2015 Physics

Intermediate 2

Finalised Marking Instructions

Part One: General Marking Principles for: Physics Intermediate 2

This information is provided to help you understand the general principles you must apply when marking candidate responses to questions in this Paper. These principles must be read in conjunction with the specific Marking Instructions for each question.

(a) Marks for each candidate response must always be assigned in line with these general marking principles and the specific Marking Instructions for the relevant question. If a specific candidate response does not seem to be covered by either the principles or detailed Marking Instructions, and you are uncertain how to assess it, you must seek guidance from your Team Leader/Principal Assessor.

(b) Marking should always be positive ie, marks should be awarded for what is correct and not deducted for errors or omissions.

GENERAL MARKING ADVICE: Physics Intermediate 2

The marking schemes are written to assist in determining the "minimal acceptable answer" rather than listing every possible correct and incorrect answer. The following notes are offered to support Markers in making judgements on candidates' evidence, and apply to marking both end of unit assessments and course assessments.

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.	$V = IR$ $7{\cdot}5 = 1{\cdot}5 \times R$ $R = 0{\cdot}2\ \Omega$	(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

2015 Physics Intermediate 2

Part Two: Marking Instructions for each Question

Section A

Question	Expected Answer(s)	Max Mark
1.	B	**1**
2.	B	**1**
3.	C	**1**
4.	A	**1**
5.	B	**1**
6.	D	**1**
7.	B	**1**
8.	A	**1**
9.	D	**1**
10.	C	**1**

Question	Expected Answer(s)	Max Mark
11.	D	**1**
12.	E	**1**
13.	A	**1**
14.	A	**1**
15.	B	**1**
16.	E	**1**
17.	E	**1**
18.	C	**1**
19.	D	**1**
20.	E	**1**

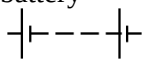
Part Two: Marking Instructions for each Question

Section B

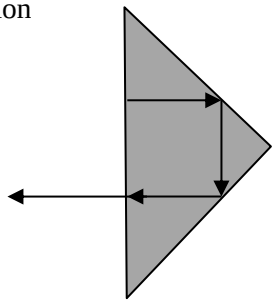
Question			Sample Answers and Mark Allocation	Notes	Inner Margin	Outer Margin
21.	**(a)**	**(i)**	$a = \frac{v-u}{t}$ **(½)** $a = \frac{440-0}{40}$ **(½)** $a = 11$ m/s^2 **(1)**	accept m s^{-2} but not m/s/s	**2**	
21.	**(a)**	**(ii)**	It has both magnitude and direction.		**1**	
21.	**(a)**	**(iii)**	d = area under graph **(½)** $d = (0{\cdot}5 \times 40 \times 440) + (10 \times 440)$ **(½)** $d = 8800 + 4400$ $d = 13200$ m **(1)**	Formula may be implied	**2**	
			Parachute creates <u>friction</u> (which acts in opposite direction to motion)	Accept air resistance or drag	**1**	

Question			Sample Answers and Mark Allocation	Notes	Inner Margin	Outer Margin
22.	**(a)**	**(i)**	Using Pythagoras: Resultant^2 = $(6 \times 10^3)^2 + (8 \times 10^3)^2$ **(1)** Resultant = 10×10^3 N **(1)** Using scale diagram: Suitable scale vectors to scale **(1)** Correct diagram **(1)**	If the candidates have a vector diagram and the vectors have been added incorrectly, eg tail to tail, then maximum 1 mark. $\pm$ $0{\cdot}5 \times 10^3$ N tolerance	**2**	
		(ii)	$\tan\theta = \frac{opposite}{adjacent}$ **(½)** $\tan\theta = \frac{6{\cdot}0\times10^3}{8{\cdot}0\times10^3}$ **(½)** $\theta = 37°$ **(1)** $\pm$ 2° tolerance (if using scale drawing method)	Must be consistent with a (i) Accept $\tan\theta = \frac{6}{8}$ $\sin\theta = \frac{6}{10}$ $\cos\theta = \frac{8}{10}$ allow 40, 37, 36·9, 36·87	**2**	
		(iii)	$a = \frac{F}{m}$ **(½)** $a = \frac{10\times10^3}{5\times10^6}$ **(½)** $a = 2 \times 10^{-3}$ m/s^2 **(1)**	consistent with a (i) accept m s^{-2} but not m/s/s	**2**	
	(b)	**(i)**	 upthrust **(1)** weight **(1)**	not gravity alone accept buoyancy or similar wording arrows must connect with object otherwise a maximum of 1½ marks can be awarded.	**2**	
		(ii)	Balanced forces or equivalent		**1**	

