

2007 Physics

Intermediate 2

Finalised Marking Instructions

© Scottish Qualifications Authority 2007

The information in this publication may be reproduced to support SQA qualifications only on a non-commercial basis. If it is to be used for any other purposes written permission must be obtained from the Assessment Materials Team, Dalkeith.

Where the publication includes materials from sources other than SQA (secondary copyright), this material should only be reproduced for the purposes of examination or assessment. If it needs to be reproduced for any other purpose it is the centre's responsibility to obtain the necessary copyright clearance. SQA's Assessment Materials Team at Dalkeith may be able to direct you to the secondary sources.

These Marking Instructions have been prepared by Examination Teams for use by SQA Appointed Markers when marking External Course Assessments. This publication must not be reproduced for commercial or trade purposes.

Physics – Marking Issues

The current in a resistor is 1.5 amperes when the potential difference across it is 7.5 volts. Calculate the resistance of the resistor.

1.	Answers V=IR 7·5=1·5R R=5·0 Ω	Mark + Comment $\binom{1}{2}$ $\binom{1}{2}$ (1)	Issue Ideal answer
2.	5·0 Ω	(2) Correct answer	GMI 1
3.	5.0	(1 ¹ / ₂) Unit missing	GMI 2 (a)
4.	4·0 Ω	(0) No evidence/wrong answer	GMI 1
5.	Ω	(0) No final answer	GMI 1
6.	$\mathbf{R} = \frac{V}{I} = \frac{7 \cdot 5}{1 \cdot 5} = 4 \cdot 0 \Omega$	(1 ¹ / ₂) Arithmetic error	GMI 7
7.	$\mathbf{R} = \frac{V}{I} = 4.0 \Omega$	(1/2) Formula only	GMI 4 and 1
8.	$\mathbf{R} = \frac{V}{I} = \underline{\qquad} \Omega$	(¹ / ₂) Formula only	GMI 4 and 1
9.	$\mathbf{R} = \frac{V}{I} = \frac{7 \cdot 5}{1 \cdot 5} = \underline{\qquad} \Omega$	(1) Formula + subs/No final answer	GMI 4 and 1
10.	$R = \frac{V}{I} = \frac{7.5}{1.5} = 4.0$	(1) Formula + substitution	GMI 2 (a) and 7
11.	$R = \frac{V}{I} = \frac{1.5}{7.5} = 5.0 \Omega$	(¹ / ₂) Formula but wrong substitution	GMI 5
12.	$R = \frac{V}{I} = \frac{75}{1.5} = 5.0 \Omega$	(¹ / ₂) Formula but wrong substitution	GMI 5
13.	$R = \frac{I}{V} = \frac{7.5}{1.5} = 5.0 \Omega$	(0) Wrong formula	GMI 5
14.	$V = IR 7.5 = 1.5 \times R R = 0.2 \ \Omega$	(1 ¹ / ₂) Arithmetic error	GMI 7
15.	$V = IR$ $R = \frac{I}{V} = \frac{1.5}{7.5} = 0.2 \Omega$	(1/2) Formula only	GMI 20

2007 Physics Intermediate 2

Marking scheme

Section A

1.	E	11.	D
2.	В	12.	С
3.	Е	13.	В
4.	В	14.	А
5.	А	15.	С
6.	В	16.	D
7.	С	17.	С
8.	D	18.	D
9.	В	19.	Е
10.	D	20.	С

2007	' Physi	ics Intermediate 2			
Sample Answer and Mark Allocation				Notes	Marks
21.	(a)	(i) $d = v t$ 3.2 = v × 20 v = 0.16 m/s	$(\frac{1}{2})$ $(\frac{1}{2})$ (1)		2
		(ii) $W = m g$ $W = 60 \times 10$ W = 600 N	$(\frac{1}{2})$ $(\frac{1}{2})$ (1)		2
		(iii) $E_P = m g h$ $E_P = 60 \times 10 \times 3.2$ $E_P = 1920 J$	$\binom{1/2}{1/2}$ $\binom{1/2}{1}$ $\binom{1}{1}$		2
	(b)	(i) $E_{K} = E_{P}$ $1920 = \frac{1}{2} \times 60 \times v^{2}$ v = 8 m/s	$(\frac{1}{2})$ $(\frac{1}{2})$ (1)		2
		 (ii) (actual speed) less air resistance during fall or not all E_P changes to E_K 	(1) (1)		2
					Total 10

Sample Ar	nswer and Mark Allocation	Notes	Marks
22. (a)	measure a distance $(\frac{1}{2})$ using a tape/rule/trundle wheel $(\frac{1}{2})$ measure time to travel this distance $(\frac{1}{2})$ with stopwatch/clock $(\frac{1}{2})$ use formula distance = average speed × time to $(\frac{1}{2})$ calculate average speed (1)		3
(b)	(i) $a = \frac{v - u}{t}$ (¹ / ₂)		
	$a = \frac{0-8}{2.5}$ (1/2)		
	$a = -3 \cdot 2 m/s^2 \tag{1}$		2
speed (m/s)	(ii) axes (¹ / ₂) shape (¹ / ₂) values (¹ / ₂)(¹ / ₂)		
	0 3 5.5 time (s)		2
	(iii) distance = area under graph $= (8 \times 3) + (\frac{1}{2} \times 2 \cdot 5 \times 8)$ $= 34m$ (1) (1)		2
			Total 9

