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SCIENCE: DOUBLE AWARD SYLLABUS A (CO-ORDINATED)

REPORT ON COMPONENTS
TAKEN IN JUNE 2000

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SCIENCE: DOUBLE AWARD SYLLABUS A

General Certificate of Secondary Education 1794

Science: 1794/01 (1780/01 and 1785/01)

General Comments

The overall performance of the candidates was of a generally high standard. The candidates' work was mostly well presented and most scripts were fully complete with the majority of candidates attempting all the questions.

Comments on Individual Questions

1 The majority of candidates displayed their ability to use a key to identify organisms, with most candidates gaining full marks. Very few candidates made the mistake of writing the letter instead of the name of the vertebrate group.

2 Most candidates were able to choose the best word to label the cell in part (a). In (b) part (i) candidates gained marks for writing the correct cell part, but candidates did not gain credit for stating the job of the nucleus is the brain of the cell. Surprisingly few candidates identified the process occurring in the mitochondrion as respiration in (b) (ii). Most candidates gained credit in part (c), however poor use of language hindered some candidates from gaining credit with answers such as the root 'provides' water. In part (d) most candidates completed the calculation correctly, gaining two marks. Part (e) was generally, answered poorly; the majority of answers included vague references to plants needed to settle into the new soil. Generally marks were given for roots/hairs damaged and the idea that water was taken in to aid recovery. Very few candidates mentioned turgidity/flaccidity in the correct context.

3 The diagram was labelled correctly by the great majority of candidates in (a), but the locating of A, D and E on the diagram in part (b) was less than accurate, with many candidates only gaining one of the three marks available. In part (c) most candidates gained one of the available marks, usually by referring to muscles, but few mentioned peristalsis or described the muscle action with sufficient detail.

4 Most candidates demonstrated a good understanding of food webs. Parts (a) and (b) were generally well answered. The only common error was to name spider or beetle as a primary consumer. In part (c) most candidates gained at least one mark but then did not extend their answers sufficiently to gain the second marking point.

5 Most candidates were able to demonstrate their data handling skills, gaining full credit for part (a). In part (b) answers often lacked the detail needed to gain all three marking points. A significant number of candidates referred to 'age' rather that the number of cigarettes per day.

6 The question was generally well answered. In part (a) a common misunderstanding was that the fossil was the remains of the animal, very few candidates were able to clearly state that the remains had been turned to rock or mineralised. In part (e) most candidates successfully

analysed the data, a few candidates failed to gain credit in part (ii) as they only identified one of the two layers.

7 Once again candidates demonstrated their ability to complete the bar chart with nearly all candidates gaining full credit for part (a). A significant number of candidates confused continuous and discontinuous variation in (b). The majority gained at least two marks for completion of the table in part (c) showing their understanding of human characteristics controlled by genes or the environment.

8 Most candidates were able to state the hairpin as the stimulus to gain credit in (a) part (i), but a significant number failed to state Susan calling out as a response in part (ii). The majority of candidates were able to interpret the chart correctly, stating that the fingertips were the most sensitive to stimulus in part (b). However in part (c) candidates were unable to suggest two causes of the difference in sensitivity. Most candidates gained only one of the two marks available. There were numerous references to 'nerves' rather than receptors and this being the 'most-used' part of the body; such responses could not be awarded credit. In part (d) few candidates displayed knowledge of sensory and motor neurones, all three parts were rarely labelled accurately.

9 Most candidates were able to identify stomach acid as a liquid used to defend the body, but many were unable to gain the second marking point by identifying tears. In (b) part (i) most candidates gained one or two marks by stating that platelets helped to form clots/scabs and white blood cells producing antibodies. Most candidates answered in insufficient detail to gain three marks; credit could not be awarded for answers such as white blood cells 'kill or fight' bacteria. In part (ii) most candidates gained credit for describing the job of the red blood cells, but plasma was identified by far less candidates.

10 With the exception of (c) (ii), this question was answered successfully by the majority of candidates. Common errors were the confusion between oxygen and carbon dioxide in (a) (i) also chlorophyll and chloroplasts in (b) part (ii). Many candidates gained one mark for stating starch as the name of a substance built up from glucose in (c) part (ii). Very few candidates scored three or four marks for this part of the question.

11 Most candidates were able to state the meaning of analgesic in part (a) and correctly name paracetamol in part (b). In part (c) the majority of candidates gained one of the three marks available. This was usually for a statement about dependency, whilst omitting comments about withdrawal symptoms.

12 Most candidates completed the table in (a) part (i) successfully and the majority went on to multiply two factors in part (ii), to gain one mark. However, a very small proportion completed the calculation, gaining the three marks available. In part (b) most candidate correctly identified two appropriate features of the apparatus, but the accompanying explanations were often insufficiently precise to gain additional marks.

Science: 1794/02 (1780/02 and 1785/02)

General Comments

The paper is designed for those candidates in the C – A* range. There was ample opportunity to demonstrate their knowledge within the paper. Few scored below 10 and there were marks up to and including 99. There are still some candidates entered for this paper who would be better doing the foundation tier. Questions gave candidates of all abilities within this cohort the chance to show what they could do. There were very few blank spaces left and there was no indication that they were short of time. No ambiguities were evident. Some questions were centre specific in their answers, either the whole centre did well or badly.
The plotting and completion of graphs is still an ongoing worry. The accuracy of plotting is not always as good as it might be. The quality and accuracy of line drawing is an area that candidates need more practice in. It is to be recommended that graphs are completed in pencil and then any mistakes can be easily rectified. The examiner then, is in no doubt which points and line they are expected to mark.
Candidates are still not reading the question carefully enough and even more worrying, not answering the question asked.

Comments on Individual Questions

1 Overall this question was well answered.

(a) This was well answered, very occasionally the line did not reach the oesophagus.

(b) Usually well answered, peristalsis was frequently given. Many candidates scored a mark for 'muscles' although there was confusion about the types of muscles (circular and longitudinal were muddled, there were a number of sphincter muscles, but these were not marking points.) A small number wrote at great length about the entire passage of the food from the mouth to the anus without mentioning peristalsis!

(c) Reasonably well answered. Candidates correctly stated that the fats were emulsified and then qualified this with either from large to smaller molecules or wrongly to fatty acids and glycerol. Other common errors included bile contains enzymes/lipase, bile controls acid levels in the stomach, or it destroys microbes. Bile breaks down fats was not enough at this level.

2 (a) Mostly correct, most common error was non-addictive/non habit forming.

(b) Well answered.

(c) The majority gained one mark. The addiction mark was expressed in many ways; few used the term 'withdrawal symptoms' but they gave actual examples of depression or sickness and the idea of being high

was well expressed. Many candidates went on to refer to tolerance and the need to take more and more of the drug.

3 Overall this question was very well answered, many were confident with this topic.

(a) (i) Very well done, many candidates scored full marks and wrote in great detail. The most common errors were vague references to germs, foreign bodies and infection e.g. block infection, engulf germs. There were, however, a lot less 'germs' than in previous years!
Generally lymphocytes and phagocytes were well known but some candidates used these terms and muddled up their roles.
Production of antigens and toxins instead of antibodies and anti toxins.

