Question number	Answer	Notes	Marks
10 a	any two from: MP1. comets orbit the Sun but moons orbit planets; MP2. moons have (approximately) circular orbits but comets have elliptical orbits; MP3. a comet has variable speed but a moon's speed is (approximately) constant;	 allow 'comet orbits are more elliptical'	2
b (i)	gravitational potential energy = mass x *g* x height;	allow rearrangements and standard symbols e.g. GPE = mgh reject 'gravity' for *g*	1
(ii)	substitution; rearrangement; evaluation to more than 1 significant figure; e.g. 2.2 = 0.75 x 1.6 x height (height =) 2.2 / (0.75 x 1.6) (height =) 1.83333…	 award 2 marks max. if mass not converted to kg giving 0.00183	3
(iii)	2.2 (J);		1
(iv)	any three from: MP1. gravitational field strength is greater on the Earth; MP2. (therefore) hammer has a greater weight on Earth; MP3. (therefore) astronaut has to apply a greater force (to lift the hammer); MP4. hammer gains more GPE on Earth;	 allow use of *g* = 10 in calculation condone 'gravity is more on Earth' ORA allow 'downward force greater' condone 'hammer is heavier' GPE on Earth is 15J gains MP1 and MP4	3
c	substitution; rearrangement; evaluation of time period; evaluation of number of orbits; e.g. $7.66 = \frac{2\pi \times 6780}{T}$ $(T =) \frac{2\pi \times 6780}{7.66}$ (T =) 5560 (s) (number of orbits = (24x60x60) / 5560 =) 15.5	allow method of finding total distance travelled and dividing by distance of one orbit ($2\pi r$) 5561 allow 15, 16	4

Total for question 10 = 14 marks