Examiners' Report
Principal Examiner Feedback

Summer 2025

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

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General

The vast majority of candidates were able to make attempts at all seven of the questions but there were a few blanks for the second part of question 7. It wasn’t always clear whether this was due to candidates running out of time or other factors. The paper had a friendly start with the both the first two questions being well answered. Questions 3 and 6 seemed to present the greatest challenge where there were a significant number of zero scores. There were some excellent scripts but there was also a substantial number where the standard of presentation made it very difficult for examiners to follow the working and award marks accordingly.

In calculations the numerical value of g which should be used is 9.8 m s^{-2}, as stated on the front of the question paper. Final answers should then be given to 2 (or 3) significant figures – more accurate answers will be penalised, including fractions but exact multiples of g are usually accepted.

N.B. If there is a given or printed answer to show, e.g. as in 1(a) and (b), 3(a), 5(a), 6(a) and (b) and 7(a), then candidates need to ensure that they show sufficient detail in their working to warrant being awarded all of the marks available**.**

Also, if a question requires a particular method to be used , as in 7(a), there will be no credit given for an alternative method.

In all cases, as stated on the front of the question paper, candidates should show sufficient working to make their methods clear to the examiner and correct answers without working may not score all, or indeed, any of the marks available.

If a candidate runs out of space in which to give his/her answer than he/she is advised to use a supplementary sheet – if a centre is reluctant to supply extra paper then it is crucial for the candidate to say whereabouts in the script the extra working is going to be done.

Question 1

(a) The overwhelming majority of candidates integrated successfully (often including the '+c') and found k, but many failed to properly show that $c = 0$ and so lost the A1*.

(b) Similarly here, a considerable number of candidates failed to justify why the constant of integration was 0 and again lost the A1*.

(c) It was common to see candidates set $s = 0$ and solve for t, but many then realised they needed $v = 0$ instead. Those that then went on to solve $v = 0$ were usually then successful in finding s when $t = 3$ and doubling to get the final correct answer. Some candidates summed two integrals, with limits 0 and 3 and 3 and $3\sqrt{2}$, to achieve the same result. Very occasionally a final answer of 27 would be given where candidates had forgotten to double. A small number of responses attempted to use *suvat* formulae not understanding that a was not constant.

Question 2

A large proportion of candidates achieved full marks on this question. A few candidates did not differentiate **r** and just substituted $t = 4$ into **r**. A small number of responses used $t = 1$. There were a small number of minor slips in differentiating, in substituting and in the impulse equation, but a larger number of candidates lost marks for not finding the speed and just gave their final answer as a vector.

Question 3

(a) It was not rare to see a candidate using areas instead of lengths, scoring 00100. Those that correctly interpreted the situation often found distances and masses for AB and CD correctly and went on to form a valid equation. A lack of care when working towards the given answer was often seen, either missing any reference to AC and DB in their working leading to the moments equation or omitting necessary brackets. It was clear that some candidates did not know how to address the two straight sections of wire, as the mass of $2a$ was sometimes tacked onto AB or CD without justification. It was also relatively common to see candidates using the length of the circumference of whole circles rather than semi-circles as their mass ratios.

(b) Almost all candidates found $\tan OAG$ successfully, although a good number thought that this was $\tan\theta$ itself. Some ended up with the reciprocal. Occasionally a candidate would use a moments equation to find the y-coordinate of the centre of mass incorrectly. Most candidates realised that they needed to use $(45^o - OAG)$, but there were a variety of errors. The most common was to use $\tan\theta = \tan 45^o - \tan OAG$ and another was to find the angles involved as decimals first. Those who correctly identified the need for the tan compound angle formula usually arrived at the correct final answer. The alternative method using perpendiculars was rare but when it was seen was often correctly applied.

Question 4

(a) Most candidates were successful in finding the speed. The most common errors were including a non-zero acceleration, omitting g and transcription and calculation slips.

(b) There were many correct solutions. Occasionally there would be a g missing in the weight component or an extra g in the mass. Sin/cos confusion and sign errors were quite rare. Lots of responses used their value of $(200+750g\sin\alpha)$ from part (a) so some responses repeated mistakes if they had a sign error earlier in the question.

