3.4 Mechanics: Projectiles and Further Kinematics: 10-minute Pack

Total Marks

EDEXCEL 9MA0 · Calculator allowed · about 10 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A particle is projected horizontally from the top of a diving board. State the horizontal component of the particle's acceleration while it is in the air.

(Total for Question 1 is 1 mark)

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2 A particle is projected with speed 30 m/s at an angle of 40 degrees above the horizontal. Find the initial vertical component of its velocity, giving your answer to 3 significant figures.

(Total for Question 2 is 1 mark)

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3 A particle is projected at an angle above horizontal ground and reaches its greatest height 2.5 seconds after projection. Using $g = 9.8$ m/s^2 and the fact that the vertical velocity is zero at greatest height, find the initial vertical component of velocity.

(Total for Question 3 is 2 marks)

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4 A particle is projected from horizontal ground with speed 23 m/s at an angle of 44 degrees above the horizontal. Using $g = 9.8$ m/s^2, show that the greatest height reached by the particle is 13.0 m, correct to 3 significant figures.

(Total for Question 4 is 3 marks)

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5 A ball is thrown from a point on horizontal ground with speed 13 m/s and lands 15 m from the point of projection. Using the range formula $R = u^2 \sin(2*\theta) / g$ and taking $g = 9.8$ m/s^2, find the smaller possible angle of projection θ, giving your answer to 3 significant figures.

(Total for Question 5 is 2 marks)

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Mark scheme · 3.4 Mechanics: Projectiles and Further Kinematics: 10-minute Pack

Question 1

$0\ m/s^2$ **B1**

Answer: $0\ m/s^2$

Question 2

awrt 19.3 m/s **B1**

Answer: 19.3 m/s (3 s.f.)

Question 3

use 0 = u - gt with t=2.5, rearranged for u **M1**

24.5 m/s cao **A1**

Answer: 24.5 m/s

Question 4

find u_y = 23sin44 (= awrt 16.0) **M1**

use $v^2 = u_y^2$ - 2gh with v=0, rearranged for h **M1**

h = 13.0 m (3 s.f.) correctly shown, cso **A1**

Answer: Greatest height = 13.0 m (as required)

Question 5

substitute into $R=u^2 \sin(2*\theta)/g$: 15 = 169 sin(2*θ)/9.8, rearrange to sin(2*θ) = 147/169 (awrt 0.870), and solve for 2*θ using arcsin (taking the value less than 90 degrees) **M1**

θ = awrt 30.2 degrees **A1**

Answer: θ = 30.2 degrees (3 s.f.)

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