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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **1a** |  So  or 3.6 (m) | **M1****A1****A1** | 3.1a1.1b1.1b | 5th Solve equilibrium problems involving Hooke's law in context |
|  | **(3)** |  |  |
| **1b** |    | **M1****A1** | 3.11.1b | 5th Solve equilibrium problems involving Hooke's law in context |
|  | **(2)** |  |  |
| (5 marks) |
| Notes**1a M1:** Applies Hooke’s law and resolves forces vertically**A1:** correct value for extension *x***A1:** correct *AB* to 2 or 3 significant figures following use of **1b M1:** Applies Hooke’s law and resolves forces vertically**A1:**  or 4.9 |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **2ai** | ,    | **M1****M1****A1** | 3.1a1.1b1.1b | 5th Solve equilibrium problems involving Hooke's law in context |
|  | **(3)** |  |  |
| **2aii** |   or 60 (N)  | **M1****A1** | 1.1b1.1b | 5th Solve equilibrium problems involving Hooke's law in context |
|  | **(2)** |  |  |
| **2b** |  or 0.60 or 1.4 m | **M1****A1****A1** | 3.1a1.1b3.1a | 5th Solve equilibrium problems involving Hooke's law in context |
|  | **(3)** |  |  |
| (8 marks) |
| Notes**2ai M1:** Attempts to resolve forces in one direction**M1:** Attempts to solve their equations to find **A1:** A correct value of  (one decimal place as specified in the question)**2aii M1:** Uses their value of  to find a value for the tension *T* (or attempts to solve their equations to find a value for *T*)**A1:** A correct value of *OP* to 2 or 3 significant figures**2b M1:** Applies Hooke’s law**A1:** A correct value for the extension *x***A1:** A correct value for *OP* |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **3a** |     | **M1****A1****M1****A1** | 3.1a1.1b1.1b3.1a | 5th Solve equilibrium problems involving Hooke's law in context |
|  | **(4)** |  |  |
| **3b** | The tension force in  decreases /  is not as strong/more stretchyThe particle will move closer to A / to the left | **B1****dB1** | 2.42.2b | 5th Solve equilibrium problems involving Hooke's law in context |
|  | **(2)** |  |  |
| (6 marks) |
| Notes**3a M1:** Applies Hooke’s law and attempts to resolve forces horizonally**A1:** A correct (unsimplified) expression (in terms of the extension *x*)**M1:** Attempts to rearrange their equation to find the extension *x***A1:** A correct value for *AP***3b B1:** Gives a valid reason**dB1:** Will move closer to *A* (to the left) – mark is dependent on a correct reason given |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **4a** |    | **M1****A1****A1\*** | 2.11.1b2.2a | 5thSolve equilibrium problems involving Hooke's law in context |
|  | **(3)** |  |  |
| **4b** | Initial , final   Max distance  | **M1****M1****M1****A1****A1** | 3.1b3.1b1.1b1.1b3.1b | 7thSolve string/spring problems involving work and energy in familiar contexts |
|  | **(5)** |  |  |
| (8 marks) |
| Notes**4a M1:** Applies Hooke’s law and attempts to resolve forces vertically**A1:** A correct (unsimplified) expression**A1:** No incorrect work leading to m = 0.3 \***4b M1:** Attempts to find change in EPE, or initial and final EPE**M1:** Attempts to find GPE**M1:** Attempts to apply conservation of energy equation**A1:** Obtains a correct 3-term quadratic**A1:** A correct value for the maximum distance (accept answer to 2 sf) |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **5a** |     | **M1****A1****A1** | 3.1a1.1b1.1b | 6th Include E.P.E. when using the work-energy principle |
|  | **(3)** |  |  |
| **5b** | Work done against friction =  Work-Energy:      | **M1****A1****M1****A1ft****M1****A1** | 3.1a1.1b3.1a1.1b1.1b1.1b | 7thSolve string/spring problems involving work and energy in familiar contexts |
|  | **(6)** |  |  |
| (9 marks) |
| Notes5a M1: Attempts to find EPEA1: A correct unsimplified expressionA1: A correct expression (accept equivalent fractions)5b M1: Attempts to find work done against frictionA1: A correct (unsimplified) expressionM1: Forms a 3-term Work-energy equationA1ft: Correct 3-term equation. f.t. their EPE from part aM1: Rearranges their equation to find a value for A1: Correct value for  |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **6a** |  GPE EPE:  and     | **M1****A1** **A1****A1****dM1****A1** | 3.1a1.1b1.1b1.1b1.1b1.1b | 7th Solve string/spring problems involving work and energy in familiar contexts |
|  | **(6)** |  |  |
| **6b** |    | **M1****A1****M1****A1** | 3.1a1.1b1.1b1.1b | 7thSolve string/spring problems involving work and energy in familiar contexts |
|  | **(4)** |  |  |

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| **6c** |      | **M1****A1****M1****A1** | 3.1b1.1b1.1b1.1b | 7thSolve string/spring problems involving work and energy in familiar contexts |
|  | **(4)** |  |  |
| (14 marks) |
| Notes**6a M1:** Attempts an energy equation with at least 3 terms**A1:** A correct GPE. May be unsimplified, but  must be a numerical value**A1:** A correct EPE:  and  OR **A1:** A correct conservation of energy equation**dM1:** Attemtps to rearrange to find *V*. Dependent on first M1**A1:** Correct value for *V*. Must be in terms of *a* and *g***6b M1:** Attempts an energy equation**A1:** A correct unsimplified equation, with a numerical value for **M1:** Attemtps to rearrange their equation to find **A1:** A correct value for . Accept 3.1**6c M1:** Attempts to find a work-energy equation. (Change in ME = work done against friction)**A1:** A correct unsimplified equation**M1:** Rearranges their work-energy equation to find W**A1:** Correct *W* |