Pearson Edexcel

Additional Assessment Materials Summer 2021

Pearson Edexcel GCSE in Physics (1PH0) Foundation

Resource Set Topic A: Motion and Forces

Questions

(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- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.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 (a) Which of these speeds would be normal for a person walking?

(1)

- ☐ **A** 0.1 m/s
- ☒ **B** 1.0 m/s
- ☐ **C** 10 m/s
- ☐ **D** 100 m/s

(b) Figure 1 shows a block hanging from a spring balance.

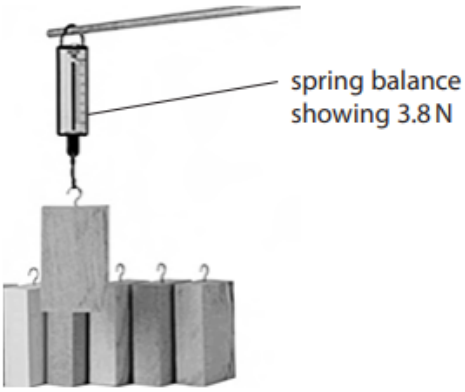

Figure 1

Use a word from the box to complete the sentence below.

density	mass	volume	weight

The quantity measured by the spring balance in Figure 1 is

(1)

weight

(c) A toy car has a mass of 0.10 kg.
The toy car accelerates at 2.0 m/s^2.

Calculate the force producing this acceleration.
State the unit.

Use the equation

$F = m \times a$

(3)

$F = ma$
$= 0.1\,kg \times 2\,ms^{-2}$
$= 0.2\,kgms^{-2}$
$= 0.2\,N$

force = 0.2 unit = N

(d) Use words from the box to complete the sentences below.

direction	energy	mass	size

(2)

Vectors have size and direction .

Scalars have only size .

1 (a) Figure 1 shows a speed/time graph for a car.

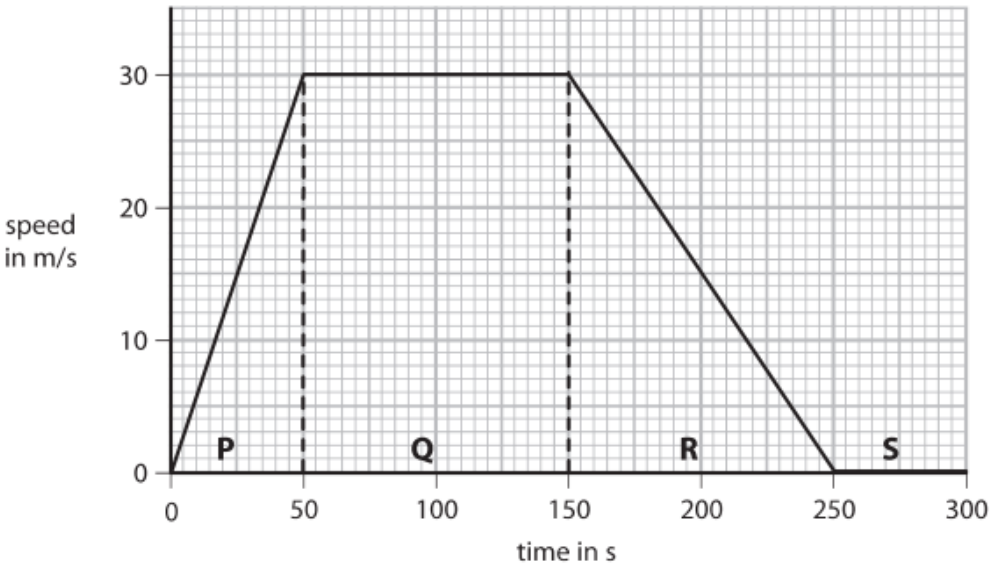

Figure 1

(i) The graph in Figure 1 is divided into four parts, **P**, **Q**, **R** and **S**.

Draw a line from the letter for each **part** to the correct **description of the motion** during that part.

One line has been drawn for you.

(2)

part	**description of the motion**
P	the car is standing still
Q	the car is accelerating
R	the car is decelerating
S	the car is travelling at constant speed

(ii) In two parts of the graph in Figure 1 the forces are balanced.

State the letters of the two parts of the graph where the horizontal forces acting on the car are balanced.

(2)

part Q and part S

(iii) Calculate the distance travelled by the car in part Q.

Use the equation

distance travelled = average speed × time

(2)

$= 30 \times (150 - 50)$
$= 30 \times 100$

distance travelled = 3000 m

(b) A car with a mass of 1800 kg is accelerating at 1.2 m/s^2.

