Commentary on candidate evidence

The candidate evidence has achieved the following marks for each question.

Question	Response	Mark available	Mark awarded	Comments
1(a)	1	3	3	The candidate has differentiated correctly, substituted values correctly and given an acceptable final answer.
1(a)	2	3	2	The candidate has differentiated correctly and substituted values correctly. The final answer however is not acceptable since the recurrence dot on the final digit indicates an indeterminate number of significant figures.
1(a)	3	3	0	The candidate has incorrectly transcribed the relationship for *v* from the question paper.
1(b)	1	3	3	The candidate has integrated correctly, substituted values correctly and given an acceptable final answer using the value for *t* carried forward from 1(a).
1(b)	2	3	0	The candidate has incorrectly transcribed the relationship for *v* from the question paper.
1(b)	3	3	2	The candidate has integrated correctly and substituted the value for *t* carried forward from 1(a). The final answer however is incorrect.

Question	Response	Mark available	Mark awarded	Comments
2(a)(i)	1	3	0	The candidate has not selected an appropriate relationship. (The squared term is missing from 'F =mrω').
2(a)(i)	2	3	3	The candidate has selected an appropriate relationship, substituted values correctly and given an acceptable final answer.
2(a)(i)	3	3	2	The candidate has selected an appropriate relationship and substituted values correctly. The final answer however is not acceptable since a unit is omitted.
2(a)(ii)	1	1	1	The candidate's statement is clumsy but acceptable.
2(a)(ii)	2	1	0	The candidate's statement is not sufficiently precise for the mark to be awarded.
2(a)(ii)	3	1	0	The candidate's statement is not sufficiently precise for the mark to be awarded.
2(b)(i)	1	2	2	The candidate has correctly named *tension* and *weight*. The direction of the weight vector was considered to be sufficiently straight and vertical.
2(b)(i)	2	2	0	The candidate has correctly named and indicated the direction of the *weight*, but has neither named nor identified *tension*. Since the candidate has not defined *R*, *Rsinθ* and *Rcosθ,* no marks can be awarded.

Question	Response	Mark available	Mark awarded	Comments
2(b)(i)	3	2	0	The candidate has named *weight* and indicated its direction. However, the candidate has not referenced this with respect to the pod. In addition, the candidate has indicated an incorrect direction for *tension*. Had the candidate referenced the forces by indicating the position of the pod, the response would have been awarded 1 mark.
2(b)(ii)	1	2	2	The candidate has given a correct statement, and made a sufficient justification.
2(b)(ii)	2	2	1	The candidate has given a correct statement, and made a justification, which is not incorrect, but is not sufficient for the second mark to be awarded.
2(b)(ii)	3	2	0	The candidate has given a correct statement, but has not attempted a justification.
3(a)	1	2	1	The candidate has selected an appropriate relationship, substituted values correctly, but has not shown the given final answer.
3(a)	2	2	2	The candidate has selected an appropriate relationship, substituted values correctly, and has shown the given final answer.
3(a)	3	2	1	The candidate has selected an appropriate relationship, substituted values correctly, but

Question	Response	Mark available	Mark awarded	Comments
				has given an incorrect unit in the final answer.
3(b)(i)	1	1	0	The candidate's explanation is not sufficient, since they have not indicated that the mass is closer to the axis of rotation.
3(b)(i)	2	1	1	The candidate's explanation of mass distribution closer to the axis is correct. The loose physics at the end of the explanation is ignored.
3(b)(i)	3	1	0	The candidate's explanation is not sufficient, since they have not indicated that the mass is closer to the axis of rotation.
3(b)(ii)	1	3	3	The candidate has selected an appropriate relationship, substituted values correctly and given an acceptable final answer.
3(b)(ii)	2	3	3	An appropriate relationship is implied by the candidate's correct substitution of values. The final answer is correct.
3(b)(ii)	3	3	0	The candidate has not selected an appropriate relationship.
5(a)	1	1	0	The candidate's statement is insufficient, the original and final positions of the unit mass has been omitted.
5(a)	2	1	1	The candidate's statement is acceptable.

Question	Response	Mark available	Mark awarded	Comments
5(a)	3	1	1	The candidate's statement is acceptable.
5(b)	1	3	0	The candidate has not selected an appropriate relationship.
5(b)	2	3	2	The candidate has selected an appropriate relationship, substituted values correctly, but has given an incorrect unit in their final answer.
5(b)	3	3	1	The candidate has selected an appropriate relationship, but has not substituted values correctly. (The negative sign is omitted.)
5(c)	1	4	1	The candidate has selected an appropriate relationship, but has not substituted values correctly. (The negative sign is omitted.)
5(c)	2	4	2	The candidate has selected an appropriate relationship, substituted values correctly, but has not combined potential energies correctly.
5(c)	3	4	2	The candidate has essentially made the same error as the previous candidate, but has attempted to combine potentials before the substitution stage. The candidate has selected an appropriate relationship, has not combined potential energies correctly, but has substituted the (incorrect) value for the combined potential correctly into the relationship. The final answer is, of course, incorrect.

