



QUESTION WORKBOOK

Motion in a vertical circle

Further Mechanics 2 · Year FM

6 questions · 23 marks

NAVY SCREEN EDITION

SECTION A · Warm-up

- A1** Explain why conservation of energy can be used for a particle on a string in a vertical circle, even though the tension varies. [2]

- A2** A particle on a string of length 1.2 m is to complete a vertical circle. Find the least speed it can have at the top, taking $g = 9.8 \text{ m/s}^2$. [3]

SECTION B · Standard

- B1** A particle on a string of length 1.2 m is to complete a vertical circle. Taking $g = 9.8 \text{ m/s}^2$, find the least speed it can have at the lowest point. [4]

- B2** A bead slides from rest on the inside of a smooth circular track of radius 2 m, starting level with the centre. Find its speed at the lowest point and the reaction there, per unit mass. [4]

- B3** State the condition for a complete circle when the particle is attached to a light rod rather than a string, and explain the difference. [3]

SECTION C · Stretch

- C1** A particle slides from rest at the top of a smooth sphere of radius r . Show that it leaves the surface where the radius makes an angle θ with the upward vertical satisfying $\cos \theta = 2/3$, and find its speed at that instant in terms of g and r . [7]