

Principal Learning

Engineering

OCR Level 3 Principal Learning **H811**

OCR Report to Centres June 2016

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of learners of all ages and abilities. OCR qualifications include AS / A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching / training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

This report on the examination provides information on the performance of learners which it is hoped will be useful to teachers in their preparation of learners 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.

OCR will not enter into any discussion or correspondence in connection with this report.

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Principal Learning

OCR Level 3 Principal Learning in Engineering H811

OCR REPORT TO CENTRES

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F557 Applications of Computer Aided Designing

General Comments:

This Unit is marked by the centre and moderated by OCR.

Centres are reminded that each series they must check that they have sent to the Moderator:

Centre Authentication Form CCS160
Internal Assessment Mark Sheet MS1
Unit Recording Sheets URS888
Controlled Assessment Summary Form WMS756.

The following points need to be considered:

- In some cases the URS form was incomplete. Presenter/markers did not complete the Teacher Comment box or the Page Number box.
- A number of learners presented work in a neat and tidy fashion but others did not. In some cases the work needed to be more securely fastened preferably using a treasury tag.
- All learners should present a contents list with page numbers and then make sure that the numbers appear on the URS888 and the work.
- A number of folders followed the same type of presentation with a similar use of some material. In general terms, the centre should be empowering learners to take charge of their own learning and development.
- In general terms Assessment Objectives 1.1, 2.1 and 3.1 seemed to have had sufficient time devoted to them but Assessment Objectives 4.1, 5.1 and 6.6 seemed to need more teaching/learning time
- In some cases, learners need to be shown how to interpret more carefully the evidence requirements for each mark band and it was difficult to find a real progression across the mark bands.

Comments on Individual Assessment Criteria:

Assessment Criteria 1

Some learners made appropriate and effective use of 2D and 3D software in designing and modelling engineering products.

Assessment Criteria 2

Some learners produced detailed and accurate drawings to specified British and International standards. In a few cases one or two dimensions appeared to be missing. A number of drawings did not have on them a name or date when they were produced.

Assessment Criteria 3

Some learners produced realistic and high quality presentation drawings which communicated design intentions.

Assessment Criteria 4

In a number of cases more detail and attention needed to be paid to the selection of appropriate materials and processes when designing for manufacture. Many learners did not provide an in-depth response to the testing and modification of design ideas.

Assessment Criteria 5

A high proportion of learners did not carry out detailed research to identify and evaluate a wide range of applications of CAD/CAM within design and manufacturing systems.

Assessment Criteria 6

A high proportion of learners did not carry out detailed research to identify and evaluate a wide range of applications of concurrent engineering within design and manufacturing systems.

F558 Selection and application of engineering materials

General Comments.

This Unit is marked by the centre and then moderated by OCR.

Centres are reminded that each series they must check that they have sent to the Moderator:

Centre Authentication Form CCS160
Internal Assessment Mark Sheet MS1
Unit Recording Sheets URS888
Controlled Assessment Summary Form WMS756

The following points need to be considered:

- In some cases centre staff, need to make more comments on the Unit Recording Sheet in the teacher comments panel provided. The column headed 'Page' also needs to be completed.
- Most learners presented work in a neat and tidy fashion but the use of a contents list with page numbers is to be encouraged. In some cases the use of a treasury tag would have kept work together.
- Some use was made of images. This and other similar types of media are to be encouraged. Good use was made of ICT.
- It is recommended that for some learners they might find it useful to divide their folders into sections that follow the assessment criteria. Detailed information can then be found in the specification for each section. It also ensures that all sections are covered
- A number of folders followed the same type of presentation with a similar use of some material. In general terms, the centre should be empowering learners to take charge of their own learning and development.

2. Comments on Individual Assessment Criteria.

Assessment Criteria 1

Learners carried out research into atomic structures, amount of bonding, periodicity and classification and classification of engineering materials in an adequate manner. With some learners more detail was needed regarding an in depth analysis and evaluation of materials and how a material was selected for a particular application.

Assessment Criteria 2

Learners investigated thermal equilibrium diagrams for a selection of alloys but more detail was needed when drawing conclusions from their findings. A range of materials were used for destructive and non-destructive testing. With some learners more detail was needed when carrying out an in depth analysis and evaluation of the testing procedures.

