| **Question** | **Scheme** | **Marks** |
| --- | --- | --- |
| **1(a)** |  | M1 A1 A1 |
|  |  | **(3)** |
| **1(b)** |  | M1 A1A1 |
|  |  | **(3)** |
|  |  | **(6 marks)** |
| **2(a)** | *\_**w**\_**v*\_6 m \_s\_-1\_5 m \_s\_-1*B*3*A*2 |  |
|  | M1A1 |
|   | A1 |
|  |  | **(3)** |
| **2(b)** |  | M1A1 |
|  | A1 |
|  |  | **(3)** |
|  |  | **(6 marks)** |
| **3(a)** | For *P*,   | M1 A1 |
|   | A1 |
|  |  | **(3)** |
| **3(b)** | For *Q*,  | M1 A1 |
|   | A1 |
| **OR** |  |
|   | M1 A1 |
|   | A1 |
|  |  | **(3)** |
|  |  | **(6 marks)** |
| **4(a)** |  |  |
| For *Q*  *I* = 3000 × 9 = 27000 (N s)  | M1A1 |
|  |  | **(2)** |
| **4(b)** | Conservation of linear momentum leading to |  |
| 15*m* = – 3*m* + 3000 × 9 | M1 A1 |
| *m* = 1500 | A1 |
|  |  | **(3)** |
|  |  | **(5 marks)** |
| **5(a)** | Conservation of momentum:  |   |
|  | M1 A1 |
|   | A1 |
|  |  | **(3)** |
| **5(b)** | Impulse = change in momentum  |  |
|   | M1 A1 |
|  |  | **(2)** |
|  |   | **(5 marks)** |
| **6(a)** | 32*v* |  |
|  CLM: 3x3 - 2x2= 3*v* + 2(*v*+1) | M1 A1 |
|  *vP*= 0.6 m s-1; *vQ*= 1.6 m s-1 | M1A1(A1 **ft)** |
|  |  | **(5)** |
| **6(b)** |  | M1 A1 **ft** |
|   | A1 |
|  |  | **(3)** |
|  |  | **(8 marks)** |
| **7(a)** |  4*u* 3*u*  *P* (2*m*) *Q* (3*m*) *V* *u*  | M1 A1A1 |
|  |  | **(3)** |
| **7(b)** | (Has been) reversed  | B1 |
|  |  | **(1)**  |
| **7(c)** |  | M1 A1A1**OR**M1 A1A1 |
|  |  | **(3)** |
|  |  | **(7 marks)** |
| **8** |   | M1 |
|  | M1 A1 |
|  | M1 A1 |
|  | M1 A1 |
|  |  | **(7 marks)** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Source paper** | **Question number** | **New spec references** | **Question description** | **New AOs** |
| 1 | M1 2015 | 1 | 1.1  | Momentum and impulse | 1.1b, 3.1b |
| 2 | M1 2013R | 1 | 1.1  | Momentum and impulse | 1.1b, 3.1b |
| 3 | M1 2013 | 1 | 1.1  | Momentum and impulse | 1.1b, 3.1b |
| 4 | M1 Jan 2012 | 1 | 1.1  | Momentum and impulse | 1.1b ,3.1b |
| 5 | M1 Jan 2011 | 1 | 1.1  | Momentum and impulse | 1.1b, 3.1b |
| 6 | M1 2011 | 2 | 1.1  | Momentum and impulse | 1.1b, 3.1b |
| 7 | M1 2017 | 2 | 1.1  | Momentum and impulse | 1.1b, 2.2a, 3.1b |
| 8 | M1 2016 | 3 | 1.1  | Momentum and impulse | 1.1b, 2.2a, 3.1b |