UNIT 3: (Double Award) PHYSICS 1
FOUNDATION 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)			Substitution: 230 × 8 (1) = 1 840 [W] (1)	1	1		2	2	
	(b)			350 indicated		1		1		
	(c)	(i)		Substitution: 420 × 20 (1) = [£]84 (1)	1	1		2	2	
		(ii)		Half as much as		1		1		
		(iii)		Saving of £42 in running costs per year **OR** save more in running costs per year			1	1		
	(d)			Substitution: $\frac{420}{1.84}$ (**ecf**) (1) = 228.26 / 228.3 (1) Award 1 mark only for: $\frac{420}{1840}$ = 0.228 / 0.23 / 0.2	1	1		2	2	
				Question 1 total	**3**	**5**	**1**	**9**	**6**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)	(i)		Variable resistor / rheostat	1			1		1
		(ii)		To vary the current / vary voltage across the lamp	1			1		1
		(iii)		Y is set so current is at its lowest / highest value and a pair of readings are taken (1) The setting of Y is varied at intervals and another pair of readings are taken at each setting (1)	2			2		2
	(b)	(i)		Increases	1			1		1
		(ii)		Decreases	1			1		1
		(iii)		Decreases	1			1		1
	(c)	(i)		Additional lamp in parallel to existing lamp	1			1		1
		(ii)		Decreases	1			1		1
		(iii)		Increases	1			1		1
		(iv)		Decreases	1			1		1
				Question 2 total	**11**	**0**	**0**	**11**	**0**	**11**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)		2 520 [kWh]		1		1	1	
		(ii)		$\frac{840}{7}$ (1) = 120 [kWh] (1)		1 1		2	2	
	(b)	(i)		360 [kWh]		1		1		
		(ii)		360 (**ecf**) × 5 (1) = 1 800 p OR £18 (answer & unit required) (1)		2		2	2	
		(iii)		3 000 × 16 (1) = 48 000 p OR £480 (answer & unit required) (1)		2		2	2	
	(c)			**Any 2 × (1) from:** • Hours of sunshine / year will vary • Angle of panel / Sun will vary • Direction of roof will vary / not all roofs face directly south		2		2		
				Question 3 total	**0**	**10**	**0**	**10**	**7**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)		24 h	1			1		
		(ii)		equator	1			1		
		(iii)		microwaves	1			1		
	(b)			Rays from radio station 1 to satellite A to radio station 2 (1) Rays from radio station 2 to satellite B to radio station 3 (1) Award 1 mark for 1 $\rightarrow$ A $\rightarrow$ B $\rightarrow$ 3		2		2		
	(c)	(i)		Substitution of: $\frac{300\,000\,000}{0.2}$ (1) = 1 500 000 000 [Hz] (1)	1	1		2	2	
		(ii)		Substitution of: 300 000 000 $\times$ 0.12 (1) = 36 000 000 [m] (1)	1	1		2	2	
				Question 4 total	**5**	**4**	**0**	**9**	**4**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
5				**Indicative content:** A wind turbine does not produce harmful waste and does not need a supply of fuel. Radioactive waste needs to be stored safely for a very long time. The output from a wind turbine is variable due to changes in wind speed. Even at maximum power output, 1 000 turbines are required to equal the reliable output from a nuclear power station. During the lifetime of a nuclear power station, each wind turbine will need replacing three times. The commissioning cost of 4 000 wind turbines is £16 000 million which is four times greater than one nuclear power station. Both types of generation have a comparable carbon footprint. Based on the above, the planners should recommend nuclear power. **5 – 6 marks:** Detailed comparison including arguments for and against both types of generation. Data is used to compare cost and numbers involved. *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.* **3 – 4 marks**: A detailed qualitative comparison with calculation of either cost or number present. *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.* **1-2 marks**: A basic qualitative comparison is given. *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.* **0 marks***: No attempt made or no response worthy of credit.*			6	6		
				Question 5 total	**0**	**0**	**6**	**6**	**0**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(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 6 total	**2**	**4**	**0**	**6**	**1**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(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		
	(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 7 total	**3**	**1**	**5**	**9**	**1**	**0**

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SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	3	5	1	9	6	0
2	11	0	0	11	0	11
3	0	10	0	10	7	0
4	5	4	0	9	4	0
5	0	0	6	6	0	0
6	2	4	0	6	1	0
7	3	1	5	9	1	0
TOTAL	24	24	12	60	19	11