Physics 1 – Summer 2015
Foundation Tier

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
1		(a)			2	320 [MJ] (1) 150 [MJ] (1)			
		(b)	(i)		1	chemical [energy]			
			(ii)		1	electrical [energy]	electricity		
		(c)	(i)		1	coal	C		
			(ii)		2	Wasted as heat (thermal) energy (1) Since turbines, pipes etc become hot / water cools (1) **Alternative:** Wasted as sound energy (1) Because of the noise [released by the machines] (1) **The 2nd mark can only be awarded if it is linked to the 1st mark.**	Cooling towers/chimney/ Transformers / friction in moving parts Steam	Other types of named energies References to CO_2	Friction only Smoke
		(d)			2	$\text{efficiency} = \frac{\text{useful power transfer}}{\text{total power input}} \times 100$ $\text{efficiency} = \frac{170}{500} \times 100$ Selection of 170 anywhere (1) Efficiency = 34 (1)	Answer alone gains both marks $\frac{500}{170} = 34$ gets 1 mark only Answer only of 0.34 gets 1 mark		170 on the answer line
		(e)			3	**Oil:** causes [increased] greenhouse effect / global warming / climate change (1) **Nuclear:** must be stored safely for a long time / problems linked to storage or leaks (1) **Coal:** causes acid rain (1)		Global warming when referring to problems with SO_2	Leaves nuclear waste / ozone layer / harmful to humans or wildlife
		Total Mark			12				

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
2		(a)	(i)		3	Gamma [rays] , Ultraviolet [waves] / UV , Micro[waves] 3 × (1)			
			(ii)		3	At the same speed as (1) Shorter than (1) Lower than (1)			
		(b)	(i)		2	Volume (1) As different volumes will cool at different rates (1) **The 2nd mark can only be awarded if it is linked to the 1st mark.**	Amount / mass / same level of water		Quantity
			(ii)	I	2	**Curve always** below given line starting from somewhere above room temperature starting on the *y*-axis (1) **Levelling** sooner at room temperature (1)		Line not at same starting point	Any lines to the right
				II	2	Line for black flask is steeper / black flask cooled quicker (1) Because black surfaces are better / good emitters [of IR] (1) **The 2nd mark can only be awarded if it is linked to the 1st mark.** **No ecf from the previous part**	Accept converse argument about white		Don't cool at the same rate because they're different colours
		Total Mark			12				

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
3		(a)	(i)		1	30 [p]			
			(ii)		2	30 × 4 000 **ecf** (1) 120 000 p (1) **Alternative:** 0.3 × 4 000 **ecf** (1) £1 200 (1)	120 000 **or** 1 200 – no workings shown award 1 mark only £1 200 p award 1 mark only		
			(iii)		2	$\frac{4\,000}{2\,000}$ (1) 2 [kW] (1)			$\frac{2\,000}{4\,000} = 2$
		(b)			2	4 000 × 0.5 (1) 2 000 [kg] (1)			
		Total Mark			7				

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
4		(a)	(i)		1	3.3 [years]			3.3 light years
			(ii)		1	99 000 [light years]			
			(iii)		1	4 500 [million km]			
		(b)	(i)		1	380 [units]			
			(ii)		1	5 [number of waves per cm]			
		Total Mark			5				

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
5		(a)	(i)		2	One quarter / 25% (1) × 20 = 5 [cpm] (1)	Alternative routes to get an answer of 5		
			(ii)		2	Repeat the test / counts per minute / take more readings (1) and find the mean (1) **OR** count / reading / measure over longer period of time (1) and divide by that number of minutes (1)			
			(iii)		1	Radon **OR** buildings / soil	Ground / earth		Named rocks / uranium
		(b)	(i)		2	350 – 20 (1 - for subtraction of 20 from any value) = 330 [cpm] (1)			
			(ii)		2	Alpha (1) Because the reading is reduced [to background level] by thin card / can't penetrate thin card (1) **The 2nd mark can only be awarded if it is linked to the 1st mark.**	**Alternative for the 2nd mark:** If it was beta or gamma the reading wouldn't be reduced by thin card		Alpha with beta or gamma Alpha absorbed by card and gamma absorbed by lead
			(iii)		1	Range of alpha is only a few [about 30] cm in air / can't penetrate the skin or clothes / not very penetrating	Short range in air can't reach them		Only harmful inside the body
			(iv)		2	Aluminium has no effect on the count rate (1) because only gamma passes through aluminium / beta can't pass through aluminium (1) **The 2nd mark can only be awarded if it is linked to the 1st mark.**	There's still a [small] count rate [beyond lead] (1) only gamma goes through lead (1)	Reference to alpha	
			(v)		1	Background count varies over time / random			
		Total Mark			13				

Question Number								
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
6		(a)			2	Increases or steps up the voltage / reduces the current (1) to reduce energy / heat losses [in the cables] (1) **The 2nd mark can only be awarded if it is linked to the 1st mark.**		Improves efficiency (given)	Reduces the power No heat loss
		(b)			1	950 000 000 [W]	950×10^6		950 MW
		(c)			2	Reduce the voltage (1) to a safer value [for use in the home] / because high voltages are more dangerous (1) **The 2nd mark can only be awarded if it is linked to the 1st mark.**	Step-down the voltage	Increase the current	
		(d)			6	**Indicative content:** Some types of power station continue working for 24 hours a day and for 365 days a year. These include nuclear, coal and oil powered stations which take a long time to shut down and to start up again. Through the day, however, demand changes, the demand being small at night while most of the population is sleeping but during the daytime there are peaks of demand, notably at breakfast time and again in early evening. To meet this demand some power stations are needed which can be brought on stream at very short notice. This is where hydroelectric power stations are very useful because they can start up within seconds by just opening a valve to let the water flow. They, along with reserve oil and gas powered stations can also be used to maintain supply during maintenance or breakdown times of other stations. **5 – 6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3 – 4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1 – 2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit.			
		Total Mark			11				