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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress descriptor |
| **4.1a** | Force = 4 × 9.8 = 39.2 (N). Accept 39. | **M1** | 1.1b | 4th  Calculate moments. |
| Moment = force × distance | **M1** | 1.1a |
| Moment = 39.2 × 3 = 117.6 (N m). Accept 118. | **A1** | 1.1b |
|  | **(3)** |  |  |
| **4.1b** | Moment = *F* × 7 = 7*F* (N m) | **A1** | 1.1b | 4th  Calculate moments. |
|  | **(1)** |  |  |
| **4.1c** | Equal moments | **M1** | 1.1a | 5th  Calculate sums of moments. |
| Solve for *F* | **M1** | 1.1b |
| 16.8 (N). Accept 17. | **A1ft** | 1.1b |
|  | **(3)** |  |  |
| (7 marks) | | | | |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress descriptor |
| **5.3a** | B1 for each correct force with correct label | **B4** | 2.5 | 3rd  Draw force diagrams. |
|  | **(4)** |  |  |
| **5.3b** | Res(→) *F* = *P* cos 30 | **M1** | 3.1b | 5th  Calculate resultant forces in perpendicular directions. |
|  | **A1** | 1.1b |
| Res(↑) *R* = 5*g* − *P* sin 30 | **M1** | 3.1b |
|  | **A1** | 1.1b |
|  | **(4)** |  |  |
| **5.3c** | If *P* = 20,  Substitute into *R*  *R* = 39 N | **M1**  **A1** | 1.1b  1.1b | 7th  The concept of limiting equilibrium. |
| Substitute into F  *F* = or 17.320… (N) | **M1**  **A1** | 1.1b  1.1b |
| If limiting equilibrium, *μ*or 0.444…  So *μ* ⩾or *μ* ⩾ 0.44 | **M1**  **A1ft** | 3.1b  3.2a |
|  | **(6)** |  |  |
| (14 marks) | | | | |
| Notes  **5.3b**  Allow if *g* explicitly evaluated. | | | | |

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| **Q** | **Scheme** | **Marks** | **AOs** | **Pearson Progression Step and Progress descriptor** |
| **8.3a** | **\\192.168.0.251\Pearson\A Level Maths\WIP files\Unit tests\Mechanics 2\Artwork\2. Files from YPS\alevel_ut_m2_u8_markscheme_aw2.png**  Diagram of two forces acting on ball. Weight (*g*) must be downwards and drag (*kv*) upwards. | **B1**  **B1** | 2.5  2.5 | 3rd  Draw force diagrams. |
|  | **(2)** |  |  |
| **8.3b** | Solve weight = drag for *v* | **M1** | 3.1b | 6th  Work with systems of forces in equilibrium. |
|  | **A1** | 1.1b |
|  | **(2)** |  |  |
| **8.3c** | Use ofwith *m* = 1 | **M1** | 1.1b | 5th  Use equations of motion to solve problems in familiar contexts. |
| is acceleration | **A1** | 1.2 |
| Total downward force is | **A1** | 3.4 |
|  | **(3)** |  |  |
| **8.3d** | Use of differentiation to evaluate both sides. | **M1** | 2.1 | 7th  Solve general kinematics problems in less familiar contexts. |
|  | **A1** | 2.1 |
|  | **A1** | 2.1 |
|  | **(3)** |  |  |
| **8.3e** | As the terminal velocity | **B1** | 3.2a | 7th  Solve general kinematics problems in less familiar contexts. |
|  | **(1)** |  |  |
| **8.3f** | Correct limitation | **B1** | 3.5b | 3rd  Understand assumptions common in mathematical modelling. |
|  |  | **(1)** |  |  |
| **(12 marks)** | | | | |
| **Notes**  **8.3a**  B1 for correct weight force labelled.  B1 for correct drag force labelled.  **8.3f**  For example,upthrust due to water pressure, drag proportional to velocity only at low velocity. | | | | |

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| **Q** | **Scheme** | **Marks** | **AOs** | **Pearson Progression Step and Progress descriptor** |
| **7.1a** | **Figure 1**    Force descriptions in words (one mark each) | **B4** | 2.5 | 3rd  Draw force diagrams. |
|  | **(4)** |  |  |
| **7.1b** | Weight force is 9.8 × 6 | **M1** | 1.1b | 7th  The concept of limiting equilibrium. |
| = 58.8 (N) (Accept awrt 59) | **A1** | 1.1b |
| Resolve forces in vertical direction. | **M1** | 3.1b |
| Normal reaction on floor is 58.8 (N) (Accept awrt 59) | **A1** | 1.1b |
| Take moments about base of ladder. | **M1** | 3.1b |
| 58.8 × 5 sin 20 = *N* × 10 cos 20 | **M1** | 1.1b |
| *N* = 10.70… (N) (Accept awrt 11) | **A1** | 1.1b |
| Resolve forces in horizontal direction. | **M1** | 3.1b |
| Friction force on floor is 10.70… (N) (Accept awrt 11) | **A1** | 1.1b |
| *μR* = 0.3 × 58.8 | **M1** | 1.1b |
| = 17.6 (N) | **A1** | 1.1b |
| > *F* | **A1** | 2.4 |
| So does not slip. | **A1** | 2.4 |
|  | **(13)** |  |  |
| **(17 marks)** | | | | |