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# Examiners' Report
# Principal Examiner Feedback

## January 2025

Pearson Edexcel International Advanced Level
In Mechanics M2 (WME02) Paper 01

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The majority of candidates showed a good understanding of the topics examined. They scored particularly well in the first half of the paper. As usual, the better work was clearly set out and accompanied by annotated diagrams.

When the topic was understood, the most common cause of loss of marks was inappropriate accuracy in the final answer. Candidates should understand that if they have used an approximate value for $g$ in their working then the final answer should be given to 2 significant figures or 3 significant figures. The rubric makes it clear that the approximation to be used is $g = 9.8$, but many candidates are clearly using $g = 9.81$, and they are losing marks for this.

**Question 1**

Most candidates obtained a correct value for the work done against friction as the package is pushed up the slope. Although the word "total" is in bold, it was common for candidates to overlook the gain in potential energy. A minority of candidates "double counted" by including both the gain in potential energy and the work done against the weight. Final answers given to more than 3 significant figures were common.

**Question 2**

(a) Many candidates assumed, incorrectly, that the van and the trailer were moving at constant speed. If the equations of motion were based on no acceleration then they scored no marks.

(b) There were many fully correct solutions to this part of the question. The most common reason for the loss of a mark was the accuracy of the final answer.

**Question 3**

(a) There were many fully correct solutions. The most common error was to given the final answer as a velocity, when the question asks for speed.

(b) The differentiation did not appear to cause any difficulties in part (a), but there were a few errors in the **i** component of the acceleration.

(c) Many candidates who worked with the position vector of $P$ gave a clear justification of the given result.

**Question 4**

(a) Despite the rubric at the top of the question and the given diagram, there were still some candidates confused between horizontal and vertical. Most candidates had correct methods for finding $x$ and $y$, including a few using conservation of energy. The most common reason for losing a mark was the accuracy of the $y$ value – it needed to be given to 2 significant figures or 3 significant figures.

(b) Most candidates had a correct strategy for finding the time taken, and hence the distance $AC$. There were some sign errors in using the *suvat* equations to find the time taken, for example use of $15 = 5.39 + gt$, which only considers part of the time.

**Question 5**

(a) The majority of candidates attempted to use $m\mathbf{v} - m\mathbf{u}$ and only a few made errors in using $m$. There were several incorrect / inappropriate equations equating vectors to scalars, but the candidates did know how to find the modulus of a vector.

(b) Those candidates who had not formed a correct expression for $\mathbf{I}$ in terms of $\lambda$, and those who had subtracted the wrong way round in part (a) were most likely to miss out on this mark.

(c) There were many fully correct solutions to this part of the question.

**Question 6**

(a) Many candidates worked in two dimensions, although it is only necessary to consider the distances from $AD$. The question asked the candidates to obtain a value for the distance $d$ defined in the question, but many solutions made no reference to $d$. Some candidates worked with mass ratios $8:3:11$, adding on the triangle rather than removing it.

(b) Most candidates used the different mass densities correctly. A small number thought that the information related to the total mass, not to the mass per unit area. Many candidates obtained the correct distance, $\frac{122a}{29}$ from $AD$. It was quite common to see lengthy calculations to obtain the distance from $PQ$. These did often give the correct answer, but it could equally have been written down by simply considering the symmetry of the figure.

**Question 7**

(a) The candidates were correct in deciding that the appropriate starting point here was to take moments about an axis through $A$. As the answer is given, it is particularly important that the working is correct throughout. Some candidates appeared to make a greater effort to work out how to get the answer $7W$ than how to form the moments equation. Some moments equations involved no resolving of forces or distances. Some equations were dimensionally inconsistent, with some term(s) including $a$ and some not.

(b) The majority of candidates formed a pair of equations by resolving horizontally and vertically, although other approaches were also seen, including reduction to a 3 force problem. The candidates often found a correct value for the angle between their force and the horizontal / vertical, but the question asked for the angle between the force and the rod, so many candidates did not score the last two marks.

**Question 8**

(a) Those candidates who started by using the impact law often obtained the correct answer. There were several sign errors, especially from candidates using a formulaic approach rather than "speed of separation = e x speed of approach". The candidates who started by stating the equation for conservation of momentum still need to use the impact law, but the work they had done was relevant to part(b).

(b) There were many correct solutions. Most errors were due to sign error in the momentum equation – in many cases this could have been avoided by drawing a diagram as the question was read through.

(c) This proved to be the most challenging task on the paper. There were many fully correct and clearly presented solutions. Most candidates gave a correct statement for the speed of $Q$ after the collision with the wall. There were then a series of values, some with descriptions, and some not. The most successful solutions sought to collate information about times and distances in a table, from which relevant terms could be extracted to form an equation in $f$.

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