

A-LEVEL

Mathematics

MM05 – Mechanics 5
Report on the Examination

6360
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General

Many of the scripts were of a very high standard. A good understanding of the mechanics principles was often seen alongside good levels of competence in mathematical techniques, which produced some very good solutions.

Question 1

This question was done very well by the vast majority of students. A small number of students only found the amplitude of the motion and did not calculate AB to complete the question. A few students formed a correct equation, but made errors solving this for a .

Question 2

There were many full correct solutions to this question. Common errors found on the other scripts were not converting the 39.2 cm to 0.392 metres and, in part (a), trying to use a formula for the period of the motion instead of applying Newton's second law.

Question 3

There were many good complete solutions to this question. The main significant error was in part (b), where a number of students used $r\dot{\theta} = 5$ to produce $\dot{\theta} = \frac{5}{3}(1 + \sin \theta)$. This did not hinder many students in the later parts as they used the printed answer from the question. Also, in part (c)(i), some students omitted the $\dot{\theta}$ when differentiating.

Question 4

In part (a), there were a variety of responses, with some students finding it difficult to form the differential equation correctly. The most common error was to omit the natural length of the spring. A few students made very little progress with this part. There were many good solutions to part (b), but some students made minor errors, for example in the differentiation of their CF or PI. A few students used incorrect forms, for example including exponential terms or multiplying trigonometric functions by t .

Question 5

There were some very good responses, but also some much weaker ones. In part (a), there were a lot of good solutions, but most incorrect attempts had missing terms, incorrect signs or a mixture of both. In part (b), some students could have shown a bit more working. The integration in part (c) was generally done well, but some students multiplied by $\frac{1}{U}$ instead of U . Most students did well on part (d), provided they had derived the expression for v correctly in part (c). Most of those who had experienced difficulty in part (c) were able to find the time and substitute this value into their expression for the velocity.

Question 6

This question was found to be more challenging by almost all of the students. In part (a), some students found it difficult to set up the given expression for the potential energy, mainly because they could not find the extension of the elastic string correctly. There were very few good answers to part (b), with only a few realising that this related to the string being taut. In part (c), almost all of the students used the given expression and differentiated correctly, but some had difficulty with the simplification and finding the possible values of θ . Quite a few gave two solutions, but only a very small number found all three. Part (d) was generally done well for the values of θ that the students had managed to obtain.

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