Assessment Criteria 3

Learners investigated the effects of different processing methods by testing and analysing a range of materials in a limited manner. With some learners more detail was needed when testing and analysing samples of the processing methods and the subsequent action that was taken.

Assessment Criteria 4

Learners investigated safety factors and modes of failure within a range of materials in a limited manner. Examples of failures were identified but more detail was needed in the explanation of the measures taken by a design engineer to anticipate, minimize and manage risks.

Assessment Criteria 5

In some cases more care needs to be taken in the selection of a product. The product must be made from a wide range of engineering materials. In some cases a list of materials needed to be presented in a clearer manner. More detail was needed when establishing the identity of the material, their properties and the reason why it was chosen to be used in that particular product. Some evidence was provided about the original form in which the material was supplied and the process that was used for its manufacture but to obtain higher marks much more detail was needed.

Assessment Criteria 6

Learners seemed to have an awareness of the latest developments in the technology of new and smart materials. It is accepted that it is difficult to define what a new or smart material is. Learners investigated new and smart materials but with some learners more detail was needed on how such materials could be applied in engineering applications.

F559 Instrumentation and control engineering

General Comments:

Section A - Most learners attempted ten questions.

Section B – All learners attempted four or more questions. When a candidate answered more than four questions the four highest marks obtained were recorded by RM Assessor.

Centres are reminded to encourage learners to attempt four questions only and spend their time on providing accurate and correct answers rather than wasting time on other questions for which they will get no reward.

In a number of cases learners attempted a question and then crossed out the response. Centres are urged to remind learners that this is not good practice because under some circumstances a marker can award marks for such questions but sometimes find it difficult to interpret what the candidate has written down.

In some cases the written response was difficult to decipher and learners should take care to write clearly and legibly.

Centres are reminded to encourage learners when answering questions that they limit their answers to the space provided on the answer sheet.

Comments on Individual Questions:

Section A

1 This was not a popular question with very few learners being able to state correctly two characteristics of a closed loop control system.

2 Generally well answered with a number of learners being awarded full marks. A number of learners stated incorrectly a unit for the open loop voltage gain.

3 Generally well answered with a number of learners being awarded full marks but with the quality of the drawing being low

4 The operational amplifier being used as a buffer amplifier was not well known. However, a number of learners labelled the input terminal correctly.

5 Generally well answered with a number of learners being awarded full marks for the explanation of what a thermistor is.

6 This was not a popular question with very few learners being able to name the components shown or alternatively being able to draw graphical symbols correctly.

7 A number of learners named two types of level sensors correctly others gave a wide range of incorrect answers some being quite inventive in their responses.

8 The term reliability when referring to an embedded system was not well known.

9 The correct explanation of a signal generator used as a diagnostic tool creating predictable stable waveforms over a range of frequencies was not well known.

10 The concept of multiplexing was not widely known in detail. There were a few learners who failed to respond to this part of the question. In general learners knew that it involved putting more than one signal down the same route but after that the detail was hazy.

Section B

1 The majority of learners answered this question.

- (a)(i) A high proportion of learners stated the correct name for the control system shown.
- (a)(ii) The labelling of the diagram was correctly carried out by a number of learners but others had no idea and seemed to be guessing. The position of the error detector was not well known. Disappointingly a number of learners could not correctly label the output of the system.
- (b) Generally well answered but a few learners introduced a feedback loop that was not asked for in the question

2 A fairly popular question.

- (a) The explanations given for the terms listed ranged from learners having some understanding to others having little or no understanding. Negative feedback was not very well explained.
- (b) A high proportion of learners named correctly four computer input devices. It was however disappointing that a few learners had no idea of computer input devices with some strange responses.

3 This was not a very popular question.

- (a) A high proportion of learners could not name the three manually operated pneumatic components shown.
- (b)(i) The 5/2 directional control valve was known by some learners.
- (b)(ii) The explanations given for the memory function circuit system ranged from learners having some understanding to others having little or no understanding.

4 This was not a very popular question.

- (a) The labelled diagram and the explanations given for the construction and action of a Bourdon Tube ranged from learners having some understanding to others having little or no understanding at all.
- (b) The reason why a Bourdon Tube is often used in a harsh environment was not well known.
- (c) A number of learners gave reasonable responses as to the effects of over-pressurising a Bourdon Tube in a working environment.

