



**2008 Physics**

**Intermediate 2**

**Finalised Marking Instructions**

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## 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.

	<b>Answers</b>	<b>Mark + Comment</b>	<b>Issue</b>
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.	$R = \frac{V}{I} = \frac{7.5}{1.5} = 4.0 \Omega$	(1½) Arithmetic error	GMI 7
7.	$R = \frac{V}{I} = 4.0 \Omega$	(½) Formula only	GMI 4 and 1
8.	$R = \frac{V}{I} = \text{_____} \Omega$	(½) Formula only	GMI 4 and 1
9.	$R = \frac{V}{I} = \frac{7.5}{1.5} = \text{_____} \Omega$	(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.	$R = \frac{V}{I} = \frac{1.5}{7.5} = 5.0 \Omega$	(½) Formula but wrong substitution	GMI 5
12.	$R = \frac{V}{I} = \frac{7.5}{1.5} = 5.0 \Omega$	(½) 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 × R R = 0.2 Ω	(1½) Arithmetic error	GMI 7
15.	V = IR $R = \frac{I}{V} = \frac{1.5}{7.5} = 0.2 \Omega$	(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 |

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Sample Answer and Mark Allocation			Notes	Marks
21.	(a)	$a = \frac{v - u}{t}$	(½)	2
		$a = \frac{9}{2}$	(½)	
		$a = 4.5 \text{ m/s}^2$	(1)	
	(b)	$F = m \times a$	(½)	2
		$F = 15 \times 4.5$	(½)	
		$F = 67.5 \text{ N}$	(1)	
	(c)	$d = \text{area under graph}$	(½)	2
		$d = (0.5 \times 9 \times 2) + (10 \times 9) + (0.5 \times 9 \times 1)$	(½)	
		$d = 9 + 90 + 4.5$		
		$d = 103.5 \text{ m}$	(1)	
	(d)	$P = \frac{1}{f}$	(½)	2
		$P = \frac{1}{0.2}$	(½)	
		$P = 5 \text{ D}$	(1)	
				<b>Total 8</b>

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

Sample Answer and Mark Allocation	Notes	Marks
<p><b>23.</b> (a) (i) <math>E_w = F \times d</math> (½)  <math>E_w = 300 \times 1.5</math> (½)  <math>E_w = 450 \text{ J}</math> (1)</p> <p>(ii) <math>E = 450 \times 500 = 225000 \text{ J}</math> (1)  <math>P = \frac{E}{t}</math> (½)  <math>P = \frac{225000}{5 \times 60}</math> (½)  <math>P = 750 \text{ W}</math> (1)</p>		<p>2</p> <p>3</p>
<p>(b) (i) <math>E = c m \Delta T</math> (½)  <math>450 \times 500 = 902 \times 12 \times \Delta T</math> (½)  <math>\Delta T = 20.787</math>  <math>= 21^\circ\text{C}</math> (1)</p> <p>(ii) energy is lost <u>to the surrounding air</u> (1)</p>		<p>2</p> <p>1</p>
		<b>Total 8</b>

Sample Answer and Mark Allocation	Notes	Marks
<b>24.</b> (a) $E_p = mgh$ (½) $E_p = 750 \times 10 \times 7.2$ (½) $E_p = 54000 \text{ J}$ (1)		2
(b) (i) 54000 J (1)  (ii) $E_k = \frac{1}{2}mv^2$ (½) $54000 = 0.5 \times 750 \times v^2$ (½) $v = 12 \text{ m/s}$ (1)		1   2
		<b>Total 5</b>

Sample Answer and Mark Allocation	Notes	Marks
<p><b>25.</b> (a) <math>P = I^2 R</math> (½)  <math>2 = I^2 \times 50</math> (½)  <math>I^2 = 0.04</math>  <math>I = 0.2 \text{ A}</math> (1)</p>		2
<p>(b) (i) <math>\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2}</math> (½)  <math>\frac{1}{R_t} = \frac{1}{60} + \frac{1}{30}</math> (½)  <math>R_t = 20 \Omega</math> (1)</p> <p>(ii) <math>P = \frac{V^2}{R}</math> (½)  <math>P = \frac{9^2}{60}</math> (½)  <math>= 1.35 \text{ W}</math> (1)</p> <p><math>P = \frac{V^2}{R}</math> (½)  <math>P = \frac{9^2}{30}</math> (½)  <math>= 2.7 \text{ W}</math> (1)</p> <p>(iii) 30 ohm resistor will overheat (1)</p>	<p>½ for equation <u>once</u> only.</p> <p>½ for both substitutions.</p>	2  3  1
(c) none (1)		1
		<b>Total 9</b>



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)	$v = f\lambda$ $340 = 850 \times \lambda$ $\lambda = 0.4 \text{ m}$	( $\frac{1}{2}$ ) ( $\frac{1}{2}$ ) (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
				<b>Total 8</b>

Sample Answer and Mark Allocation	Notes	Marks
<p>27. (a) (i) The resistance of LDR drops (with light level rise) (1)</p> <p>V across R rises (1)</p> <p>until <u>MOSFET</u> switches <u>on</u> the motor (1)</p> <p>(ii) to set the light level at which the blind closes. (1)</p>		<p>3</p> <p>1</p>
<p>(b) (i) 3000 ohms (1)</p> <p>(ii) <math>V_1 = \left( \frac{R_1}{R_1 + R_2} \right) V_s</math> (½)</p> <p><math>V = \left( \frac{600}{600 + 3000} \right) \times 12</math> (½)</p> <p>V = 2 V (1)</p> <p>(iii) Since <math>V &lt; 2.4</math> V transistor will not switch on (1) so blinds do not shut. (1)</p>		<p>1</p> <p>2</p> <p>2</p>
		<b>Total 9</b>

Sample Answer and Mark Allocation	Notes	Marks
<p>28. (a) (i) to limit current in/voltage across the LED (1)</p> <p>(ii) <math>V_r = 12 - 2 = 10 \text{ V}</math> (1)  <math>R = \frac{V}{I}</math> (½)  <math>R = \frac{10}{0.02}</math> (½)  <math>R = 500 \Omega</math> (1)</p> <p>(iii) <math>I = 10 \times 20</math> (1)  <math>= 200 \text{ mA}</math> (1)  <math>= 0.2 \text{ A}</math></p>		<p>1</p> <p>3</p> <p>2</p>
<p>(b) <math>\frac{n_s}{n_p} = \frac{V_s}{V_p}</math> (½)  <math>\frac{n_s}{200} = \frac{84}{12}</math> (½)  <math>n_s = 1400 \text{ (turns)}</math> (1)</p>		<p>2</p>
		<b>Total 8</b>

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	( $\frac{1}{2}$ ) ( $\frac{1}{2}$ ) ( $\frac{1}{2}$ ) ( $\frac{1}{2}$ )	2
	(c)	Make thinner/or less curved	(1)	1
	(d)	Long sight	(1)	1
				<b>Total 5</b>

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

Sample Answer and Mark Allocation	Notes	Marks
<b>31.</b> (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 (1) 8.1 8 10.8 4 13.5 <b>2 kBq</b> (1)		2
(c) Any 2 of <b>shielding</b> /limiting <b>time</b> of exposure/ increasing <b>distance</b> (1) <b>each</b>		2
(d) (i) $H = w_r D$ (½) $= 20 \times 10 \text{ mGy}$ (½) $= 200 \text{ mSv}$ (1)		2
(ii) Tissue type (1)		1
		<b>Total 8</b>

[END OF MARKING INSTRUCTIONS]