

## Chapter 9 Past Paper Questions

1. An apple and a leaf fall from a tree at the same instant. Both apple and leaf start at the same height above the ground but the apple hits the ground first.

You may be awarded marks for the quality of written communication in your answer.

Use Newton's laws of motion to explain why

- (i) the leaf accelerates at first then reaches a terminal velocity,

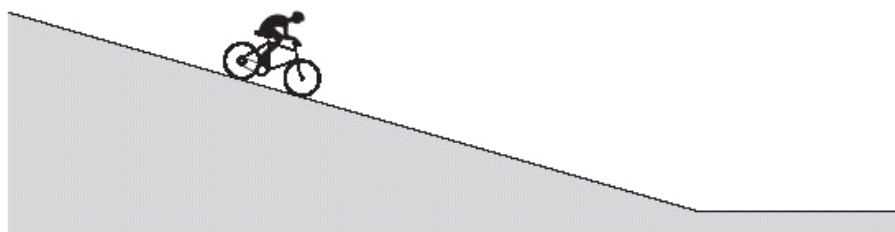
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- (ii) the apple hits the ground first.

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(Total 5 marks)

2. A cyclist **pedals** downhill on a road, as shown in the diagram below, from rest at the top of the hill and reaches a horizontal section of the road at a speed of  $16 \text{ m s}^{-1}$ . The total mass of the cyclist and the cycle is 68 kg.



- (a) (i) Calculate the total kinetic energy of the cyclist and the cycle on reaching the horizontal section of the road.

answer ..... J

- (ii) The height difference between the top of the hill and the horizontal section of road is 12 m. Calculate the loss of gravitational potential energy of the cyclist and the cycle.

answer ..... J

(2)

- (iii) The work done by the cyclist when pedalling downhill is 2400 J. Account for the difference between the loss of gravitational potential energy and the gain of kinetic energy of the cyclist and the cycle.

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(3)

- (b) The cyclist stops pedalling on reaching the horizontal section of the road and slows to a standstill 160 m further along this section of the road. Assume the deceleration is uniform.

- (i) Calculate the time taken by the cyclist to travel this distance.

answer..... s

(3)

- (ii) Calculate the average horizontal force on the cyclist and the cycle during this time.

answer ..... N

(3)

(Total 13 marks)