OCR
RECOGNISING ACHIEVEMENT

Principal Learning

Engineering

OCR Level 3 Principal Learning **H811**

OCR Report to Centres

June 2013

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates 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 candidates which it is hoped will be useful to teachers in their preparation of candidates 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

Content

Overview

Centres are to be congratulated on their efficient administration and delivery of paperwork and compact discs. Centres submitted the Attendance Register, Centre Authentication Form CCS 160 and examination papers correctly filled in and on time.
With moderated Units, Centres are reminded that it is essential that all Form are accurately completed.

There is evidence that some centres are becoming too systematic in their approach to this qualification. With this systematic approach in mind centres should consider the learners' complete learning experience when designing learning programmes. This is particularly important in relation to learners studying alongside real work commitments where they may bring with them a wealth of experience that could be utilised to maximum effect by presenters.

For most moderated units 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 be found in the specification for each section. It also ensures that all sections are covered. In addition, the use of a treasurer tag is recommended.

A number of folders for various moderated units followed the same type of presentation with a similar use of some material. In general terms, centres should be empowering learners to take charge of their own learning and development.

In some cases, with moderated units, learners need to be shown how to interpret more carefully the evidence requirements for each mark band and presenters are reminded that progression across the bands is characterised by (i) increasing breadth and depth of understanding (ii) increasing coherence, evaluation and analysis (iii) increasing independence and originality.

When a disc is being submitted more attention needs to be paid to the labelling of files. In future each learners file must be named according to the following instructions:
Centre number_Candidate number_Unit number_Series.

F556 Engineering business and the environment

This unit was marked by centres and moderated by OCR.
Most learners presented work in a neat and tidy fashion but the use of a treasury tag is to be encouraged. In a number of cases a contents list with page numbers would have been useful.
In some cases learners used a local engineering business as their model for covering this unit. This practice is to be encouraged.

Assessment Criteria 1
The majority of learners were able to give an adequate description of the internal structure of a typical business, and did identify different roles within the organisation. Some additional supporting evidence on possible career pathways through the business studied would have been advantageous.
There were some good responses in relation to internal and external factors affecting business operations along with a brief analysis of risks associated with running both small and large businesses.
To gain higher marks a more detailed analysis of the risks associated with the business was needed.

Assessment Criteria 2
The majority of learners presented an adequate submission dealing with the roles of a 'Project Management' team and outlined the typical responsibilities of the individual members of the team. The concept of good time management within the team was understood but more detail would have been useful.

Assessment Criteria 3
An adequate description and evaluation was given by learners dealing with environmental issues linked to engineering businesses.
To gain higher marks a more detailed explanation and a deeper evaluation was needed in all areas of these criteria.

Assessment Criteria 4
The possible effects of external environmental factors and how they are managed within a typical business organisation was generally well known
However, to gain higher marks a more detailed explanation was needed in all areas of these criteria.

Assessment Criteria 5
All learners undertook a simple chemical analysis using local environmental samples presenting their findings in a clear and logical format. Some use was made of images and graphs by learners. To gain higher marks a more detailed analysis and evaluation of results was needed.

F557 Application of computer aided designing

This Unit was marked by the centre and moderated by OCR.
The following points need to be considered:

- All learners should present a contents list with page numbers and then make sure that the numbers appear on the Unit Recording Sheet and the work.
- In general terms Assessment Objectives 1.1, 2.1 and 3.1 appeared 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.
- It is anticipated that learners will work on the production of a range of 2D and 3D CAD models of design ideas. It is possible that work undertaken at Level 2 could be further enhanced using the learner's own brief and specification from previous units.
- If the Level 2 work is not followed through then learners will need to produce a design brief and specification even though there are no marks for this.
- Models could be produced using reverse engineering techniques from existing products incorporating standard components. This approach could enhance the presentation of the technical work required for the product study in Unit F558: Selection and application of engineering materials.
- It is suggested that one model should be the result of concurrent engineering methods.
- The results of testing could be recorded in short reports with screen shot animation or video sequences. Evidence could also include the use of digital images taken in real time as activities occur.

