



Cambridge Technicals Level 3

Engineering

05822-05825 & 05873

Unit 2 Science for 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](#).

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General Comments:

In general candidates are making good use of the answer space available to show working for calculation questions and are more often including correct units in numerical answers. Candidates need to make sure that they read the question properly and make better use of scientific terminology to improve their overall performance in this paper. There seemed little evidence of candidates running out of time. Question 6 proved to be challenging for many candidates as it had a synoptic nature.

Comments on Individual Questions:

Question 1

1(a) was generally well answered, with many candidates showing good understanding of base SI units in this context.

In 1(b) very few candidates gained all three marks, despite the first two conversions being relatively straightforward. A common error in the first example was to suggest that 5 m is $5 \times 10^{-6} \mu\text{m}$ instead of $5 \times 10^6 \mu\text{m}$. Common misconceptions in converting 10 cm^2 included forgetting the squared factor or thinking that 10 cm^2 is a square $10 \text{ cm} \times 10 \text{ cm}$. Converting units is a skill needed throughout the paper and in engineering in general.

1(c) was generally well answered.

In 1(d) most candidates were able to write some relevant comments about calibration and were able to gain some marks here.

In 1(e) many candidates were able to calculate both relative error and absolute correction, but some omitted the negative sign on the correction.

Question 2

2(a) Most candidates were able to correctly calculate the acceleration in part (i) from the information given in the graph, and it was good to see the majority including the correct units. Some candidates used the total time period rather than just the 5 seconds when the velocity was changing. However, in part (ii), many candidates did not use the mass of the driver to calculate the force acting on the driver.

2(b) Most candidates used the correct equation from the formula booklet to calculate kinetic energy in part (i), but there were still a large proportion of candidates who did not attempt to convert the velocity of 100 km h^{-1} to m s^{-1} , or made an error in their conversion. Some then forgot to square the velocity or used the incorrect mass. In part (ii) many candidates did not choose the equation $\text{power} = \text{force} \times \text{velocity}$ from the formula booklet, which would then have needed some rearrangement to calculate the force. Many candidates attempted to use the SUVAT equations to find acceleration and hence force, which could have gained them full marks but was a two-step process, so gave more opportunity for errors to occur. Again, some candidates used the wrong mass, and some used the acceleration calculated in part (a)(i).

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2(c) was not particularly well answered. Most candidates attempted to calculate rather than use a scale drawing, but often made mistakes in finding the magnitude of the resultant force. Finding the angle seemed to be the hardest mark to achieve in this question. Some candidates used cosine instead of sine, but the majority showed little understanding of how to find an angle.

Question 3

In 3(a) a significant number of candidates did not draw a decay curve to show the discharge of a capacitor. Most drew a straight line between the points stated in the question. Most candidates showed a limited understanding of the concept of the time constant for a capacitor. Many suggested that it was the gradient or the area under the graph.

3(b) It was good to see that many candidates converted the current given in mA to a current in A before calculating the amount of charge in part (i). In part (ii) many candidates chose the incorrect equation $W = QV$ from the formula booklet, not realising that for a capacitor the potential difference is not constantly at 40 V so $W = \frac{1}{2}QV$ is the correct equation to use.

3(c) Part (i) involved a two-step calculation. Many candidates only did the first step of calculating the input power of 600 W, and then not using the efficiency to find the output power. In part (ii) candidates needed to realise that the input power should be used to find the energy supplied in a minute, but most were able to choose the correct equation from the formula booklet.

Question 4

In 4(a), although many candidates were able to identify which material was stiffer and which was stronger, they were unable to explain the reason clearly. There were several vague comments such as “is stiffer because it takes more stress over strain”, which doesn’t mean anything. Some candidates referred to the amount of force, but as the graph was a stress-strain graph there is no indication of the dimensions of the materials. Part (iii) seemed much more difficult as very few candidates were able to identify that material 2 was tougher and that toughness relates to the energy absorbed by the material or the area under the stress-strain graph.

4(b) was a more open question with several alternative acceptable approaches. Some candidates were able to set out their calculations well as the evidence for selecting the material. Some candidates used inconsistent powers of ten, or did not show their working very well, but most were able to identify steel as the more suitable choice, even if the reasoning was not well presented.

Question 5

In 5(a) most candidates were able to use the correct equations to work out the pressure and force appropriately in parts (i) and (ii). Part (iii) proved slightly more challenging as it required more application of ideas rather than directly using an equation from the formula booklet.

5(b) Part (i) was generally well answered. Part (ii) was challenging too many candidates, but some were able to gain some of the marks for performing relevant calculations even if they did not manage to get the correct final answer. This is a good reason for ensuring that working is shown clearly.

Question 6

This question was not well answered as candidates found it difficult to apply scientific knowledge to new situations, which is a useful skill for all engineers. The text in the question gave them the information needed to find the mass flow rate in part (i), but they also needed to find the

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equation for the volume of a cylinder from the formula booklet and recall the relationship between mass, density and volume.

In part (ii) many candidates missed the point about being asked for the “energy per unit mass”, and used the equation to calculate the potential energy of some mass of water instead.

Part (iii) should have just entailed multiplying the potential energy per unit mass, by the mass per second (or mass flow rate) to give energy per second or power supplied to the turbine, but many candidates used the information about the efficiency of the generator instead.

In part (iv) some candidates were able to gain one mark for correctly calculating the energy input for the generator by dividing the power output (3300 kW) by the efficiency of 95%. However, a large number of candidates multiplied instead. This question clearly had complicated multi-stage calculations and highlights that candidates do need to read the questions very carefully.

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