2011 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.

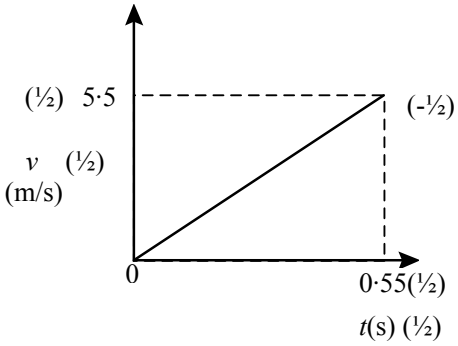
	Answers	**Mark + Comment**	**Issue**
1.	$V = IR$ $7{\cdot}5 = 1{\cdot}5R$ $R = 5{\cdot}0\ \Omega$	(½) (½) (1)	Ideal answer
2.	$5{\cdot}0\ \Omega$	(2) Correct answer	GMI 1
3.	5·0	(1½) Unit missing	GMI 2 (a)
4.	$4{\cdot}0\ \Omega$	(0) No evidence/wrong answer	GMI 1
5.	_____ Ω	(0) No final answer	GMI 1
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.	$R = \frac{V}{I} =$ _____Ω	(½) Formula only	GMI 4 and 1
9.	$R = \frac{V}{I} = \frac{7{\cdot}5}{1{\cdot}5} =$ _____Ω	(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.	$V = IR \quad 7{\cdot}5 = 1{\cdot}5 \times R \quad R = 0{\cdot}2\ \Omega$	(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

2011 Physics Intermediate 2

Marking scheme

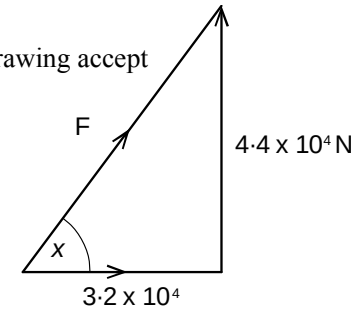
Section A

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

2011 Physics Intermediate 2			
Sample Answer and Mark Allocation		**Notes**	**Marks**
21. (a)	$s = vt$ (½) $t = \frac{11}{20}$ (½) $= 0{\cdot}55$ s Accept 0·6 s (1)	Accept $D = ST$ on its own for ½ mark	**2**
(b)	$= \frac{v-u}{t}$ (½) $v = 10 \times 0{\cdot}55$ (½) $= 5{\cdot}5$ m/s Accept 6 m/s (1)	g = 9·8 → 5, 5·4, 5·39 g = 9·81 → 5, 5·4, 5·40, 5·396	**2**
(c)	 (½) for each axis (-½) if no origin (-½) for inappropriate line	Figures on axis must be consistent with parts (a) and (b) above *s* vs *t* → No marks	**2**

Sample Answer and Mark Allocation	Notes	Marks
(d) s = area under graph (½) **OR** $s = \overline{v}t$ (½)* (½) s = $\frac{1}{2} \times 0 \cdot 55 \times 5 \cdot 5$ (½) s = $\left(\frac{5 \cdot 5}{2}\right) \times 0 \cdot 55$ (½) (½) s = 1·5 m (1)* s = 1·5 m (1)* (1)	*Accept 2, 1·5, 1·51, 1·513 *Must be $s = \overline{v}t$. No other symbols	**2**
		Total 8

Sample Answer and Mark Allocation				Notes	Marks
22.	(a)	(i)	Acceleration is the change of <u>velocity</u> (<u>not speed</u>) in <u>unit time</u> (1)	Need to be indication of time requirement. <u>No (½)</u>.	**1**
		(ii)	Direction of satellite is (continually) changing (1) **OR** <u>Velocity</u> of satellite is (continually) changing (1) **OR** There is an <u>unbalanced</u> (<u>not 'resultant'</u>) force on the satellite (1)		**1**
	(b)		F = 12 - 2 = 10 N (1) $F = ma$ (½) $\therefore 10 = 50a$ (½) $a = 0{\cdot}2$ m/s^2 (½) Direction is right (½)	No attempt to calculate F ½/3 for formula	**3**
					Total 5

