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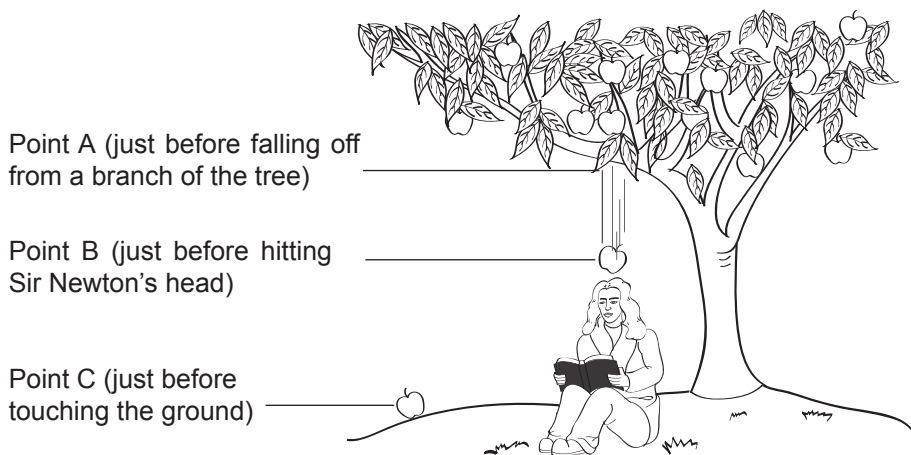
MARKS

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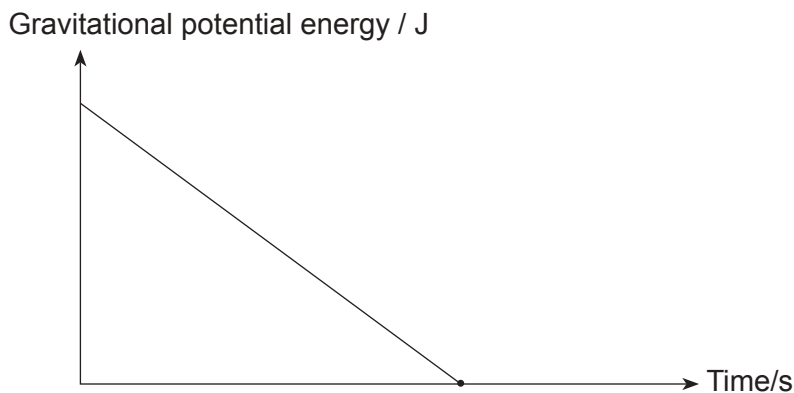
Forms and Uses of Energy



1. Sir Isaac Newton was resting under an apple tree when a ripe apple fell on his head with a thud.



The graph below shows the change in the gravitational potential energy of the apple throughout its fall from the tree until it hits the ground.

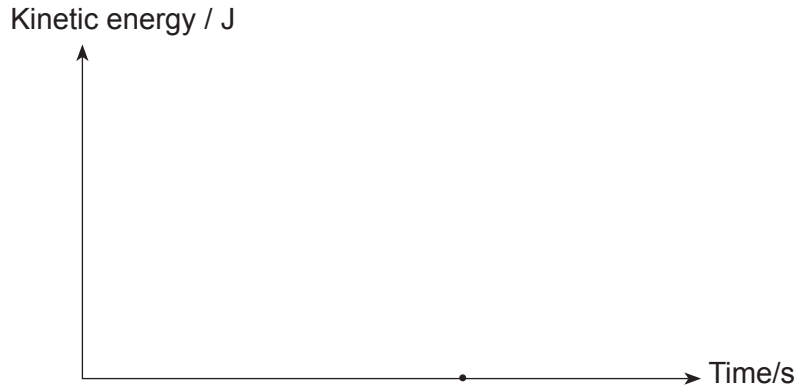


- (a) On the graph, mark the approximate positions of points A, B and C.

[1½m]

- (b) Complete the graph below to show the change in kinetic energy of the apple over the same period of time. Mark the approximate positions of points A, B and C.

[1½m]



- (c) What is the relationship between the gravitational potential energy and the kinetic energy of the apple during its fall? [2m]

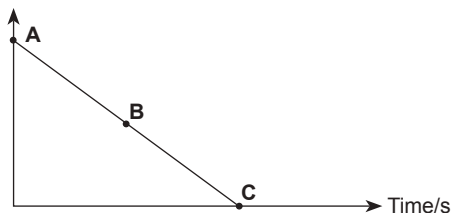
- (d) Apart from gravitational potential energy, what other forms of energy are lost during the fall of the apple? [2m]

- (e) Assuming that the masses of the apples on a taller tree are the same as that on a shorter tree and the likelihood of being hit by an apple is the same for both trees, would it have been safer or more dangerous for Newton to have been resting under a taller apple tree? Explain. [3m]

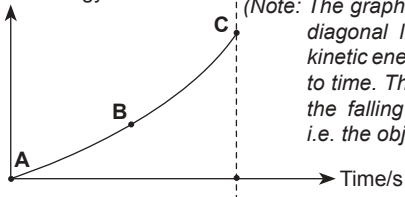
Answers to Forms and Uses of Energy



1. (a) Gravitational potential energy / J



- (b) Kinetic energy / J



(Note: The graph is a curve and not a straight diagonal line because the change in kinetic energy is not directly proportional to time. The rate of change of speed of the falling object increases over time i.e. the object accelerates as it falls.)

- (c) At first, the gravitational potential energy is at its maximum when the apple is at its highest point while kinetic energy is at its minimum (0). As the apple falls towards the ground, the gravitational potential energy decreases while the kinetic energy increases.
- (d) Sound energy of the apple when it hits Newton's head and the ground is lost. Some kinetic energy is also lost due to the slowing down of the falling apple as a result of air resistance (friction between the apple and the air as it falls.)
- (e) The speed of a falling object increases with height through which it falls. As such, an apple from a taller tree would hit Newton at a higher speed, resulting in a greater amount of force exerted on his head. In conclusion, it would be more dangerous for Newton to rest under a taller apple tree.

Adapted:

Science Process Skills for Upper Block 5/6

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