Assessment Criteria 1
Learners should use 2D and 3D software packages to design and model simple engineered products. Examples of such packages are: TechSoft 2D Design, AutoCAD, ProDesktop, SolidWorks and AutoDesk Inventor
Parts may include solid objects, castings, engineering components, moulds, formers and folded sheet components.
Learners should be encouraged to use components of existing products as a basis for CAD modelling, scanning and reverse engineering – consumer products, engineering components, jewellery, historical artefacts.
Learners should incorporate standard components in assemblies of parts – fastenings, nuts, bolts, screws, gears, pulleys, racks; electrical and pneumatic components.

Assessment Criteria 2
In some cases learners needed to give more detail when producing drawings to British and International standards including the creation of orthographic and pictorial views of parts and assemblies. More care needed to be taken when learners used dimension lines, stated tolerances and presented appropriate cross-sectional views.

Assessment Criteria 3
In some cases more detail was needed when learners produced, modified and stored drawings of the product. Use was made of colour, rendered, textured, exploded, sectioned and annotated views. Learners could have created temporary cross sections or translucency to view interior details.
There could have been more views of parts enhanced by photorealistic material rendering with the addition of background images and additional graphics relevant to the designed product.

Assessment Criteria 4
More detail was needed when learners used physical tests or computer generated tests to examine load bearing characteristics of a component part for modifications dealing with sharp/round edges, square/round holes and with/without stiffening ribs.

Learners could have given more detail of how they manufactured a prototype in foam or wax to evaluate ergonomics. Not much evidence was provided for simulation motion in parts and assemblies and how the use animation was carried out to explain the workings of mechanisms. Much more evidence could have been provided by the use screen shots, digital images, animations and video sequences.

Assessment Criteria 5
To gain higher marks it was necessary for learners to give more detail regarding the research that was carried out to identify and evaluate the application of CAD/CAM within combined design/manufacturing systems. Visiting speakers and industrial visits are to be encouraged.

Assessment Criteria 6
Much more detail was needed when planning and carrying out research to evaluate the applications of concurrent engineering systems.

F558 Selection and application of materials

This unit was marked by centres and moderated by OCR.
The following points need to be considered:

- Centre staff could 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.
- Some use was made of images. This and other similar types of media are to be encouraged together with much more use of ICT.

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. 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. 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. 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
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. Learners investigated new and smart materials but more detail was needed on how such materials could be applied in engineering applications.

F559 Instrumentation and control engineering

Section A - Most learners attempted ten questions.

Section B – All learners attempted four questions.

Centres are reminded to encourage learners to attempt four questions only and spend their time on providing accurate, well presented answers.
In some cases learners had clearly failed to read the question fully and went on to provide a response that was not actually relevant. Learners should be advised to read the complete question before attempting a response.

Section A – Ten short answer questions

1 This was a popular question attempted by all learners with a number of learners being awarded full marks for being familiar with input devices.

2 Generally well answered with the majority of learners being awarded full marks.

3 A badly answered question. Drawings of the Wheatstone Bridge were very popular but did not answer the question.

4 Generally well answered by the majority of learners correctly naming a sensor that is used to measure fluid pressure.

5 The formula for gain in a negative feedback system was relatively well known. There were some errors in the detail but in general learners gained the mark.

6 The formula: force = pressure x area was not well known. A number of learners found difficulty in converting 400 kPa to pascal.

7 Generally well answered but the quality of drawing was low.. A few learners presented obscure drawings of valves. The mark available for showing the piston was generally gained but there were a number of cases where the air lines had not been drawn on to the cylinder. A few learners had drawn a single acting cylinder with spring return.

8 A number of learners gained at least one mark for stating a practical application of a Programmable Logic Controller (PLC).

9 Generally well answered by the majority of learners correctly explaining what is meant by the term 'virtual instrumentation'.

10 The responses to this question on the necessity to monitor control systems showed slightly more knowledge than has been seen in the past on similar questions.

Section B Four questions from eight to be answered.

Question 1
The majority of learners answered this question, with most gaining marks in all three parts.
(a) Most responses had good explanations of what is meant by the term 'Block diagram of a Control System'.
(b) The majority of learners provided a very accurate labelled diagram of a block diagram of an open loop control system. The quality of most drawings was very high with information within each block.