Sample Answer and Mark Allocation		Notes	Marks
23. (a) $W = mg$ (½) $= 50{,}000 \times 10$* (½) $= 500{,}000$ N (1)		*If g = 9·8 accept 490,000 or 500,000 If g = 9·81 accept 491,000 or 500,000	**2**
(b) 500,000 N* (1)		*Must be consistent with (a) *Don't penalise repeated sig.fig.error	**1**
(c) For scale drawing accept (5·4 ± 0·3) (36 ± 3º) (54 ± 3º)  $F^2 = \quad ^2 + \quad ^2$ (½) $F = 5{\cdot}4 \times 10^4$N* (1) $\tan x = \frac{4 \cdot 4 \times 10^4}{3 \cdot 2 \times 10^4}$ (½) $x = 54°$† (½) $F = 5{\cdot}4 \times 10^4$ N at 036(º) (½)		*Accept 5×10^4, $5{\cdot}4 \times 10^4$, $5{\cdot}44 \times 10^4$, $5{\cdot}441 \times 10^4$ If added 'tail-to-tail' max 1½ † Accept 50°, 54°, 54·0°, 53·97° * must be consistent with x	**3**

Sample Answer and Mark Allocation	Notes	Marks
(d) $H = DW_R$ (½) $= 15 \times 10^{-6} \times 1$ (½) $= 1{\cdot}5 \times 10^{-5}$ Sv (15×10^{-6}) (1)		**2**
(e) Ionisation is when an atom gains or loses electrons (1) must have one only needed	No (½)	**1**
		Total 9

Sample Answer and Mark Allocation				Notes	Marks
24. (a)	(i)	$(33\text{-}21) = 12$ °C	(1)	*Must be consistent with parts (i) + (ii)	**1**
	(ii)	$(120{,}000\text{-}12{,}000) = 108{,}000$ J	(1)		**1**
	(iii)	$E_h = cm\Delta T$	(½)		
		$108{,}000 = c \times 2{\cdot}0 \times 12$	(½)		
		$c = 4{,}500$ J/kg °C* (not J/kg/°C)	(1)		**2**
(b)	(i)	Measured value of E_h too large OR ΔT too small	(1)		
		Heat lost to <u>surroundings</u> (or similar) * OR water not evenly heated (or similar) †	(1)	*to air, from water, from equipment etc † or immersion heater not fully immersed Explanation <u>must</u> be offered	**2**
	(ii)	Insulate beaker **OR** Put lid on beaker **OR** Stir water **OR** Fully immerse heater	(1)		**1**
(c)		$E = Pt$	(½)	*If no conversions answer is 21,600. Also accept 22,000	
		$108{,}000$† $= P \times 5 \times 60$	(½)	† must be consistent with (a) (ii) or wrong physics	
		$P = 360$ W*	(1)		**2**
					Total 9

Sample Answer and Mark Allocation	Notes	Marks
25. (a) $\frac{1}{R_T} = \frac{1}{R_1}+\frac{1}{R_2}$ (½) $= \frac{1}{4}+\frac{1}{2}$ (½) $\therefore R_T = 1{\cdot}3\ \Omega$ (1) Accept 1 Ω, 1·33 Ω, 1·333 Ω		**2**
(b) $R_T = R_1 + R_2$ (½) $= 1{\cdot}3 + 6$ (½) $= 7{\cdot}3\ \Omega$ Consistent with (a) (1) Accept 7·3 Ω, 7·33 Ω, 7·333 Ω		**2**
(c) (Voltage across 2 Ω resistor = Voltage across 4 Ω resistor) $V = IR$ (½) $= 0{\cdot}1 \times 4$ (or $0{\cdot}2 \times 2$) (½) $= 0{\cdot}4$ V (1) (½) max, if divide final answer by 2		**2**
		Total 6

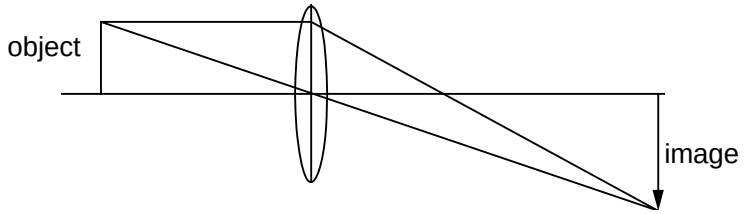
Sample Answer and Mark Allocation	Notes	Marks
26. (a) dc – <u>electrons</u>* flow around a circuit in one direction only (1) ac – <u>electrons'</u>* direction changes/reverses after a set time (1) *Accept '<u>current'</u> Some indication needed eg (repeatedly)	No (½) marks	**2**
(b) (i) ac OR mains OR one on left (1)	*Accept 'increase <u>or</u> decrease' OR step up or step down	**1**
(ii) Transformers are used to <u>change</u>* the <u>magnitude</u> † (size ok) of an (alternating) voltage OR current (1)	†might be implied eg step up or step down	**1**
(iii) $Percentage\ efficiency = \frac{useful\ P_o}{P_i} \times 100$ (½) $\therefore useful\ P_o = \frac{30}{100} \times 50$ (½) $= 15\ W$ (1)		**2**
		Total 6

