4 **(a)** The planet Jupiter has many moons. One of its moons, Io, takes 1.53×10^5 s to orbit Jupiter. The mean radius of the orbit of Io about Jupiter is 4.22×10^5 km.

Calculate the centripetal acceleration of Io.

centripetal acceleration = ... $m\,s^{-2}$ [2]

(b) A second moon of Jupiter, Amalthea, has a centripetal acceleration of $3.87\,m\,s^{-2}$.

(i) Explain why the gravitational field strength at the position of each moon has the same magnitude and direction as the centripetal acceleration of the moon.

.....

.....

.....

..... [2]

(ii) Calculate the ratio

$$\frac{\text{radius of the orbit of Io}}{\text{radius of the orbit of Amalthea}}.$$

ratio = ... [2]