(c) A high proportion of learners stated correctly what each sensor was measuring within the block diagram of the washing machine control system. A few learners confused 'level of water' with volume or amount of water which was close but not quite accurate. The explanation of the role of the sensors ranged from accurate to inaccurate but some marks were awarded to most learners.

Question 2
Not a particularly popular question especially parts **(c)** and **(d)**.
(a) A majority of learners explained correctly what is meant by the term 'negative feedback' in a control circuit.
(b) Most learners gave correct examples of practical applications of a feedback system. The answers provided were wide ranging. There were a few instances of inappropriate applications.
(c) In general the formula for a negative feedback amplifier was correctly stated and used to determine the overall gain. Other evidence showed that some learners had difficulty in calculating the overall gain.
(d) The formula Overall gain = $A/(1 + \beta A)$ was generally known but a high proportion of learners could not transpose it to determine the feedback fraction (β). Consequently few correct answers were seen.

Question 3
A fairly popular question.
(a) Learners presented a wide range of responses..
(b) A few learners gave correct examples of practical applications of a multiplexer. The answers provided were wide ranging. There were some instances of inappropriate applications.
(c) A few learners provided a very accurate labelled diagram of a multiplexer. The quality of most drawings was very high with plenty of information provided. In general learners knew that it involved putting more than one signal down the same route but after that the detail was hazy.

Question 4
A fairly popular question.
(a) Learners presented a wide range of responses. **(b)** A number of learners gave correct examples of practical applications of a Digital to Analogue converter. The answers provided were wide ranging. There were some instances of inappropriate applications. In this and part **(c)** there were a number of responses that dealt with analogue to digital conversion, this is an example of the need for learners to read the question very carefully.
(c) Some learners provided a very accurate labelled diagram of a Digital to Analogue converter. The quality of most drawings was very high with plenty of information provided.

Question 5
A fairly popular question.
(a) Learners presented a wide range of responses.
(b) A high proportion of learners experienced difficulty with the form of input and output signal for an electronic amplifier.
(c) The responses to this question to explain the effects on the transfer of signals over long distances when using wire cabling showed more knowledge than has been seen in the past on similar questions.

Question 6
A fairly popular question.
(a) Learners presented a wide range of responses. **(b)** A number of learners stated applications that were incorrect. The responses did show that there was often confusion between pneumatics and hydraulics with reference to fluid flowing through the system. Learners must be advised that a question on pneumatics will be concerned with systems powered by compressed air; examples of applications of a pneumatic ram did include a number of responses that could not be accepted for this reason.

(c) A few learners provided a very accurate labelled diagram of how a lever set/reset 5-port valve could be used to control a double acting cylinder. The quality of most drawings was very high with plenty of information provided. There was a common misconception that the 5 port-valve was controlled by push button valves rather than a lever action with spring return.

Question 7

A fairly popular question.

(a) Learners presented a wide range of responses. Very few learners made any reference to collection and storage of data for later analysis; reference was made instead to closed loop systems in general and the feedback element in them. A number of learners had confused quality with security in their explanation.

(b) A number of learners gave correct examples of monitored control systems. The answers provided were wide ranging. There were some instances of inappropriate applications.

(c) A number of learners gave a response to this question but many lacked detail. A good answer would have included reference to embedded systems, dedicated functions, real time computing, function, purpose, reliability and performance. In most there was no reference to the embedded system but a lot of detail on the function of the domestic white goods chosen.

Question 8

The majority of learners answered this question, with most gaining marks in all three parts.

(a) The reasons for using simulation software were well known.

(b) The purpose of using a virtual Cathode Ray Oscilloscope (CRO) for testing a simulated circuit was not well known. A number of learners gave responses that would have been applicable to the use of the CRO in real time.

(c) A wide range of descriptions provided. Good answers could have included the following:

Time Base

There are two controls on the same spindle. One is calibrated in time/division and the other ranges from off to calibrate. Adjustment causes changes in the horizontal direction of the waveform. The time/division provides a selection of sweep rates e.g. 10ms/div i.e. allowing the horizontal scale to be changed.

