Additional Assessment Materials
Summer 2021

Pearson Edexcel GCSE in Physics (1PH0)
Higher

Resource Set Topic A: Motion and Forces

Questions

(Public release version)

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

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- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.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

6 (a) The symbol '*g*' can be used to refer to the acceleration due to gravity.

The acceleration due to gravity '*g*' has the unit of m/s^2.

'*g*' can also have another unit.

Which of these is also a unit for *g*?

(1)

☒ **A** J/kg

☒ **B** J/kg^2

☒ **C** N/kg

☒ **D** N/kg^2

(b) Two students try to determine a value for *g*, the acceleration due to gravity.

(i) They measure the time, *t*, for a small steel ball to fall through a height, *h*, from rest.

They measure *t* to be 0.74 s, using a stopwatch.

They measure *h* to be 2.50 m, using a metre rule.

Calculate a value for *g* from the students' measurements.

Use the equation

$$g = \frac{2h}{t^2}$$

(2)

g = ... m/s^2

(ii) They record the time t for two more drops from the same height.

The three values for time t are

0.74 s, 0.69 s, 0.81 s.

Calculate the average value of time t to an appropriate number of significant figures.

(2)

average value of time t = ... s

(c) Explain **one** way the students could improve their procedure to obtain a more accurate value for g.

(2)

....

....

....

....

(d) A car travelling at 15 m/s comes to rest in a distance of 14 m when the brakes are applied.

Calculate the deceleration of the car.
Use an equation selected from the list of equations at the end of this paper.

(3)

deceleration = ... m/s^2

9 (a) A student investigates the relationship between force and acceleration for a trolley on a runway.

Figure 12 shows some of the apparatus the student uses.

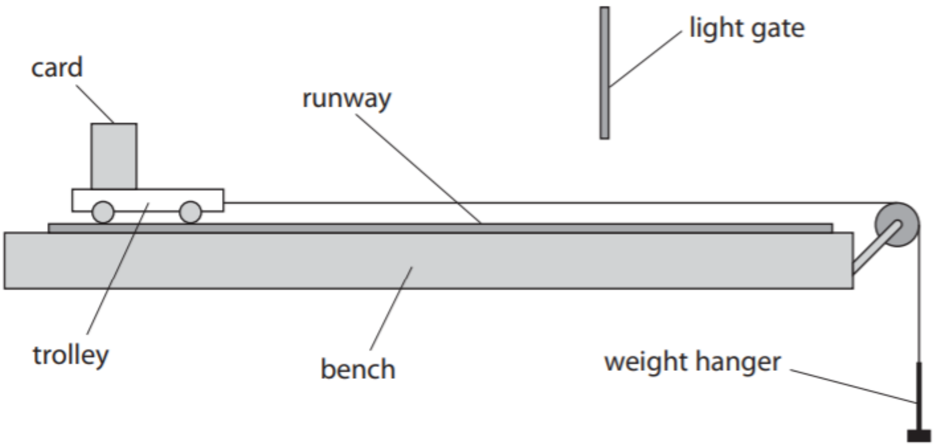


Figure 12

(i) Describe how the student could increase the accelerating force applied to the trolley.

(2)

....

....

....

....

(ii) Describe how the mass of the moving system can be kept constant.

(2)

....

....

....

....

*(b) Figure 13 shows two objects, Q and R, before and after they collide.

Figure 13

The arrows show the direction of movement of the objects.
The arrows are not to scale.

Explain how momentum is conserved in the collision.

Use Newton's third law and Newton's second law in your answer.

Newton's second law can be written as

$$\text{force} = \frac{\text{change in momentum}}{\text{time}}$$

(6)

....

....

....

....

....

....

....

....

....

....

....

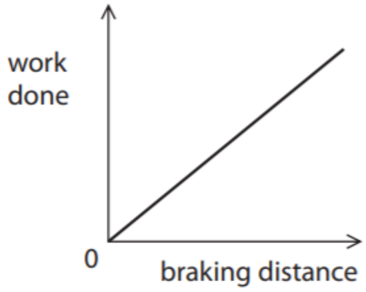
....

1 (a) The work done to bring a car to rest is given by the equation

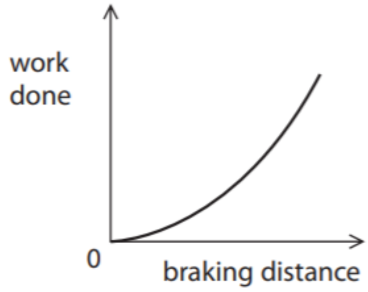
$$\text{work done} = \text{braking force} \times \text{braking distance}$$

Which of these graphs is correct for the car if a constant braking force is applied?

