

A particle P of mass m is free to move on the smooth inner surface of a fixed hollow sphere of radius a . The centre of the sphere is O and the point C is on the inner surface of the sphere, vertically below O . The points A and B on the inner surface of the sphere are the ends of a diameter of the sphere. The diameter AOB makes an acute angle α with the vertical, where $\cos \alpha = \frac{4}{5}$, with A below the horizontal level of B . The particle is projected from A with speed u , and moves along the inner surface of the sphere towards C . The normal reaction forces on the particle at A and C are in the ratio $8 : 9$.

(i) Show that $u^2 = 4ag$. [6]

[illegible]

- (ii)** Determine whether P reaches B without losing contact with the inner surface of the sphere. [6]

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