

**UNIT 3: (Double Award) PHYSICS 1
HIGHER TIER****MARK SCHEME****GENERAL INSTRUCTIONS**Recording of marks

Examiners must mark in red ink.

One tick must equate to one mark (apart from the questions where a level of response mark scheme is applied).

Question totals should be written in the box at the end of the question.

Question totals should be entered onto the grid on the front cover and these should be added to give the script total for each candidate.

Marking rules

All work should be seen to have been marked.

Marking schemes will indicate when explicit working is deemed to be a necessary part of a correct answer.

Crossed out responses not replaced should be marked.

Credit will be given for correct and relevant alternative responses which are not recorded in the mark scheme.

Extended response question

A level of response mark scheme is used. Before applying the mark scheme please read through the whole answer from start to finish. Firstly, decide which level descriptor matches best with the candidate's response: remember that you should be considering the overall quality of the response. Then decide which mark to award within the level. Award the higher mark in the level if there is a good match with both the content statements and the communication statements.

Marking abbreviations

The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.

cao = correct answer only
ecf = error carried forward
bod = benefit of doubt

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(a)			2.5		1		1		
	(b)	(i)		A and B		1		1		
		(ii)		B and C		1		1		
	(c)			30 [cm]		1		1	1	
	(d)			Vibration / oscillations (1) [in transverse waves] are at right angles to wave motion (1)	2			2		
				Question 1 total	2	4	0	6	1	0

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Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
2	(a)		Ticks in boxes 3, 4 and 6 i.e. Adding loft insulation reduces heat loss by 1 200 J/s (1) Before house C had its cavity walls filled with foam it was losing 5 600 J/s (1) If house C had double glazing installed its energy loss would reduce to 3 500 J/s (1)			3	3	1	
	(b)	(i)	Conduction	1			1		
		(ii)	Conduction (1) Convection (1)	2			2		
		(iii)	Loft insulation is a poor conductor because it traps air (1) Rate of heat loss by conduction through ceiling reduces (1) Less energy transfer by convection in roof space (1)	3			3		
	(c)	(i)	Because it loses the most heat per second			1	1		
		(ii)	Rate of heat loss decreases <u>so</u> heat supply decreases (1) less fuel used means less carbon emissions (1)		1	1	2		
			Question 2 total	6	1	5	12	1	0

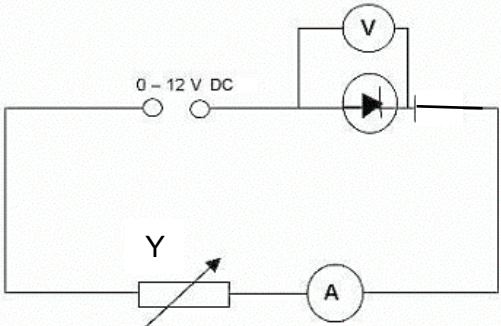
Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)	Satellite remains in the same point relative to the Earth (1) so satellite dishes do not need to move (1) they remain in continuous communication with each other / complete Earth coverage (1)	3			3		
		(ii)	Satellite B placed at approximately 2 o'clock		1		1		
		(iii)	Rays from radio station 1 to satellite A to ground station at about 1 o'clock on Earth (1) Rays from ground station to satellite B to radio station 2 (1)		2		2		
	(b)	(i)	Substitution: $3 \times 10^8 = f \times 20$ (1) Manipulation: $\frac{3 \times 10^8}{20}$ (1) $= 1.5 \times 10^9$ [Hz] (1) answer / conversion	1			3	3	
		(ii)	Substitution: $3 \times 10^8 \times 0.48$ (1) $= 1.44 \times 10^8$ (1) Division by 4 to give 3.6×10^7 [m] (1) OR $\frac{0.48}{4} = 0.12$ (1) Substitution: $3 \times 10^8 \times 0.12$ (1) $= 3.6 \times 10^7$ [m] (1)	1			3	3	
			Question 3 total	5	7	0	12	6	0

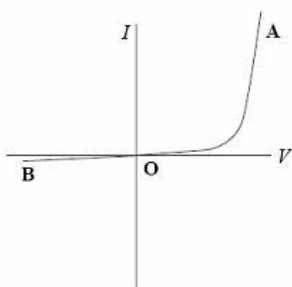
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Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)	Use of matching data pair e.g. $\frac{840}{7}$ (1) = 120 [kWh] (1)		2		2	2	
		(ii)	Energy output is directly proportional to area. OR As area doubles so does energy output. OR As area increases energy output increases (1 mark only)		2		2		
		(iii)	Energy sold to grid: $360 \times 5 = 1800$ p OR £18 (1) Energy saved: $3000 \times 16 = 48000$ p OR £480 (1) FIT: $3360 \times 12 = 40320$ p OR £403 (1) Total gain = 90 100 p OR £901 (1)		4		4	4	
	(b)		Hours of sunshine / year will vary (1) Angle of panel will vary (1) Direction of roof will vary / not all roofs face directly south (1)			3	3		
			Question 4 total	0	8	3	11	6	0

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)			Substitution: 230×8 (1) = 1840 [W]	1	1		2	2	
	(b)			Within range of 320 to 410 [kWh]			1	1		
	(c)	(i)		Substitution: 420×20 (1) = £84 (1)	1	1		2	2	
		(ii)		A cost half as much to run per year as D (1) Saving of £42 in running costs per year (1) Payback time of extra cost is less than a year / which is more than the extra cost (1)			3	3		
	(d)			Substitution & conversion $420 = 1.84 \times \text{time}$ (ecf) (1) Manipulation: $\frac{420}{1.84}$ (1) = 228.26 / 228.3 (1) Award 2 marks only for: $\frac{420}{1840} = 0.228 / 0.23 / 0.2$ [2] only	1	1 1		3	3	
				Question 5 total	3	4	4	11	7	0

Question		Marking details	Marks Available					
			AO1	AO2	AO3	Total	Maths	Prac
6	(i)	<p>Indicative content:</p>  <p>The circuit is set up as shown. (This may be expressed in words i.e. a power supply is connected in series with a diode, ammeter and variable resistor. A voltmeter is connected in parallel with the diode.) Accept a variable dc power supply. The resistance of Y is set so current is at its lowest / highest value and a readings of current and voltage are taken. The resistance of Y is varied at intervals and another pair of readings are taken at each setting. The power supply is reversed and pairs of readings are taken as before.</p> <p>5 – 6 marks Detailed description of circuit and methodology including references to positive and negative orientation of the power supply. <i>There is a sustained line of reasoning which is coherent, relevant, substantiated and logically structured. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.</i></p>	6			6		6

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
6		(i)	<p>3 – 4 marks Detailed description of circuit and methodology. <i>There is a line of reasoning which is partially coherent, largely relevant, supported by some evidence and with some structure. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.</i></p> <p>1-2 marks A basic description is given. <i>There is a basic line of reasoning which is not coherent, largely irrelevant, supported by limited evidence and with very little structure. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.</i></p> <p>0 marks <i>No attempt made or no response worthy of credit.</i></p>						
		(ii)	 <p>1 mark for correct line in top right quadrant OA. 1 mark for correct line in bottom left quadrant OB.</p>	2			2		2
Question 6 total				8	0	0	8	0	8

HIGHER TIER**SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES**

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	2	4	0	6	1	0
2	6	1	5	12	1	0
3	5	7	0	12	6	0
4	0	8	3	11	6	0
5	3	4	4	11	7	0
6	8	0	0	8	0	8
TOTAL	24	24	12	60	21	8