Additional Assessment Materials

Summer 2021

Pearson Edexcel GCE A Level Physics

Topic 4: Materials

Test 1

(Public release version)

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Additional Assessment Materials, Summer 2021

General guidance to Additional Assessment Materials for use in 2021

Context

- Additional Assessment Materials are being produced for GCSE, AS and A levels (with the exception of Art and Design).
- The Additional Assessment Materials presented in this booklet are an **optional** part of the range of evidence teachers may use when deciding on a candidate's grade.
- 2021 Additional Assessment Materials have been drawn from previous examination materials, namely past papers.
- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.

Purpose

- The purpose of this resource to provide qualification-specific sets/groups of questions covering the knowledge, skills and understanding relevant to this Pearson qualification.
- This document should be used in conjunction with the mapping guidance which will map content and/or skills covered within each set of questions.
- These materials are only intended to support the summer 2021 series.

1

13 Raindrops of different sizes fall with different terminal velocities through air.

The table shows the measured value of the terminal velocity for raindrops of different sizes.

Raindrop size	Drop diameter / mm	Terminal velocity / m s^{-1}
small	0.5	2.1
medium	2.0	6.5
large	5.0	9.1

(a) Derive, using Stokes' law, the following expression for the terminal velocity v of a spherical raindrop in terms of its radius r.

$$v = \frac{2g\rho r^2}{9\eta}$$

where ρ is the density of rainwater and η is the viscosity of air.

You should ignore upthrust.

(2)

(b) Show that the expression given in (a) produces a value of about 800 m s^{-1} for the terminal velocity of a large raindrop.

(2)

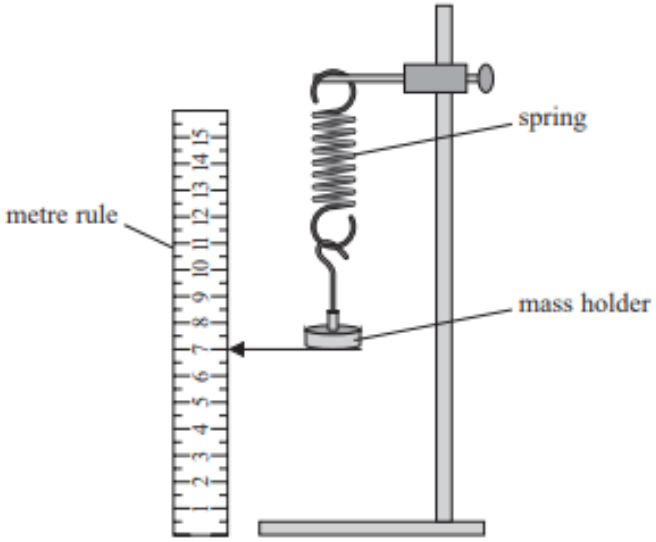
$\rho = 1.0 \times 10^{3}$ kg m^{-3}
$\eta = 1.8 \times 10^{-5}$ Pa s

(c) Explain whether Stokes' law is suitable for calculating the terminal velocity of raindrops.

(3)

(Total for Question 13 = 7 marks)

11 A student investigated the behaviour of a spring under tension. The spring was hung vertically with a mass holder attached.



The position of the bottom of the mass holder was recorded. The spring was stretched by adding masses to the mass holder and the new positions were recorded. The extension of the spring each time was calculated.

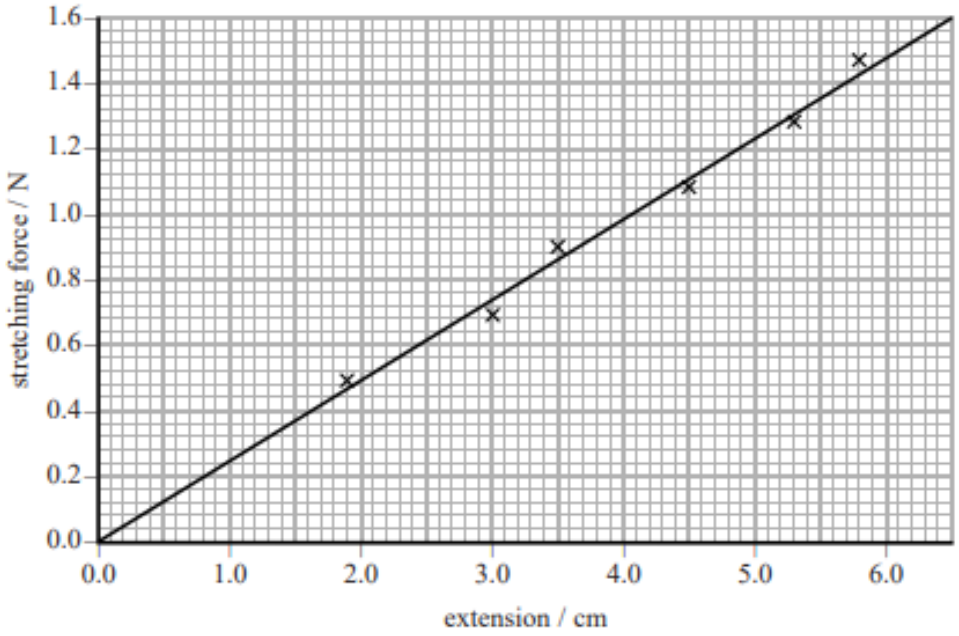
The student produced the following table.

Mass added / g	Extension / cm	Stretching force / N
50	1.9	0.49
70	3	0.69
90	3.5	0.9
110	4.5	1.08
130	5.3	1.28
150	5.8	1.47

(a) Criticise the student's table.

(2)

(b) The student used her data to plot a graph as shown.



Determine a value for the force constant k of the spring.

(2)

k = ...

TOTAL FOR PAPER IS 11 MARKS