



# Performance Report

Name: Bob

Date: 22/05/2024

Test ID: PHY101

Marks Obtained: 57.0/84

Q1: Which of the following is a vector quantity? [2 marks]

A: Speed

B: Velocity

C: Distance

D: Time

Student Response: B

Correct Answer: B

Explanation: Velocity is a vector quantity as it has both magnitude and direction, while the others are scalar quantities.

Marks Awarded: 2.0

Q2: The displacement of a particle is given by  $s(t) = 3t^2 + 2t + 1$ . Find the velocity of the particle at  $t = 2$ s. [10 marks]

Student Response: Velocity at  $t=2$  is  $ds/dt = 6t + 2$ , so  $v(2) = 6(2) + 2 = 14$  m/s

Correct Answer: Velocity at  $t=2$  is  $v(2) = ds/dt = 6t + 2$ , so  $v(2) = 6(2) + 2 = 14$  m/s

Explanation: Differentiate  $s(t) = 3t^2 + 2t + 1$  with respect to  $t$  to get the velocity function  $v(t) = 6t + 2$ .

Then, substitute  $t = 2$  to find  $v(2)$ .

Marks Awarded: 9.5



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Q3: A car accelerates uniformly from rest to a speed of 20 m/s in 10 seconds. What is the magnitude of its acceleration? [2 marks]

A: 1 m/s<sup>2</sup>

B: 2 m/s<sup>2</sup>

C: 3 m/s<sup>2</sup>

D: 4 m/s<sup>2</sup>

Student Response: B

Correct Answer: B

Explanation: Acceleration is calculated as (final velocity - initial velocity) / time = (20 m/s - 0 m/s) / 10 s = 2 m/s<sup>2</sup>.

Marks Awarded: 2.0

Q4: A ball is thrown vertically upwards with an initial velocity of 30 m/s. Calculate the maximum height reached by the ball. (Take  $g = 10 \text{ m/s}^2$ ) [10 marks]

Student Response: The maximum height can be calculated using  $h = u^2 / (2g)$ .

Correct Answer: Maximum height  $h = u^2 / (2g) = (30 \text{ m/s})^2 / (2 * 10 \text{ m/s}^2) = 45 \text{ m}$

Explanation: Using the formula for maximum height in vertical motion,  $h = u^2 / (2g)$ , where  $u$  is the initial velocity and  $g$  is the acceleration due to gravity.

Marks Awarded: 8.5

Q5: Derive the equation of motion:  $v^2 = u^2 + 2as$ . [10 marks]

Student Response:  $v = u + at$  and  $s = ut + 0.5at^2$ , derive  $v^2 = u^2 + 2as$ .



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Correct Answer: Derivation of  $v^2 = u^2 + 2as$  from the equations of motion.

Explanation: Use the equations of motion to derive the required equation: start from  $v = u + at$  and  $s = ut + 0.5at^2$ .

Marks Awarded: 6.5

Q6: Explain the difference between average speed and instantaneous speed. [10 marks]

Student Response: Average speed is the total distance divided by the total time.

Correct Answer: Average speed is the total distance traveled divided by the total time taken, while instantaneous speed is the speed at any given instant of time.

Explanation: Explain the differences in definitions and implications of average speed and instantaneous speed.

Marks Awarded: 4.5

Q7: An object moves along a straight line with an initial velocity of 5 m/s and a constant acceleration of  $3 \text{ m/s}^2$ . Determine the position of the object after 4 seconds. [10 marks]

Student Response:  $s = ut + 0.5at^2 = 5 \cdot 4 + 0.5 \cdot 3 \cdot 4^2 = 44 \text{ m}$

Correct Answer: Position after 4s,  $s = ut + 0.5at^2 = 5 \cdot 4 + 0.5 \cdot 3 \cdot 4^2 = 20 + 24 = 44 \text{ m}$

Explanation: Use the equation of motion  $s = ut + 0.5at^2$ , where  $u$  is the initial velocity,  $a$  is the acceleration, and  $t$  is the time.

Marks Awarded: 9.5

Q8: A cyclist travels a distance of 15 km in 50 minutes. Calculate the average speed in m/s. [10



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marks]

Student Response: Unattempted

Correct Answer: Average speed = Total distance / Total time = 15 km / (50/60) hr = 15 km / (5/6) hr  
= 18 km/hr =  $18 \times 1000 / 3600$  m/s = 5 m/s

Explanation: Convert time into hours, calculate the average speed in km/hr, and then convert to m/s.

Marks Awarded: 0

Q9: Explain the significance of the slope of a velocity-time graph. [10 marks]

Student Response: The slope of a velocity-time graph represents acceleration.

Correct Answer: The slope of a velocity-time graph represents the acceleration of the object.

Explanation: Explain that the gradient of a velocity-time graph gives the rate of change of velocity, which is acceleration.

Marks Awarded: 7.5

Q10: Two objects are thrown vertically upwards with the same initial velocity. Explain why their times of flight are the same, irrespective of their masses. (Ignore air resistance) [10 marks]

Student Response: Time of flight is independent of mass because gravitational acceleration is the same.

Correct Answer: The time of flight is independent of mass because the acceleration due to gravity is constant for all objects, regardless of their masses.

Explanation: Using the equations of motion and the concept that gravitational acceleration is the same for all masses, explain why time of flight remains unchanged.



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Marks Awarded: 7.0

