

15/19

F5 Newtonian Gravity

Fields

- F5.1 Complete the questions in the table; you may assume that all measurements are made above the surface of the astronomical body:

Mass of body /kg	Distance from centre of body	Gravitational field strength at this distance /N kg ⁻¹
(a)	6400 km = Earth radius	9.8
Earth mass	2 × Earth radius	(b)
4.8×10^8 (asteroid)	6100 km	(c)
(d)	3.2×10^6 m	4.0

- F5.2 Calculate the force of attraction between two metal spheres each of mass 20 kg whose centres are 20 cm apart.

- F5.3
- a) At a distance of 1.0×10^7 m from the centre of planet Mogg, the gravitational field strength (g) due to Mogg is 2.1 N kg^{-1} . Calculate g at a distance of 5.0×10^7 m.
 - b) The planet Mogg is completely spherical, with radius 2.3×10^6 m. Calculate g at a height of 100 km above the surface of the planet. Use the information given in (a).
 - c) Using the information in (a) and (b), calculate the gravitational field strength due to planet Mogg at a distance of 3.0×10^6 m from the centre.

Potential

- F5.4 For a planet of mass 6.0×10^{24} kg, calculate the following:

- a) The gravitational potential in J kg^{-1} at a distance 6.4×10^6 m from the centre of the planet
- b) The distance from the centre of the planet where the gravitational potential is $-1.1 \times 10^6 \text{ J kg}^{-1}$

- F5.5 For a planet of mass 1.0×10^{24} kg, calculate the gravitational potential, in J kg^{-1} , at the following distances from the centre of the planet:

