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SPECA

GCSE Combined Science (AQA Trilogy) · Physics

Forces and Motion · Tiered Worksheet

Section A: Foundation

Speed, velocity, and graphs

1) State the difference between distance and displacement. **[2]**

2) A cyclist travels 400 m in 80 seconds at constant speed. Calculate their speed. **[2]**

3) State the typical speed of a person walking, in m/s. **[1]**

4) Define velocity, and explain how it differs from speed. **[2]**

5) A distance-time graph shows a straight line rising from the origin. State what the gradient of this line represents. **[1]**

6) A car accelerates from 4 m/s to 22 m/s in 6 seconds. Calculate its acceleration. **[2]**

7) State what the gradient of a velocity-time graph represents. **[1]**

8) A ball is dropped and falls freely near Earth's surface. State its approximate acceleration. **[1]**

9) Explain what happens to an object falling through a fluid as it speeds up, in terms of the forces acting on it, up to the point it reaches terminal velocity. **[3]**

Newton's Laws and stopping distance

10) State Newton's First Law, and use it to explain why a car travelling at a steady speed has balanced forces acting on it. **[3]**

11) State Newton's Second Law, and use `F = m × a` to calculate the force needed to accelerate a 1200 kg car at 3 m/s². **[3]**

12) State Newton's Third Law, giving one example of a pair of forces it describes. **[2]**

13) Define stopping distance in terms of thinking distance and braking distance. **[2]**

14) Give two factors that can increase a driver's thinking distance. **[2]**

15) Give two factors that can increase a vehicle's braking distance. **[2]**

16) Explain, in terms of energy, what happens when a car's brakes are applied. **[2]**

17) Explain why a car travelling at a higher speed needs a greater braking force to stop in the same distance as at a lower speed, and explain one danger of very large decelerations. **[3]**

Section B: Higher (in addition to Section A)

Circular motion, graphs in depth, inertia, and momentum

18) Explain, with an example, why an object moving in a circle at constant speed still has a continuously changing velocity. **[2]**

19) A distance-time graph for an accelerating car is curved. Describe how you would find the car's speed at one specific point on the curve. **[2]**

20) A velocity-time graph shows a car accelerating from 0 m/s to 20 m/s over 10 seconds, as a straight line. Describe how you would use the graph to find the distance travelled in that time, and calculate it. **[3]**

21) Define inertia and inertial mass. **[2]**

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22) Calculate the momentum of a 900 kg car travelling at 15 m/s. **[2]**

23) State the principle of conservation of momentum. **[2]**

24) A trolley of mass 2 kg moving at 6 m/s collides and joins with a stationary trolley of mass 4 kg. Using conservation of momentum, calculate the velocity of the combined trolleys after the collision. **[3]**

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