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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **1a** | So  or 3.6 (m) | **M1**  **A1**  **A1** | 3.1a  1.1b  1.1b | 5th  Solve equilibrium problems involving Hooke's law in context |
|  | **(3)** |  |  |
| **1b** |  | **M1**  **A1** | 3.1  1.1b | 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** | 3.1a  1.1b  1.1b | 5th  Solve equilibrium problems involving Hooke's law in context |
|  | **(3)** |  |  |
| **2aii** | or 60 (N) | **M1**  **A1** | 1.1b  1.1b | 5th  Solve equilibrium problems involving Hooke's law in context |
|  | **(2)** |  |  |
| **2b** | or 0.60  or 1.4 m | **M1**  **A1**  **A1** | 3.1a  1.1b  3.1a | 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** | 3.1a  1.1b  1.1b  3.1a | 5th  Solve equilibrium problems involving Hooke's law in context |
|  | **(4)** |  |  |
| **3b** | The tension force in  decreases /  is not as strong/more stretchy  The particle will move closer to A / to the left | **B1**  **dB1** | 2.4  2.2b | 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\*** | 2.1  1.1b  2.2a | 5th  Solve equilibrium problems involving Hooke's law in context |
|  | **(3)** |  |  |
| **4b** | Initial , final        Max distance | **M1**  **M1**  **M1**  **A1**  **A1** | 3.1b  3.1b  1.1b  1.1b  3.1b | 7th  Solve 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** | 3.1a  1.1b  1.1b | 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** | 3.1a  1.1b  3.1a  1.1b  1.1b  1.1b | 7th  Solve string/spring problems involving work and energy in familiar contexts |
|  | **(6)** |  |  |
| (9 marks) | | | | |
| Notes  5a M1: Attempts to find EPE  A1: A correct unsimplified expression  A1: A correct expression (accept equivalent fractions)  5b M1: Attempts to find work done against friction  A1: A correct (unsimplified) expression  M1: Forms a 3-term Work-energy equation  A1ft: Correct 3-term equation. f.t. their EPE from part a  M1: 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** | 3.1a  1.1b  1.1b  1.1b  1.1b  1.1b | 7th  Solve string/spring problems involving work and energy in familiar contexts |
|  | **(6)** |  |  |
| **6b** |  | **M1**  **A1**  **M1**  **A1** | 3.1a  1.1b  1.1b  1.1b | 7th  Solve string/spring problems involving work and energy in familiar contexts |
|  | **(4)** |  |  |

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| **6c** |  | **M1**  **A1**  **M1**  **A1** | 3.1b  1.1b  1.1b  1.1b | 7th  Solve 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* | | | | |