

- 1 (a) (i) On Fig. 1.1, draw lines to represent the gravitational field outside an isolated uniform sphere.



Fig. 1.1

- (ii) A second sphere has the same mass but a smaller radius. Suggest what difference, if any, there is between the patterns of field lines for the two spheres.

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[3]

- (b) The Earth may be considered to be a uniform sphere of radius 6380 km with its mass of 5.98×10^{24} kg concentrated at its centre, as illustrated in Fig. 1.2.

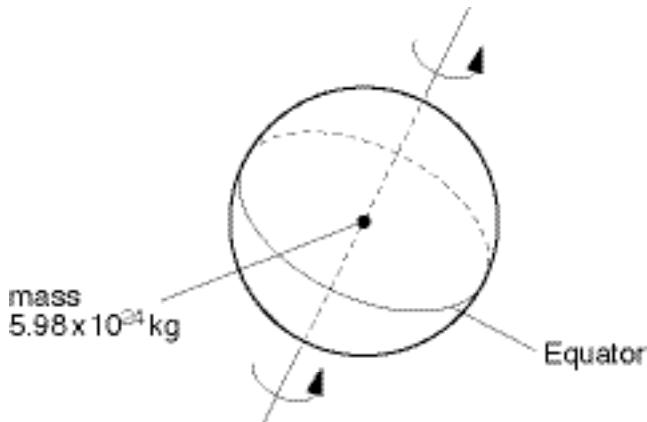


Fig. 1.2

A mass of 1.00 kg on the Equator rotates about the axis of the Earth with a period of 1.00 day (8.64×10^4 s).

Calculate, to three significant figures,

- (i) the gravitational force F_G of attraction between the mass and the Earth,

$$F_G = \dots\dots\dots\dots\dots \text{N}$$

- (ii) the centripetal force F_C on the 1.00 kg mass,

$$F_C = \dots\dots\dots\dots\dots \text{N}$$

- (iii) the difference in magnitude of the forces.

$$\text{difference} = \dots\dots\dots\dots\dots \text{N}$$

[6]

- (c) By reference to your answers in (b), suggest, with a reason, a value for the acceleration of free fall at the Equator.

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[2]