5 This was not a very popular question.

- (a) Very few learners answered this question correctly. Most responses had no idea of how the orifice plate was used as a flow detector.
- (b) The advantages of using an orifice plate as a flow detector was not well known.
- (c) A wide range of vague and incorrect answers for alternative methods of measuring fluid flow were presented. It was quite apparent that learners had no idea of what they were trying to say.

6 A popular question.

- (a) A high proportion of learners named correctly the type of transistor being used in the circuit.
- (b) The circuit diagram was generally correctly completed by a high proportion of learners. The others few had no idea of what they were doing.
- (c) A wide range of responses given for the description of how the circuit works, some reasonably correct with others having no idea at all of what they were doing. Learners need to remember that in darkness the resistance of an LDR is high. This then leads on to the concept of a potential divider with the LDR and the 10K resistor and so on.
- (d) The use of street lighting was a very popular answer given as a practical example of how this circuit could be used.

7 A fairly popular question

(a) A high proportion of learners attempted this question. The explanation of the processor and the user interface in embedded systems was not very well done. Learners gave better explanations concerning memory and display devices. It was obvious that a few learners had no idea of the meaning of the terms listed relating to hardware in embedded systems.

(b) A wide range of answers stating the benefits of an embedded system over a Programmable Logic Controller in many cases turned out to be figments of imagination on the part of the learners.

8 A popular question.

(a) Most responses stated correctly three benefits of using a simulation software package rather than making the circuit with real components. A few learners stated other incorrect benefits clearly showing they had no idea of the purpose of a simulation software package.

(b) A high number of learners produced the diagram correctly by using a battery, a suitable switch and three signal lamps.

A high proportion of learners used correctly:

a voltmeter to measure the potential difference across one signal lamp

a voltmeter to measure the total potential difference and

an ammeter to measure the total current.

A few learners need to be reminded that a voltmeter must be connected across a component.

F560 Maintaining engineering systems

General Comments.

This Unit is initially marked by the centre and then moderated by OCR.

Centres are reminded that each series they must check that they have sent to the Moderator:

Centre Authentication Form CCS160
Internal Assessment Mark Sheet MS1
Unit Recording Sheets URS888
Controlled Assessment Summary Form WMS756

The following points may need to be considered:

- Most learners presented work in a neat and tidy fashion but the use of a contents list with page numbers should be encouraged.
- Centres need to provide annotation on the work submitted.
- Some use was made of images and ICT; this and other similar types of media are to be encouraged.
- Most of the folders moderated followed a standard type of presentation with similar material being used. In general terms the centres should be empowering learners to take charge of their own learning and development.
- To obtain higher marks more attention needs to be paid to the assessment criteria under consideration. The main area to consider is when statements have to be justified and when conclusions have to be drawn.

Comments on Individual Assessment Criteria:

Assessment Criteria 1

Learners, in general, showed an ability to select and construct a range of data and to apply basic statistical methods to it. All learners satisfactorily undertook some form of maintenance activity. More detail was needed to be provided when dealing with justified conclusions.

Assessment Criteria 2

Some learners showed only a basic ability to identify and explain the various types of system failure and their consequences. The methods used to predict systems failure was not well known. More detail needed to be provided when dealing with justifications.

Assessment Criteria 3

Learners need to show a better awareness of the correlation between maintenance plans and operational effects.

In a number of cases learners provided a basic 'cost benefit' analysis in regards to their maintenance plans. The justification of financial factors needed to be covered at a higher level.

F561 Production and Manufacturing

General Comments.

This Unit is marked by the centre and then moderated by OCR.

Centres are reminded that each series they must check that they have sent to the Moderator:

Centre Authentication Form CCS160
Internal Assessment Mark Sheet MS1
Unit Recording Sheets URS888
Controlled Assessment Summary Form WMS756

The following points may need to be considered:

- Not all Centres provided a correctly completed Unit Recording Sheet.
- The panel for page numbers and teacher comments had not been filled in. This causes a delay in the moderation process. It is important that evidence can be clearly tracked.
- Most learners presented work in a neat and tidy fashion but in some cases a treasury tag would have been better.
- The use of a contents list with page numbers should be encouraged. A number of learners had not provided page numbers on their work.
- Some use was made of images; this and other similar types of media are to be encouraged. Most learners made good use of ICT.
- Most of the folders observed followed a standard type of presentation with similar material being used. In general terms the centres should be empowering learners to take charge of their own learning and development.

Comments on Individual Assessment Criteria:

Assessment Criteria 1

A number of learners were able to give a detailed description of different types of manufacturing processes and systems.

It should be clear that a manufacturing system includes one off, batch, mass production etc. and a manufacturing process can be casting, forming, cutting and joining. A number of learners provided little information about processes.

Where a learner was clear about systems and processes the advantages and disadvantage were clearly explained.

Assessment Criteria 2

A number of learners gave an adequate explanation of CAE, CAM and CNC. In a number of cases more detail was needed when dealing with the application of CAE, CAM and CNC within a manufacturing system.

Assessment Criteria 3

Most learners gave details of investigating and researching into assembly systems and techniques, quality control and quality assurance requirements and statistical process control. All research was very theoretical missing the opportunity to make the findings more exciting. Perhaps the use of images may have helped.

Assessment Criteria 4

Many learners did not produce a detailed production plan. The details that need to be taken into account include:

- materials, parts and components to be used including assembly systems
- processes to be used and statistical process control
- tools, equipment and machinery to be used
- the sequence of production, including critical production and quality control points
- production scheduling, including realistic deadlines
- how quality will be checked and inspected
- health and safety factors.

There was very little evidence that industrial visits had taken place or that videos had been shown or the use of visiting speakers had been employed.

Assessment Criteria 5

More detail was needed about software and how it was used to prepare a schedule for manufacture. A schedule for the production of an engineering product should include:

- all preparation, processing and assembly stages
- the sequencing and timing of stages
- critical production and quality control points
- production and quality control procedures
- allocation of tasks and responsibilities.

Some learners presented a Gantt chart.

F562 Innovative Design and Enterprise

General Comments.

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Centres are reminded that each series they must check that they have sent to the Moderator:

Centre Authentication Form CCS160
Internal Assessment Mark Sheet MS1
Unit Recording Sheets URS888
Controlled Assessment Summary Form WMS756

The following points may need to be considered:

- Samples moderated were generally well organised and presented in a neat and readable format but a number of learners needed to make use of a treasure's tag to hold work together.
- The use of a contents list with page numbers should be encouraged.
- It is recommended that all learners divide their folders into sections that follow the assessment criteria.
- In a number of cases learners needed to state at the beginning of the work which product and entrepreneur was being considered.
- Some use was made of images; this and other similar types of media are to be encouraged.
- Most of the folders observed followed a standard type of presentation with similar material being used. In general terms the centres should be empowering learners to take charge of their own learning and development.

Comments on Individual:

Assessment Criteria 1

Virtually all learners scored well in this area. Learners generally planned and carried out thorough research into a successful engineered product, referencing it to an associated entrepreneur.

Sources of research were, in the main, well documented, acknowledged and included as part of their evidence.

Assessment Criteria 2

Learners generally showed a good awareness of how early entrepreneurship gives rise to a range of new and innovative products. Many had carried out an analysis of their chosen product and provided good evidence as to how it could be developed using new and emerging technologies.

Higher marks could have been obtained by giving a deeper analysis of the product as an example of an innovative engineering design.

Assessment Criteria 3

Some learners needed to give more detail concerning the issues of marketing and selling the new product. Other learners did not give sufficient detail when critically evaluating the commercial aspects of the product.

The principles of developing, marketing and selling a new product should have included: market research, protecting ideas, business planning, start-up costs, finance and grants, taxes, health and safety, IT and e-commerce, sales and marketing.

Assessment Criteria 4

A reasonable awareness was shown by some learners regarding the environmental and social impacts of engineering activities. Other learners needed to be more aware of the local and global impact of engineering in terms of: resources, noise, ecology, biodiversity and climate. In some cases the learner needed to produce a detailed evaluation of the environment and social impact of the product studied. A number of learners needed to give more detail of the social impact of engineering, locally and globally in terms of: economic well being, physical safety, health and security.