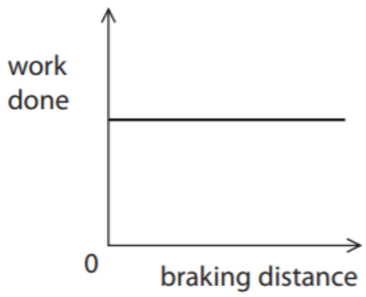
(1)



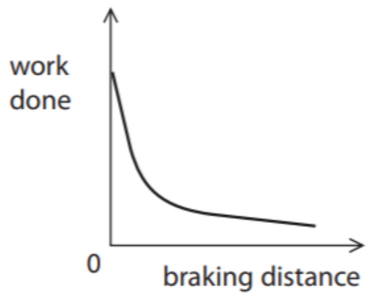
☒ **A**



☒ **B**



☒ **C**



☒ **D**

(b) Before the car brakes it has kinetic energy.
The kinetic energy decreases as it brakes.

State what happens to the kinetic energy during braking.

(1)

....

....

(c) The graph in Figure 1 shows how the braking distance, *d*, of a car depends on the velocity, *v*, of the car when the brakes are first applied.

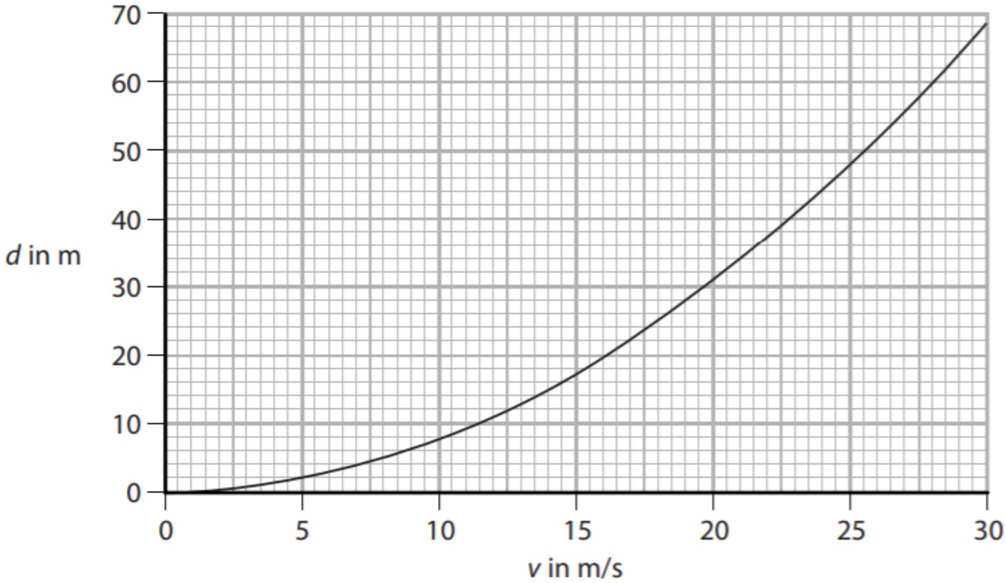


Figure 1

An equation relating braking distance, *d*, to velocity, *v*, is

$$d = \frac{v^2}{C}$$

where *C* is a constant.

Use the equation and data from the graph in Figure 1 to calculate a value for *C*.

Give a unit for *C*.

(4)

$C =$ .... unit ....

7 (a) The force that keeps an object moving in a circular path is known as the

(1)

- ☒ **A** balancing force
- ☒ **B** centripetal force
- ☒ **C** reaction force
- ☒ **D** resistance force

(b) Figure 11 shows an object moving in a circular path.

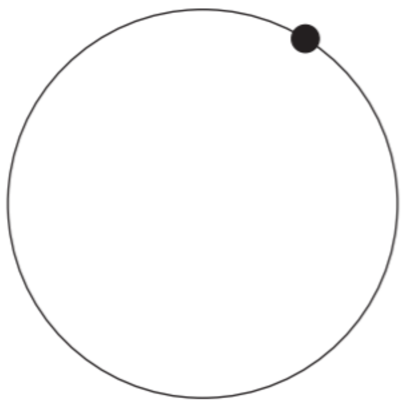


Figure 11

(i) Draw an arrow on Figure 11 to show the direction of the force that keeps the object moving in a circular path.

