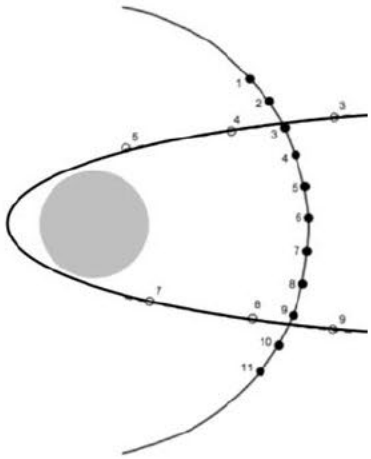
| Question number | Answer | Notes | Marks |
|---|---|---|---|
| 1 ( a) (i) | omet orbit behind Sun completed correctly; | Dashed or solid curved line | 1 |
| (ii) | X marked anywhere in grey area;<br><br>e.g.<br> | No need to label X as "Sun"<br>X should be left of the imaginary 5-7 line, reject X placed outside the orbit<br><br>the curve should be 'pointy' not a part of a circle, such that distance week6-week 5 > distance week 5-week4 | 1 |
| (iii) | Any one of the following ideas-<br>MP1. comet was behind/near the Sun;<br>MP2. comet was obscured/eclipsed by Sun;<br>MP3. light from comet could not reach astronomer;<br>MP4. Sun too bright to allow observation;<br>MP5. we should not look directly at the Sun; | Allow labelled sketch | 1 |
| (iv) | C – week 9; | | 1 |
| (v) | Any two of -<br>MP1. Same time between observations;<br><br>MP2. Different distances between observations;<br>MP3. Speed = distance ÷ time; | Allow specific reference to 'a week' as the same time between observations | 2 |

| | | | |
|---|---|---|---|
| (vi) | Any one of -<br>Energy argument – transfer of GPE to KE (ORA);<br><br>Force argument, e.g. pulled by the Sun's gravitational force; | <br><br><br><br>Ignore<br>• unqualified 'pulled by gravity'<br>• gravitation from other bodies | 1 |
| (b) | Substitution into given formula;<br><br>Conversion from days to hours;<br>Calculation;<br>e.g. v = 2 × π × 150 000 000 ÷ (365 x 24)<br>= 110 000 (km/hour) | <br><br>24 seen<br><br><br>107 589/108 000 (km/hour)<br>Allow due π (ONLY) a number that rounds to 110 000<br><br>2 582 130 = 2 (no 24 hr)<br>43 036 =2 (used 60 instead of 24) | 3 |

Total 10 marks

| Question number | Answer | Notes | Marks |
|---|---|---|---|
| 2 (a) | any suitable from:<br>e.g.<br>• asteroid;<br>• meteor(ite);<br>• (artificial) satellite;<br>• a moon;<br>• comet;<br>• named planet;<br><br><br><br>• dwarf planet e.g. Pluto;<br>• neutron star;<br>• white dwarf;<br><br>any two suitable from:<br>• (the) Universe;<br>• galaxy;<br>• solar system;<br>• star / Sun;<br><br>• named planet (1);<br>• named planet (2);<br><br><br><br><br><br>galaxy; | accept appropriate correct answers<br><br><br><br><br><br>planets:<br>• Mercury<br>• Venus<br>• Mars<br><br><br><br><br><br><br><br><br>'Sun and star' is 1 mark only<br>planets should be gas giants:<br>• Jupiter<br>• Saturn<br>• Uranus<br>• Neptune | 4 |
| (b) (i) | gravitational force / gravitational pull / (force of) gravity; | | 1 |
| (ii) | B; | | 1 |
| (iii) | single straight arrow directed towards the Sun; | judge by eye | 1 |
| (iv) | B; | | 1 |
| | | total marks = 8 | |

| Question number | Answer | Notes | Marks |
|---|---|---|---|
| 3 (a) | **B** galaxy – solar system – Sun – planet | | 1 |
| (b) (i) | MP1. Idea that (orbit) shapes both (approximately) circular;<br>MP2. Idea that both planets orbit the same star /Sun;<br>MP3. similar plane of orbit;<br>MP4. Same direction of orbit; | accept elliptical, oval, eccentricity<br>Allow "Sun is at centre of orbit" | 2 |
| (ii) | different orbital radii ; | Allow<br>• Earth (orbit) radius < Mars orbit radius<br>• different time period<br>• correct reference to speed of orbit<br>• different circumference<br>reject incorrect comparisons | 1 |
| (c) | Substitution into correct equation;<br>Evaluation;<br>Answer to two significant figures;<br><br>e.g. $v = \frac{2 \times \pi \times 23\,500}{1.26}$ (1 mark)<br><br>= 117 000 (2 marks)<br><br>=120 000 (km/day) (3 marks) | $2\pi r/T$ ONLY<br><br>NO mark for equation as it is given on page 2<br><br>Bald correct answer to 3 or more s.f. scores 2 marks, e.g. 117186 | 3 |
| (d) | MP1. Idea that the **orbital** radii of the two Moons are different;<br>MP2. Idea that **orbit** radius of Enceladus is larger; | Ignore references to gravity<br><br>ORA<br>NB<br>MP1 will be subsumed within MP2 response<br>e.g orbit radius of Enceladus is ten times as big (ORA) gets both marks<br>Allow response in terms of **orbit** / **orbit** diameter / **orbit** circumference | 2 |

Total 9 marks

| Question number | Answer | Notes | Marks |
|---|---|---|---|
| 4 (a) | Venus; | | 1 |
| | | | |
| (b) | because it has the largest mass; | ignore references to diameter/size | 1 |
| | | | |
| (c) (i) | density = $\frac{\text{mass}}{\text{volume}}$ ; | in words or accepted symbols e.g. $\rho = m/V$<br><br>condone D for density | 1 |
| | | | |
| (ii) | changing diameter to radius;<br>substitution;<br>evaluation;<br><br>e.g.<br>$\rho = \frac{100 \times 10^{24}}{[4/3 \times 3.14 \times 25000^3]}$<br><br>$1.5 \times 10^{12}$ (kg/km$^3$) | if diameter used instead of radius (gives $1.9 \times 10^{11}$) max 2<br><br>-1 for POT error<br><br>allow answers rounding down to $1.5 \times 10^{12}$ (kg/km$^3$) | 3 |
| | | | |
| (d) | change of time into seconds (seen anywhere);<br>use of orbital radius as $150 \times 10^6$ km;<br>evaluation;<br>e.g.<br><br>$v = \frac{2 \times 3.14 \times (150 \times 10^6)}{365 \times 24 \times 60 \times 60}$<br><br>29.9 (km/s) | no mark for eqn as this is given<br><br>allow 30 (km/s) | 3 |
| | | | |
| (e) | an evaluation to include 3 of:<br><br>MP1. identifying period as time of orbit;<br><br>MP2. correct **detail** of why statement is right/wrong;<br><br>MP3. correct use of data comparing 2 planets;<br><br>MP4. period depends on distance from the Sun; | can refer to either mass or diameter of planet for 'size'<br><br>must name planets<br><br>must name planets | 3 |

Total 12 marks