Question	Response	Mark available	Mark awarded	Comments
5(c)	4	4	4	The candidate has selected an appropriate relationship, substituted values and combined potential energies correctly, and given an acceptable final answer.
6(a)	1	1	1	The candidate's statement is acceptable.
6(a)	2	1	0	The candidate's statement is incorrect.
6(a)	3	1	0	The candidate's statement is not acceptable, due to the lack of an implication of effects.
6(a)	4	1	0	The candidate's statement is not acceptable due to their use of the phrase 'point of reference' rather than frame of reference.
6(b)(ii)	1	1	1	The candidate's line is acceptable.
6(b)(ii)	2	1	1	The candidate's dotted line is acceptable.
6(b)(ii)	3	1	1	The candidate's line is judged to be sufficiently vertical and straight.
6(c)(i)	1	2	1	The candidate has correctly substituted values into the given relationship, but has incorrectly rounded 6·74982 to '6·74'. The mark for the final answer is not awarded.
6(c)(i)	2	2	2	The candidate has correctly substituted values into the given

Question	Response	Mark available	Mark awarded	Comments
				relationship, and given the correct final answer.
6(c)(i)	3	2	2	The candidate has correctly substituted values into the given relationship, and given the correct final answer. The candidate's working shows '$3 \times 10^{8\,2}$'. This is treated as bad form rather than wrong physics.
6(c)(ii)A	1	2	2	The candidate has correctly substituted values into the given relationship, and given an acceptable final answer.
6(c)(ii)A	2	2	2	The candidate has correctly substituted values into the given relationship, and has given an acceptable final answer. The candidate has not given a unit in the final answer, but this is not required in this question
6(c)(ii)A	3	2	1	The candidate has correctly substituted values into the given relationship, but has given an incorrect unit in their final answer.
6(c)(ii)B	1	2	1	The candidate's sketch shows a curve which is asymptotic to the horizontal axis, but it does not start from the solar radius.
6(c)(ii)B	2	2	2	The candidate's sketch shows a curve which is asymptotic to the horizontal axis, and starts from the solar radius.
6(c)(ii)B	3	2	0	The candidate's sketch shows a curve, which is not sufficiently

Question	Response	Mark available	Mark awarded	Comments
				clear and does not touch the solar radius line.
7(a)(ii)A	1	1	0	The candidate's statement is incorrect – as *all* hydrogen fusion stops.
7(a)(ii)A	2	1	1	The candidate's statement is correct. The additional information is ignored.
7(a)(ii)A	3	1	1	The candidate's statement is correct.
7(a)(ii)B	1	1	1	The candidate's statement is correct.
7(a)(ii)B	2	1	0	The candidate's statement is incorrect, due to their use of 'planet'. In addition the candidate has not indicated that thermal pressure is greater than gravitational force.
7(a)(ii)B	3	1	0	The candidate's use of 'fussion' is not acceptable because of the potential confusion between fusion and fission. This is 'issue 22' in the Physics: general marking principles.
7(b)(i)	1	3	3	The candidate has selected an appropriate relationship, substituted values correctly and given the correct final answer.
7(b)(i)	2	3	2	The candidate has selected an appropriate relationship, initially substituted values correctly, but has given an incorrect final answer (due to the use of '1·67'

Question	Response	Mark available	Mark awarded	Comments
				rather than 1·6 in the subsequent working).
7(b)(i)	3	3	3	The candidate has selected an appropriate relationship, substituted values correctly and given an acceptable final answer.
7(b)(ii)	1	3	2	The candidate has selected an appropriate relationship and substituted values correctly. The rounding of values at an intermediate stage however has resulted in an incorrect final answer.
7(b)(ii)	2	3	1	The candidate has selected an appropriate relationship, but has substituted incorrect values.
7(b)(ii)	3	3	3	The candidate has selected an appropriate relationship and substituted values correctly. In this case, the rounding of values at an intermediate stage has resulted in a correct final answer.
7(c)	1	1	1	The candidate's statement is acceptable.
7(c)	2	1	1	The candidate's statement is correct.
8(a)	1	3	1	The candidate has selected an appropriate relationship, but their use of '$E_{min} \geq \ldots$' is incorrect, and so the mark for substitution of values is not awarded.
8(a)	2	3	2	The candidate has selected an appropriate relationship, substituted values correctly, but

Question	Response	Mark available	Mark awarded	Comments
				has given an incorrect unit in their final answer. The use of ± can be ignored.
8(a)	3	3	3	The candidate has selected an appropriate relationship, substituted values correctly, and given the correct final answer. The use of ± can be ignored.
8(b)	1	3	2	The candidate has selected an appropriate relationship and substituted values correctly. Despite the acceptable final answer, the incorrect rounding of values at an intermediate stage (‘166’) means that the mark for the final answer is not awarded.
8(b)	2	3	3	The candidate has selected an appropriate relationship, substituted values correctly and given the correct final answer.
8(b)	3	3	3	The candidate has selected an appropriate relationship, substituted values correctly, and given the correct final answer. In this question, a unit is not required in the final answer, though if given, it must be correct.
8(c)	1	4	2	The candidate has selected an appropriate relationship, substituted values correctly, but has not given a unit in their answer. The candidate’s explanation is insufficient for the fourth mark to be awarded.

Question	Response	Mark available	Mark awarded	Comments
8(c)	2	4	4	The candidate has selected an appropriate relationship, substituted values correctly, and given the correct answer. The candidate's explanation is sufficient for the fourth mark to be awarded.
8(c)	3	4	3	The candidate has selected an appropriate relationship, substituted values correctly, and given the correct answer. The candidate's explanation is insufficient for the fourth mark to be awarded.