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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress descriptor |
| **5.1a** | Force descriptions in words × 3 (one mark each)  Force values ×3 (one mark each) | **B3**  **B3** | 2.5  1.1b | 3rd  Draw force diagrams. |
|  | **(6)** |  |  |
| **5.1b** | Limiting equilibrium means *F* = *μR* | **M1** | 3.1b | 7th  The concept of limiting equilibrium. |
| *P* = 0.3 × 9.8 × 5 | **M1** | 1.1b |
| *P* = 14.7 (N) accept awrt 15 (N) | **A1** | 1.1b |
|  | **(3)** |  |  |
| (9 marks) | | | | |
| Notes  **5.1b**  Allow if *g* explicitly evaluated. | | | | |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress descriptor |
| **6.2a** | Calculate initial velocities. | **M1** | 3.1a | 7th  Solve problems in familiar contexts involving projectile motion. |
| Initial horizontal velocity(m s−1). | **A1** | 1.1b |
| Initial vertical velocity(m s−1). | **A1** | 1.1b |
| Use of suvat equations. | **M1** | 3.1a |
|  | **A1** | 1.1b |
|  | **A1** | 1.1b |
| Max occurs when | **M1** | 2.4 |
| (s) | **A1** | 1.1b |
| then *x* = 0.2 (m) | **A1** | 1.1b |
| and *y* = 0.1 (m) | **A1** | 1.1b |
|  | **(10)** |  |  |
| **6.2b** | Max height when hits wall. | **M1** | 3.1b | 8th  Solve problems in unfamiliar contexts involving projectile motion. |
| Solve for *t.* | **M1** | 1.1b |
|  | **A1** | 1.1b |
| Substitute *t* into *y.* | **M1** | 1.1b |
| *y* = 0.075 m = 7.5 cm | **A1** | 3.2a |
|  | **(5)** |  |  |
| **6.2c** | Any valid limitation. For example, the ball bounces off the wall. | **B1** | 3.5b | 3rd  Understand assumptions common in mathematical modelling. |
|  | **(1)** |  |  |
| (16 marks) | | | | |

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| **Q** | **Scheme** | **Marks** | **AOs** | **Pearson Progression Step and Progress descriptor** |
| **7.2a** | No net force means | **M1** | 1.1b | 4th  Calculate resultant forces using vectors. |
| So *f* = −5 | **A1** | 2.2a |
|  | **(2)** |  |  |
| **7.2b** | Use of moment = force perpendicular distance from pivot. | **M1** | 1.1a | 5th  Find resultant moments by considering direction. |
| Moment = 2 × 1 + 3 × 3 + 5 × 3 | **M1** | 1.1b |
| = 26 N cm | **A1ft** | 1.1b |
| = 0.26 N m | **A1ft** | 1.1b |
|  | **(4)** |  |  |
| **(6 marks)** | | | | |

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| **Q** | **Scheme** | **Marks** | **AOs** | **Pearson Progression Step and Progress descriptor** |
| **8.1a** | Integrate **v** w.r.t. time | **M1** | 1.1a | 8th  Solve general kinematics problems using calculus of vectors. |
| (Allow omission of **C**) | **A1** | 1.1b |
|  | **A1** | 1.1b |
|  | **(3)** |  |  |
| **8.1b** | Differentiate **v** w.r.t. time | **M1** | 1.1a | 8th  Solve general kinematics problems using calculus of vectors. |
|  | **A1** | 1.1b |
| Substitute *t* = 4 into **a** | **M1** | 1.1b |
| When *t* = 4,  (m s−2) | **A1** | 1.1b |
|  | **(4)** |  |  |
| **8.1c** | **j** component is 1 when *t* = 1 | **M1** | 3.1a | 8th  Solve general kinematics problems in a range of contexts using vectors. |
|  | When *t* = 1, **r** =**i** + **j**(m) | **A1** | 1.1b |
|  |  | **(2)** |  |  |
| **(9 marks)** | | | | |