Sample Answer and Mark Allocation	Notes	Marks
27. (a) To reduce <u>current</u> in LED (1) **OR** To reduce <u>voltage</u> across LED **OR** To reduce <u>power</u> to LED		**1**
(b) $V = 6 - 2 = 4$ V (1) $V = IR$ (½) $\therefore R = \frac{4}{0{\cdot}1}$ (½) $= 40\ \Omega$ (1)		**3**
(c) $P = I^2R$ $P = V^2/R$ (½) $= (0{\cdot}1)^2 \times 40$* $= 16/40$* (½) $= 0{\cdot}4$ W $= 0{\cdot}4$ W (1) *Must be consistent with (b) $P = IV$ $= 0{\cdot}1 \times 4 = 0{\cdot}4$ W		**2**
		Total 6

Sample Answer and Mark Allocation	Notes	Marks
28 (a) (i) $P = IV$ (½) $= 0{\cdot}4 \times 10^{-3} \times 0{\cdot}5$ (½) $= 2 \times 10^{-4}$ W (1) (ii) $\frac{4\times10^{-3}}{2\times10^{-4}}$ (1) = 20 (cells) * (1) *Must be consistent with (a) (i)	*Must be whole number rounded up -½ if not	**2** **2**
(b) Light → electric (al) Not 'electricity' (1) -or "to", but something needed (not just two words)	No (½) marks	**1**

Sample Answer and Mark Allocation	Notes	Marks
(c) $v = f\lambda$ (½) $\therefore \lambda = \frac{v}{f}$ $= \frac{3\times10^{8}}{6\cdot7\times10^{14}}$ (½) $= 4\cdot5 \times 10^{-7}$ m (1) Accept 4×10^{-7}, $4\cdot48 \times 10^{-7}$, $4\cdot478 \times 10^{-7}$		**2**
		Total 7

Sample Answer and Mark Allocation	Notes	Marks
29 (a) (i) P – Ultraviolet <u>OR</u> UV (1) Q – Microwaves (1)	<u>Must</u> give P and Q or -1 provided UV written first. One only without P or Q → 0	**2**
(ii) $s = vt$ (½) $\therefore t = \frac{s}{v}$ $= \frac{4 \cdot 50 \times 10^{12}}{3 \times 10^{8}}$ (½) $= 1 \cdot 5 \times 10^{4}$ s (250 min, 4·2, 4·17, 4·167 h) (1)		**2**
(iii) Decrease/reduces/goes down/lessens (1)		**1**
(b) $Q = It$ (½) $\therefore I = \frac{Q}{t}$ $= \frac{360}{60}$ (½) $= 6$ A (1)		**2**
		Total 7

Sample Answer and Mark Allocation	Notes	Marks
30. (a) $P = \frac{1}{f}$ (½) Ignore - sign $= \frac{1}{0 \cdot 03}$ (½) $= 33$ D (1) Accept 30, 33·3, 33·33		**2**
(b) Accurate placement of object and lens* (1) Appropriate rays drawn (minimum of 2 rays) (1) Image (must be drawn or labelled) (1) *Scale wrong → lose this mark		**3**
(c) Long sight (1) Converging lens brings light rays to <u>focus on retina</u> by <u>reducing focal length</u> (or equivalent). (1) Eye lens not powerful enough -0		**2**
		Total 7

Sample Answer and Mark Allocation	Notes	Marks
31. (a) $N = At$ (½) $= 300 \times 10^{-6} \times 24 \times 60 \times 60$ (½) = 26 (decays) or (atoms) (1) Accept 25 or 26		**2**
(b) 2400 → 1200 → 600 → 300 (½) for halving (½) for correct number of 'halves' $3 \times 5{,}730 = 17{,}190$ years (1)		**2**
(c) An electron (1)		**1**
(d) A helium <u>nucleus</u> **OR** equivalent eg 2p + 2n (1)		**1**

Sample Answer and Mark Allocation	Notes	Marks
(e) Greater Stronger -0 More powerful -0 (1)		**1**
(f) (i) (Aluminium) would stop <u>α particles</u> also (1) (ii) Any 2 valid answers (2)	Protective clothing must be justified. (Includes gloves + lead suits etc but not safety glasses) ie safety glasses can count as second mark Shielding (1) Short times (1) Point away from people (1) Increased distance (1) Wash hands (1), etc <u>Only 1 item of clothing valid</u>	**1** **2**
		Total 10

[END OF MARKING INSTRUCTIONS]