(c) Candidates found this part harder. A few used 16 instead of 10, but mostly the errors involved missing out the $200d$ term altogether, missing out just the d in the $200d$ term or accounting for the work done against the weight twice (once in the *mgh* formula and the other by combining the weight with 200 before multiplying by d).

Question 5

(a) Some candidates encountered difficulties with clear notation, especially when distinguishing between v_P and v_Q, the speeds after the collision. Even u, the initial speed, was sometimes unclear, which occasionally made it challenging to apply the CLM and NEL equations accurately. However, there were many correct solutions with very few inversions of the NEL expression seen and very few candidates with inconsistent CLM and NEL equations. Those who chose to work with $-v_P$ occasionally had problems with directions/signs in (c) and (d)

(b) Most candidates used the correct masses in their KE expressions. Some candidates did not simplify their expression for v_P which resulted in a more complicated process for them to find v_P^2. The simplification of $\frac{1}{2}mv_Q^2$ was a common source of error and there were a few unfortunate uses of the incorrect $(x+y)^2 = x^2 + y^2$.

There was some very laboured simplification but also some very elegant work. The phrase KE loss did not prompt all candidates to realise that the final KE was less than the initial KE so that their subtraction was sometimes the wrong way round.

(c) Some candidates who knew they had gone wrong with (b) did not attempt the last two parts. This was unfortunate as it was possible for candidates who had not achieved any success earlier in the question to gain full marks here by using the impulse-momentum equation for Q.

However, it was also common for candidates who had been successful thus far to fail to gain marks through using the wrong signs in the impulse-momentum equation for P.

(d) Again candidates who had received no marks in (a) and (b) but had found e correctly in part (c) often gained full marks here. Many candidates were familiar with this scenario while some candidates who had gained full marks thus far, chose not to attempt this part. There were very few solutions which were the reciprocal of the answer. It was unfortunate that candidates who had found an incorrect value for e in (c) often had a nonsensical value of $e > 1$ and so could only gain one of the marks.

Question 6

A significant number of candidates were very familiar with this work and produced complete efficient and accurate solutions.

(a) The omission of a in the moments equation or *sin/cos* confusion was rare and most candidates successfully produced the required expression with only a few failing to state the answer in the form requested.

(b) There were occasional sign errors here. The most common reason for not achieving full marks was a resistance to using the variables defined in the question.

(c) Resolving horizontally was the most common approach. There was occasional success using moments about B, but most attempts failed to include all the forces.

Most candidates recognised that the use of trig. identities was required. Some candidates saw the $2\sin\theta\cos\theta$ as an invitation to use $\sin 2\theta$ but then could not make progress. The knowledge that $\dfrac{1}{\cos^2\theta} = \sec^2\theta$ was common but the relationship between $\sec^2\theta$ and $\tan^2\theta$ was not always known. A few candidates produced the required identity for themselves from $\sin^2\theta + \cos^2\theta = 1$

Question 7

(a)There were many solutions offered that used *suvat* formulae, the requirement to use the conservation of energy principle seeming to have been overlooked and scored nothing.

Some candidates who knew how to use conservation of energy were confused by the $\sqrt{(5V^2)}$ and often had $\sqrt{5}$ left in their answers. Those who worked in two stages were usually able to gain the marks via use of $v^2 = 180$.

(b) A number of candidates did not attempt this part.

A minority used energy for this solution, with most working with components.

Candidates who quickly found the horizontal velocity at *O*, realised this meant that they had the horizontal velocity at *A* and used the 30º/60º triangle to find the vertical velocity at *A*, made quick work of this question. Occasionally there was 30º/60º confusion or the velocity components at *O* were the wrong way round. It was fairly common to see candidates assume that the velocity at *A* was perpendicular to the initial velocity, or the velocity at 11 m, rather than to the plane.

Many candidates, however, produced many equations with no definite purpose in mind. The failure to identify which part of the motion was being considered:- *OA*, *OP* or *PA* often caused confusion.

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