

- 1 (a) The point P in Fig. 1.1 represents a point mass.

On Fig. 1.1, draw lines to represent the gravitational field around P.



Fig. 1.1

[2]

- (b) A moon is in circular orbit around a planet.

Explain why the path of the moon is circular.

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..... [2]

- (c) Many moons are in circular orbit about a planet.

The angular velocity of a moon is ω when the orbit of the moon has a radius r about the planet.

Fig. 1.2 shows the variation of r^3 with $1/\omega^2$ for these moons.

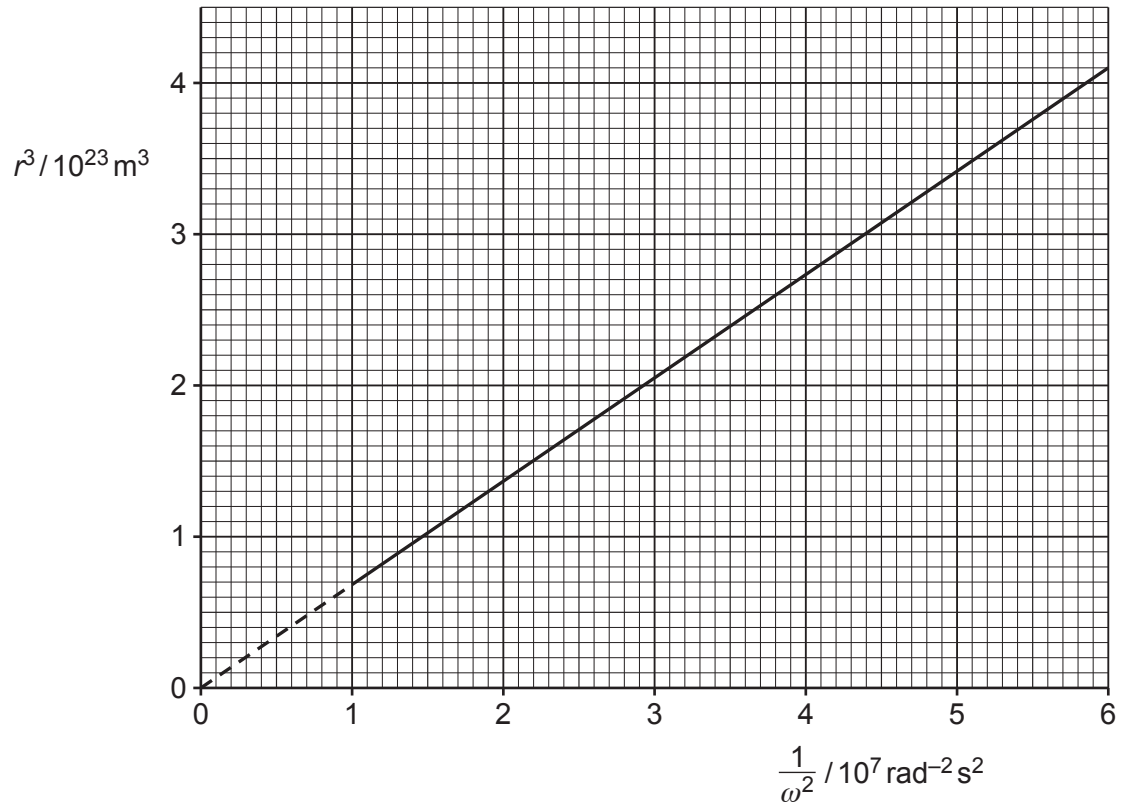


Fig. 1.2

- (i) Show that the mass M of the planet is given by the expression

$$M = \frac{\text{gradient}}{G}$$

where G is the gravitational constant.

[2]

- (ii) Use Fig. 1.2 and the expression in (c)(i) to show that the mass M of the planet is 1.0×10^{26} kg.

[1]

- (iii) Determine the speed of a moon in orbit around the planet with an orbital radius of 1.2×10^8 m.

speed = ms^{-1} [3]