Assessment Criteria 5

Some learners presented a reasonable description of sustainable engineering and drew valid conclusions as to whether their chosen engineered product could be construed as being an example of sustainable engineering. More detail could have been provided describing sustainability in terms of energy, materials, chemicals and water. The use of materials that are renewable within the lifetime of the product they are part of and that are capable of return to ecological systems to perform useful function was not fully covered by many learners.

F564 Scientific Principles and Applications for Engineers

General Comments.

This Unit is marked by the centre and then moderated by OCR.

Centres are reminded that each series they must check that they have sent to the Moderator:

Centre Authentication Form CCS160
Internal Assessment Mark Sheet MS1
Unit Recording Sheets URS888
Controlled Assessment Summary Form WMS756

The following points need to be considered:

- Learners presented work in a neat and tidy fashion but the use of a contents list with page numbers is to be encouraged.
- Markers must provide adequate annotation. Work that contained a lot of ticks but little or no annotation inevitably delays the moderation process. Page numbers must be provided on the Unit Recording Sheet.
- In some cases more care needs to be taken when using units and symbol abbreviations.
- Good use was made of images; this and other similar types of media are to be encouraged.
- In some cases to obtain higher marks much more attention needs to be paid to the assessment criteria under consideration.
- Use was made of identification codes, by some Centres, so that if necessary the experiment could be repeated using the identical equipment.
- In many cases a basic explanation of the theory behind the experiment was given but to obtain high marks much more detail was needed.
- In some cases learners needed to provide more details concerning errors and inaccuracies.
- It was difficult to find a number of learners that had presented a detailed conclusion that gave an explanation and an evaluation that covered all aspects of the experiment.

Centres are reminded that the OCR Web site is always being updated and should be regularly looked at. For the next submission the latest model assignment is available with some details as follows:

For assessment you will undertake ten tasks which will cover the Learning Outcomes.

Task	Learning Outcomes
1	1 Forces and Motion and 2 Kinematics
2	3 Dynamics and 4 Force, Work and Power
3	5 Deformation of solids and 17 Properties of Materials
4	6 Electricity
5	10 Gravitational Fields, 11 Electric Fields and 12 Capacitors
6	13 Electromagnetism and 14 Electromagnetic Induction
7	15 Thermal physics and 16 Nuclear Atom and Radioactivity
8	18 Electronics
9	7 Quantum Physics, 8 Electromagnetic Waves and 9 Waves
10	19 Chemical Reactions and 20 Organic Compounds and functional groups

Each task will be marked out of 30 marks giving a total of 300 marks for this unit.

Learners submitted a folder of ten experiments to satisfy the assessment requirements for this unit. Each experiment consisted of eleven points. The learning outcome 'Health and Safety' did not appear as a separate point but was inherent throughout the conduct of all of the experiments.

Title, description and theory.

Learners stated a title, gave a thorough explanation of the theory behind the experiment with fairly detailed knowledge being presented and adequately described the stages involved in the experiments. In some cases there were omissions and inaccuracies.

Equipment, diagrams and photographs

Learners listed the equipment used with a reasonable degree of accuracy but a few learners needed to make clear that they could find and use the same equipment again if the experiment needed to be repeated. Most learners produced clearly drawn diagrams, fully and accurately labelled. The use of annotated images was found to be very useful in the moderation process.

Methodology

Learners described in reasonable detail the method of carrying out the experiments and gave details of any health and safety issues that needed to be considered. In some cases more detail was needed about how the experiment had been carried out and much more emphasis needed to be placed on health and safety matters.

Results, format and errors

Learners generally produced results in the form of a table. Tabulated data, as seen, is much easier to interpret and use than a disconnected collection of numbers. The labelling of the table, in some cases was not completely accurate. Most learners stated the correct quantity but did not correctly state the unit.

Where appropriate, graphs were drawn to a sensible size with accurate labelling of axes. It was obvious from the graph where data had been taken from to work out subsequent values. A number of learners could have made a more detailed statement of how accurately the results had been taken and how many errors had been found and how these errors had been dealt with. It is often a useful practice to leave the equipment intact so that if errors or omissions become obvious it is possible to check previous observations since the equipment is still available for use.

Conclusion

In some cases learners needed to give a more detailed explanation of their conclusions giving in particular a more in-depth evaluation of all aspects of the experiment's.

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