(a) (ii) Usually well answered. The function of red blood cell was well known, although some negated the mark by including food. Water, tissue fluid and hormones were the most common errors for the other part of the blood.

(b) Generally well known. Most common errors were
- saliva contains enzymes to digest microbes
- microbes digested by white blood cells
- mucus in the respiratory system traps microbes
- reference to kidneys
- presence and role of cilia was a little worrying!

4 (a) An easy calculation for those candidates for whom the paper is intended. Most were able to calculate the correct temperature rise. Sometimes two factors (Temp. rise x 4.2 J) were multiplied without the 20g water.

(b) Quite a high scoring part, one common misconception was that the stirrer was to agitate the biscuit. There were good ideas of heat transfer but the use of oxygen was not always well explained.

5 Overall, the better candidates scored well on this question.

(a) Well answered although a few candidates mentioned taking up water by 'active transport'.

(b) Well answered. Incorrect answers were often 3 and 18.

(c) This question was not answered well. Most common errors were:

- not to consider that the roots/root hairs would be damaged but that the roots were 'disturbed' or taken out of the soil
- not to say that there was less water absorbed but that the roots would have no water
- referring to broken transpiration streams and air in xylem

- referring to the plant or leaves wilting and not discussing wilting/flaccid/turgid cells
- referring to roots getting established, settling down again or searching for or finding water
- since the question asked about wallflowers a number of candidates talked about the loss of support of the wall for the flowers!

Weaker candidates scored 1 mark for the plants taking up water on recovery.

(d) Well answered.

(e) Candidates seemed to make their answers very complicated with references to respiration and photosynthesis. A number gained the mark for water loss but many referred to stomata without specifying open or closed. Candidates mix up guard cells and stomata talking of open guard cells.
One or two candidates did not know the purpose of the cobalt chloride paper, giving that it would change colour due to acid from gas exchange by photosynthesis.

(f) The mechanism of opening a stoma was not well understood. A lot of candidates gained one mark knowing that the guard cell became turgid but went on to say that the guard cells contracted or pulled apart. The knowledge of different thickness of the walls varied from centre to centre, There were some very clear explanations with diagrams. A few candidates thought that the stomata should open when the guard cells became flaccid.
Again there was confusion between the terms guard cells and stoma. Some failed to mention guard cells at all, despite the clue in part (d.)

6 This question was poorly answered, only the best candidates scored well.

(a) A large number of candidates lost marks for inaccurate terminology using nerve, nerve cells or neurones for the receptor. Candidates did not read the question carefully, and explained reasons not causes. Quite a few candidates scored for the differences in thickness of skin or distance from the surface.
There were many vague references to the need of certain areas to be sensitive, to the fat levels of certain areas and to bony wrists!

(b) The 'receptor' mark usually scored and to a lesser extent the electrical impulse but here marks were lost for use of terms such as signals, pulses or electrical messages. Few candidates scored three marks. There were many descriptions of the reflex arc, tracing the entire route from receptor to C.N.S.
Few mentioned transducing the energy despite its reference in the syllabus.

(c) Good candidates gained three marks here but many put stimulus for receptor and response for effector.

(d) Very few marks were awarded here, there were many vague rambling answers referring to synapses and neurotransmitters but failing to concentrate on the structure and function of a neurone. When awarded, marks were given for the idea of length and distance and the fatty sheath and insulation, but even here the description of the myelin sheath was often woolly, e.g. insulating sheath. Many thought that long meant fast transmission.

7 The genetics was well answered overall.

(a) (i) Good answers, when errors arose they were either giving genotypes instead of gametes, using sex chromosomes with the alleles or using their own letters.

(a) (ii) Well answered, a few gave phenotypes.

(b) Did not score well because the most common answer was 'radiation' which was not accurate enough. Named chemicals were seen, and there were vague references to carcinogens, pollutants and mutagens. There were a number of references to the living conditions of the gerbils, the diet of the pregnant gerbils and the idea of inbreeding among gerbils!

8 Many did well on this question.

(a) Quite well answered, most possibilities given, Occasionally candidates did not say whether their answer referred to a decrease or increase and so lost their marks.

(b) (i) Reasonably well known although most common errors were to give 'energy level' or refer to energy flows.

(ii) Most organisms from the diagram appeared as answers! Not well understood. A common error was caterpillar or beetle.

(c) (i) Well answered. Some candidates named organisms or processes.

(ii) A significant number of candidates did not indicate a knowledge of the term 'organic'. Otherwise quite well answered although common errors were carbon dioxide, carbon, water, named plants and animals.

(iii) Well answered, most common errors were photosynthesis, reproduction, growth and vague references to waste products.

9 This question gave candidates the opportunity to gain many marks and good candidates did.

(a) Well known, very few 'respiration' equations, even those who mixed up the symbols attempted to balance their equations. Some included energy on the right hand side of the equation. Some candidates wrote word equations. A few gave the reverse.

(b) (i) Well answered. A minority gave photosynthesis or digestion here.

(ii) Many candidates scored all 4 marks here but weaker candidates struggled giving structures not substances e.g. flowers, pollen tuber etc. Other common errors were glycogen, glucagon, sugars, water and carbon dioxide.

(c) Well answered, heat and humidity were the most common errors.

(d) (i) Quite well answered.

(ii) Not well understood, even when candidates chose E correctly they struggled to explain why, not linking their answer to carbon dioxide concentration.
Limiting factors were not well understood, only the stronger candidates scored this.

(e) This was very well answered. A large number of candidates knew about this, especially the reflection of green light and so its inability to be used for photosynthesis. The most common errors were references to white light and light intensities (dark and light) instead of wavelengths.

10 (a) (i) Did not score well. Many candidates knew the position of a predator in a food chain but did not refer to 'killing' and too often did not specify 'animal' feeding on organisms instead. Many knew the answer but did not describe it fully.

(ii) Well answered. Marks were lost for not qualifying features, e.g. claws not sharp claws and for not linking the adaptation to being successful predators, e.g. references to temperature control etc. Some thought that the otter could breathe under water.

(b) Good candidates scored three marks easily showing a good understanding of pesticides passing through the food chain and it becoming concentrated. Many weaker candidates, however, scored none giving a full description of the effects of eutrophication linking it to fertilisers not pesticides. Other candidates lost marks by concentrating on the pesticides killing pests/insects in the river and so destroying the food chain completely.

(c) This was well answered, the idea of competition was well understood.

11 This question was quite testing and only the stronger candidates scored more than half marks.

(a) (i) Overall the points were accurately plotted.

(ii) The curves were reasonably well drawn, rulers were hardly ever used and there were very few thick or double lines.

(iii) Most candidates only gained one mark for the description of increased sweat and decreased urine. A few tried to describe the changes and managed to give a steady decrease but they often then described a rapid increase rather than a changing rate. Some candidates gave the initial and final volumes for both but did not refer to how they changed with temperature.

