

- 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.

● P

**Fig. 1.1**

[2]

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

Explain why the path of the moon is circular.

.....

.....

.....

..... [2]

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

The angular velocity of a moon is  $\omega$  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.

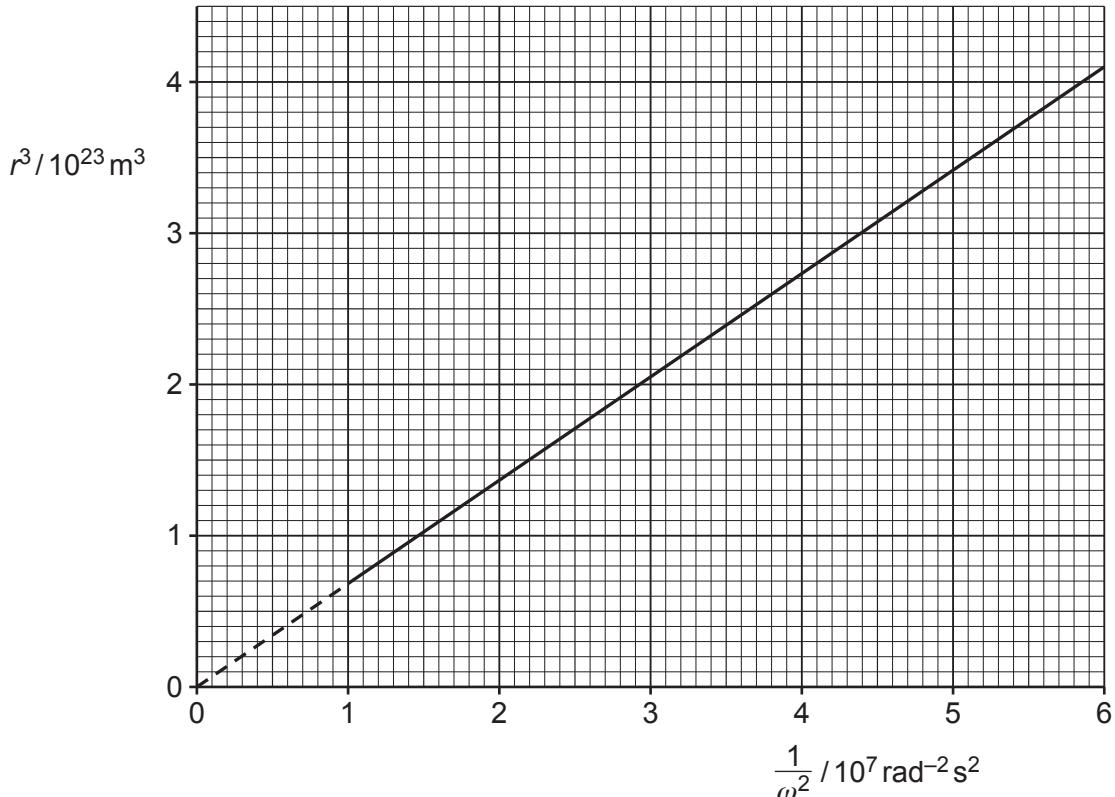


Fig. 1.2

- (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  $1.0 \times 10^{26} \text{ kg}$ .

[1]

- (iii) Determine the speed of a moon in orbit around the planet with an orbital radius of  $1.2 \times 10^8 \text{ m}$ .

speed = .....  $\text{ms}^{-1}$  [3]