

Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

4 Forces

Exercise G, Question 4

Question:

A particle of mass 10 kg is placed on a rough plane, inclined at 45° to the horizontal. If $\mu = 0.5$ find the least force required to keep the particle in equilibrium, if the force acts upwards, along the line of greatest slope.

Solution:

Resolving along plane

$$F + P = 98 \cos 45^\circ$$

$$F = 98 \cos 45^\circ - P$$

Resolving perpendicular to plane

$$R = 98 \sin 45^\circ$$

Limiting equilibrium

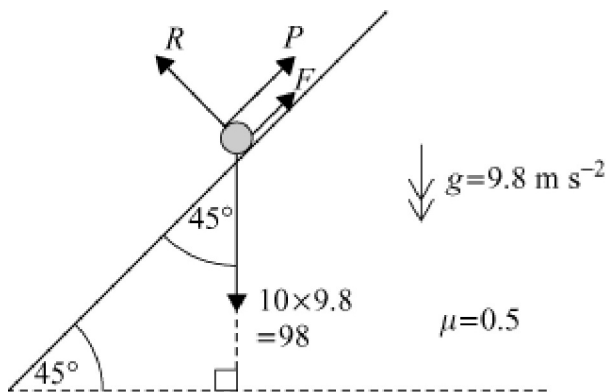
$$F \leq 0.5 \times R$$

$$\text{i.e. } 98 \cos 45^\circ - P \leq 0.5 \times 98 \sin 45^\circ$$

$$\therefore 98 \cos 45^\circ - 0.5 \times 98 \sin 45^\circ \leq P$$

$$\text{i.e. } P \geq 34.648\dots$$

i.e. minimum force is 34.7 N (3 s.f.)



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