(b) A large number of candidates scored only one mark for restating the answer to 11(a)(iii) even though they wrote very long descriptions. Too often these related to temperature control with references to vasodilation, details of sweating etc. rather than the regulation of water in the body. There were good candidates who did show a very clear understanding of the process giving accurate concise descriptions and they usually only lost one or two marks for lack of detail, especially references to water levels in the blood or reabsorption of water into the blood or the brain detecting changes in the concentration of the blood. The answer to this question tended to be centre specific. Some candidates thought that water absorption takes place in the liver.

12 Not very well answered.

(a) (i) Only the stronger candidates scored both marks. Quite a number of candidates were aware of each cell containing DNA or information but did not link it to the development of the plant. Common errors were for candidates to refer to cells growing not dividing or asexual reproduction of the cells or meiosis being the form of division. There were many references to the growing medium and hormones encouraging them to grow so well that only a few cells were needed.

(ii) Not very well answered, there were references to disease, contamination or microbes but many candidates were concerned about unwanted mutations or genes.

(iii) The answers for sucrose were usually correct. The amino acids were described as parts of protein, a form of protein or broken down proteins but their role in the formation of proteins was not explained. Auxins were too often linked to descriptions of tropisms linked more to controlling direction of growth rather than elongation or promotion of growth.

(b) Not high scoring. As the question asked for economic advantages, the most common incorrect answer was 'it is cheap'. Too many candidates linked two or more answers together on one line and so were unable to gain full marks. The most common error was to describe advantages linked to selective breeding or the manipulation of genes. Many candidates repeated the same point but expressed it in different ways.

13 This question was poorly answered, even the better candidates often failed to gain full marks.

(a) Too many candidates failed to link their answers to respiration, basing their answers on breathing linked to oxygen and carbon dioxide. Those candidates who did link respiration to the production of carbon dioxide failed to gain the second mark because they vaguely described exercise but did not refer to increased or decreased exercise and its effect on respiration.

(b) Answers from (a) tended to be extended and repeated again here. Many candidates realised the need to remove carbon dioxide, referring to lactic acid, oxygen debts etc. but did not explain how the change in carbon dioxide can result in a change in breathing rate. The stronger candidates did explain that the increased carbon dioxide could be detected in the blood but a common error was to say in the hypothalamus not the medulla. These candidates then rarely described the actual mechanism for increasing the breathing rate. Nerve impulses were hardly ever mentioned and most answers were vague and described stimulating the heart or lungs to increase breathing or take in more oxygen. Intercostal muscles and diaphragm were rarely seen. This is a higher level paper but it was obvious that few centres had taught this section of the syllabus

Science: 1794/03 (1781/01 and 1786/01)

General Comments

The paper proved to be accessible and yet discriminating across the full range of grades for which it was intended. A very wide range of marks were obtained by candidates. There were few marks above 80, however, indicating that the majority of candidates had been entered by Centres for the appropriate tier. It was pleasing to see that the vast majority of candidates, even those for whom some of the questions must have appeared very demanding, had made an attempt at all the questions. There were very few scripts with blank spaces. The paper rewarded those candidates who had a good understanding of the Sc3 part of the syllabus and some high marks were seen. Time did not seem to be a problem and there were very few scripts indeed that did not include an attempt at the last question.

Candidates often lost marks by not answering the question actually asked, by not acting on the prompts provided in some questions or by not using the information provided. Candidates should be advised to read questions carefully before answering them, in the knowledge that time will not be a problem.

Comments on Individual Questions

1 Most candidates recognised the apparatus for simple distillation and could name the apparatus and also identify which must be the salty water and which the pure water. At lower grades this question discriminated well with weaker candidates labelling the condenser as a filter funnel or putting the salty water and the pure water in the wrong locations.

In part (b) it was a little disappointing to see so many candidates referring to using litmus or paper when the question asked them to use Universal indicator solution. Many did not say what they would see, saying instead that they would 'look for a colour change'. Other candidates stated 'you should refer to the chart'.

2 Again this was usually well answered by the vast majority of candidates although across the whole range every possible combination of three choices was seen. The commonest error was to think that aluminium foil was obtained from crude oil. A few candidates only circled two answers.

3 This was very well answered by the more able candidates. It discriminated well at the lower end with weaker candidates selecting 'the halogens' as examples of metals. When candidates select more than the permitted number of answers, one mark is subtracted, it is essential that they read the question and follow the instructions given.

4 This question discriminated well. Candidates at the top end of the intended range achieved well but those at the lower end found the question demanding. Examiners commented on many disappointing responses.

Parts (a)(i) and (a)(ii) were usually well answered with the commonest error being to write in the names of the sulphates rather than metals. In part (b) some candidates had difficulty in relating the information in the table and their knowledge of this reaction to the substances involved in the reaction. In (b)(i) copper sulphate was the most common incorrect answer and in part (b)(ii) magnesium sulphate.

Part (c) discriminated well. Better candidates were able to suggest repeating the experiment using a thermometer and then detecting a temperature increase. Many candidates lost the second mark by looking for a 'temperature change' and some looked for a decrease. A surprising number of candidates suggested 'heating up' the mixture to see if it was exothermic.

Fewer candidates than expected could circle the two transition metals in part (d). In (d)(ii) there was much confusion over the reason why a metal has a particular use and many answers had the 'use' and the 'reason' mismatched; for example ideas about copper keeping water warm in pipes because 'it is a good conductor of heat' or even 'a good conductor of electricity'. Candidates should be taught that copper does not corrode or does not react with water; it is incorrect to say that it 'does not rust'. It is also not correct to describe copper as a 'cheap metal'.

Part (e) proved demanding for all but the more able of candidates taking this paper. Many suggested that the zinc would 'shoot across the water and explode' or 'fizz violently'. Others wrote a balanced equation saying what would happen but gave no details about what they would see.

5 Most candidates were able to score both marks in part (a) but some gave vague answers in part (b) such as 'it is harmful', 'it is bad for your health' or 'it is bad for the environment'. Some described carbon monoxide as 'containing harmful gases'. It was pleasing, however, to see how many candidates did know about the poisonous nature of carbon monoxide.

There were a very wide range of responses to part (c). Candidates at the top end of the range could refer to the greenhouse effect and its effect on the Earth's weather scoring between one and three marks. Other candidates seemed confused by the destruction of the ozone layer, often by 'holes being burned in it' or acid rain.

6 This question required candidates to interpret the data about polymers and their related uses. Candidates at the top end of the range scored all of the marks while those at the lower end were still able to score two or three marks.

Most were able to state two reasons why polythene cannot be used to make saucepans in part (a), the commonest error being to say that 'it did not conduct electricity' and suggesting a worrying misconception about heating using electricity.

Part (b) proved much more discriminating with candidates having to select the correct data to say why PVC is **better than** polythene. The answer 'it does not conduct electricity' is therefore incorrect.

Many candidates correctly stated that PVC could not be bent easily in part (c) although some said that it was suitable because it could be bent. The answer that 'it could be coloured easily' was also allowed.

A very wide range of suggestions were made in part (d) although answers such as 'for frying pans', 'for candles' and 'for aluminium foil' were certainly not allowed. Many candidates gave the simple answer 'for shopping bags' or 'for cling film' and gained the mark.

