3.3 Newton's Laws of Motion, Momentum and Stopping Distances: 10-minute Pack

EDEXCEL 4PH1 · Calculator allowed · about 10 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 State Newtons first law as it applies to the motion of a car travelling along a straight, level road.

(Total for Question 1 is 2 marks)

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2 State Newtons third law and give a road-traffic example involving a car and the road surface.

(Total for Question 2 is 2 marks)

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3 Explain briefly how alcohol consumption increases a driver's stopping distance, referring to thinking distance and braking distance where appropriate. Give three distinct points.

(Total for Question 3 is 3 marks)

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4 Calculate the resultant force required to accelerate a 1200 kg car from rest at 0 to 2.5 m/s in 5.0 s on a straight road. Use F = ma and show your substitution and final unit.

(Total for Question 4 is 3 marks)

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Mark scheme · 3.3 Newton's Laws of Motion, Momentum and Stopping Distances: 10-minute Pack

Question 1

an object remains at rest or continues with constant velocity unless acted on by a resultant force	**B1**
application to a car: the car will keep moving at the same speed and direction unless a resultant force (e.g. brakes, friction, engine thrust) acts on it	**B1**

Answer: An object stays at rest or keeps moving with constant velocity unless a resultant force acts on it; for a car this means it keeps moving at the same speed and direction unless forces such as braking or friction act.

Question 2

for every action there is an equal and opposite reaction	**B1**
example: tyre pushes backwards on the road and the road pushes forwards on the tyre with equal magnitude	**B1**

Answer: For every action there is an equal and opposite reaction; e.g. a tyre pushes backwards on the road and the road pushes forwards on the tyre with equal magnitude.

Question 3

alcohol impairs reaction time, so thinking distance increases	**B1**
alcohol can impair judgement and steering leading to delayed or inappropriate braking, contributing further to increased stopping distance	**B1**
at higher intoxication braking may be less effective due to poor control, indirectly increasing braking distance or reducing use of brakes correctly; accept any other valid effect of alcohol on the driver, e.g. reduced concentration or poorer hazard perception, so the car travels further before the brakes are applied	**B1**

Answer: Alcohol slows reaction time increasing thinking distance; it impairs judgement so braking is delayed or inappropriate; at higher intoxication braking effectiveness and control may be reduced, increasing overall stopping distance.

Question 4

quotes the equation F = ma and uses a = (v - u) / t	**M1**
substitutes: a = (2.5 - 0) / 5.0 = 0.50 m/s^2 and then F = 1200 x 0.50	**M1**
gives F = 600 N cao with unit	**A1**

Answer: 600 N

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