Motion: Speed, Velocity and Acceleration

Forces and motion · 4 questions · step-by-step answers at the end

Name: Date: Score: / 4

USEFUL EQUATIONS

$v = s / t \quad a = (v - u) / t \quad v^2 = u^2 + 2as$

Questions

Show your working in the space under each question.

1. A cyclist slows from 12 m/s to 4 m/s in 4.0 s. Find the acceleration.

2. A car accelerates steadily from rest to 24 m/s in 8.0 s. Find its acceleration and the distance it travels.

3. A stone falls from rest for 2.0 s (g = 9.8 m/s²). Find its speed and the distance fallen.

4. What does a horizontal line mean on (a) a distance–time graph and (b) a velocity–time graph?

Step-by-step answers

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1. $a = (4 - 12)/4.0 =$ **-2.0 m/s²** (a deceleration of 2.0 m/s²).

2. 1. $a = (v - u)/t = (24 - 0)/8.0 =$ **3.0 m/s²**.

2. Distance = area under the velocity–time graph, a triangle: ½ × 8.0 × 24 = **96 m**.

3. Check: $v^2 = u^2 + 2as \rightarrow 576 = 2 \times 3.0 \times 96$ ✓

Answer: 3.0 m/s²; 96 m

3. $v = 9.8 \times 2.0 =$ **19.6 m/s**; distance = average speed × time = 9.8 × 2.0 = **19.6 m**.

4. (a) The object is **stationary**. (b) It is moving at **constant velocity**.