7 Examiners have commented on the number of very creditable responses to the question from candidates covering a wide range of abilities.

There were a large number of correct responses to part (a)(i), including some from candidates who are only likely to achieve a lower grade. Part (a)(ii) proved more difficult, however, with the answers 'neutron' or 'core' sometimes appearing.

Most candidates knew that lithium was in Group 1 but far fewer could say that it was in Period 2; the commonest answers were '7' or '1'.

Some candidates did not read the question carefully and wrote down the name of the element instead of its symbol in part (c). Others wrote down the answer 'HE', which was also incorrect.

It was pleasing to see how many candidates, across the whole ability range, had clearly seen, and could recall, the safety measures needed for the reaction of the Group 1 metals with water. It is clear that Centres are following very good safety procedures. The question was very well answered with the need for goggles and a screen the most common answers.

8 This was a poorly answered question with even the more able candidates unable to recognise reaction types from word equations. There was no clear pattern to the incorrect answers seen. Part (a)(iii) was the one that was scored more often than the other two. In part (b) many of the weaker candidates put other symbols such as 'H' or 'Na' in the spaces.

9 This question discriminated well at the higher end with some more able candidates obtaining 7 or 8 marks. However, it was pleasing to see that less able candidates were able to at least plot the points on the chart; very few bar charts were seen. Graph plotting appears to improve each year.

Part (a) was very poorly answered indeed and revealed some remarkable misconceptions about what is causing the loss of mass in this experiment. This was often even true of the more able candidates who would then go on and deal with the rest of the question faultlessly. The range of answers seen included: 'the marble disintegrates', 'the marble

dissolves', 'the marble expands', 'the marble melts', 'the acid evaporates', 'air is trapped', 'the marble absorbs the hydrochloric acid', 'the cotton wool absorbs the acid', 'water is burned off', 'heat energy is lost', 'a gas is produced and this is weightless', 'hydrogen is given off'.

Most candidates answered (b)(i) and (b)(ii) well and more able candidates were able to give a simple but clear explanation to part (iii). They could either refer to the slope of the graph or to the table of results to answer this question. Candidates are advised to avoid drawing exceptionally thick or multiple lines when putting in lines of best fit. They may also find it advisable to use a sharp pencil rather than ink and Centres may wish to encourage their candidates to do this.

Part (c) discriminated well. Many candidates realised that the reaction would be faster and so put the second line below the first one. However, only the best candidates then realised that the final mass loss would be the same.

10 This question discriminated very well for the more able candidates taking the paper and proved challenging for those at about grade C. It was pleasing to see that weaker candidates did attempt the question and sometimes showed aspects of understanding of the bonding topic.

Many candidates scored the mark for sodium chloride, although a considerable number put 'sodium chlorine', but far fewer candidates scored the mark for sulphur dioxide. Many put 'sulphur oxide'. A number of candidates gave 'sodium oxide' for sulphur dioxide.

Better candidates were able to see the link between melting point and structure, 'giant structures have high melting points but molecular structures have low melting points'. Poorer answer referred to 'the bigger the structure the bigger the melting point', this was not awarded marks.

Most candidates had the correct answer for (c).

A very wide range of electron arrangements were seen in (d), better candidates found this straightforward, however.

In part (e) many candidates gained both marks though many of the less able gained just one mark for putting '28'. Errors that occurred often involved subtracting, multiplying or dividing 40 and 16.

Part (f) was demanding but more able candidates were able to recognise that both calcium and strontium are in Group 2 and that both would react by loosing two electrons to form Ca^{2+} or Sr^{2+}. Other candidates had enough understanding to state that both elements were in the same group. The question discriminated well at the higher end of the paper.

11 The earth science question proved very accessible for the vast majority of candidates this year and some high scores were seen. The question involved candidates using the information given at the start of the question which most were able to do.

Only the weaker candidates lost marks in parts (a) and (b) sometime mentioning the formation of lava or describing 'cooling' rather than crystallising.

In part (c) it was important for candidates to refer to high temperature and high pressure. References to 'heat' were not accepted and neither were 'pressure' nor 'temperature' without the 'high'.

Part (d) was found to be slightly more difficult with some candidates believing that granite would contain fossils while chalk would not.

12 The last two questions on the paper were deliberately intended not to be the hardest ones on the paper and to allow candidates to finish on questions that they could feel they had been more successful at. The marks to both were good, yet they discriminated well at the lower grade boundaries.

In part (a)(i) of question 12, a considerable number of candidates selected 'neutralisation'. Part (b) required candidates to know the origins of the raw materials used in the Haber process. While the more able found this straightforward it was clear that weaker candidates often had very little idea, 'limestone' often appeared for both. Many candidates thought that air was the source for hydrogen.

Some excellent responses were seen to part (c)(i) with most candidates being able to correctly sequence the steps involved in the process of eutrophication. The commonest incorrect sequence was BAECD.

There were a significant number of responses in (c)(ii) involving 'fertilisation' or 'distillation'.

13 This was again well answered by most candidates. Common errors included putting' oxygen' for part (c) and 'carbon dioxide' for part (d).

Science: 1794/04 (1781/02 and 1786/02)

General Comments

The paper enabled candidates to demonstrate their full potential in a wide range of the syllabus. There was no evidence of candidates being short of time and no parts of any question where the marks were inaccessible. Although the vast majority of the candidates made a good or very good attempt to answer all questions there were places where candidates did not fully address the questions set, failed to fully use the data given or did not write answers requiring extended and continuous answers in the detail demanded. There were ample opportunities for candidates at all levels to answer with symbol equations and to carry out quantitative work.

Comments on Individual Questions

1. This was intended to be an easy entry into the paper with parts (a)-(d) common with 1794/03. The frequent mistakes amongst weaker candidates were to confuse group and period in (b) and to write the name of the element in (c) rather than the symbol. Part (d) was intended to test the candidates on the safety precautions needed for a particular reaction. Sometimes candidates gave very general answers on laboratory safety like tying hair back or not running around rather than precautions for this reaction. The answer that Mr Green should stand well away was not given credit as it was considered impossible in practice. Few candidates warned about the need to use small pieces of alkali metals. Despite the help given there were few correct answers to (e). This is a very common equation, frequently examined but still few knew NaOH was formed. Part (f) was intended to give opportunities for the most able candidates to explain the trend in reactivity of the alkali metals. While there were many good answers, there were very few who scored all marks. Some took the question to refer to elements in groups 1 and 2.

2. Candidates have difficulties linking structure with properties. Most were able to make the correct link between giant structure and high melting point and molecular structure and low melting point. Even with the most able candidates the arrangement of electrons in the calcium and oxide ions was not always correct with oxide as 2,6,2 quite common. In (c) candidates had to find the relative atomic masses of calcium and oxygen in the Periodic Table. There were some that found atomic numbers by mistake. Although (d) was answered well by many there were many who answered in terms of covalent bonding and sharing of electrons. Again there were many who failed to score all the marks here.

3. This was a straightforward question on types of reaction and a simple equation to balance. While it provided a confidence boost for the most able candidates it did cause some problems with the weaker candidates on this paper.

