2007 Physics

Intermediate 2

Finalised Marking Instructions

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.

	Answers	Mark + Comment	Issue
1.	V=IR 7·5=1·5R R=5·0 Ω	(½) (½) (1)	Ideal answer
2.	5·0 Ω	(2) Correct answer	GMI 1
3.	5·0	(1½) 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.	$R = \frac{V}{I} = \frac{7{\cdot}5}{1{\cdot}5} = 4{\cdot}0\,\Omega$	(1½) Arithmetic error	GMI 7
7.	$R = \frac{V}{I} = 4{\cdot}0\,\Omega$	(½) Formula only	GMI 4 and 1
8.	$R = \frac{V}{I} = \underline{\qquad}\,\Omega$	(½) Formula only	GMI 4 and 1
9.	$R = \frac{V}{I} = \frac{7{\cdot}5}{1{\cdot}5} = \underline{\qquad}\,\Omega$	(1) Formula + subs/No final answer	GMI 4 and 1
10.	$R = \frac{V}{I} = \frac{7{\cdot}5}{1{\cdot}5} = 4{\cdot}0$	(1) Formula + substitution	GMI 2 (a) and 7
11.	$R = \frac{V}{I} = \frac{1{\cdot}5}{7{\cdot}5} = 5{\cdot}0\,\Omega$	(½) Formula but wrong substitution	GMI 5
12.	$R = \frac{V}{I} = \frac{75}{1{\cdot}5} = 5{\cdot}0\,\Omega$	(½) Formula but wrong substitution	GMI 5
13.	$R = \frac{I}{V} = \frac{7{\cdot}5}{1{\cdot}5} = 5{\cdot}0\,\Omega$	(0) Wrong formula	GMI 5
14.	V = IR 7·5 = 1·5 × R R = 0·2 Ω	(1½) Arithmetic error	GMI 7
15.	V = IR $R = \frac{I}{V} = \frac{1{\cdot}5}{7{\cdot}5} = 0{\cdot}2\,\Omega$	(½) Formula only	GMI 20

2007 Physics Intermediate 2

Marking scheme

Section A

1.	E	11.	D
2.	B	12.	C
3.	E	13.	B
4.	B	14.	A
5.	A	15.	C
6.	B	16.	D
7.	C	17.	C
8.	D	18.	D
9.	B	19.	E
10.	D	20.	C

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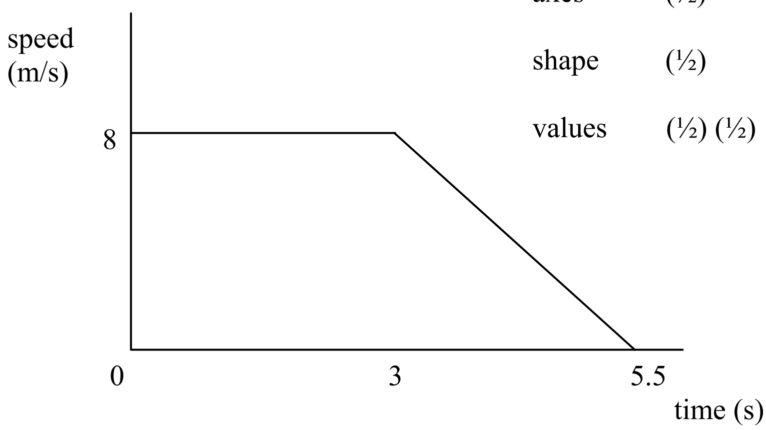
Sample Answer and Mark Allocation	**Notes**	**Marks**
21. (a) (i) $d = v\,t$ (½) $3.2 = v \times 20$ (½) $v = 0{\cdot}16$ m/s (1)		2
(ii) $W = m\,g$ (½) $W = 60 \times 10$ (½) $W = 600$ N (1)		2
(iii) $E_P = m\,g\,h$ (½) $E_P = 60 \times 10 \times 3.2$ (½) $E_P = 1920$ J (1)		2
(b) (i) $E_K = E_P$ (½) $1920 = ½ \times 60 \times v^2$ (½) $v = 8$ m/s (1)		2
(ii) (actual speed) less (1) air resistance during fall **or** not all E_P changes to E_K (1)		2
		Total 10

