

## Chapter 10 Past Paper Questions

1. A skydiver of mass 70 kg, jumps from a stationary balloon and reaches a speed of  $45 \text{ m s}^{-1}$  after falling a distance of 150 m.

(a) Calculate the skydiver's

(i) loss of gravitational potential energy,

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(ii) gain in kinetic energy.

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**(4)**

(b) The difference between the loss of gravitational potential energy and the gain in kinetic energy is equal to the work done against air resistance. Use this fact to calculate

(i) the work done against air resistance,

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(ii) the average force due to air resistance acting on the skydiver.

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**(3)**

**(Total 7 marks)**

2. A packing case is being lifted vertically at a constant speed by a cable attached to a crane. The packing case has a mass of 640 kg.

(a) With reference to one of Newton's laws of motion, explain why the tension,  $T$ , in the cable must be equal to the weight of the packing case.

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

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(3)

(b) The packing case is lifted through a vertical height of 8.0 m in 4.5 s.

Calculate

(i) the work done on the packing case,

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(ii) the power output of the crane in this situation.

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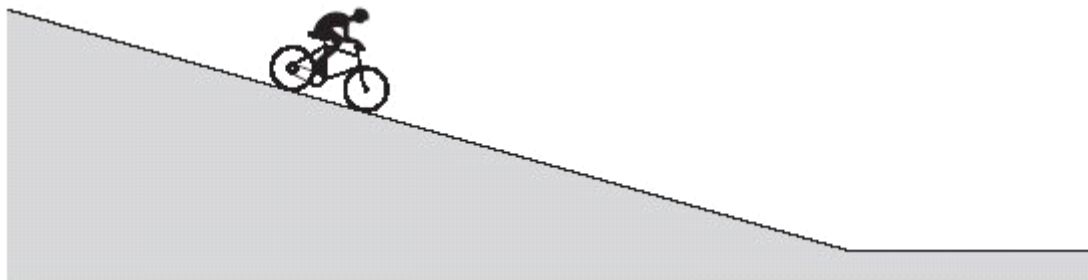
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(3)

(Total 6 marks)

3. 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  $68 \text{ kg}$ .



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

answer ..... J

(2)

- (ii) The height difference between the top of the hill and the horizontal section of road is  $12 \text{ m}$ .

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)**