4 This question required the manipulation of the information given and was answered well by most candidates. In (b) candidates had to write down the names of the two processes. Some tried to explain what was happening. This showed a misunderstanding of the command word. Sloppy use of language such as 'high heat' caused candidates to lose marks in (c). In (e) candidates had to describe how extrusive and intrusive rocks were formed. There were some excellent answers here but they were confined to the more able candidates.

5 This question was largely targeted at Standard Demand (grades C and D). Because of this considerable help was given with scales and axes and there were no anomalous points. In (a) most candidates had a better idea than in previous years why there was a loss of mass during the reaction. Few attributed the loss of mass to the marble chips dissolving. Most candidates could plot the points correctly and draw a good curve. There were many good answers to (c)(iii). Candidates either commented on the steepness of the graph in the two sections or calculated the loss of mass using the data in the table. Either was acceptable. It was not enough for two marks, however, just to answer the graph was steeper. Most candidates could sketch a graph to show the curve expected under different conditions. A significant number tried unsuccessfully to do this in the space at the bottom of the page. Part (d) was the extension at High Demand where candidates were required to explain the results obtained in the third experiment. The encouragement to use ideas of particles was ignored even by some good candidates. This certainly provided a good opportunity for candidates to show an understanding of particle collision theory.

6. Part (a) which was common to 1794/03 was answered well by most candidates. Part (b) involving a flow diagram and some recall on the Haber process and the formation of a fertiliser was answered poorly by many. It was very common to see nitrogen and hydrogen the wrong way round. Nitrogen must be in the top box because it comes from the air. Ammonium was a frequent mistake in the centre box. Few could name the catalyst in (b)(ii) and the acid required was often wrong. If an acid was given it was usually hydrochloric acid.

7 In part (a) most candidates gave the correct answer linking octane with alkane. In (b) it was very pleasing to see that the vast majority appreciated the different products formed when a hydrocarbon burns in different amounts of air. In previous years this always proved difficult. Since many people, especially young people, die each year as a result of carbon monoxide poisoning, it is pleasing to see the greater awareness of this problem amongst the candidates. Answers to (c) were less good. A variety of incorrect names were given in (c)(i) such as combustion, polymerisation etc. The term cracking was not well known but sometimes candidates scored the marks with other suitable names. Part (c)(iii) was another equation but this time a little more was required than just balancing. The frequent mistake was to write 2H rather than H_2. The colour change in (c)(iii) continues to cause difficulties with answers such as discoloured and clear being common wrong answers. There was some improvement in the writing of graphical (displayed) formulae in (d)(i).

There were a few who gave correct structures for poly(ethene) rather than ethene. The answers to (d)(ii) were disappointing even from some of the most able candidates. References were still made to cost even though the question ruled this out.

8 Most candidates could score both marks in (a) and draw a sensible plate boundary in (b). Most knew the cause of an earthquake. The answers to (d) were less convincing. The question was attempting to examine the statement about social, economic and environmental effects of an earthquake. It was hoped that candidates would concentrate on other than construction of buildings etc. and this was specifically ruled out by the question. There were still many answers about high rise buildings or flexible structures being built. These were not credited.

9 It is pleasing to report that so many candidates were able to score well on this question. The compound phosphine was totally unfamiliar to the candidates and there were many excellent answers. So often chemical calculations produce a negative response from candidates. There was considerable evidence of candidates being prepared to answer this type of question. In (a) a few just used their understanding of the Periodic table to write PH_3 without using the data. They scored only 1 mark for the correct formula. The data had to be used. In (c) there were many correct 'dot and cross' diagrams clearly showing the bonding and non-bonding electrons. A significant number showed inner shells of electrons, despite the prompt in the question. They were not penalised for this but again it is an example of where the full information in the questions is not being used.

10. There was a wide range of answers to this question. In (a) an answer such as because it is useful or because it was harmful were not deemed to be suitable at this level. Answers could be economic or environmental. Answers to (b) (i) and (ii) were generally good but (b)(iii) was less well answered. The fact that numbers did not cancel out was not a concern to some. Answers such as 1.14285714286 tonnes were seen. While this year no penalty was made for too many significant figures, it seems reasonable in the future if some penalty should be applied. A few were put off by the use of tonnes.

11. Most candidates gave fluorine as the correct answer in (a) with its symbol. A few gave astatine. More common was to see Fl as the symbol and flourine as the incorrect spelling. Most predicted the correct state in (b)(i) and suggested a suitable melting point in (b)(ii). However, the explanation was often not convincing and did not seem to use the data given. The colour of astatine was usually correct. Part (b)(iv) caused more problems with incorrect names and or incorrect formulae.
Part (c)(i) was not the easy question it seems with many incorrect answers. Establishing the pattern is very important when considering displacement reactions. Most answers to (d)(ii) were correct but there were few correct answers to (d)(iii). This question was targeted at High demand and a correct, balanced equation was demanded. In view of the demand and the prompting given iodine had to be written as I_2 and all species had to have correct formulae for the first mark. Then the

balancing gave access to the second mark. Despite (d) examining a non-H statement there were few correct answers even from the most able candidates. A frequent use of sodium hydroxide was in hair shampoo or indigestion tablets. Vague statements such as glass for sodium carbonate or soap for sodium hydroxide were not accepted and the importance of the use of these chemicals for **making** glass or soap was required.

Science: 1794/05 (1782/01 and 1787/01)

General Comments

This paper was designed to be accessible to those students in the grade range GG to CC. It provided opportunity for candidates to demonstrate positive achievement by showing want they knew and what they could do.

There were few candidates who did not make a reasonable attempt at all questions on the paper and many scored high marks.

Candidates are told that they **must** show their working whenever a calculation is to be attempted and it was pleasing to note that there were far fewer occasions where working was missing. Errors by a factor of ten were common as answers to question 6 (d) but candidates who showed the **speed = distance ÷ time** equation and correctly substituted **90000÷0.3** scored two of the three possible marks. In addition, a mark was awarded if candidates showed how they answered question 8 (b) (iv).

Diagrams and graphs should be drawn in pencil. Mistakes can then be more easily corrected and the examiner is left in no doubt which line represents the answer. The quality of line drawing on graphs was quite poor from many candidates. The use of a ruler for a straight line graph is expected. Many graphs are drawn either freehand or with a ruler that is too short to span the range of the graph.

There was some evidence that candidates did not spend enough time reading the question but wrote down something about the topic.

The use of English made some candidates' answers difficult to fully understand and credit could not therefore be given. Some candidates contradicted themselves by giving opposing answers with the same part of the question. There was a general lack of good scientific language.

Comments on Individual Questions

1 (a) This was designed as an 'easy starter' and the vast majority of candidates scored well. Weaker candidates, who had not read the question properly, sometimes chose two luminous objects and others chose the Sun and the Moon.

(b) Many candidates failed to use a ruler. A good number had the ray zigzagging down the length of the periscope. Few candidates added arrows to their lines to indicate that they were in fact rays of light. Many thought that the image was real. Most knew it was the same size and the right way up.

(c) Credit was not given for simply describing the diagrams. Some general reference to transverse and longitudinal waves was required.

