2008 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.	$V = IR$ $7·5 = 1·5R$ $R = 5·0\ \Omega$	(½) (½) (1)	Ideal answer
2.	$5·0\ \Omega$	(2) Correct answer	GMI 1
3.	$5·0$	(1½) Unit missing	GMI 2 (a)
4.	$4·0\ \Omega$	(0) No evidence/wrong answer	GMI 1
5.	_____ Ω	(0) No final answer	GMI 1
6.	$R = \dfrac{V}{I} = \dfrac{7·5}{1·5} = 4·0\ \Omega$	(1½) Arithmetic error	GMI 7
7.	$R = \dfrac{V}{I} = 4·0\ \Omega$	(½) Formula only	GMI 4 and 1
8.	$R = \dfrac{V}{I} = $_____ Ω	(½) Formula only	GMI 4 and 1
9.	$R = \dfrac{V}{I} = \dfrac{7·5}{1·5} = $_____ Ω	(1) Formula + subs/No final answer	GMI 4 and 1
10.	$R = \dfrac{V}{I} = \dfrac{7·5}{1·5} = 4·0$	(1) Formula + substitution	GMI 2 (a) and 7
11.	$R = \dfrac{V}{I} = \dfrac{1·5}{7·5} = 5·0\ \Omega$	(½) Formula but wrong substitution	GMI 5
12.	$R = \dfrac{V}{I} = \dfrac{75}{1·5} = 5·0\ \Omega$	(½) Formula but wrong substitution	GMI 5
13.	$R = \dfrac{I}{V} = \dfrac{7·5}{1·5} = 5·0\ \Omega$	(0) Wrong formula	GMI 5
14.	$V = IR$ $7·5 = 1·5 \times R$ $R = 0·2\ \Omega$	(1½) Arithmetic error	GMI 7
15.	$V = IR$ $R = \dfrac{I}{V} = \dfrac{1·5}{7·5} = 0·2\ \Omega$	(½) Formula only	GMI 20

2008 Physics Intermediate 2

Marking scheme

Section A

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

2008 Physics Intermediate 2		
Sample Answer and Mark Allocation	**Notes**	**Marks**
21. (a) $a = \dfrac{v - u}{t}$ (½) $a = \dfrac{9}{2}$ (½) $a = 4{\cdot}5 \ \text{m/s}^2$ (1)		2
(b) $F = m \times a$ (½) $F = 15 \times 4.5$ (½) $F = 67{\cdot}5 \ \text{N}$ (1)		2
(c) d = area under graph (½) $d = (0{\cdot}5 \times 9 \times 2) + (10 \times 9) + (0{\cdot}5 \times 9 \times 1)$ (½) $d = 9 + 90 + 4{\cdot}5$ $d = 103{\cdot}5 \ \text{m}$ (1)		2
(d) $P = \dfrac{1}{f}$ (½) $P = \dfrac{1}{0{\cdot}2}$ (½) $P = 5 \ \text{D}$ (1)		2
		Total 8

Sample Answer and Mark Allocation				Notes	Marks
22.	(a)	Stated scale diagram accuracy (1131 N)	(½) (½) (1)		
		OR			
		$d = \sqrt{800^2 + 800^2}$	(1)		
		$= 1131$ N	(1)		2
	(b)	(i) $W = mg$ $= 180 \times 10$ $= 1800$ N	(½) (½) (1)		2
		(ii) resultant $= 2700 - 1800 = 900$ N $a = \dfrac{F}{m}$ $= \dfrac{900}{180}$ $= 5$ m/s^2	(1) (½) (½) (1)		3
					Total 7

Sample Answer and Mark Allocation					Notes	Marks
23.	(a)	(i)	$E_w = F \times d$ $\quad\quad$ (½) $E_w = 300 \times 1 \cdot 5$ $\quad$ (½) $E_w = 450$ J $\quad\quad$ (1)			2
		(ii)	$E = 450 \times 500 = 225000$ J $\quad$ (1) $P = \dfrac{E}{t}$ $\quad$ (½) $P = \dfrac{225000}{5 \times 60}$ $\quad$ (½) $P = 750$ W $\quad$ (1)			3
	(b)	(i)	$E = c\, m\, \Delta T$ $\quad$ (½) $450 \times 500 = 902 \times 12 \times \Delta T$ $\quad$ (½) $\Delta T = 20.787$ $\quad\quad = 21°C$ $\quad$ (1)			2
		(ii)	energy is lost <u>to the surrounding air</u> $\quad$ (1)			1
						Total 8

