Newton's laws and kinematics: Horizontal

Question Paper 3

Level	A Level
Subject	Maths
Exam Board	AQA
Module	Mechanics 1
Topic	Newton's Laws of motion
Sub Topic	Newton's laws and kinematics: horizontal
Booklet	Question Paper - 3

Time Allowed: **24 minutes**

Score: **/19**

Percentage: **/100**

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

Q1. A cyclist travels along a straight horizontal road. She accelerates uniformly from a speed of 2 m s^{-1} to 6 m s^{-1} as she travels 10 metres.

(a) (i) Show that the acceleration of the cyclist is 1.6 m s^{-2}.

(2)

(ii) Find the time that it takes the cyclist to travel this distance.

(2)

(b) Model the cyclist as a particle of mass 65 kg. A constant resistance force of magnitude 35 N acts on the cyclist. A horizontal force of magnitude F newtons also acts on the cyclist in the direction of motion. Find F.

(3)
(Total 7 marks)

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A box, of mass 20 kg, is initially at rest on a rough horizontal surface. A horizontal force of magnitude P newtons is applied to the box. The coefficient of friction between the box and the surface is 0.3.

(a) State the magnitude of the normal reaction force acting on the box.

(1)

(b) Find the magnitude of the friction force that acts on the box if:

(i) $P = 80$;

(ii) $P = 40$.

(3)

(c) Find the value of P when the box is accelerating at 0.8 m s^{-2}.

(3)

(d) When the box reaches a speed of 6 m s^{-1}, the horizontal force P is removed. Find the distance that the box travels after the force P is removed.

(5)
(Total 12 marks)