2 Electromagnetism remains a mystery to many and is still confused with charge. Candidates referred to 'magnetic charge' or labelled the poles of the magnets with + and/or – signs.

(a) Most correctly identified the direction of the needle in compass C but fewer in compass D. The care taken in aligning the compass needles with field lines often left something to be desired. Only the minority of candidates correctly identified both poles as being North poles.

(b) There were few good answers. Typically the current 'forced' or 'pushed' the iron bar across. Many answers indicating that the coil wound up tighter were seen. Other common errors included the hammer being attracted to the gong or the hammer becoming a magnet. Examiners did distinguish between 'magnetic' and 'magnetised'. Iron is a magnetic material which becomes magnetised when in a coil. More candidates could explain why the hammer returned, although a large number did link their answer to the switch being opened. Again, examiners were looking for evidence that the candidate was clearly identifying the make and break of the circuit and not the labelled switch.

(c) Whilst many candidates realised that there would be permanent attraction between the magnet and the iron bar, their poor use of scientific terminology let them down. Common answers included 'keep ringing' and hammer being 'stuck' to the gong. Most could suggest one way of making the bell louder and many could suggest both increasing the number of turns and increasing the current.

3 (a) The genuine attempt by the question setter to provide a neat set of crossed lines as the answer was lost on many candidates. The result was a confusion of lines, often crossed out - several times. It would appear that the order of the electromagnetic spectrum is not well known.

(b) This was answered with most candidates scoring at least three marks.

(c) Surprisingly few candidates answered visible light. More chose infra-red. Many did not know. Whilst multiple reflections along the fibre were drawn, there was insufficient care given to angles of incidence and reflection being equal. Few candidates mentioned Total Internal Reflection or the Critical Angle.

4 (a) This was well answered with current being the most common error.

(b) The earth wire was well known although many thought that it was the neutral wire which carried no current. Lack of clarity hindered many from obtaining marks in part (iii). The consumer unit itself does not 'blow', 'trip' or 'switch off', rather the fuse or circuit breaker within it.

(c) Many knew that the current would be higher, but could not link that with a reason for thicker wires. The increased temperature was often linked to the water.

(d) There were numerous ways of manipulating the numbers in the table and candidates found most of them. Addition, subtraction and division all feature. Credit was given for table errors correctly carried forward providing working was shown. Many candidates failed to include the 1.0kWh in the table.

5 (a) This was generally well answered.
(b) Many candidates failed to read the question. Answers to part (i) indicating that the bottle would be rejected were very common. The requirement for fair testing was understood by many. The relative penetrating properties of alpha and gamma radiation were not well known. Most were able to identify safety as a reason for using ultrasound instead of gamma radiation.

6 (a) Most candidates knew of two satellites and there was no one other distracter which was chosen in preference to the others.
(b) Many were able to identify one or two reasons but all too frequently the need to report on the weather at regular intervals was cited as reason. More bizarre, was the suggestion that the weather satellite was going vertically so sped up when going downwards because of gravity!
(c) Most knew gravity as the force
(d) The most common error was to multiply and obtain the answer 27000. Some candidates gained decimal points (90.000) whilst other lost them (03). The need to show working cannot be emphasised enough. At least one mark is gained by writing the equation.

7 (a) Whilst radiation was well known, evaporation was a common second answer.
(b) There were a large number of pseudo-biological answers which did not relate to the question. Again candidates did not read the question and failed to relate their answers to energy transfers. Those who did often referred to 'heat evaporating' or ' heat particles'.
(c) Many described how the foil blanked stopped energy from the Sun warming him.

8 (a) Candidates were often not clear enough in their descriptions. Many spoke of there being 'more force' at E instead of more leverage or more force **on the spring** if pushed at E. In this example the spring was close to the pivot, so greater distance from spring was an allowable reason when to be precise greater distance from pivot was the preferred answer.
(b) The last entry in the table was very frequently given as 07 instead of 107, showing either a hurried or careless approach. Points were well plotted, 62 being the one most commonly incorrectly plotted at 64. Lines were better but still not as good as they could be. Thirty centimetre rules should be used.
(c) There were few good answers. Some managed to identify a moment but few were able to pursue the calculation to its conclusion.

9 (a) Most identified S as the switch, but the symbols for the other components were less well known.
(b) The question was referring to making the motor spin faster and required the resistive component to be adjusted accordingly.

(c) There were three observations to explain. Many candidates just chose one – usually the more difficult last observation.
(d) This was well answered.

Science: 1794/06 (1782/02 & 1787/02)

General Comments

There was a pleasing response to this paper, with the majority of candidates gaining success in a broad range of questions; there was ample scope for the candidates to show what they knew and understood. Very few sections were left unanswered and there was no evidence of candidates having insufficient time to complete the paper.

Some parts of the syllabus are better understood than others; there was a significant improvement in the performance on the radioactivity question this year, though some areas, notably electrostatics and the electromagnetism with the d.c. motor, still cause problems.

Candidates are now clearly told to show their working in calculations; it was pleasing to see a general improvement in this area with most showing a methodical approach with the relevant equation stated where required. Following QCA guidelines, there was a reduction in the amount of quantitative work compared with last year's paper, but it was pleasing that the overall standard of candidates' work did not suffer as a consequence of this. Candidates are generally showing an improvement in the continuous prose sections compared with past years, though some could still benefit by focusing their thoughts before committing themselves to paper, to avoid over lengthy responses which flow beyond the allotted space and are sometimes thus difficult to interpret.

Centres should be aware that some candidates lose unnecessary marks by poor quality drawing notably in graph work. Diagrams and graphs should be done in pencil. Mistakes can then be more easily corrected and the examiner is left in no doubt which line represents the answer. The use of a ruler for a straight line graph is expected. Care should be taken when attempting the best fit line for curved graphs – where the use of a ruler between points is not appropriate. Pleasingly, the use of too thick lines – which can obscure the points – is becoming increasingly rare.

There was a general feeling that candidates had been well prepared for the paper; relevant scientific language was used in many questions by a wide range of the candidates. Centres had nearly always been careful to ensure that the appropriate candidates had been entered for this tier.

Comments on Individual Questions

1 (a) Most gained the first mark, but only good candidates were able to explain that only radiation could pass trough a vacuum, or that the other processes required particles.

(b) Most candidates gained the evaporation mark. Good candidates answered this well, weaker students were vague about the process of evaporation and energy transfer. Many students were side-tracked into giving 'biological style' answers that missed the point.

(c) This was disappointingly not successfully done. A significant number of weaker candidates produced non-scientific answers such as 'reflects heat' or 'traps heat'; without attempting to use ideas of radiation, conduction, convention or evaporation. Some were confused into thinking that 'the blanket reflects the Sun's radiation' was relevant. Only good candidates gained more than two marks.

2 (a) Many candidates scored well here although a significant minority obviously did not understand what a moment of force was.

(b) The calculation was often correct; a surprising number of candidates were unsuccessful with the unit. Candidates not quoting the formula often substituted 'upside down' obtaining the incorrect answer of 2.