Frequency (X controls)

The X gain allows the signal to be adjusted and expanded about the centre of the screen. The X shift control allows movement of the signal horizontally.

Amplitude (Y controls)

There are two controls on the same spindle. One is calibrated in V/div and can be adjusted to the appropriate value for the test being undertaken. The Y shift moves the signal up or down as the case may be.

The most popular misconceptions for each control were that in changing the control the nature of the original signal changed, ie. If the frequency (x control) is adjusted the incoming signal will continue at the same frequency, only its trace on the screen will have been expanded or compressed. Very few learners mentioned the positional controls for X shift and Y shift.

F560 Maintaining engineering systems

This unit was marked by centres and moderated by OCR.
The following points 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.
- Very good use was made of images and ICT; this and other similar types of media are to be encouraged.

Assessment Criteria 1
Suitable systems listed in the model assignment are process control systems for production lines, timing systems for vehicle engines, electro/mechanical systems for control of items such as hoists, elevators or stock picking systems, hydraulic systems for off-road plant or agricultural equipment and valve control systems for utility industries.
Learners, in general, showed an ability to select, collect and structure production and maintenance data in a limited manner. The application of statistical methods to the data collected did not in all cases determine an appropriate maintenance strategy for the engineered system chosen. All learners satisfactorily undertook some form of basic maintenance activity. More detail was needed 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. The evaluation of the effects of different approaches to maintenance on operational and strategic efficiency could have included: operator safety, scrap and rework, poor product quality, lost production, improved product reliability, failure to deliver, loss of competitiveness, loss of business, difficulty in planning production, reduction of waste and poor corporate image.
In a number of cases learners provided a basic 'cost benefit' analysis in regards to their maintenance plans. The justification of financial factors was covered at a low level**.**

Assessment Criteria 4
Learners were generally unaware of the need to carry out a cost benefit analysis in regards to their maintenance plans. Aspects that should have been considered are: materials and equipment against financial values and reduced costs and increased business, financial value of time and the correct level of spares.

F561 Production and manufacturing

This unit was marked by centres and moderated by OCR.
The following points need to be considered:

- Most learners presented work in a neat and tidy fashion but the use of a treasury tag and a contents list with page numbers should be encouraged.
- Some use was made of images; this and other similar types of media are to be encouraged.
- The unit content encourages the use of a wide range of teaching approaches to aid learners with a variety of styles to demonstrate their abilities, thus supporting the aim of developing those generic skills that support a young person's employability.
- Care must be taken in the selection of an appropriate manufacturing system based on the centre's locality to enable learners to make a detailed study in an actual learning environment of the: assembly system, assembly techniques involved, quality control checks used, quality procedures and statistical process control employed.
- Learners, need to be provided with every opportunity to carry out individual research, participate confidently and creatively within a team and assess and reflect on their own contribution and that of others.
- Organised visits to local engineering manufacturing companies could be of benefit to the learners in order to understand manufacturing and production methods.
- This unit could be linked with Unit F558 Selection and application of engineering materials and Unit F560 Maintaining engineering systems.

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, mass production, batch and a manufacturing process can be casting, forming, cutting and joining. A number of learners provided very little information about processes.
Where a learner was clear about systems and processes the advantages and disadvantage were clearly explained.

Assessment Criteria 2
To gain marks in the higher band learners must explain and clearly identify, with reasons and full details, the application of CAE, CAM and CNC within a manufacturing system.
This explanation should include characteristics of scales of manufacture and the influence this will have on selection of manufacturing systems, identifying their advantages and disadvantages..

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. Perhaps the use of images would have helped.

Assessment Criteria 4
Most 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

Emphasis needs to be placed on industrial visits, the use of videos and having visiting speakers.

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

Most learners presented a Gantt chart.

F562 Innovation, design and enterprise

This unit was marked by centres and moderated by OCR.
The following points need to be considered:

- Most learners presented work in a neat and tidy fashion but the use of a treasury tag and a contents list with page numbers should be encouraged.
- 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.

