

A level Physics B

H557/01 Fundamentals of physics

Question Set 10

1. (a) The Moon is in circular orbit around Earth at constant speed.
Explain why we describe the Moon as accelerating towards the Earth.

(b) (i) Starting from the equation for circular motion show that the acceleration of the Moon towards the Earth is given by [2]

$$a = \frac{4\pi^2 R}{T^2}$$

where the Moon's orbital radius is R and the Moon's orbital time is T .

(ii) Show that the Moon's acceleration is less than 3 mms^{-2} . [1]

$$R = 3.84 \times 10^8 \text{ m} \quad T = 2.35 \times 10^6 \text{ s}$$

(iii) The Moon's orbital radius $R = 60 R_{\text{Earth}}$. [1]
The gravitational acceleration at the Earth's surface $g = 9.8 \text{ m s}^{-2}$.

Calculate the acceleration due to the Earth's gravity at the Moon's orbit.

Compare this value to the value calculated in (ii).

acceleration = m s^{-2} [3]

Total Marks for Question Set: 7

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