

Name of the Student: _____

Max. Marks : 22 Marks

Time : 22 Minutes

Q1.

An athlete uses a training machine in a gym.

The display on the machine shows the time spent on the machine and the amount of energy transferred during a training session.

Figure 5 shows the displays for two different sessions by the same athlete.

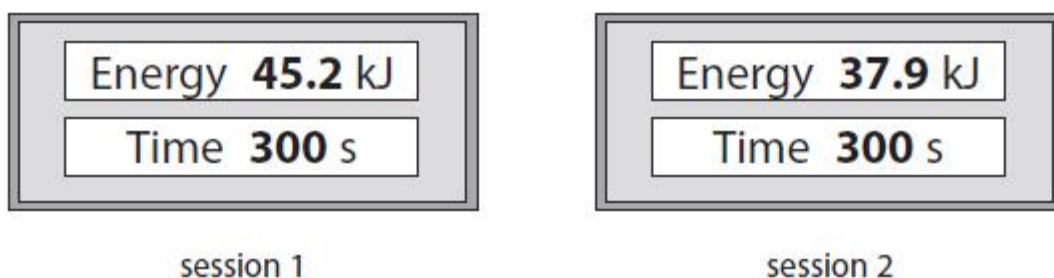


Figure 5

Explain what the displays show about the average power of the athlete in each of these two sessions.

(2)

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(Total for question = 2 marks)

Q2.

A cyclist starts to cycle.

The cyclist does 1600 J of useful work to travel 28 m.

Calculate the average force the cyclist exerts.

(3)

(Total for question = 3 marks)

Q3.

Figure 13 shows a storage heater.

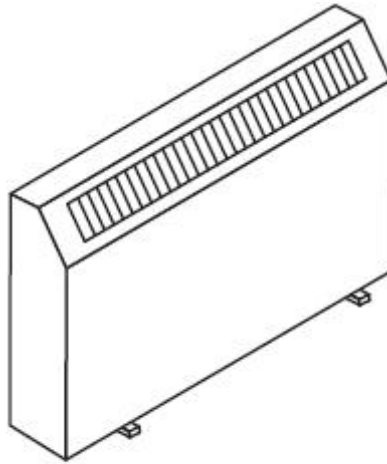


Figure 13

The storage heater contains bricks.

The bricks are heated electrically.

The electrical heater supplies 210 kJ of energy to each brick in the storage heater.

One brick has a mass of 5.8 kg.

The specific heat capacity for the brick is 860 J/kg K.

(i) Use this data to calculate the increase in temperature of the brick.

(2)

temperature increase = °C

(ii) The actual temperature increase will be smaller than you calculated in (i).

Explain why the actual temperature increase will be smaller than the value in (i).

(2)

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Q4.

A rock falls off the top of a cliff of height h .

Figure 1 shows the rock falling.

The Earth exerts a force of 150 N on the rock.

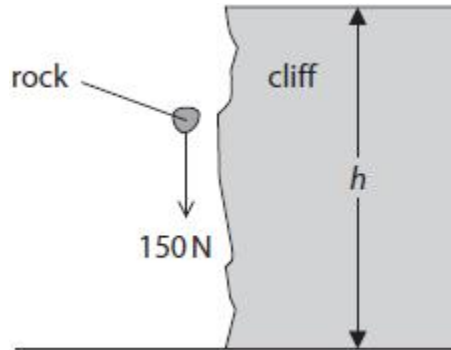


Figure 1

The work done by this force when the rock falls from the top to the bottom of the cliff is 2700 J.

(i) Calculate the height, h , of the cliff.

(2)

$h = \dots\dots\dots$ m

(ii) State the value of the kinetic energy of the rock just before it hits the ground.

(1)

kinetic energy = $\dots\dots\dots$ J

(iii) The mass of the rock in Figure 1 is 15 kg.

Calculate the velocity of the rock just before it reaches the bottom of the cliff.

(2)

velocity = m/s

(Total for question = 5 marks)

Q5.

A ball has a mass of 0.046 kg.

(i) Calculate the change in gravitational potential energy when the ball is lifted through a vertical height of 2.05 m.

Use the equation

$$\Delta GPE = m \times g \times \Delta h$$

(2)

change in gravitational potential energy = J

(ii) The ball is released.

Calculate the kinetic energy of the ball when the speed of the ball is 3.5 m/s.

(3)

kinetic energy of the ball = J

(iii) The ball bounces several times.

Figure 1 shows how the height of the ball above the floor changes with time.

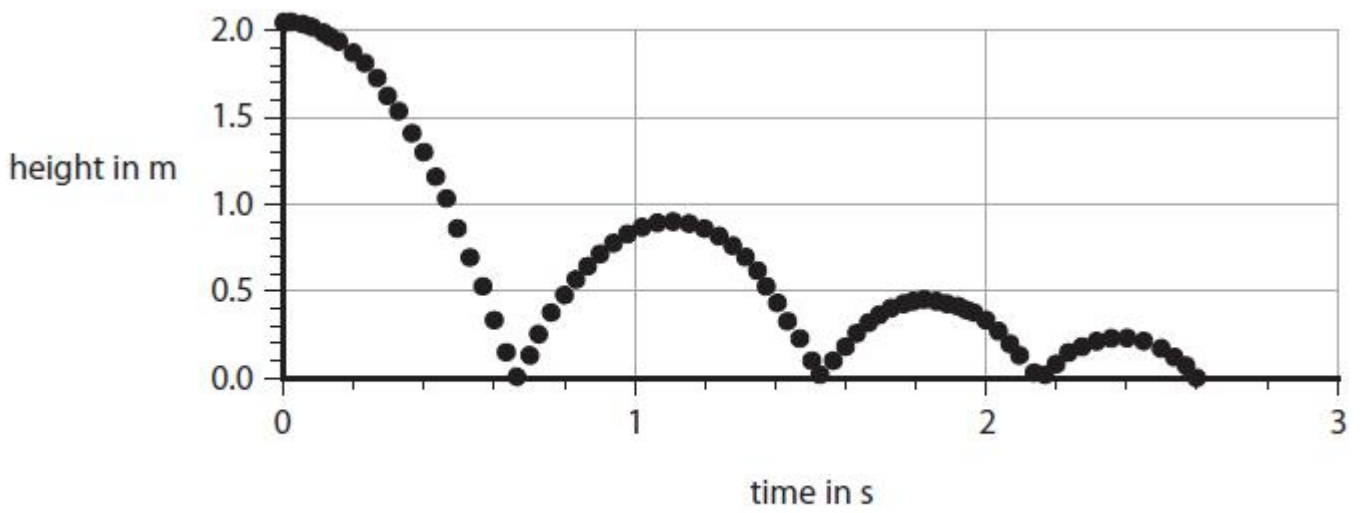


Figure 1

Use Figure 1 to estimate the maximum height that the ball reaches after the first bounce.

(1)

height after first bounce = m

(iv) Explain why the ball does not bounce back to its starting height of 2.05 m.

(2)

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(Total for question = 8 marks)