Examiners' Report/
Principal Examiner Feedback

Summer 2012

GCE Mechanics 5 (6681) Paper 01

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications come from Pearson, the world's leading learning company. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk for our BTEC qualifications.
Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

If you have any subject specific questions about this specification that require the help of a subject specialist, you can speak directly to the subject team at Pearson.
Their contact details can be found on this link: www.edexcel.com/teachingservices.

You can also use our online Ask the Expert service at www.edexcel.com/ask. You will need an Edexcel username and password to access this service.

Pearson: helping people progress, everywhere
Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

Summer 2012
Publications Code UA032686

Introduction

The paper proved to be very demanding for many of the candidates, but most were able to complete it in the time allowed. Much of the work produced was clearly and logically presented but an increasing number of candidates need to be reminded to include full explanations of methods used. A number of solutions were very difficult to read because the handwriting was illegible and this sometimes resulted in a significant loss of marks. Candidates also need to read questions carefully and ensure that they answer the question asked. By far the best source of marks came from the first two questions and parts (a) and (b) of question 5 whilst the ones that caused the most difficulty were questions 4, 6 and 7.

In calculations the numerical value of g which should be used is 9.8, as advised on the front of the question paper. Final answers should then be given to 2 (or 3) significant figures – more accurate answers, including fractions, will be penalised.

Question 1

This proved to be a straightforward starter with many candidates earning full marks. Of the errors seen, the most common were failure to use an integrating factor – methods for solving second order differential equations were sometimes used, omission of the minus sign in the power of e in the integrating factor, failing to multiply throughout by the integrating factor and forgetting to add on a constant of integration.

Question 2

There were many completely correct solutions to the first part of this question. Of the few who were unable to obtain the given equation the majority had no idea where to start whilst a few simply missed out terms. In part (b), a number of fully correct answers were also seen and it was pleasing to see evidence of accurate integration. The most common errors were using 15 instead of -15 for the rate of increase of the mass, taking the initial mass as 2100 instead of 1500, failing to find an expression for v in terms of t and evaluating between t = 0 and t = 40 instead.

Question 3

Many candidates scored full marks on this question. There were few errors in part (a) and most were able to obtain the given answer. There were many errors, however, in the second part. A number of candidates continue to use $v^2=u^2 + 2as$ for motion which is not in a straight line and will be penalised despite it giving a correct expression for the speed of the particle before the impact. Of those who correctly attempted to use energy to determine this, a number used the moment of inertia of the body rather than that of the particle. A significant number then failed to use conservation of angular momentum in the impact between the particle and rod and hence used an incorrect angular speed in their final energy equation. However, the potential energy loss was almost always correctly calculated, either separately or by using a centre of mass.

Question 4

There were very few completely correct solutions. Most were unable to find an expression for the angular acceleration by taking moments about *Q* and many failed to write down a correct equation for the motion perpendicular to the rod. Many of the equations seen were dimensionally incorrect due to wrong acceleration components being used. Of those candidates who were able to make some headway, the most common mistakes made were errors in masses or distances or simply sign errors. The few candidates who found the angular acceleration by differentiating an energy equation usually did it correctly and went on to score full marks.

Question 5

Parts (a) and (b) were almost always correct with the printed answer in part (b) providing a useful check for the working in the first part. Rather surprisingly, however, the last part was often poorly done. The most common error was failing to use moments of forces with appropriate displacement vectors. In particular it was common to see $\mathbf{F}_3$ used with the displacement **PQ** instead of **OP** or **OQ.** Occasional sign errors in the vector products were also seen and **F** x **r** used instead of **r** x **F**, although if used consistently in part (c), there was no penalty.

Question 6

Part (a) was often poorly done. Three equations were required and of those candidates who knew to use the equation of motion for each particle, many assumed that the tension in each part of the string was the same. They were then unable to form the third equation, the equation of motion for the pulley and were therefore unable to find the angular acceleration. In the second part those candidates who were able to form an energy equation or a correct equation of rotational motion were generally successful but the majority were unable to make a coherent attempt.

Question 7

A large number of candidates were unable to prove what is a fairly standard result in part (a). Many made it much more difficult by taking their strip perpendicular to instead of parallel to *AB*. Of those who did take a parallel strip, many then simplified the problem by assuming that the triangle was isosceles or even equilateral and lost a lot of marks. In the second part, a deduction from part (a) was required for the first mark, and this was often lost. The final part proved to be a real challenge for all but the very best candidates and there was a lot of fudging to obtain the given answer. Most candidates had problems dealing with the masses involved and many tried to use the parallel axes rule for a triangle without having the MI about an axis through its centre of mass.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:
http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

Further copies of this publication are available from
Edexcel Publications, Adamsway, Mansfield, Notts, NG18 4FN

Telephone 01623 467467
Fax 01623 450481
Email publication.orders@edexcel.com
Order Code UA032686 Summer 2012

For more information on Edexcel qualifications, please visit
www.edexcel.com/quals

Pearson Education Limited. Registered company number 872828
with its registered office at Edinburgh Gate, Harlow, Essex CM20 2JE

Ofqual

Llywodraeth Cynulliad Cymru
Welsh Assembly Government

Rewarding Learning