Pearson Edexcel

Examiners' Report

Principal Examiner Feedback

October 2021

Pearson Edexcel International A Level

Mathematics in Mechanics 2 (WME02)

Paper : WME02/01

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General

The quality of the work seen was very varied. There were some candidates who offered confident solutions to all eight questions. There were also many candidates who did not seem to have a secure understanding of some aspects of the syllabus. When candidates did understand the mechanics involved, they frequently made errors in the arithmetic and algebra required.

Although it has been mentioned in previous reports, there are still many candidates losing accuracy marks through giving final answers to more than three significant figures after using an approximate value for g. The rubric on the paper gives very clear advice on this matter, and the candidates need to follow this advice.

Report on Individual Questions

Question 1

(a) The given answer enabled most candidates to recover from any initial errors and obtain the correct answer. Several candidates tried to include the change in gravitational potential energy. It was common to see the final answer stated as $\frac{12}{65}mg$ rather than $\frac{12}{65}mgd$.

(b) There were several fully correct answers. The question asks for answers in terms of g and d, but some candidates substituted a value for g. It was quite common to see a decimal approximation to $\sqrt{0.4}$. The most common errors were due to omitting a term in the work-energy equation, often the work done against friction, or due to sign errors in setting up the equation.

Question 2

Many candidates showed a good understanding of this topic. The two equations for the motion of the vehicle usually contained the correct terms, but there were several sign errors. The modal score of 7 marks for this question reflects the large number of candidates who gave more than three significant figures in their final answer.

Question 3

(a) The majority of candidates made a correct start by differentiating the expression for x and looking for solutions of $v = 0$. Some candidates found this very difficult, but as the question rules out $t = 0$ the factor $t^{\frac{1}{2}}$ can be ignored and what is left is a straight-forward quadratic equation.

(b) There were several clear and correct solutions. Some candidates did not take account of the change in direction of travel when $t = 1$. Some candidates created work for themselves by integrating their expression from part (a) to get back to the expression given in the question. Several candidates adopted an incorrect strategy by integrating the given expression for x.

(c) The majority of candidates gave a fully correct solution to this part of the question.

Question 4

Those candidates who were confident in working with vectors had no difficulties with this question. Several candidates wrote down an incorrect impulse – momentum equation because they did not deal correctly with being given one velocity and one speed. Some candidates were able to recover from an incorrect initial equation, but a large number were happy to equate vectors to scalars.

Question 5

(a) For most candidates this question presented a familiar scenario and they made a correct start by attempting to take moments about B. All the distances required can be found by using similar triangles, but the majority of candidates used trigonometry. There were several errors in the angles used, and more confusion than usual between sines and cosines. The given answer meant that candidates could continue without completing this part of the question.

(b) There were a lot of fully correct solutions to this part of the question. The simplest approach here was to resolve the forces acting on the rod horizontally and vertically. A small number of candidates were successful in resolving parallel and perpendicular to the rod. Some candidates tried a second moments equation, but they often left out a relevant force.

Question 6

(a) Most candidates scored some marks for this part of the question. The use of conservation of momentum and Newton's Experimental Law was often correct, but there were several sign errors in using the impulse. A clear diagram can be a very useful way of summarising the information given in the question and avoiding confusion over directions and values.

(b) The majority of candidates attempted to form expressions for E and $2E$. There was some confusion over which was which, and several candidates worked with the general form "$\frac{1}{2}mv^2$", never using the correct values for the masses.

Question 7

(a) The rubric to this question makes it clear to candidates that they should be using the formula for the position of the centre of mass of a sector, but many solutions showed no evidence that this had been considered. Some candidates who did try to use the formula did not use the correct angle, so the correct value of $\frac{2a}{\pi}$ was unusual. The other common problem was to use an incorrect area for the sector. Given that the centre of mass lies on EC, the simplest route is to take moments about EC, but some candidates reached the correct answer by using AB as the axis.

(b) Candidates who had not obtained the given answer in part (a) often made no attempt to answer part (b). Marks were available in this part to candidates who were using the correct area ratios, and to those who could use their answer correctly to find the required angle.

Question 8

(a) This part of the question instructs candidates to consider the energy of the particle, but a significant minority tried to avoid this by using *suvat* equations. There were many correct solutions. The most common error was to give the answer as an exact fraction which is not appropriate following the use of an approximate value for g.

(b) There are several possible approaches to this question. The most common was to use $s = ut + \frac{1}{2}at^2$ to find the angle of projection and then to find the horizontal distance. There were some sign errors in the working, and several candidates confused the speed with the vertical component of the speed. Some candidates did not score the final accuracy mark because they gave their answer to more than three significant figures.

(c) All of the alternatives shown on the mark scheme were seen, and a few variations on these. The most common errors were in the accuracy, and confusion between speeds and vertical components of speeds.

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