# Additional Assessment Materials
Summer 2021

## Pearson Edexcel GCE A Level Physics

## Topic 2: Mechanics
Test 1

(Public release version)

# 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- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.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.

**8** In the sport of curling, two teams of 'curlers' take turns sliding polished granite stones across an ice surface towards a circular target marked on the ice.



commons.wikimedia.org

(a) A stone of mass 19.6 kg is accelerated uniformly for 1.25 s before being released by a curler. The stone then decelerates uniformly to rest, travelling 32.5 m in a time of 17.5 s.

Calculate the average useful power developed by the curler in accelerating the stone.

(4)

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Average power = _____

**14** A physics class made a toy rocket. A drinks bottle was partially filled with water and inverted over a valve. An air pump delivered air to the bottle until the pressure forced the bottle from the valve and the water was ejected from the bottle at high speed.



A velocity-time graph for the bottle for the first 4 s after take-off is shown.
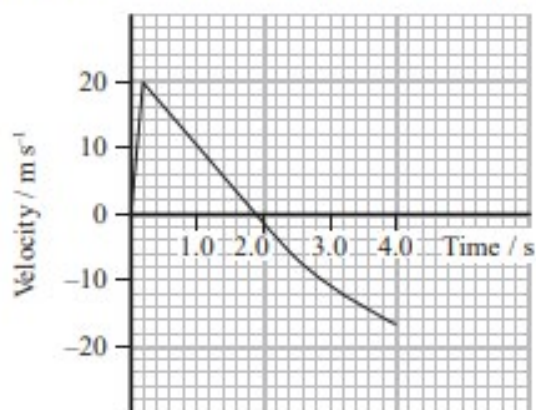


(a) Determine the height to which the rocket travelled.

(2)

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Height = ..........................................

(b) Sketch the corresponding acceleration-time graph on the axes below.

(5)



**(Total for Question 14 = 7 marks)**

11 A sports class is studying cycling. They produce a video of a cyclist on a horizontal lawn. The cyclist starts from rest.
They produce a sketch graph of the velocity $v$ of the cyclist against time $t$.



(a) Explain the shape of this graph and include a consideration of force as part of your answer.

(3)

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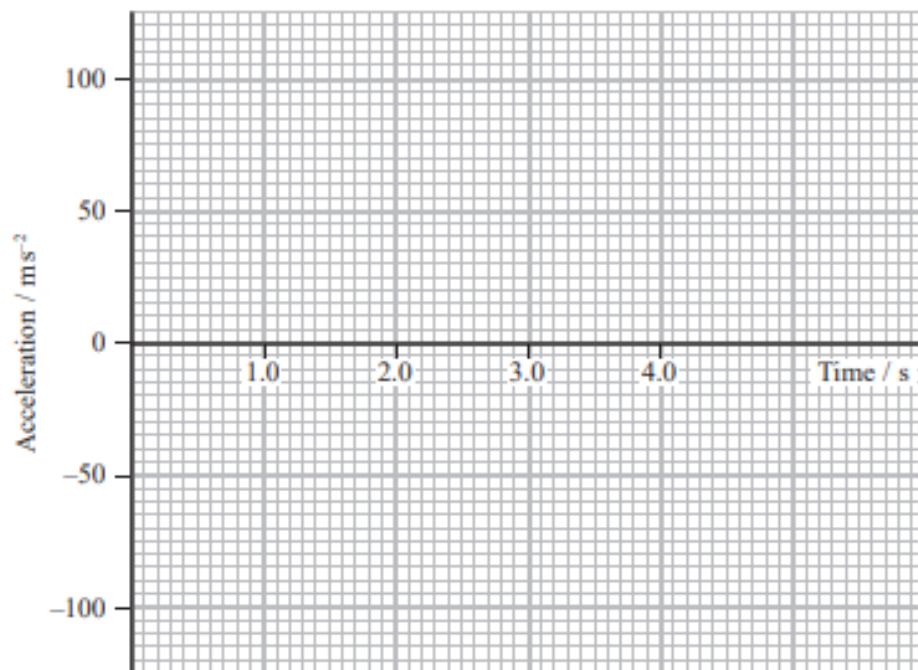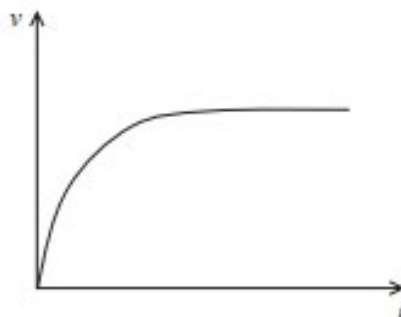.................................................................................................................................................................

