



Cambridge Technicals Level 3

Engineering

05822-05825 & 05873

Unit 3 Principles of Mechanical Engineering

OCR Report to Centres June 2018

About this Examiner Report to Centres

This report on the 2018 Summer assessments aims to highlight:

- areas where students were more successful
- main areas where students may need additional support and some reflection
- points of advice for future examinations

It is intended to be constructive and informative and to promote better understanding of the specification content, of the operation of the scheme of assessment and of the application of assessment criteria.

Reports should be read in conjunction with the published question papers and mark schemes for the examination.

The report also includes links and brief information on:

- A reminder of our **post-results services** including **reviews of results**
- Link to **grade boundaries**
- **Further support that you can expect from OCR**, such as our CPD programme

Reviews of results

If any of your students' results are not as expected you may wish to consider one of our Reviews of results services. For full information about the options available visit the [OCR website](#). If University places are at stake you may wish to consider priority service 2 reviews of marking which have an earlier deadline to ensure your reviews are processed in time for university applications: <http://www.ocr.org.uk/administration/stage-5-post-results-services/enquiries-about-results/service-2-priority-service-2-2a-2b/>

Grade boundaries

Grade boundaries for this, and all other assessments, can be found on the [OCR website](#).

Further support from OCR



Attend one of our popular CPD courses to hear exam feedback directly from a senior assessors or drop in to an online Q&A session.

<https://www.cpdhub.ocr.org.uk>

CONTENTS

**Cambridge Technicals Level 3
Engineering
(05822-05825 & 05873)**

OCR REPORT TO CENTRES

Content	Page
Unit 3 Principles of Mechanical Engineering	4

Unit 3 Principles of Mechanical Engineering

General Comments:

Candidates demonstrated a good understanding of calculations involving areas and volumes and were able to make appropriate unit conversions. On these topic areas, responses include clear presentation which helped candidates to avoid careless mistakes and secure high marks. Many candidates were able to calculate positions of centres of gravity again supported by clear presentation. Candidates demonstrated good understanding of simple lever and gear calculations, and were able to distinguish between different types of lever and to identify problems and reasons for selection of different gear arrangements.

Candidates from many centres did not seem to have the necessary skills to resolve forces in appropriate directions using simple trigonometry and lacked understanding of the necessary conditions for equilibrium. This was the case in relation to force equilibrium and even more so in relation to rotational equilibrium and application of the “principle of moments”.

Comments on Individual Questions:

Question 1

Candidates generally used their knowledge and skills appropriately to carry out simple moments calculations in 1(a)(i) and the velocity ratio (of a class 1 lever) in 1(a)(ii). They also identified suitable examples of a class 2 lever in 1(b), identified appropriate reasons for the selection of a particular gear type in 1(c) and identified problems with a different gear type in 1(d).

Many candidates did not seem to have the necessary understanding of free body force diagrams and Newton’s 3rd law to show the forces acting **on** the class 1 lever correctly in 1(a)(i). Candidates also seemed to have some difficulty with calculations on compound gear systems in 1(e).

Question 2

In question 2(i) candidates were able to show some or all of the forces acting correctly. Common mistakes related to the direction of the normal contact force. Force diagrams were mostly well drawn. The best responses included arrows with arrow heads and were drawn with rulers so that directions were unambiguous.

In question 2(ii) candidates showed an awareness of the relationship between normal contact and friction forces although the calculation of the normal contact force using simple trigonometry caused difficulties for many.

OCR Report to Centres – June 2018

In 2(iii) many candidates showed awareness of the application of Newton's 2nd law but did not take into account all the forces acting. Most frequently the component of the weight was omitted.

In 2(iv) candidates used their knowledge of uniform motion to select an appropriate "suvat" equation and to calculate velocity, and in 2(v) candidates used their knowledge of kinetic energy to calculate a value. The best responses calculated both values and used these to calculate the increase.

Question 3

Candidates showed good knowledge and skills relating to area and volume calculations in question 3(a)(i) and 3(a)(ii). Clear presentation helped candidates to carry out these calculations correctly. Most candidates converted units correctly as required by the question.

Candidates also showed good recall of the definitions of stress and strain to carry out the calculations in 3(a)(iii) and 3(b). Candidates also showed familiarity with the idea of plastic deformation in 3(iv).

Question 4

In 4(a) and 4(c)(i), some candidates used clear presentation to calculate the vertical and horizontal components of the forces acting on a body in equilibrium and showed good understanding of the principle that the sum of forces (in any direction) = 0 (for a body in equilibrium). However many candidates did not seem to understand this principle and/or had difficulty resolving forces in a particular direction and so did not respond correctly.

In 4(b) candidates generally showed an awareness of the correct approach to find the coordinates of the centroid. Some candidates, who did not calculate the correct coordinates, also did not score compensation marks for correct method because their work was not clearly presented.

In 4(c)(i) many candidates used the appropriate method and clear presentation to calculate the magnitude of the resultant force. Dealing with several forces in 4(c)(ii) caused difficulties for many candidates in the calculation of the moment.

Question 5

Many candidates showed good recall and understanding of the equations linking power, work and time, and Work, force and distance in questions 5(i) and 5(ii). Some candidates did not write down an appropriate unit for "work done" which was expressly required in the question. In 5(iii) many candidates calculated the correct increase in Kinetic Energy but relatively few were able to write down the correct "work – energy" equation.

OCR Report to Centres – June 2018

Some candidates did not follow the clear instruction in the question to use “an energy method” and instead attempted the question using Newton’s 2nd law and “suvat” equations.

Question 6

In 6(a)(i) candidates demonstrated some ability to apply force equilibrium to the problem but most seemed to find it difficult to write down correct expressions taking moments about appropriate points. Of these, many omitted (or used an incorrect) the self-weight term.

Very few candidates identified the correct type of beam support in 6(a)(ii). Many candidates stated the correct magnitude of force in 6(a)(iii), but most did not state the correct position and/or direction.

In 6(b) candidates identified appropriate examples of force but many made no mention of the structure or structural element that the force was acting on.

About OCR

OCR (Oxford Cambridge and RSA) is a leading UK awarding body. We provide qualifications which engage people of all ages and abilities at school, college, in work or through part-time learning programmes.

As a not-for-profit organisation, OCR's core purpose is to develop and deliver general and vocational qualifications which equip learners with the knowledge and skills they need for their future, helping them achieve their full potential.

© OCR 2018

OCR (Oxford Cambridge and RSA Examinations)
The Triangle Building
Shaftesbury Road
Cambridge
CB2 8EA

OCR Customer Contact Centre

Telephone: 02476 851509

Facsimile: 02476 421944

Email: vocational.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office:
The Triangle Building, Shaftesbury Road, Cambridge, CB2 8EA
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553

© OCR 2018

