

Name of the Student: _____

Max. Marks : 19 Marks

Time : 19 Minutes

Q1.

Figure 4 shows a drone.



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Figure 4

A different drone has a mass of 4.5 kg.

This drone rises from the ground to a height of 20 m.

- (i) Calculate the change in gravitational potential energy when the drone rises through a height of 20 m.

The gravitational field strength $g = 10 \text{ N/kg}$.

(2)

change in gravitational potential energy = J

- (ii) State the amount of useful work done by the blades as the drone rises through 20 m.

(1)

useful work done = J

- (iii) It takes 4 s for the drone to rise through 20 m.

Calculate the useful power developed by the blades in this time of 4 s.

(2)

useful power developed = W

(Total for question = 5 marks)

Q2.

Figure 15 shows a 'Mars rover' descending to the surface of the planet Mars.

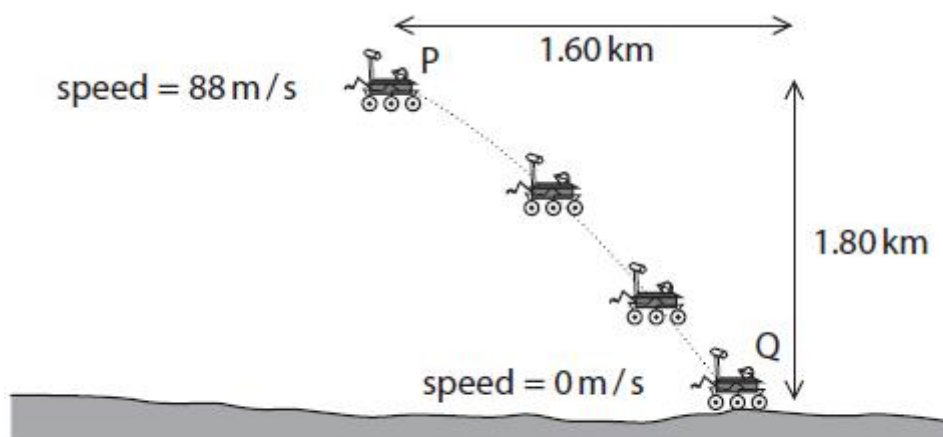


Figure 15

- (i) Calculate the change in gravitational potential energy of the rover as it descends from position P to position Q.

Mass of rover = 1100 kg

Gravitational field strength on Mars = 3.7 N / kg

Give your answer to 2 significant figures.

(3)

change in gravitational potential energy = J

- (ii) Use data from Figure 15 to calculate the change in kinetic energy of the rover as it descends from position P to position Q.

(2)

change in kinetic energy = J

- (iii) The rover is slowed down safely using thrusters and a parachute (not shown in Figure 15).

The thrusters use jets of gas to control movements and the parachute is designed to be used in the atmosphere of Mars.

Describe the energy changes involved in terms of the work done by various forces as the rover descends. (3)

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(Total for question = 8 marks)

Q3.

Figure 17 shows an athlete training with a push sled.

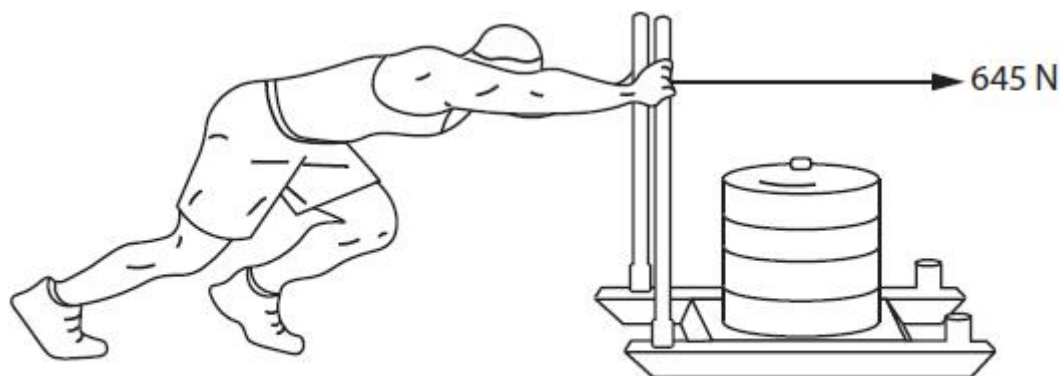


Figure 17

The athlete pushes the sled with a force of 645 N.

Calculate the distance the sled moves when the force of 645 N does 7440 J of work on the sled.

Give your answer to an appropriate number of significant figures.

(3)

distance moved = m

(Total for question = 3 marks)

Q3.

Figure 8 shows an athlete training with a push sled.

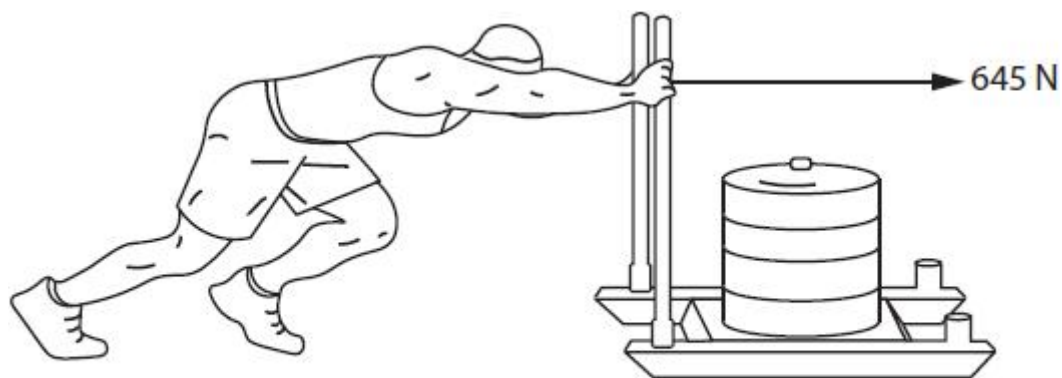


Figure 8

The athlete pushes the sled with a force of 645 N.

Calculate the distance the sled moves when the force of 645 N does 7440 J of work on the sled.

Give your answer to an appropriate number of significant figures.

(3)

distance moved = m

(Total for question = 3 marks)