

Question number	Answer	Notes	Marks														
9 (a)	dimensionally correct substitution; rearrangement; evaluation of period in seconds; period in minutes; e.g. $7.5 = \frac{2 \times \pi \times (780 + 6\,371)}{T}$ $(T =) \frac{2 \times \pi \times (780 + 6\,371)}{7.5}$ $(T =) 5\,991 \text{ (s)}$ $(T =) 99.85 \text{ (mins)}$	no mark for equation as given if R_E or height used instead of orbital radius then 3 marks max allow range of 99-100 (mins) 10.89... , 88.9... gets 3 marks 653.45... , 5337... gets 2 marks	4														
(b)	(number of revolutions = $24 \times 60 / 99.8$) = 14.42;	allow ECF from (a) allow 14, 14.4	1														
(c)	<table><thead><tr><th>Statements</th><th>Tick</th></tr></thead><tbody><tr><td>the higher the speed, the lower the height of the satellite</td><td>✓</td></tr><tr><td>a greater period means that the satellite has a greater speed</td><td></td></tr><tr><td>satellites that orbit higher make more revolutions per day</td><td></td></tr><tr><td>lower height satellites have shorter periods</td><td>✓</td></tr><tr><td>satellites with a higher speed make fewer revolutions per day</td><td></td></tr><tr><td>the higher the number of revolutions per day, the shorter the period</td><td>✓</td></tr></tbody></table> 1 mark for each correct tick;;; if more than three ticked, then -1 for each additional tick		Statements	Tick	the higher the speed, the lower the height of the satellite	✓	a greater period means that the satellite has a greater speed		satellites that orbit higher make more revolutions per day		lower height satellites have shorter periods	✓	satellites with a higher speed make fewer revolutions per day		the higher the number of revolutions per day, the shorter the period	✓	3
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Total for question 9 = 8 marks