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Examiners' Report/ Principal Examiner Feedback

Summer 2016

Pearson Edexcel GCE in Mechanics M3 (6679) Paper 01

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Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:
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This was found to be a very accessible paper and as a consequence the grade boundaries are very high. Marks were lost due to failing to round to 2 or 3 significant figures when using $g = 9.8\ \text{ms}^{-2}$ and by using rounded answers in subsequent working, leading to incorrect final results.

Students should take care to present their work neatly as examiners have to be able to read the work to establish the student's intentions! Overwriting a mistake is a dangerous practice as sometimes the resulting work is illegible. Some students appear to read the questions too quickly as their initial attempts proceed down an incorrect route and some persist in using their incorrect answer in the next part of a question instead of the answer given in the question. Clearly labelled diagrams can be a significant help in producing succinct solutions.

Question 1

This was generally answered very well, although (a) was not as strong as (b). Most knew what to do in (a) and generally managed it accurately. A few students found the acceleration perfectly, but failed to multiply by the mass and so dropped 3 marks; most realised that they had to give a positive answer. The differentiation did not generally cause problems, with very few logs appearing. Some did not explicitly state that they were finding $\text{d}v/\text{d}x$ and if they stalled later this meant that they lost their first mark, even though their integration was correct.

Part (b) was generally answered very well, with even students who scored 0 in (a) tending to get full marks on (b). Apart from small accuracy slips, there were no common mistakes of note.

Question 2

This question was also generally answered well, with most students managing to find the correct equation as shown in the main scheme. The other popular approach was to use $y = 2x$ and virtually all students who did this went on the find the required distance, possibly helped by already knowing what the answer ought to be. A very small number attempted to work with a solid. Those who confused either the equation of the line or the correct moment formula did nearly always go on to divide by an area and many somehow got to a distance of 3 (possibly removing minus signs), probably because they knew that was what they should get.

Question 3

In part (a) nearly all students obtained a valid EPE term and formed an energy equation, with most favouring the main mark scheme method. A few chose to make their life difficult by measuring x from the equilibrium position, although this did at least mean that they did not have to solve a 3 term quadratic. There were many students showing no working for solving their quadratic, but as most had a correct equation this did not hurt them. It was very unusual for a student not to complete the question by adding the 1.5 if necessary. Part (b) had more slips, with a fair number of students forgetting to include the weight term, although the majority did get the correct answer. What was noticeable was that students lost accuracy from (a) to (b), where using the 3significant figure answer from (a) led to the value of 24.01. Whilst most went on to give a 2 or 3

significant figure answer and therefore did not lose marks, it is perhaps worth reminding students to keep accurate values in their calculators.

Question 4

The most common score for part (a) was 4. Nearly all students managed to find the correct distances and mass ratios, forming their equation correctly. Many formed fairly monstrous equations rather than going to easy ratios. Many strangely chose to get rid of π, r and so on but left in the 1/3 just to make their lives more interesting. Nearly all did manage to correctly tidy up their equation and use the difference of two squares to arrive at the answer, but mostly they had their signs the wrong way round. It was very rare to see a student actually justify the swapping of the signs, probably because they are used to just removing the signs when asked for distances. Part (b) was almost always fully correct.

Question 5

Part (a) was answered very well, given the complexity of some of the algebra. Nearly all students found the correct radius and the resolving was done correctly. There was generally enough working to clearly show how the final result was formed, the only jumps coming when rationalising denominators or taking out factors, but it was generally clear that the required result had been shown. Most went on to find the similar form for the second tension. In part (b) most knew how to start, but a significant number struggled to produce the required inequality for T convincingly. Some realised that they needed < for their final answer and went back to swap their original inequality to an incorrect one as they had failed to realise that the required division reversed the inequality.

Question 6

Throughout the question it was often difficult to know whether students were working with a mass of m or $2m$, as many did not show the $2m$ explicitly before cancelling in their energy equation. In general if full marks were gained in (a), then the first 2 marks were also gained in (b). Most knew that they needed an equation of motion along the radius and they generally included a tension. It was, however, very common to use just m in this equation, losing the final mark. It was generally realised that the required condition was for the tension to be greater than zero, but a significant number did not realise that it could also equal zero and so lost marks at the end. In general the final M mark was gained, as it was very rare for a student to have formed both equations and not realise that v^2 could be eliminated. As in question 5, the need for the inequality to change direction caused confusion for some, with many just assuming that x and AB were the same and deciding to reverse their inequality at some point in their working. The students who chose to work in $l - AB$ made things look messy to begin with, but did have very clear working towards the correct inequality.

Question 7

Part (a) showed the benefits of reading these reports and checking previous mark schemes. Far more students than usual worked with $\ddot{x}$ and gave a concluding statement. Very few worked with a and those who did generally corrected themselves before the end. A few decided to introduce a second tension, generally ending up with the correct equation, whilst scoring no marks. Having arrived at an SHM equation most were able

to find both the period and the maximum speed. Part (c) was also answered remarkably well, with nearly all students using 0.6 and most of the students who chose to use sine did go on to produce a complete method. Part (d) caused no problems for almost all students. In part (e), the vast majority knew to find the new velocity (often found in (d)) and then easily went on to find the new amplitude. Both (b) and (e) were answered correctly by students who had not been successful in showing SHM, by using energy instead.

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