(c) The graph questions were an opportunity for easy marks for the majority of candidates, who were able to score full marks. A few lost a mark by choosing an inappropriate place or gradient for the straight line (or for poor quality).

(d) Most gained one mark for a correct moment (i.e. 780 x 90) but thereafter the question discriminated well with the better candidates able to gain the other two marks.

3 (a) Most candidates could name the particles correctly as 'electrons', but answers to how they moved where often insufficiently clear, particularly when 'from negative to positive' was involved.

(b) Although most candidates recognised that there was a greater current, some also thought there was a greater voltage. Good candidates quoted a lower resistance for thicker wires, but a significant number stated that thick wires provide better insulation, either electrical or heat, missing the point.

(c) Although some candidates made numerical errors in the table, 'errors carried forward' ensured success for a large majority in these parts. 'Water heater' was a common error in (ii), based on its high power rating.

4 (a) Almost all candidates gave reasonable reflections inside the optical fibre, but few quoted or made it clear that $\angle i = \angle r$; however, it was pleasing that many candidates were able to discuss relevant terms , such as 'total internal reflection' and 'critical angle' with understanding and confidence.

(b) Part (i) was answered well by many though some lost marks because their answers were too vague and sometimes unnecessarily complex. In part (ii), most candidates had good ideas and answered well; part (iii) was less successful with a significant number not appreciating the idea of 'avoiding surgery'.

5 (a) Although there were many sensible answers to this, some suggestions were rather drastic, i.e. relocating the tower. Weaker

candidates tended to plump for e.g. 'use another dish', or 'a longer wavelength', without any clear idea given as to how this might improve reception.

(b) Parts (i) and (ii) were well done; part (iii) was often omitted or only half completed with the transmitter end frequently missed out. Part (iv) proved to be a good discriminator – wavefronts were generally drawn curved, but more care could have been taken over consistency of wavelength, and only good candidates were careful to focus the waves on 'R'.

(c) The motor effect continues to be a stumbling block for many students. Part (i) was disappointingly done; most candidates who seemed to be on the way to a correct answer talked about the magnetic field set up in the coil, but failed to mention the forces on each side of the coil. There were frequent incorrect references to repulsion and attraction to the poles. Part (ii) was more successful with candidates often showing an intuitive grasp of the idea of spinning the other way due to current reversal. Part (iii) proved to be very difficult for a broad range of the candidates; there was notable difficulty in expressing the ideas carefully and correctly and it was rare to see good use of the diagrams in terms of the relevant forces.

7 (a) This was well answered by most, though a few candidates did not realise that they needed to say 'spins faster' and 'on brighter'.

(b) Part (i) posed few problems with most gaining full marks – a common error was to quote the current as 0.5 mA. In part (ii) the equation was known, and the substitution of values was generally sound, but candidates struggled with the conversion from mA or omitted to do so. In part (ii), although a significant number of candidates picked up one mark for saying that the resistance decreased as the voltage increased, very few appreciated or stated that the resistance initially was very large or infinite. Part (iv) was very disappointingly done with a large majority of candidates not appreciating what was required. Some gained one mark for saying that in effect it was a series circuit, with the current through the red LED being the same as through the motor, but very few made any reference to the voltage being the same across each LED, as they were in parallel.

8 (a) Part (i) was poorly understood by several candidates. Many did not refer to the supporting rod in their answer, being side-tracked by the spark between dome and ball. Others, who gained the first mark by appreciating that charge flows through it, saw the importance of the rod as 'completing the circuit'. Few gained both marks here. A large majority gained the mark in part (ii).

(b) Part (i) was the most disappointingly done question on the paper. Very few candidates realised that ions were involved at all. Most failed to score here. Pleasingly the calculation was much more successful; many candidates appreciated that voltage is energy / charge and gained the first mark and good candidates were able to handle the units confidently and achieve the correct answer of 90 000 V.

9 (a) These parts were well answered by most candidates; marks were usually missed through lack of detail in the answers rather than incorrect physics. For example, most candidates scored the 'safety' mark in part (iii) but fewer elaborated on this, e.g. mentioned the harm gamma rays can cause the body.

(b) Part (i) was much better answered than in previous years, with many explaining this correctly in terms of nuclei/ particles. In part (iii) the graph was generally well done, with a good line drawn. Pleasingly, a good number were also successful in part (ii). Most candidates were able to make relevant comments in part (iv) usually along the lines of 'the half life is too short and so the source will need to be frequently replaced'. Consequently many gained both marks.

10 (a) It was good to see a large majority of candidates gained full marks with the calculations. Some lost the third marks by writing the answer (from the calculator) as 2^{-3} instead of 2×10^{-3} or 0.003.

(b)-(f) This, new style, comprehension question was very well received by the candidates, with many scoring high marks. The questions proved to be accessible for the broad range of candidates. Common errors were:

- that infra-red has a shorter wavelength than visible light in (b)(i)
- reference to nuclear fission instead of fusion in (d)(ii)
- simply saying that the planet was 'bigger' in (e) rather than having a larger mass.

SCIENCE

SYLLABUSES 1777 – 1795

Moderation of Coursework

Introduction

Once again, this was a year of consolidation. Most Centres are now familiar with the organisation and management of the assessment, and few 'new' activities were seen.

The greater familiarity with the requirements needed to match each of the mark descriptions resulted in a smaller proportion of Centres making judgements which, overall, fell outside the agreed 'tolerance limits' of ±4/63. Thus fewer Centres required an adjustment to the raw marks, and this is a pleasing trend.

Administration

The vast majority of Centres submitted mark-lists on or before the closing date and despatched samples of work promptly.

Most Centres responded promptly to the request for the sample and presented it in a clear and organised way with the whole sample arranged in the candidate number order as requested by the moderator. The care and effort put in by teachers was very much appreciated.

The number of amendments to candidates' marks due to arithmetic and/or transcription errors was again significant this year. Centres need to ensure that this part of the administrative process is completed accurately - and carefully cross-checked within the Centre - before the marks are totalled and submitted to OCR.

Most Centres followed the QCA rules correctly although the QCA definition of an investigation in which candidates address **all four** skill areas was not always appreciated. Some Centres still appeared to be confused with the use of a dash (-) and zero on candidates' work to indicate, respectively, no work attempted in a particular Skill Area and work which is presented but which is not worthy of any credit.

Most Centres described internal moderation in terms of teachers constructing agreed mark schemes followed by cross-moderation of small samples of marked work. It is very important for Centres to ensure that there is effective moderation across all the Science syllabuses which are in use, e.g. between Single and Double Award Science and between Science and the Separate Sciences.

The quality of annotation was still variable, and at the very least it was expected that Centres used the hierarchical syllabus codes such as P.4a, P.4b and P.6a adjacent to where the evidence for a match was found, so that the final mark which had been awarded was justified.

The following points are provided to indicate additional aspects which facilitate the work of moderators.

- The use of plastic wallets is not very helpful for moderators and it is best to staple each piece of work in the top left-hand corner and collate the work of each candidate.

- Centres need to include the Sciences/CW/S/00 form and to attach the correctly completed Sc1 Coursework Record Card to candidates' pieces of coursework.