Assessment Criteria 1
A majority of learners scored well in this area. Learners planned and carried out a quite thorough research into a successful engineered product and referenced it to an associated entrepreneur. Sources of research were, in the main, well documented and 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 of how it can 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
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 environmental 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 a useful function was not fully covered by many learners.

F563 Mathematical techniques and applications

It was a pleasure to see so many well presented and clearly argued solutions to the questions from learners who had clearly developed a very sound understanding of the principles and techniques required for this unit.

Section A - Most learners attempted all fifteen questions.
Section B – Most learners attempted three questions.

Centres are reminded to encourage learners to attempt three questions only and spend their time on providing accurate and correct answers.
When attempting a question a few learners gave a final answer without showing any working. It is always in the best interest of the learner to show as much detail as possible because if the answer is incorrect nothing can be awarded but if information is provided of how the final answer was arrived at, marks can often be awarded for the methods employed.

Section A Fifteen short answer questions

1 Generally well answered but in a few cases learners did not correctly state x + 8. A few learners did not complete the simplification but left it as 6x + 8 - 5x.

2 Generally well answered.

3 Generally well answered. A number of learners could not find a common denominator.

4 Generally well answered. In a few cases after finding - 6x - 8 = 2x + 6 learners could not correctly arrive at x = - 1.75.

5 A badly answered question. Most learners could not recall the formula for the subtended angle at the centre of a circle.

6 Generally well answered.

7 A badly answered question. The majority of learners did not appreciate that the response needed reference to a right-angle triangle.

8 A mixed response. A proportion of learners stated the incorrect formula for the area of a triangle given the length of three sides.

9 Generally well answered. In a few cases the rules of differentiation were not known.

10 A mixed response. Most learners differentiated sin x but a number of incorrect answers were given for 5 ln (3x)

11 A mixed response. Most learners stated the constant C but a high proportion of learners were not aware of the integral for sin 2x.

12/**13**/**14**/**15** Generally well answered.

Section B The learner had a choice of answering three questions from eight.

Question 1
A very popular question.
(a) Generally well answered with a majority of learners giving the correct response of 3.037.
(b)(i)(ii) A high proportion of learners could not transpose the given equation for d and subsequently did not state a correct value for d. However a number of learners gained marks through the use of error carried forward.
(c) Generally well answered with a majority of learners stating that $d = D/\sqrt{V}$.

Question 2
A very popular question.
(a) Generally well answered.
(b)(c) A high proportion of learners calculated the correct value for A = 15 and B = 75.
(d) A high proportion of learners did a check to confirm that the values of A = 15 and B = 75 were correct.

Question 3
A fairly popular question.
(a) Generally well answered with a majority of learners giving the correct response that length b = 6.19 m.
(b) Generally well answered with a majority of learners giving the correct response that Angle C = 81.88^0.
(c) Generally correctly answered.

Question 4
Not a very popular question.
(a) Generally well answered with good quality diagrams.
(b) Any method of solution was not very well known.
(c) Most learners provided an answer.

Question 5
Not a popular question.
(a) A number of learners calculated correctly the gradients of the curve.
(b) It seemed that the majority of learners did not understand what 'rate of change' meant.
(c) Most learners did not gain any marks because they had difficulty with the differentiation.

Question 6
A reasonably popular question.
(a) Generally correctly answered.
(b) Generally well answered drawing a graph from the completed table in part **(a)**. A number of interesting graphs appeared from using incorrect values from the table. However a number of learners gained marks as examiners allowed errors to be carried forward.
(c) Generally well answered.

Question 7
A popular question.
(a)(b)(c) Generally well answered.

Question 8
A popular question.
(a)(b)(c)(d) Generally well answered.

F564 Scientific principles and applications

It was a pleasure to see so many well presented solutions to the tasks/experiments from learners who had clearly developed a sound understanding of the principles and techniques required for this unit.
This unit was marked by centres and moderated by OCR.
Centres submitted the Attendance Register and the Centre Authentication Form correctly filled in.
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. Page numbers should 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.
- 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.
- A number of learners needed to give a more in-depth explanation when dealing with the conclusion of an experiment.

Centres are reminded that the OCR Web page 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 tasks/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. Other learners made use of identification codes. 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.
It was obvious from graphs 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.

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