Sample Answer and Mark Allocation	Notes	Marks
22. (a) measure a distance (½) using a tape/rule/trundle wheel (½) measure time to travel this distance (½) with stopwatch/clock (½) use formula distance = average speed × time to calculate average speed (1)		3
(b) (i) $a = \frac{v - u}{t}$ (½) $a = \frac{0 - 8}{2.5}$ (½) $a = -3{\cdot}2 \text{ m/s}^2$ (1)		2
(ii) axes (½) shape (½) values (½) (½) 		2
(iii) distance = area under graph (½) = (8 × 3) + (½ × 2·5 × 8) (½) = 34m (1)		2
		Total 9

Sample Answer and Mark Allocation					Notes	Marks
23.	(a)	(i)	$E_H = c\,m\,\Delta T$ $E_H = 4180 \times 10 \times 80$ $E_H = 3{\cdot}34 \times 10^6$ J	(½) (½) (1)		2
		(ii)	$E = P\,t$ $3{\cdot}34 \times 10^6 = 2{\cdot}5 \times 10^3 \times t$ $t = 1340$ s	(½) (½) (1)		2
		(iii)	not all E_H used to heat water OR E_H lost to surroundings	 (1)		1
	(b)		$P = I\,V$ $2{\cdot}5 \times 10^3 = I \times 230$ $I = 10{\cdot}9$ A	(½) (½) (1)		2
	(c)		$E_H = l\,m$ $E_H = 22{\cdot}6 \times 10^5 \times 1{\cdot}2$ $E_H = 2{\cdot}71 \times 10^6$ J	(½) (½) (1)		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 mA P = I V $P = 50 \times 10^{-3} \times 4{\cdot}8$ P = 0·24 W	(1) (½) (½) (1)		3
(c) $\frac{n_s}{n_p} = \frac{V_s}{V_p}$ $\frac{50}{1000} = \frac{4 \cdot 8}{V_2}$ $V_2 = 96$ V	(½) (½) (1)		2
(d) smaller (in a step down transformer), voltage steps down, current steps up **or** similar	(1) (1)		2
			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		(½) (½) (1)		2
	(c)	$V_R = 8 - 2 = 6$ V $V = I\,R$ $6 = 15 \times 10^{-3} \times R$ $R = 400\ \Omega$		(1) (½) (½) (1)		3
						Total 8

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

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

Sample Answer and Mark Allocation	Notes	Marks
28. (a) (i) (waveform) Q (1)		1
(ii) (waveform) Q (1)		1
(b) (i) $v = f\lambda$ (½) $340 = 2 \times 10^3 \times \lambda$ (½) $\lambda = 0{\cdot}17$ m (1)		2
(ii) $d = v\,t$ (½) $20{\cdot}4 = 340 \times t$ (½) $t = 0{\cdot}06$ 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	(½) (½) (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

Sample Answer and Mark Allocation					Notes	Marks
30.	(a)	(i)	loss or gain of electrons from <u>atom or molecule</u>	(1)		1
		(ii)	alpha greatest ionisation (density)	(1) (1)		2
		(iii)	source Y <u>long half-life</u> but <u>short range</u>	(1) (1)		2
	(b)	(i)	$V = I R$ $9 = 30 \times 10^{-3} \times R$ $R = 300\ \Omega$	(½) (½) (1)		2
		(ii)	electrical to sound	(1)		1
						Total 8

Sample Answer and Mark Allocation				Notes	Marks
31.	(a)	cosmic rays radon gas **or** other correct answers	(1) (1)		2
	(b)	N = A t 4 = A × 10 A = 0·4 Bq	(½) (½) (1)		2
	(c)	168 --- 84 in 4 minutes **or** 120 --- 60 or other pair of values half-life = 4 minutes	 (1) (1)		2
					Total 6

[END OF MARKING INSTRUCTIONS]