3.4 Hooke's Law, Moments and Centre of Mass: 10-minute Pack

Total Marks

EDEXCEL 4PH1 · Calculator allowed · about 10 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 State the SI unit of the spring constant k in the equation F = k e for a spring in statics.

(Total for Question 1 is 1 mark)

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2 A 2.0 N weight is placed 0.30 m to the left of a pivot and a 3.0 N weight is placed 0.20 m to the right of the pivot. Calculate the resultant moment about the pivot and state whether the net turning is clockwise or anticlockwise.

(Total for Question 2 is 2 marks)

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3 A tall narrow container and a short wide container have the same mass distribution height such that the tall container has a higher centre of mass. State which container is more stable and give one reason referring to the centre of mass height.

(Total for Question 3 is 2 marks)

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4 Define the limit of proportionality for a spring, as used when interpreting a force-extension graph.

(Total for Question 4 is 2 marks)

5 State the principle of moments for an object in equilibrium on a pivot, as used to solve statics problems.

(Total for Question 5 is 2 marks)

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Mark scheme · 3.4 Hooke's Law, Moments and Centre of Mass: 10-minute Pack

Question 1

$N\ m^{-1}$ or N per m	**B1**

Answer: $N\ m^{-1}$

Question 2

calculates left moment = 2.0 x 0.30 = 0.60 N m and right moment = 3.0 x 0.20 = 0.60 N m	**M1**
gives resultant moment = 0.00 N m and states no net turning (balanced) cao	**A1**

Answer: Resultant moment = 0.00 N m; balanced, no net turning

Question 3

states the short wide container is more stable	**B1**
gives reason: lower centre of mass gives smaller tipping moment so harder to tip	**B1**

Answer: The short wide container is more stable because its centre of mass is lower, producing a smaller tipping moment for the same tilt

Question 4

identifies the limit of proportionality as the point beyond which extension is no longer directly proportional to force	**B1**
may state it is the point on a force-extension graph where the line stops being straight (becomes curved)	**B1**

Answer: The limit of proportionality is the point beyond which extension is not directly proportional to force; on a graph it is where the straight line starts to curve

Question 5

states that for equilibrium the sum of clockwise moments about a pivot equals the sum of anticlockwise moments	**B1**
may mention moments measured about the same pivot	**B1**

Answer: Sum of clockwise moments about a pivot = sum of anticlockwise moments about that pivot (for equilibrium)

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