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(b) A student makes the following statement.

The work done by the cyclist is converted into the kinetic energy of the cyclist and bicycle.

Criticise this statement.

(3)

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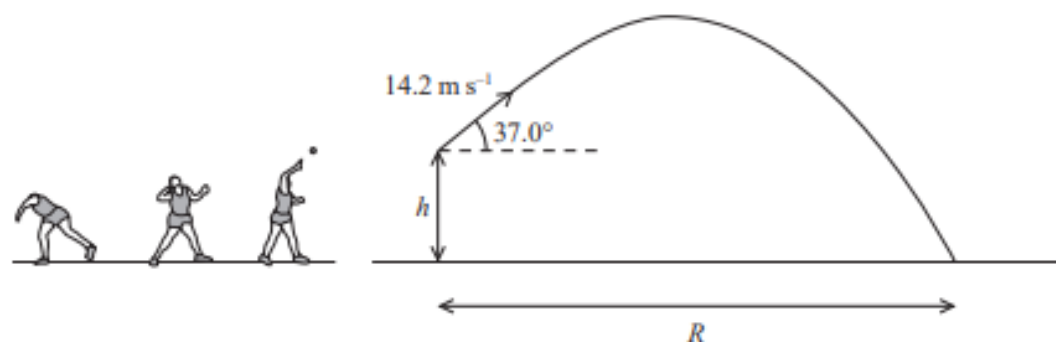
**(Total for Question 11 = 6 marks)**

**12** The shot put is an Olympic field event. The distance for the women's world record shot put is in excess of twenty two metres.

The shot is a metal ball, which is thrown from a standing position so that it lands on the ground a horizontal distance $R$ away from the thrower.



A shot is thrown from a height $h$ above the ground with an initial velocity of 14.2 m s$^{-1}$ at an angle of 37.0° to the horizontal. The time it takes for the shot to reach the ground is 1.98 s.

(a) Show that the vertical component of the initial velocity is about 8.6 m s$^{-1}$.

(2)

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(b) Calculate the height $h$ above the ground from which the shot was thrown.

(3)

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$h =$ ..................................................................................

(c) Calculate the horizontal distance $R$ for this throw.

(3)

$R = $ ................................................
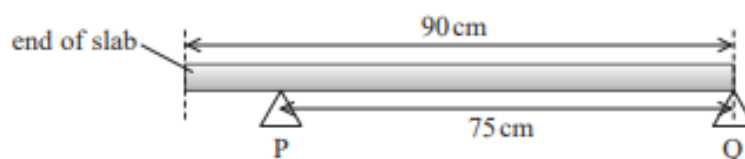
**(Total for Question 12 = 8 marks)**

**11** A uniform paving slab is to be used as a garden step.

(a) State what is meant by the centre of gravity of an extended body.

(1)

(b) The paving slab has a weight of 310 N and a length of 90 cm and will be supported at two points, P and Q, as shown. The distance between P and Q will be 75 cm.



This might be unsafe because a person who places all their weight at the end of the slab might tip the slab.

A person of mass 70 kg stands at the end of the slab.

Deduce whether the slab will tip.

(4)

**(Total for Question 11 = 5 marks)**

**16** Scientists have been studying a type of jumping spider that can jump up to six times its body length.

(a) The scientists photographed a spider at 0.02s intervals, during a jump. The picture is taken from the photograph and is shown actual size.



platform

(i) Deduce whether the images show that the motion in the *x*-direction is independent of the motion in the *y*-direction. You should take measurements using the cross marking the centre of gravity of the spider.

(4)

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(ii) Show that the initial velocity of the spider at the start of the jump is about $1\,\mathrm{m\,s^{-1}}$. You should take measurements using the cross marking the centre of gravity of the spider.

(5)

(iii) The spider achieves this jump by extending its two back legs by $3.0\,\mathrm{mm}$.

Calculate the average force the spider exerts in each leg to achieve the jump.

mass of spider $= 150\,\mathrm{mg}$

(3)

Average force = ..................................................

**TOTAL FOR PAPER IS 42 MARKS**