Question			Sample Answers and Mark Allocation	Notes	Inner Margin	Outer Margin
23.	**(a)**		Total momentum before (a collision) = total momentum after (a collision) **(½)** in the absence of external forces. **(½)**		**1**	
	(b)		$m_1u_1 + m_2u_2 = (m_1 + m_2)v$ **(½)** $80{\cdot}0 \times v = (80{\cdot}0 + 120{\cdot}0) \times 1{\cdot}20$ **(½)** $80{\cdot}0v = 200{\cdot}0 \times 1{\cdot}20$ $v = 3{\cdot}00$ m/s **(1)**	m_2u_2 term may be omitted since $u_2 = 0$ accept 3·0, 3·000, 3·0000 also accept 3 as the answer (suspend significant figure rule).	**2**	
	(c)		$E_k = ½ mv^2$ **(½)** $E_k = 0{\cdot}5 \times 200{\cdot}0 \times 1{\cdot}20^2$ **(½)** $E_k = 144$ J **(1)**		**2**	
	(d)		$E_w = Fd$ **(½)** $144 = F \times 2{\cdot}0$ **(½)** F = 72 N **(1)**	Must be consistent with (c)	**2**	
24.	**(a)**	**(i)**	Example: insulators − plastic **(½)** conductors – copper **(½)**		**1**	
		(ii)	Conductors allow charges to move and insulators do not	or similar	**1**	
	(b)	**(i)**	$Q = It$ **(½)** $= 800 \times 10^{-3} \times 60 \times 60 \times 2$ **(½)** $= 5760$ C **(1)**	Accept 6000, 5800	**2**	
		(ii)	$Q = It$ **(½)** **(½)** $t = \frac{5760}{50 \times 10^{-3}} = 115200$s **(1)** $= (32$h$)$	Answer is $1{\cdot}15 \times 10^5$ s Consistent (b)(i) −½ if converted to hours incorrectly	**2**	
	(c)		$v = f\lambda$ **(½)** $3{\cdot}0 \times 10^8 = 2{\cdot}0 \times 10^9 \times \lambda$ **(½)** $\lambda = 0{\cdot}15$ m **(1)**		**2**	

Question			Sample Answers and Mark Allocation	Notes	Inner Margin	Outer Margin
25.	**(a)**		correct symbol for: • battery • lamp • resistor • switch **½ each (total 2)** **correct circuit (1)**	battery  or multiple cells (more than two but don't penalise if there aren't exactly four)	**3**	
	(b)		$V=IR$ **(½)** $2{\cdot}5 = 0{\cdot}50 \times R$ **(½)** $R = 5{\cdot}0\ \Omega$ **(1)**	Accept 5 Ω	**2**	
	(c)		Brighter **(1)** More current through lamp L (as current divides through lamp M and resistor) **or** greater voltage across lamp L (as smaller effective resistance for parallel circuit) **(1)**	Must have brighter to access any marks, same brightness or dimmer award 0 marks. 0 marks if no attempt at a justification or justification is wrong physics. 1 mark for brighter with an attempt at justification that isn't wrong physics. 2 marks for brighter with a correct justification	**2**	
26.	**(a)**		a.c. − Current changes direction continuously **(1)** d.c. − Current is in one direction **(1)**	Must be reference to continuously (or similar)	**2**	
	(b)		$\frac{n_s}{n_p} = \frac{v_s}{v_p}$ **(½)** $\frac{250}{5000} = \frac{750}{v_p}$ **(½)** $V_p = 15000$ V **(1)**		**2**	
	(c)	**(i)**	$P = IV$ **(½)** $= 150 \times 700$ **(½)** $= 105000$ W **(1)**		**2**	
		(ii)	Efficiency $= \frac{P_o}{P_i} \times 100$ **(½)** $= \frac{84000}{105000} \times 100$ **(½)** $= 80\%$ **(1)**	Must be consistent with (c) (i)	**2**	

