HIGHER

8.7 Velocity Time Graphs: Test Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A vehicle travels at a constant velocity of 5 m/s for 6 seconds. Work out the distance travelled in that time.

(Total for Question 1 is 1 mark)

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2 Consider a vehicle with velocity described by: from t = 0 s to 3 s velocity increases uniformly from 0 to 6 m/s; from t = 3 s to 8 s velocity is constant at 6 m/s; from t = 8 s to 10 s velocity decreases uniformly from 6 to 0 m/s.

(a) State the time interval when the vehicle is speeding up. **(1)**

(b) State the time interval when the vehicle moves at constant speed. **(1)**

(c) State the time interval when the vehicle is slowing down. **(1)**

(Total for Question 2 is 3 marks)

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3 A velocity-time graph has three consecutive sections: section 1 has a negative gradient, section 2 has gradient 0, section 3 has a positive gradient. Describe the motion in each section.

(Total for Question 3 is 3 marks)

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4 A vehicle has velocity given by: $0 \leq t < 5$ s: $v = 4$ m/s; $5 \leq t \leq 9$ s: $v = -2$ m/s. (Negative means the opposite direction.)

(a) Find the displacement from $t = 0$ to $t = 9$ s. **(2)**

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(b) Find the total distance travelled from $t = 0$ to $t = 9$ s. **(2)**

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(Total for Question 4 is 4 marks)

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5 At $t = 2$ s the velocity of a vehicle is 4 m/s. At $t = 8$ s the velocity is 10 m/s. Calculate the average acceleration between $t = 2$ s and $t = 8$ s.

(Total for Question 5 is 2 marks)

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6 Show that a vehicle with velocity described by: $0 \leq t \leq 10$ s velocity increases uniformly from 0 to 10 m/s; $10 \leq t \leq 20$ s velocity is constant at 10 m/s; travels 150 m in the first 20 seconds.

(Total for Question 6 is 3 marks)

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7 The velocity-time graph of a cyclist is made up of straight line segments joining the points (t, v) = (0, 0), (5, 18), (10, 18), (14, 0), where t is the time in seconds and v is the velocity in m/s. Work out the acceleration of the cyclist between $t = 0$ and $t = 5$.

(Total for Question 7 is 2 marks)

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8 The table gives the velocity v (m/s) of a train at different times t (seconds). t = 0: v = 7, t = 3: v = 8, t = 6: v = 13, t = 9: v = 11, t = 12: v = 16. Use trapeziums to estimate the distance travelled between t = 0 and t = 12.

(Total for Question 8 is 4 marks)

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9 The velocity-time graph of a train is made up of straight line segments joining the points (t, v) = (0, 0), (8, 4), (18, 4), (22, 18), (26, 0), where t is the time in seconds and v is the velocity in m/s. Work out the average speed over the whole journey. Give your answer correct to 1 decimal place.

(Total for Question 9 is 4 marks)

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10 A drone starts from rest and accelerates uniformly at 1 m/s^2 for 10 seconds. It then travels at constant velocity for 10 seconds before decelerating uniformly to rest in 8 seconds. Work out the total distance travelled.

(Total for Question 10 is 5 marks)

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11 The table gives the velocity v (m/s) of a train at different times t (seconds). t = 0: v = 1, t = 3: v = 12, t = 6: v = 6, t = 9: v = 0, t = 12: v = 16. Use trapeziums to estimate the distance travelled between t = 0 and t = 12.

(Total for Question 11 is 4 marks)

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12 The table gives the velocity v (m/s) of a car at different times t (seconds). t = 0: v = 5, t = 2: v = 9, t = 4: v = 10, t = 6: v = 12, t = 8: v = 6. Use trapeziums to estimate the distance travelled between t = 0 and t = 8.

(Total for Question 12 is 4 marks)

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13 Stretch question. A vehicle has the following velocity-time profile: $0 \leq t < 4$ s: v = 3 m/s (constant); $4 \leq t < 10$ s: velocity increases uniformly from 3 m/s to 15 m/s; $10 \leq t \leq 12$ s: velocity decreases uniformly from 15 m/s to 3 m/s. Work out the total distance travelled from t = 0 to t = 12 s.

(Total for Question 13 is 4 marks)

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Mark scheme · 8.7 Velocity Time Graphs: Test Pack

Question 1

30 m cao	**B1**

Answer: 30 m

Question 2

(a) 0 to 3 s oe	**B1**

(a) Answer: 0 to 3 s

(b) 3 to 8 s oe	**B1**

(b) Answer: 3 to 8 s

(c) 8 to 10 s oe	**B1**

(c) Answer: 8 to 10 s

Question 3

section 1: vehicle is slowing down or decelerating oe	**B1**
section 2: vehicle is at constant velocity or moving at steady speed oe	**B1**
section 3: vehicle is speeding up or accelerating oe	**B1**

Answer: Section 1: slowing down. Section 2: constant speed. Section 3: speeding up.

Question 4

(a) compute 4*5 + (-2)*4 = 20 - 8 oe	**M1**
(a) 12 m cao	**A1**

(a) Answer: 12 m

(b) compute total distance = 4*5 + | -2 * 4 | = 20 + 8 oe	**M1**
(b) 28 m cao	**A1**

(b) Answer: 28 m

Question 5

use a = (10 - 4) / (8 - 2) = 6 / 6 oe	**M1**
1 m/s^2 cao	**A1**

Answer: 1 m/s^2

Question 6

area of triangle 0.5 * 10 * 10 = 50 oe	**M1**
area of rectangle 10 * 10 = 100 oe	**M1**
150 m cao cso	**A1**

Answer: 150 m

Question 7

change in velocity / change in time = 18/5	**M1**
3.6 m/s^2	**A1**

Answer: 3.6 m/s^2

Question 8

strip width 3	**B1**
area of a trapezium (a + b)h/2 used	**M1**
all trapezium areas added	**M1**
130.5 m cao	**A1**

Answer: 130.5 m

Question 9

area of at least one section found	**M1**
total distance 136	**M1**
divides by total time 26	**M1**
5.2 m/s cao	**A1**

Answer: 5.2 m/s

Question 10

maximum velocity 1 x 10	**M1**
distance while accelerating = 1/2 x 10 x 10	**M1**
distance at constant velocity = 10 x 10	**M1**
distance while decelerating = 1/2 x 10 x 8	**M1**
190 m cao	**A1**

Answer: 190 m

Question 11

strip width 3	**B1**
area of a trapezium (a + b)h/2 used	**M1**
all trapezium areas added	**M1**
79.5 m cao	**A1**

Answer: 79.5 m

Question 12

strip width 2	**B1**
area of a trapezium (a + b)h/2 used	**M1**
all trapezium areas added	**M1**
73 m cao	**A1**

Answer: 73 m

Question 13

area 0-4 s = 3 * 4 = 12	**M1**
area 4-10 s = average velocity (3+15)/2 * 6 = 9 * 6 = 54	**M1**
area 10-12 s = average velocity (15+3)/2 * 2 = 9 * 2 = 18	**M1**
84 m cao	**A1**

Answer: 84 m

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