

- (a) State Newton's Law of Gravitation.

..... [1]

- (b) A satellite of mass m is in a circular orbit of radius r about a planet of mass M . It may be assumed that the planet and the satellite are uniform spheres that are isolated in space.

Show that the linear speed v of the satellite is given by the expression

$$v = \sqrt{\frac{GM}{r}}$$

where G is the gravitational constant. Explain your working.

[2]

- (c) Two moons A and B are in circular orbits about a planet, as illustrated in Fig. 2.1.

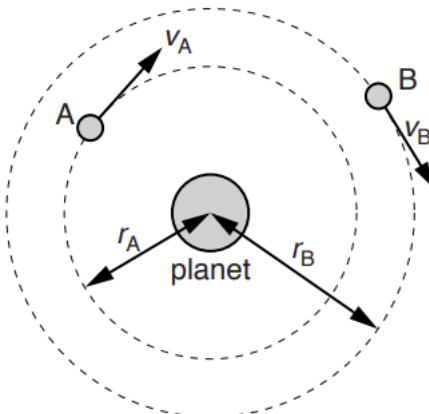


Fig. 2.1 (not drawn to scale)

Moon A has an orbital radius r_A of 1.3×10^8 m, linear speed v_A and orbital period T_A .

Moon B has an orbital radius r_B of 2.2×10^{10} m, linear speed v_B and orbital period T_B .

(i) Determine the ratio

$$1 \quad \frac{v_A}{v_B}$$

[2]

$$2 \quad \frac{T_A}{T_B}$$