Question			Sample Answers and Mark Allocation	Notes	Inner Margin	Outer Margin
27.	**(a)**		P		**1**	
	(b)		$V_R = 12 - 2{\cdot}4 = 9{\cdot}6$ (V) **(1)** $V=IR$ **(½)** $9{\cdot}6 = I \times 400$ **(½)** $I = 0{\cdot}024$ A **(1)**		**3**	
	(c)		(Light on LDR decreases) so R_{LDR} increases **(1)** V across LDR increases **(1)** (to a level which switches on the transistor)		**2**	
28.	**(a)**		$d = vt$ **(½)** $= 1500$ **(½ data mark)** $\times 5{\cdot}4 \times 10^{-5}$ **(½)** $= 0{\cdot}081$(m) **(½)** divide by 2 = 0·0405m **(½)**	Note: the divide by 2 can be either for time or distance 0·81 m must have units if final answer Data mark awarded anywhere	**3**	
	(b)		Longer **(1)** frequency same but <u>velocity greater</u> **(1)**		**2**	
	(c)		$V_{gain} = \frac{V_o}{V_i}$ **(½)** $500 = \frac{V_o}{2\times10^{-3}}$ **(½)** $V_o = 1$ V **(1)**		**2**	

Question			Sample Answers and Mark Allocation	Notes	Inner Margin	Outer Margin
29.	**(a)**		**(½)** each section 		**2**	
	(b)	**(i)**	change in velocity/speed due to change in medium		**1**	
		(ii)	Q		**1**	
		(iii)	$P = \frac{1}{f}$ **(½)** $1{\cdot}25 = \frac{1}{f}$ **(½)** f = 0·8 m **(1)**		**2**	
30.	**(a)**		(count rate) increases		**1**	
	(b)	**(i)**	Source X: **(1)** beta is required (owing to the range/some of it would be absorbed by the paper) **(½)** with a long half-life **(½)**	Can explain why the other sources are not suitable - eg alpha would be absorbed/not reach the detector and gamma would not be affected **(½)** Could identify why beta is required for first **(½)** and then explain that source Y's half-life is too short (to be useful) **(½)** Must have source X otherwise no marks can be awarded. Must be an attempt at an explanation that isn't wrong physics to award the first mark.	**2**	
		(ii)	Time for activity to decrease by half	Not - the time for the radiation/count rate to half	**1**	
		(iii)	(high-frequency) electromagnetic wave		**1**	
	(c)		using graph − 2 hours	Accept 1·9 – 2·1 hrs	**2**	

Question			Sample Answers and Mark Allocation	Notes	Inner Margin	Outer Margin
31.	**(a)**		slows neutrons	or similar	**1**	
	(b)		(nuclear) fission	Not chemical	**1**	
	(c)		$E_h = cm\Delta T$ **(½)** $184{\cdot}5 \times 10^6 = 1230 \times 1500 \times \Delta T$ **(½)** $\Delta T = 100$ °C **(1)**		**2**	
	(d)	**(i)**	$H = Dw_R$ **(½)** $H = 20 \times 10^{-3} \times 1$ **(½)** $H = 20 \times 10^{-3}$ Sv or 20 mSv **(1)**	Accept 2×10^{-2} Sv, 0·02 Sv	**2**	
		(ii)	$A = \frac{N}{t}$ **(½)** $3 \times 10^6 = \frac{N}{60}$ **(½)** $N = 1{\cdot}8 \times 10^8$ **(1)**	No units: including inappropriate units would lose ½ mark	**2**	
		(iii)	Type of radiation **or** Tissue type		**1**	

[END OF MARKING INSTRUCTIONS]