Sample Answer and Mark Allocation	Notes	Marks
24. (a) $E_p = mgh$ (½) $E_p = 750 \times 10 \times 7\cdot2$ (½) $E_p = 54000$ J (1)		2
(b) (i) 54000 J (1)		1
(ii) $E_K = \dfrac{1}{2}mv^2$ (½) $54000 = 0.5 \times 750 \times v^2$ (½) $v = 12$ m/s (1)		2
		Total 5

Sample Answer and Mark Allocation				Notes	Marks
25.	(a)	$P = I^2 R$ $2 = I^2 \times 50$ $I^2 = 0{\cdot}04$ $I = 0{\cdot}2$ A	(½) (½) (1)		2
	(b)	(i) $\dfrac{1}{R_t} = \dfrac{1}{R_1} + \dfrac{1}{R_2}$ $\dfrac{1}{R_t} = \dfrac{1}{60} + \dfrac{1}{30}$ $R_t = 20\ \Omega$	(½) (½) (1)		2
		(ii) $P = \dfrac{V^2}{R}$ $P = \dfrac{9^2}{60}$ $= 1{\cdot}35$ W $P = \dfrac{V^2}{R}$ $P = \dfrac{9^2}{30}$ $= 2{\cdot}7$ W	(½) (½) (1) (½) (½) (1)	½ for equation <u>once</u> only. ½ for both substitutions.	3
		(iii) 30 ohm resistor will overheat	(1)		1
	(c)	none	(1)		1
					Total 9

Sample Answer and Mark Allocation				Notes	Marks
26.	(a)	Sound energy to Electrical energy	(1)		1
	(b)	(i) None	(1)		1
		(ii) Greater	(1)		1
	(c)	$v = f\lambda$ $340 = 850 \times \lambda$ $\lambda = 0{\cdot}4$ m	(½) (½) (1)		2
	(d)	(i) If light inside the prism strikes the surface at an angle greater than the critical angle it will be totally internally reflected.	(1)		1
		(ii) internal reflection right angle – conditional on internal reflection	(1) (1)		2
					Total 8

Sample Answer and Mark Allocation	Notes	Marks
27. (a) (i) The resistance of LDR drops (with light level rise) (1) V across R rises (1) until <u>MOSFET</u> switches <u>on</u> <u>the motor</u> (1)		3
(ii) to set the light level at which the blind closes. (1)		1
(b) (i) 3000 ohms (1)		1
(ii) $V_1 = \left(\dfrac{R_1}{R_1 + R_2}\right)V_S$ (½) $V = \left(\dfrac{600}{600 + 3000}\right)\times 12$ (½) V = 2 V (1)		2
(iii) Since V< 2·4 V transistor will not switch on (1) so blinds do not shut. (1)		2
		Total 9

Sample Answer and Mark Allocation	Notes	Marks
28. (a) (i) to limit current in/voltage across the LED (1)		1
(ii) $V_r = 12 - 2 = 10$ V (1) $R = \dfrac{V}{I}$ (½) $R = \dfrac{10}{0\cdot02}$ (½) $R = 500 \ \Omega$ (1)		3

(iii) $I = 10 \times 20$
       $= 200$ mA   (1)
       $= 0.2$ A   (1)
		2

(b) $\dfrac{n_s}{n_p} = \dfrac{V_s}{V_p}$ (½) $\dfrac{n_s}{200} = \dfrac{84}{12}$ (½) $n_s = 1400$ (turns) (1)		2
		Total 8

Sample Answer and Mark Allocation				Notes	Marks
29.	(a)	Converging/convex	(1)		1
	(b)	ray parallel to axis and through 'f' ray through centre of lens projections to a point image position 5-7 cm	(½) (½) (½) (½)		2
	(c)	Make thinner/or less curved	(1)		1
	(d)	Long sight	(1)		1
					Total 5

Sample Answer and Mark Allocation				Notes	Marks
30.	(a)	Count rate increases	(1)		
		Air is more easily penetrated/less metal to be penetrated	(1)		2
	(b)	Gamma	(1)		
		penetrates best/other two would not penetrate steel	(1)		2
	(c)	x-rays longer/gamma shorter	(1)		1
					Total 5

Sample Answer and Mark Allocation				Notes	Marks
31.	(a)	time taken for half of the radioactive atoms to decay or activity to decrease by half	(1)		1
	(b)	Days activity 0 64 2.7 32 table (or similar) 5.4 16 8.1 8 10.8 4 13.5 **2 kBq**	(1) (1)		2
	(c)	Any 2 of **shielding**/limiting **time** of exposure/ increasing **distance**	(1) **each**		2
	(d) (i)	$H = w_r D$ $= 20 \times 10$ mGy $= 200$ mSv	(½) (½) (1)		2
	(ii)	Tissue type	(1)		1
					Total 8

[END OF MARKING INSTRUCTIONS]