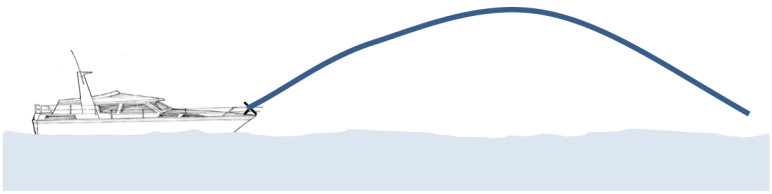
| Question Number | Answer | Mark |
|---|---|---|
| **17(a)(i)** | • Initial angle at approximately 30° (by eye) with approximately parabolic shape. **(1)**<br>  | **1** |
| **17(a)(ii)** | • Use of $v^2 = u^2 + 2as$ (with $u$ and $v$ the correct way around) **(1)**<br>**Or**<br>Loss of KE = gain of GPE (i.e. $u_V^2 = 2gh$)<br>• See $u$ sin 30° for initial vertical component of velocity $u_V$ **(1)**<br>• $u$ = 57 (m s$^{-1}$) **(1)**<br>Example of calculation<br>$0^2 = (u \sin 30°)^2 + (2\times - 9.81$ N kg$^{-1}$ × 42 m)<br>$u_V = u \sin 30° = 28.7$ m s$^{-1}$<br>$u = 57.4$ m s$^{-1}$ | **3** |
| **17(a)(iii)** | • Use of trig to determine the horizontal component of the initial velocity **(1)**<br>METHOD 1 **(1)**<br>• Use of suitable equation(s) of motion to determine the time of flight **(1)**<br>• Use of $v = s/t$ to determine the horizontal distance travelled by the flare **(1)**<br>• Comparison of distance to boat to distance flare travelled with conclusion consistent with student's value<br>e.g. 7.9 km is less than 8.0 km so the flare can be seen.<br>Example of calculation<br>$0 = (57.4$ m s$^{-1}\times \sin 30° \times t) - (0.5\times 9.81$ N kg$^{-1}\times t^2)$<br>$t = 5.85$ s<br>$s = (57.4$ m s$^{-1}\times \cos 30° \times 5.85$ s) = 49.7 m s$^{-1}$ × 5.85 s = 291 m | **4** |

| | | |
|---|---|---|
| | METHOD 2<br>• Use of $v = s/t$ to determine the time to reach 200 m<br>• Use of $s = ut + \frac{1}{2}at^2$ to find height reached after 200 m travel<br>• Explains conclusion consistent with student's value<br>e.g. flare above the sea and in range so visible | |
| **17(b)** | • Air resistance/drag is ignored **Or** air resistance/drag is **(**presumed to be) negligible **(1)** | **1** |
| | **Total for question 17** | **9** |