|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q** | **Scheme** | | **Marks** | **AOs** | **Pearson Progression Step and Progress descriptor** |
| **1a** | **Figure 1** | General shape of the graph is correct. i.e. horizontal line, followed by negative gradient, followed by a positive gradient. | **M1** | 3.3 | 4th  Use and interpret graphs of velocity against time. |
| Vertical axis labelled correctly. | **A1** | 1.1b |
| Horizontal axis labelled correctly. | **A1** | 1.1b |
|  | | **(3)** |  |  |
| **1b** | Makes an attempt to find the area of trapezoidal section where the car is decelerating. For example,is seen. | | **M1** | 1.1b | 4th  Calculate and interpret areas under velocity–time graphs. |
| Makes an attempt to find the area of the trapezoidal section where the car is accelerating. For example,is seen. | | **M1** | 1.1b |
| States that | | **M1** | 1.1b |
| Solves to find the value of *T*: *T* = 30 (s). | | **A1** | 1.1b |
|  | | **(4)** |  |  |
| **(7 marks)** | | | | | |
| **Notes**  **1a**  Accept the horizontal axis labelled with the correct intervals.  **1b**  Award full marks for correct final answer, even if some work is missing. | | | | | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q** | **Scheme** | | **Marks** | **AOs** | **Pearson Progression Step and Progress descriptor** |
| **2a** | Velocity = acceleration × time seen or implied. | | **M1** | 3.1b | 4th  Use and interpret graphs of velocity against time. |
| Velocity = 11 × 8 = 88 m s−1 | | **A1** | 1.1b |
| **Figure 2** | General shape of the graph is correct. i.e. positive gradient, followed by horizontal line, followed by negative gradient not returning to zero. | **M1** | 3.3 |
| Vertical axis labelled correctly. | **A1** | 1.1b |
| Horizontal axis labelled correctly. | **A1** | 1.1b |
|  | | **(5)** |  |  |
| **2b** | Makes an attempt to find the area of the trapezoidal section. For example,is seen. | | **M1** | 1.1b | 4th  Calculate and interpret areas under velocity–time graphs. |
| Demonstrates an understanding that the three areas must total 1404. For example,  or  is seen. | | **M1** | 2.1 |
| Correctly solves to find *T* = 10.5 (s). | | **A1** | 1.1b |
|  | | **(3)** |  |  |
| **(8 marks)** | | | | | |
| **Notes**  **2a**  Accept the horizontal axis labelled with the correct intervals.  **2b**  Award full marks for correct final answer, even if some work is missing. | | | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Q** | **Scheme** | **Marks** | **AOs** | **Pearson Progression Step and Progress descriptor** |
| **3a** | seen or implied. | **M1** | 3.1b | 5th  Use equations of motion to solve problems in familiar contexts. |
| Finds the value of *a*: m s−2 | **A1** | 1.1b |
|  | **(2)** |  |  |
| **3b** | Use the fact that  to write 3*t*1 = 4*t*2 or 3*t*1 − 4*t*2 = 0 or equivalent. | **M1** | 1.1b | 5th  Use equations of motion to solve problems in familiar contexts. |
| States or implies that *t*1 + *t*2 = 35 | **M1** | 3.1b |
| Solves to find *t*1 = 20 or *t*2 = 15. Could use substitution or simultaneous equations. Does not need to find both values for mark to be awarded as either value can be used going forward. | **A1** | 1.1b |
| Use *v* = *u* + *at* to write either *x* = 6 + 0.4(20) or 20 = *x* + 0.4(15) | **M1** | 2.2a |
| Finds *x* = 14 (m s−1). | **A1ft** | 1.1b |
|  | **(5)** |  |  |
| **3c** | States or implies that | **M1** | 2.2a | 5th  Use equations of motion to solve problems in familiar contexts. |
| Finds the value of *s*: (m). | **A1** | 1.1b |
|  | **(2)** |  |  |
| **(9 marks)** | | | | |
| **Notes**  **3b**  Award ft marks for a correct answer using their value from part **a**. | | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Q** | **Scheme** | **Marks** | **AOs** | **Pearson Progression Step and Progress descriptor** |
| **4a** | Demonstrates an understanding of the need to use  This can implied by using the equation in the next step(s). | **M1** | 3.1b | 5th  Use equations of motion to solve problems in familiar contexts. |
| Demonstrates the need to use (*t* – 3) when finding the displacement of *Q* from *A* (or use (*t* + 3) when finding the displacement of *P* from *A*). Can be implied in either of the following steps. | **M1** | 3.1b |
| Displacement of *P*: | **A1** | 1.1b |
| Displacement of *Q*: | **A1** | 1.1b |
|  | **(4)** |  |  |
| **4b** | Writes | **M1** | 3.1b | 5th  Use equations of motion to solve problems in familiar contexts. |
| Makes an attempt to simplify this equation. For example, | **M1** | 1.1b |
| Simplifies this expression to | **A1** | 1.1b |
|  | **(3)** |  |  |
| **4c** | Makes an attempt to use the quadratic formula: | **M1** | 2.2a | 5th  Use equations of motion to solve problems in familiar contexts. |
| Solves to find *t* = 30.21... (s).  Could also show that  (s). | **A1** | 1.1b |
| States or implies | **M1** | 3.1b |
| Makes a substitution using their 30.21… into the formula: | **M1** | 1.1b |
| Finds *s* = 139.36... (m). Accept awrt 139 (m). | **A1 ft** | 1.1b |
|  | **(5)** |  |  |
| **(12 marks)** | | | | |
| **Notes**  **4a**  Award both accuracy marks if the following is seen:  Displacement of *P* from *A*:  Displacement of *Q* from *A*:  **4c**  Award ft marks for a correct answer using their ‘30.2’. They will have previously lost the first accuracy mark. | | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Q** | **Scheme** | **Marks** | **AOs** | **Pearson Progression Step and Progress descriptor** |
| **5a** | States or implies that *s* = −80 | **B1** | 3.1b | 5th Use equations of motion to solve problems involving vertical motion. |
| States or implies that *a* = −9.8 | **B1** | 3.1b |
| Writes  or makes a substitution | **M1** | 3.1b |
| Finds *v* = 42.70... (m s−1). Accept awrt 42.7 (m s−1). | **A1** | 1.1b |
|  | **(4)** |  |  |
| **5b** | States or implies that *s* = 5 m. | **B1** | 3.1b | 5th Use equations of motion to solve problems involving vertical motion. |
| Simplifies  to obtain | **M1** | 1.1b |
| Makes an attempt to use the quadratic formula: | **M1** | 1.1b |
| Solves to find  *t* = 0.35… (s). Accept awrt 0.35 (s). | **A1** | 1.1b |
| Solves to find *t* = 2.91… (s). Accept awrt 2.92 (s). | **A1** | 1.1b |
| States that the ball is above 85 m for 2.56… (s). Accept awrt 2.6 (s). | **B1** | 3.2a |
|  | **(6)** |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **5c** | States or implies that at the greatest height *v* = 0 | **B1** | 3.1b | 5th Use equations of motion to solve problems involving vertical motion. |
| Finds the value of *u*:  (m s−1). Accept awrt 8.5 (m s−1). | **M1** | 3.1b |
| Writes  or makes a substitution | **M1** | 3.1b |
| Finds *s* = 3.72...(m). Accept awrt 3.7 (m). | **A1 ft** | 1.1b |
|  | **(4)** |  |  |
| **(14 marks)** | | | | |
| **Notes**  **5c**  Award ft marks for a correct answer using their answer from part **a**. | | | | |