7 A light elastic band of length 20 cm is stretched to a length of 28 cm, and then allowed to return back to its original length. Fig. 7.1 shows how the length of the band varies with the force applied.

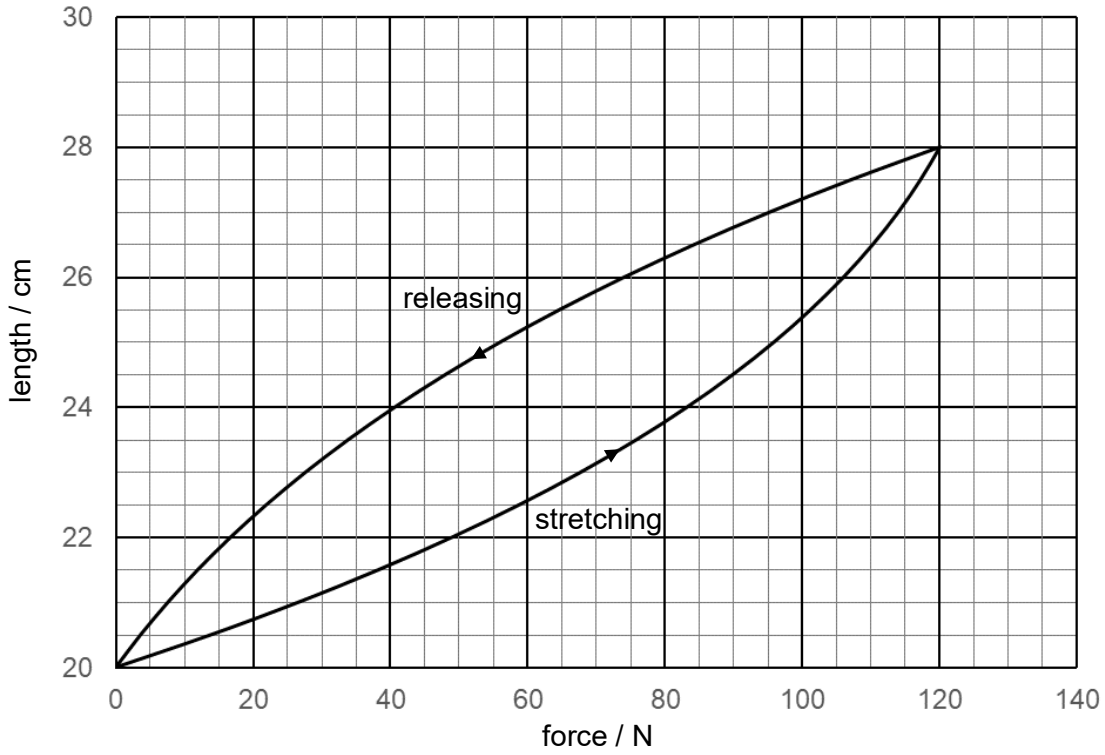

Fig. 7.1

(a) Explain how the graph shows that the band does not obey Hooke's Law.

.....

.....

.....

.....

.....

.....[2]

(b) Estimate the work done by the applied force to stretch the band.

work done = ... J [2]

(c) The elastic band is used in a catapult to project a pellet into the air. The band is stretched to a length of 28 cm and released. Explain using Fig. 7.1, why the kinetic energy of the pellet at the point of release is significantly smaller than your answer in **(b)**.

.....

.....

.....

.....

.....[2]

(d) The initial kinetic energy of the projected pellet is 3.8 J. Calculate the efficiency of the band in accelerating the pellet.

efficiency = ... [2]

(e) Suggest one reason for the loss in efficiency.

.....

.....[1]

(f) The elastic band is replaced with another new elastic band of the same length which obeys Hooke's Law. It is also stretched to a length of 28 cm and transfers 3.8 J of kinetic energy to the pellet.

(i) Calculate the spring constant of this band.

spring constant = ... N m^{-1} [2]

(ii) Sketch the graph for this new elastic band on Fig. 7.1. [1]

[Total: 12]

Section B

Answer **one** question from this Section in the spaces provided.