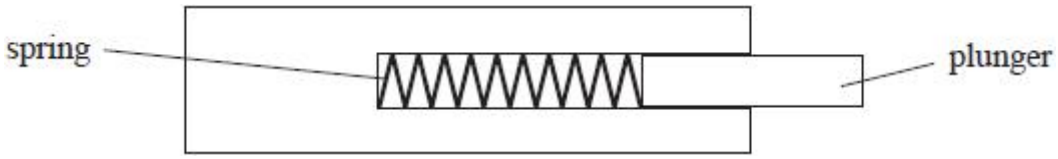
Name of the Student:_____

Max. Marks : 20 Marks **Time : 20 Minutes**

Q1.

A school dynamics trolley has a plunger attached to a spring. When the plunger is pushed in, the spring is compressed. When the plunger is released, it is pushed back out by the spring.



(a) A student investigated the spring to determine whether it obeys Hooke's law in compression.

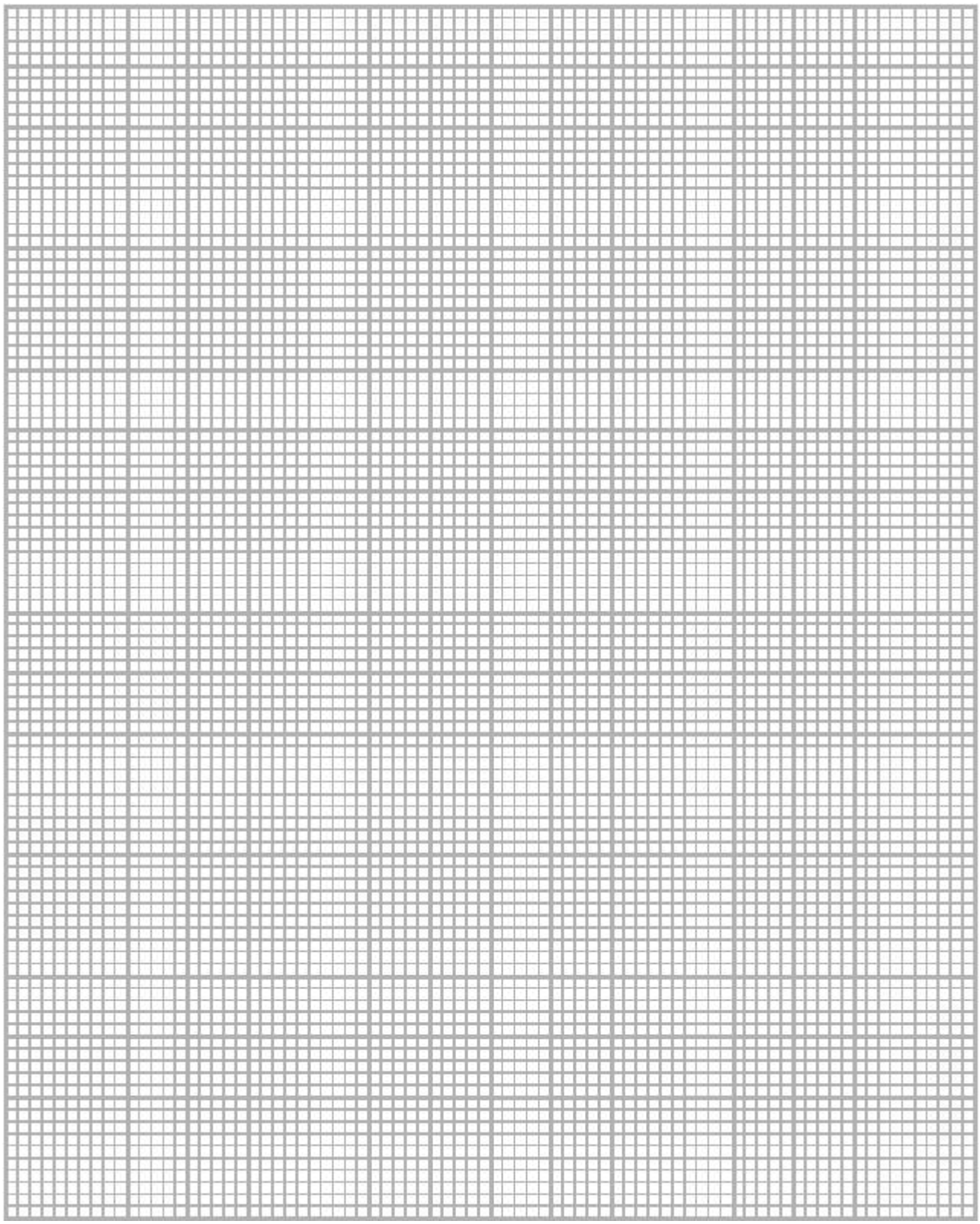
The trolley was placed vertically in front of a scale and weights were added in turn to the top of the plunger, as shown. The position of the end of the plunger was recorded each time.

The recorded results are shown in the table.

Weight / N	Position of plunger / cm	
0.00	37.3	
2.00	37.0	
4.00	36.6	
6.00	36.2	
8.00	35.9	
10.00	35.5	

(i) Use the results to plot a graph of weight against compression. You may use the additional column for your processed data.

(5)



(ii) The student concluded that the spring obeys Hooke's law with a spring constant of about 600 N m^{-1}. Determine whether the student's conclusion is justified.

(4)

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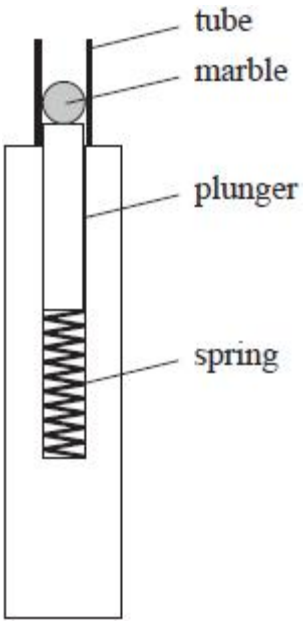
(b) Another trolley was adapted by placing a tube around the plunger so that it could be used to launch marbles. A marble was placed in the tube while the plunger was depressed. When the plunger was released it launched the marble.



Determine the maximum possible launch velocity of the marble when the spring is compressed by 5.4 cm.
spring constant = 610 N m^{-1}
mass of marble = 4.1 g
mass of plunger = 35.4 g

(4)

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Maximum launch velocity = ...

(c) The launch velocity was measured using a light gate and data logger. This produced a smaller value for the launch velocity than that calculated in (b).

Give a reason why this method produced a smaller value for the launch velocity.

(1)

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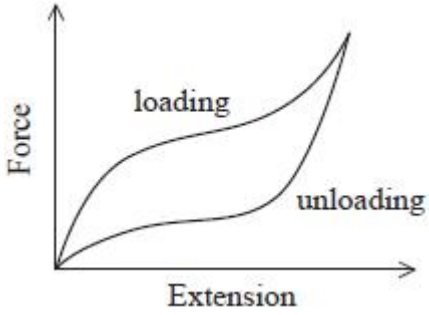
(Total for question = 14 marks)

Q2.

* A resistance band is a length of an elastic material that can be used for exercise. The user repeatedly applies an increasing tensile force (loading) and then releases the force (unloading).

The force-extension graph for the resistance band is shown.



The user finds that the band gets warm during use.

Describe, with reference to the graph, the behaviour of the resistance band when it is repeatedly loaded and unloaded.

(6)

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(Total for question = 6 marks)