Calculate the force used to accelerate the car.

Use the equation

force = mass × acceleration

(2)

$F = 1800 \times 1.2$

force = 2160 N

6 (a) (i) Which of these would be a typical speed for a racing cyclist travelling down a steep straight slope?

(1)

- ☒ **A** 0.2 m/s
- ☒ **B** 2 m/s
- ☒ **C** 20 m/s
- ☒ **D** 200 m/s

(ii) A cyclist travels down a slope.
The top of the slope is 20 m vertically above the bottom of the slope.
The cyclist has a mass of 75 kg.

Calculate the change in gravitational potential energy of the cyclist between the top and the bottom of the slope.

The gravitational field strength, g, is 10 N/kg.

(3)

GPE Change = $GPE_{TOP} - GPE_{BOTTOM}$
$= mgh - mgh$
$= 75 \times 10 \times 20 - 75 \times 10 \times 0$
$= 15000 - 0$

change in gravitational potential energy = 15000 J

(b) An aircraft waits at the start of a runway.
The aircraft accelerates from a speed of 0 m/s to a speed of 80 m/s.
The acceleration of the aircraft is 4 m/s^2.

Calculate the distance, x, travelled by the aircraft while it is accelerating.

Use the equation

$$x = \frac{v^2 - u^2}{2a}$$

(2)

$$= \frac{(80)^2 - (0)^2}{2(4)} = \frac{6400}{8}$$

x = 800 m

(c) A student needs to measure the average speed of an accelerating trolley between two marks on a bench.

Figure 5 shows the arrangement of some apparatus that the student can use.

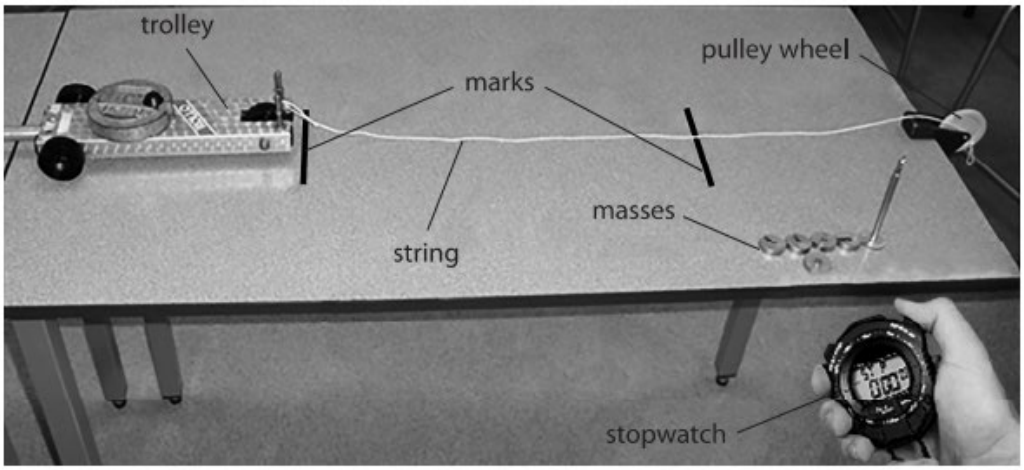

Figure 5

(i) One piece of apparatus is missing from the diagram.
This piece of apparatus is needed to determine the average speed.

State the extra piece of apparatus needed to determine the average speed.

(1)

ruler

(ii) Describe how the student can make the trolley accelerate along the bench.

(2)

By providing a force on the string, by hanging masses on the piece of string hanging from the pulley.

(iii) The student wishes to develop the experiment to determine the acceleration of the trolley.

State **one other** measurement that the student must make to determine the acceleration of the trolley.

(1)

Speed of the trolley at the second mark.

2 (a) (i) Which of these is the correct equation that relates force, mass and acceleration?

(1)

- ☐ **A** $F = m + a$
- ☐ **B** $F = m - a$
- ☒ **C** $F = m \times a$
- ☐ **D** $F = m \div a$

(ii) A cyclist has a mass of 70 kg.

Calculate the force needed to accelerate the cyclist at 2.0 m/s^2.

State the unit.

(2)

$F = ma$
$= 70\text{kg} \times 2\text{m/s}^2$
$= 140\text{kgm/s}^2$
$= 140\text{N}$

force = 140 unit = N

(b) Another cyclist travels 1200 m in a time of 80 s.

Calculate the average speed of the cyclist.

Use the equation

$$\text{average speed} = \frac{\text{distance}}{\text{time}}$$

(2)

$= \frac{1200}{80}$

average speed = 15 m/s

(c) A student wants to measure the average speed of a cyclist.