Sam	ple Ar	nswer and Mark Allocation	Notes	Marks
23.	(a)	(i) $E_{\rm H} = c \ m \ \Delta T$ (½) $E_{\rm H} = 4180 \times 10 \times 80$ (½) $E_{\rm H} = 3.34 \times 10^6 \ J$ (1)		2
		(ii) $E = P t$ (1/2) $3 \cdot 34 \times 10^{6} = 2 \cdot 5 \times 10^{3} \times t$ (1/2) t = 1340 s (1)		2
		(iii) not all E_H used to heat water OR E_H lost to surroundings (1)		1
	(b)	P = I V (½) $2 \cdot 5 \times 10^3 = I \times 230$ (½) I = 10.9 A (1)		2
	(c)	$\begin{split} E_{\rm H} &= 1 \ m & (\frac{1}{2}) \\ E_{\rm H} &= 22 \cdot 6 \times 10^5 \times 1 \cdot 2 & (\frac{1}{2}) \\ E_{\rm H} &= 2 \cdot 71 \times 10^6 \ {\rm J} & (1) \end{split}$		2
				Total 9

Sample Answer and Mark Allocation				Notes	Marks
24.	(a)	Transformers only work on a.c.	(1)		1
	(b)	I = $150/3 = 50 \text{ mA}$ P = I V P = $50 \times 10^{-3} \times 4.8$ P = 0.24 W	$(1) \\ (\frac{1}{2}) \\ (\frac{1}{2}) \\ (1)$		3
	(c)	$\frac{n_s}{n_p} = \frac{V_s}{V_p}$	(¹ / ₂)		
		$\frac{50}{1000} = \frac{4 \cdot 8}{V_2}$	(1/2)		
		V ₂ = 96 V	(1)		2
	(d)	smaller (in a step down transformer), voltage steps down, current steps up or similar	(1)		2
			(1)		Total 8

Sample Answer and Mark Allocation				Notes	Marks
25.	(a)	(i) IR = infrared	(1)		1
		(ii) both arrive at the same time both travel at the same speed (or speed of light or 3×10^8 m/s)	(1) (1)		2
	(b)	$Q = I t $ $Q = 3 \times 2 \times 60 \times 60 $ $Q = 21 600 C $ (1/2)			2
	(c)	V _R = 8 - 2 = 6 V V = I R 6 = 15 × 10 ⁻³ × R R = 400 Ω			3
					Total 8

Sample Answer and Mark Allocation				Notes	Marks
26.	(a)	thermistor	(1)		1
	(b)	as temperature drops, voltage across <u>thermistor</u> rises or resistance of <u>thermistor</u> rises when <u>voltage goes above certain level</u> MOSFET switches on relay <u>switch</u> closes (and heater circuit is completed)	 (1) (1) (1) 		3
	(c)	to set the <u>temperature</u> at which the heater is switched on	(1)		1
					Total 5

Sam	ple Ar	nswer and Mark Allocation	Notes	Marks
27.	(a)	(i) refraction (1)		1
		(ii) reflection (1)		1
		(iii) red (1)		1
	(b) two forces: air resistance and weight (balanced (2
				Total 5

Sam	ple An	iswer :	and Mark Allocation	Notes	Marks
28.	(a)	(i)	(waveform) Q (1)		1
		(ii)	(waveform) Q (1)		1
	(b)	(i)	$v = f \lambda$ $340 = 2 \times 10^{3} \times \lambda$ $\lambda = 0.17 \text{ m}$ (1) (1)		2
		(ii)	$d = v t (1/2) 20.4 = 340 \times t (1/2) t = 0.06 s (1)$		2
	(c)	(wavelength) decreased(1)speed of sound slower(1)			2
					Total 8

Sample Answer and Mark Allocation				Notes	Marks
29.	(a)	E = D m $E = 3 \times 50 \times 10^{-6} \times 6$ $E = 9 \times 10^{-4} J$	$\binom{1}{2}$ $\binom{1}{2}$ (1)		2
	(b)	lead absorbs X-rays or lead shields leg from X-rays	(1)		1
	(c)	type of radiation or organ/type of tissue	(1)		1
					Total 4

Sam	ple Ar	iswer a	and Mark Allocation	Notes	Marks
30.	(a)	(i)	loss or gain of electrons from <u>atom</u> <u>or molecule</u> (1)		1
		(ii)	alpha(1)greatest ionisation (density)(1)		2
		(iii)	source Y(1)long half-life but short range(1)		2
	(b)	(i)	$V = I R (1/2)9 = 30 \times 10^{-3} \times R (1/2)R = 300 \Omega (1)$		2
		(ii)	electrical to sound (1)		1
					Total 8

Sample Answer and Mark Allocation			Notes	Marks
31.	(a)	cosmic rays(1)radon gas(1)or other correct answers		2
	(b)	N = A t $(\frac{1}{2})^{1/2}$ 4 = A × 10 $(\frac{1}{2})^{1/2}$ A = 0.4 Bq (1)		2
	(c)	168 84 in 4 minutes or $120 60$ or other pair of valueshalf-life = 4 minutes		2
				Total 6

[END OF MARKING INSTRUCTIONS]