

1.4 Homework (Horizontal Projection)

A-Level Applied Mathematics : Mechanics : Year 2

Projectiles (Kinematics III)

*Any solution based entirely on graphical
or numerical methods is not acceptable*

Marks Available : 18

Question 1

In 1971, astronaut David Scott conducted a mechanics experiment on the moon, where there is no atmosphere. From his right hand he dropped a metal hammer whilst simultaneously dropping from the same height a feather from his left.

Which one of the following options describes what will happen next ?

- A The hammer and the feather will float about, weightless
- B The feather will fall to the surface of the moon fastest
- C Both hammer and feather will fall to the surface arriving at the same time
- D The hammer will fall to the surface of the moon fastest



[1 mark]

Question 2

A particle is projected horizontally with a velocity of 30 m s^{-1}

- (i) Find the horizontal and vertical components of the displacement of the particle from the point of projection after 3 seconds.

[3 marks]

- (ii) Find the distance of the particle from the point of projection after 3 seconds.

[2 marks]

Question 3

A particle is projected horizontally from the top edge of a seacliff with speed 8 m s^{-1}

It enters the sea with a speed of 20 m s^{-1}

- (i) Show, by using the theorem of Pythagoras, that the vertical component of the velocity with which the particle enters the sea is -18.33 m s^{-1}

[2 marks]

- (ii) Calculate the time of flight.

[2 marks]

- (iii) Calculate the height of the cliff at the point from which the particle was launched.

[3 marks]

Question 4

A horizontal pipe discharges sewage with initial velocity of 4 m s^{-1}

What is the velocity of a lump of sewage 1.75 seconds later as it enters a cesspit where it will be treated ?

[5 marks]

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Teachers may obtain detailed worked solutions to the exercises by email from MHHShrewsbury@Gmail.com