The student estimates that one of his own steps is 1 m.

He counts 100 steps between two posts on a track.

He uses a stopwatch to measure the time the cyclist takes to travel between the two posts.

Figure 2 shows the set-up used to measure the average speed.

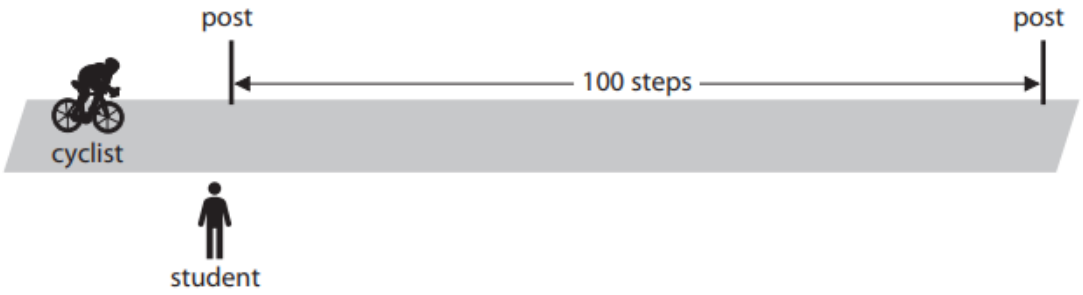

Figure 2

State **two** improvements the student could make to this method.

(2)

1 He can use a measuring wheel to measure the distance between the two poles.

2 Use a high speed camera to measure time taken at both poste.

9 (a) Which of these is a vector?

(1)

- ☒ **A** energy
- ☒ **B** force
- ☒ **C** mass
- ☒ **D** work

(b) (i) State the equation that relates acceleration to change in velocity and time taken.

(1)

$$a = \frac{v-u}{t}$$

(ii) A van accelerates from a velocity of 2 m/s to a velocity of 20 m/s in 12 s.

Calculate the acceleration of the van.

(2)

$a = \frac{v-u}{t}$

$= \frac{20-2}{12} = \frac{18}{12}$

acceleration = 1.5 m/s²

(c) Figure 17 is a velocity/time graph for 15 s of a cyclist's journey.

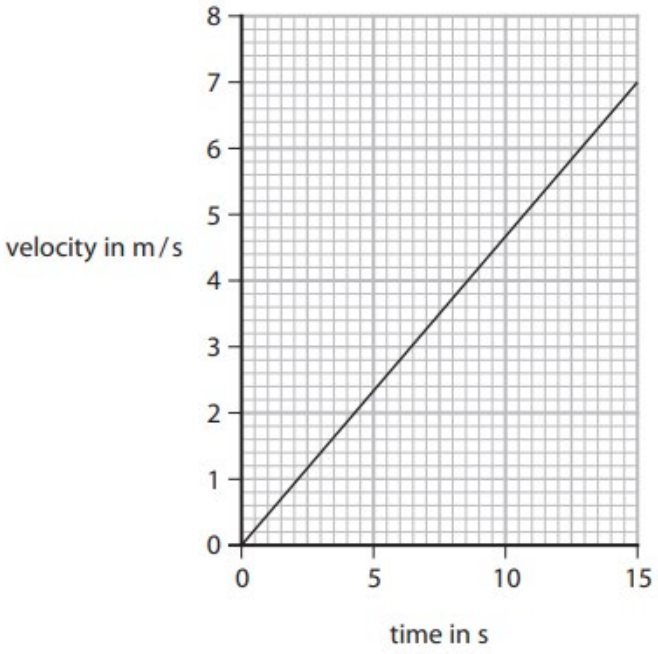

Figure 17

Calculate the distance the cyclist travels in the 15 s.

(3)

distance = area under the graph.

$= \frac{1}{2} \times b \times h$

$= \frac{1}{2} \times 15 \times 7$

distance = 52.5 m

*(d) Many factors can affect the stopping distance of a car.

Some of these factors involve the driver and some of these factors involve the car or the road.

Explain how the stopping distance of a car is affected by

- factors involving the driver
- factors involving the car or the road.

You should include examples in your explanations.

(6)

Factors involving driver:

- Thinking distance of the driver can affect the time taken between driver seeing a distraction and applying breaks.
  Eg: An old driver may take more time to process an obstacle in the road and press the pedal late.

Factors involving the car or road:

- The car may have old tyres that may reduce the friction causing the car to slide on the road more.
- The road may be wet also causing friction to decrease, increasing the breaking distance.
- Both factors contribute to breaking distance as it increase the time between driver applying breaks and car coming to a halt.

TOTAL FOR PAPER IS 45 MARKS