Energy Transfers

Total Marks : 19

Q1.

A cyclist has a mass of 64 kg.

(i) The cyclist rides from a flat road to the top of a hill.

The top of the hill is 24 m above the flat road.
Calculate the gain in gravitational potential energy, ΔGPE, of the cyclist.
Use g = 10 N/kg
Use the equation

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

(2)

gain in gravitational potential energy = ... J

(ii) The cyclist returns to the flat road.

The mass of the cyclist is 64 kg.
Calculate the kinetic energy of the cyclist when the cyclist is travelling at 6.0 m/s.
Use the equation

$$KE = \tfrac{1}{2} \times m \times v^2$$

(3)

kinetic energy = ... J

(iii) The cyclist then uses the brakes on the bicycle to stop.

Explain what happens to the kinetic energy of the cyclist.

(2)

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Q2.

A model train has a mass of 8.0 kg.
It travels at a speed of 1.5 m/s.

Calculate the kinetic energy of the model train.

Use the equation

$$\text{kinetic energy} = \tfrac{1}{2} \times \text{mass} \times (\text{speed})^2$$

(3)

kinetic energy = ... J

Q3.

(i) Which of these would be a typical speed for a racing cyclist travelling down a steep straight slope?

(1)

- ☐ **A** 0.2 m/s
- ☐ **B** 2 m/s
- ☐ **C** 20 m/s
- ☐ **D** 200 m/s

(ii) A cyclist travels down a slope.
The top of the slope is 20 m vertically above the bottom of the slope.
The cyclist has a mass of 75 kg.

Calculate the change in gravitational potential energy of the cyclist between the top and the bottom of the slope.

The gravitational field strength, g, is 10 N/kg.

(3)

change in gravitational potential energy = ... J

Q4.

Figure 7 shows a skier going down a hill.

Figure 7

She descends through a vertical height of 200 m.

The skier's mass is 65 kg.

(i) Calculate the change in gravitational potential energy.
Use the equation

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

Take the gravitational field strength, g, as 10 N / kg.

(2)

change in gravitational potential energy = ... J

(ii) At the bottom of the slope her speed was 36 m/s.

Calculate her kinetic energy at the bottom of the slope.
Use the equation

$$KE = \frac{1}{2} \times m \times v^2$$

(3)

kinetic energy = ... J