B4**
10(b)(ii)	solenoid OR bolt no longer magnetised OR bolt no longer attracted	**B1**
	(spring contracts and pulls) bolt back / bolt returns (to original position) / (door) unlocked	**B1**

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Question	Answer	Marks
11(a)	nucleon numbers balance each side of equation	**B1**
	proton numbers balance each side of equation	**B1**
	$^{0}_{-1}\beta$	**B1**
11(b)(i)	background radiation OR radiation from the environment	**B1**
	rocks / ground / buildings / food / space / weapons testing / nuclear accidents or waste / sun / air / radon / argon	**B1**
11(b)(ii)	random (variation)	**B1**
11(b)(iii)	clear evidence of subtracting 23 from (original) count	**C1**
	clear evidence of dividing original / corrected count by 4	**A1**
	clear evidence of adding 23 correctly to result after division	**A1**

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