(1)

(ii) The object in Figure 11 is moving at constant speed.

Explain why it is not moving with constant velocity.

(2)

....

....

....

....

(c) Figure 12 shows a skier on a slope.

The skier travels down the slope with a constant acceleration.

The speed of the skier is measured at points P and Q.

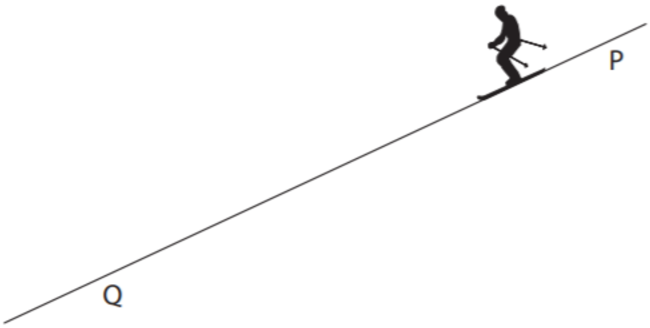


Figure 12

The table in Figure 13 gives some data about the skier making one downhill run.

acceleration	3.0 m/s^2
speed at P	7.6 m/s
speed at Q	24 m/s

Figure 13

(i) Calculate the distance from P to Q.

Use an equation selected from the list of equations at the end of this paper.

(3)

distance from P to Q = ... m

(ii) Calculate the time taken for the skier to travel from P to Q.

(3)

time from P to Q = ... s

3 (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)

(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)

acceleration = ... m/s^2

(c) Figure 3 is a velocity/time graph for 15 s of a cyclist's journey.

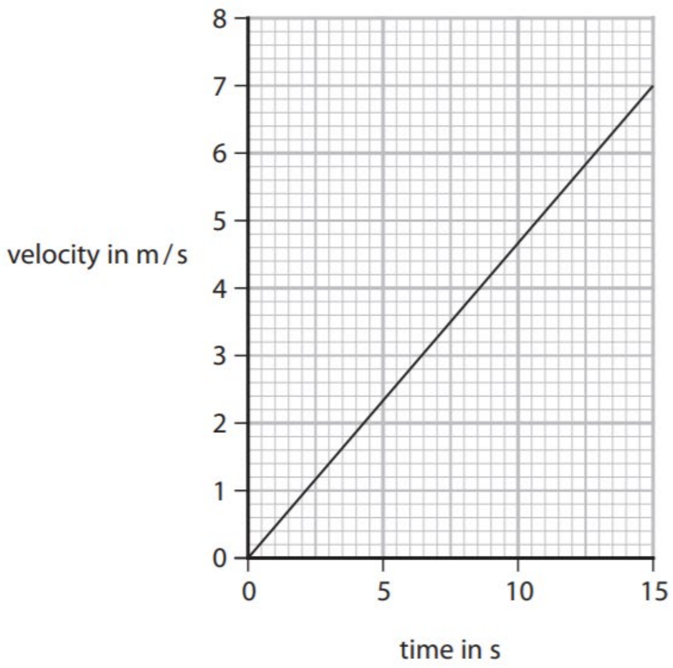


Figure 3

(i) Calculate the distance the cyclist travels in the 15 s.

(3)

distance = ... m

(ii) Another cyclist starts from rest, but his acceleration decreases as time increases.

Sketch the velocity / time graph for this cyclist on Figure 3.

(2)

9 (a) Figure 12 is a diagram showing a rocket that is sent into space to try and change the path of a small asteroid.

