2023 Sec 3 Advanced Physics Exercise 3

Gravitational Fields

Name: _____ ( ) Class: 3/ ___ Date: _____

Given 3 formulae:

$v = r\omega$;	$a = \frac{v^2}{r}$;	$F = \frac{Gm_1m_2}{r^2}$

where G: universal gravitational constant = 6.7×10^{-11} N m^2 kg^{-2} (given if needed).

1 On the Earth's surface, the acceleration of free fall, g, is 9.8 m s^{-2}.
The mean radius of the Earth is 6.4×10^6 m.
Calculate the mass of the Earth by considering the gravitational force on an object at the Earth's surface.

mass of Earth = …….

2 The radius of the Earth is 6.36×10^6 m and the gravitation field strength on Earth's surface is g.
The value of the gravitational field strength at a point P above the Earth's surface is 0.25 g. Calculate the height of P **above** the Earth's surface.

height = …….

3 The distance between the centres of Earth and the Moon is about 4.0×10^8 m, and their relative masses are about 81:1.

A spacecraft travels away from Earth towards the Moon. Determine the distance from the centre of Earth at which equal gravitational forces are exerted on the spacecraft by Earth and the Moon.

distance from the centre of the Earth = …….

4 A satellite of mass 1200 kg is orbiting the Earth with an orbital radius of 6610 km. The mass of the Earth is 6.0×10^{24} kg. Calculate the linear speed of the satellite.

speed = …….

Answers:	1.	6.0×10^{24} kg	2.	6.36×10^6 m
	3.	3.6×10^8 m	4.	7800 m s^{-1}