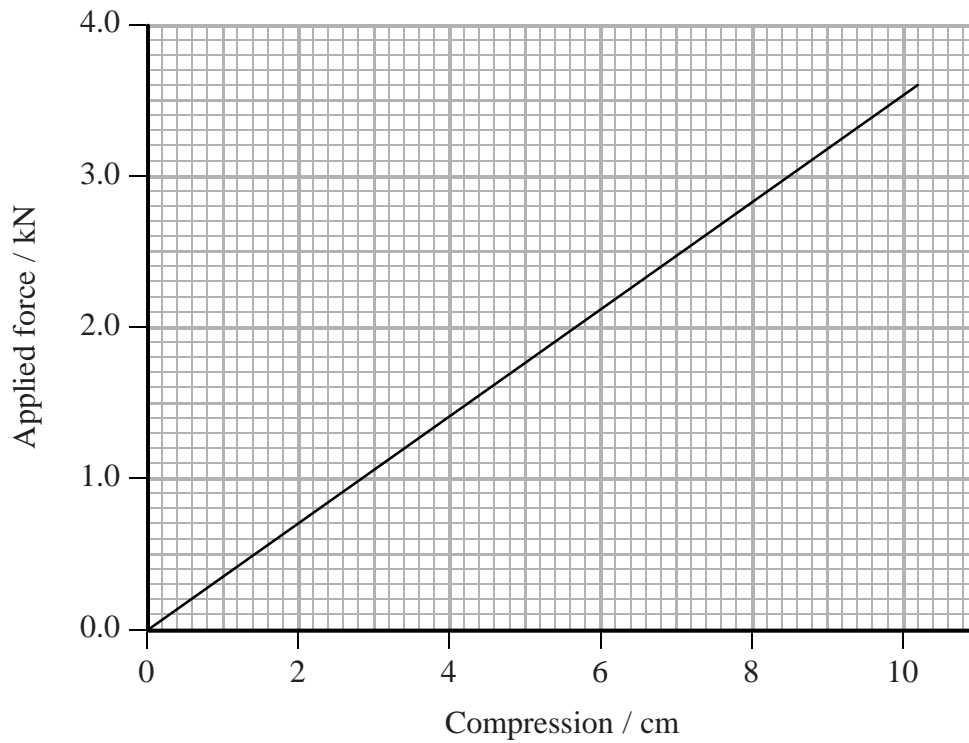


1 A pogo stick is a toy used for jumping up and down. The pogo stick contains a spring which is under compression.

(a) The force-compression graph for the spring from the pogo stick is shown.

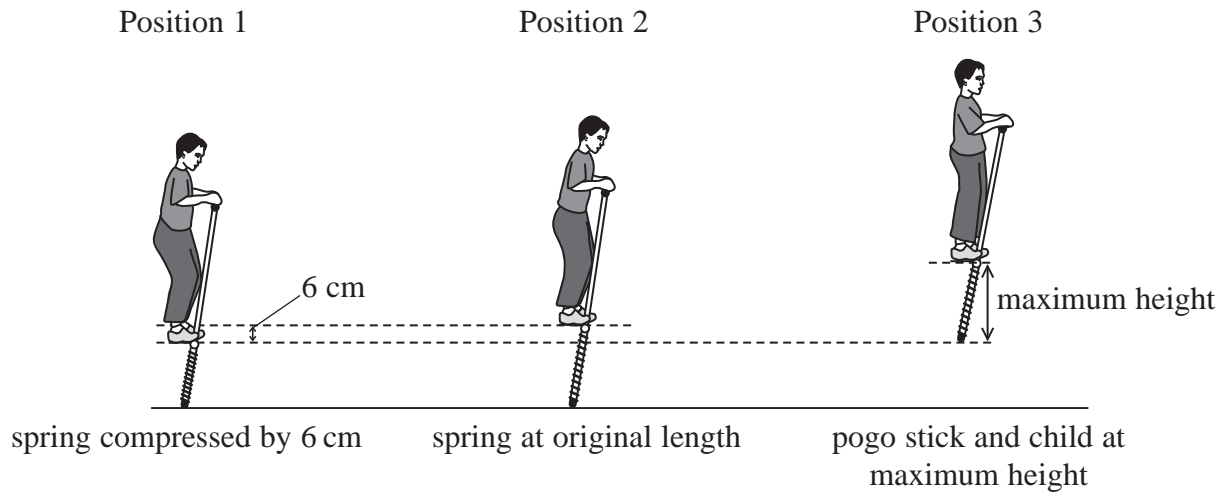


Determine the spring constant for the spring.

(2)

Spring constant =

- (b) Inside the pogo stick the spring is compressed by 3 cm. A child jumps onto the foot rest of the pogo stick and the spring is compressed by a further 6 cm. The pogo stick and child move up to a maximum height at position 3.



- (i) Use the graph to show that the work done by the child on the spring is about 130 J.

(3)

- (ii) When the spring is at its original length, as shown in position 2, the child is at his maximum speed.

State the energy transfers that occur as the child moves upwards from position 1 to position 2.

(2)

(iii) By considering the energy transfers as the child moves upwards from position 1 to position 2, calculate the maximum speed of the child.

mass of child and pogo stick = 35 kg.

(4)

Maximum speed =

\***(c)** Between positions 1 and 2 the pogo stick is pushing down on the ground.

With reference to Newton's laws of motion, explain how this downward force causes the child and pogo stick to rise.

**(3)**

**(Total for Question = 14 marks)**