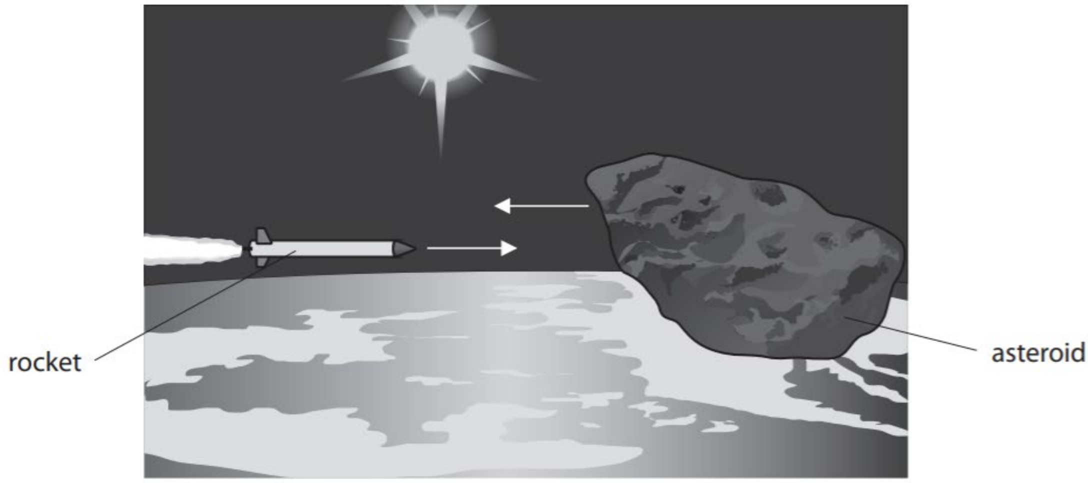


Figure 12

(i) The rocket has a mass of 5.5×10^5 kg and is travelling to the right at 14 km/s.

Which of these is a correct calculation of the momentum of the rocket in kg m/s?

Use the equation

$$p = m \times v$$

(1)

☒ **A** 7.7×10^3 kg m/s

☒ **B** 7.7×10^6 kg m/s

☒ **C** 7.7×10^9 kg m/s

☒ **D** 7.7×10^{12} kg m/s

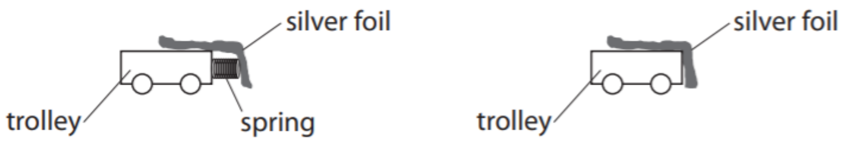
(ii) The asteroid has a momentum of 7.5×10^{10} kg m/s and a mass of 8.0×10^6 kg.

Calculate the speed of the asteroid.

(2)

speed of the asteroid = ... m/s *(b) A student investigates the effect of a crumple zone on the force exerted during a collision.

The student has one trolley with a spring at the front and another trolley without a spring.



The student uses the arrangement in Figure 13.

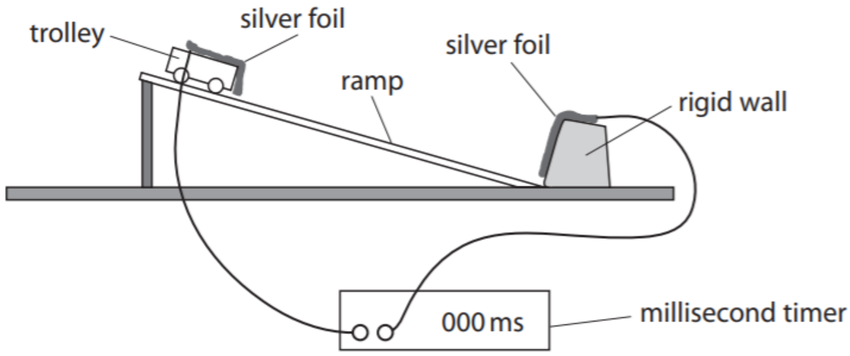


Figure 13

After a trolley is released, it accelerates down a slope and bounces off a rigid wall.

The speed of a trolley can be measured just before a collision with the wall and just after a collision with the wall.

The silver foils are connected to a millisecond timer.

The silver foils make contact with each other during the collision, so the time they are in contact can be read from the millisecond timer.

Explain how the student could investigate the effect of a crumple zone on the average force exerted during the collision.

Your explanation should include:

- how to determine the force (you may wish to refer to an equation from the list of equations at the end of this paper)
- how the effect of crumple zones may be shown in the investigation
- precautions that may be necessary to achieve accurate results.

(6)

(c) Newton's third law, when applied to the collision of the rocket and the asteroid as shown in Figure 12, can be stated as follows:

The force exerted by the rocket on the asteroid is equal and opposite to the force exerted by the asteroid on the rocket.

Explain how this statement links to the conservation of momentum in the collision.

(4)

TOTAL FOR PAPER IS 58 MARKS