- The name of a contact at the Centre is helpful in case any points need to be clarified.

- The marks to be *'counted'* should be clearly identified by giving the name of the activity on the cover sheet. It is also helpful if the *'counting'* marks are circled or high-lighted on the scripts.

- Annotation on scripts is most helpful in supporting marking decisions if it is shown at the points where evidence for the mark occurs in the script, or explains ephemeral evidence.

- Where marks are changed by internal moderation, the mark changes should be shown and explained on the script. Mark-lists, cover-sheets, etc should also be updated. If this is not undertaken, it is very difficult to tell which of two or more marks shown is the final, agreed decision reached in a particular Skill Area.

- For whole investigations in which only one or two of the marks are to be counted, it is necessary to send the **whole** of the investigation report.

- For exercises which cover only one or two Skill Areas it is important to provide evidence of how the task was presented, and copies of any information provided for candidates.

- Only those pieces of work which contribute marks to the final total for a candidate should be sent.

Activities

Investigations based on topics first met at KS3 or even KS2 can be helpful in allowing weaker candidates to show what they can do (e.g. pulse-rate and exercise, craters, pendulums). However, even quite able candidates often adopt a low-level approach to such tasks and Centres need to be aware of the danger of over-marking.

Investigations still appear to be the most common and successful way of assessing candidates. However, Skill Area tasks do have their place and those involving the assessment of Skill Areas A and E appeared to be the most appropriate.

A number of Centres still seem to encourage their candidates to study the effect of more than one variable. It is certainly better for candidates to use a suitable range of only **one variable** so that they have time to collect data of sufficient accuracy and reliability.

One of the most common reasons for Moderators having to adjust Centres' marks was still the low level of demand of the investigation in terms of the scientific theory required or of the practical complexity. A common example of this situation was in the plotting of cooling curves when the effect of different numbers of layers of insulation was studied. The award of high marks in such cases could not normally be confirmed. Centres are recommended to consider the common exemplar material published jointly by all the Awarding Bodies for suitable guidance in this area.

Fewer candidates used spread sheets in processing their results. Those who did were more careful about constructing graphs, so that errors in incorrect scaling or 'dot-to-dot' lines were less common.

The activities used for assessment were very much as last year. However, on rare occasions data-logging was used by some Centres, but it must be appreciated that candidates still need to make their own decisions about the number and range of measurements to take and record.

Guidance booklets, coursework consultants and INSET meetings organised by OCR have all proved very useful for Centres in understanding the key elements of the assessment scheme. However, it is apparent that some Centres still need to take up one or more of these methods of assistance if their candidates' marks are not to be adjusted again next year. Further details are provided at the end of this report.

Interpretation of the Mark Descriptions

The Mark Descriptions were written such that in each Skill Area they can be used in a hierarchical sequence to assess students' work. Most Centres have appreciated this fact, but some Centres are assuming that if the higher mark descriptions are matched then the lower ones can be ignored. This *'high-water-marking'* approach almost invariably leads to significant downward adjustments being made to their candidates' marks, and this is most noticeable in Skill Area E.

Marking at the lower end of the scale is often erratic. For weaker candidates, it is often difficult to decide between 2, 3 or 4 marks. Centres that use CoA courses are probably best able to assess this area accurately and consistently because of their training in setting and marking tasks at this level, and they also have to ensure comparability of standards between GCSE and CoA.

Skill Area P

Many candidates were given high marks for Skill P for just retrieving information from secondary sources, without really using it in their particular investigation, and this has been a common complaint amongst moderators for a number of years. Furthermore, Centres need to guard against giving credit to *'wrong'* science when it appears in candidates' reports.

Although most candidates appreciate the requirement for fair testing it needs to be made more specific within their reports if a match to P.4a is to be confirmed. In many cases, a match to P.4b can be implied by a consideration of the data which the candidate has actually managed to take and record, but a match to P.4a always has to be explicit.

It appeared that many candidates were not given the opportunity to select their own apparatus or to choose the range and concentrations of their solutions, and this limited the marks available to them.

The quality of scientific knowledge and understanding which is acceptable for P.6a and P.8a for particular investigations varied considerably between Centres. The Programme of Study, the Coursework guidance booklets and past examination papers should be consulted. For example, in the popular enzyme investigations it is expected that simple collision theory and the lock-and-key mechanism is described, and incorporated into plans, if P.8a is to be supported.

Although many candidates performed preliminary practical work, they did not always report their results and describe how they were used to inform the plan, and therefore a match to P.8b was not secure. Those candidates who used secondary sources often just stated information rather than using it in shaping their plans.

Skill Area O

In general, Centres applied the mark descriptions up to 6 marks correctly and marks were supported by moderators.

The presentation of tables of results has improved and most candidates labelled the columns with the correct units.

To award O.6a candidates need to obtain *'sufficient, systematic and accurate'* data and repeat observations/measurements if there are results clearly in error. As a general rule, the effect of five different values of a particular variable over a suitable range should be investigated to in order to meet the *'sufficiency'* statement. The use by some Centres of only three or four values in a particular investigation limited the marks available, and Centres need to be aware of the subsequent 'knock-on' effect this can have in Skill Area A.

The use of, for example, electronic stopwatches leads to candidates recording measurements to an unrealistic degree of accuracy and for 8 marks it is expected that candidates should show appreciation of this fact.

To match O.8a candidates should use equipment which requires suitably demanding skills of operation and precision to obtain a sufficient quantity of reliable data to enable suitable conclusions to be made. A number of Centres awarded high marks for investigations that involved limited practical skill and this put their candidates' marks at risk. In this category are investigations which require the recording of:

- the colour changes in the enzyme-catalysed decomposition of starch using iodine,
- the time for coagulation in the rennin/milk reaction,
- the height of froth in the catalase/potato investigation.

Many Centres did not consider the quality of the evidence when awarding 8 marks in this Skill Area. Many candidates repeated measurements and then proceeded to average widely different values, and this does not match the O.8a Mark Description.

8 marks should only be awarded in this Skill Area when the evidence collected is fully adequate for the task (including repeats to check reliability). The results should also match reasonable expectations – it is usually possible to calculate *'text-book'* results from the quantities used by the candidate – and repeat results should match sufficiently closely to confirm that "precision and skill" have been used.

Skill Area A

Many candidates reported their conclusions from their data but failed to use any scientific knowledge and understanding in support.

The quality of drawing graphs varied considerably, and to match A.6a candidates must choose suitable scales, label the axes correctly, include units, plot the points accurately and draw the appropriate best fit line. The latter aspect is still causing problems particularly within some biological investigations. A bar chart is not normally sufficient to confirm the award of A.6a.

When numerical calculations are carried out using practical measurements, it is expected that candidates will use the appropriate number of significant figures in their answers.

Candidates often simply stated that their results matched their prediction but failed to give the appropriate depth of analysis necessary for a secure match to A.8b.

8 marks should only be considered where the work is quantitative (either testing a formal mathematical link between variables or based on statistical techniques) and the closeness of fit to theoretical predictions is considered all across the range tested.

Skill Area E

Success in this Skill Area is improving slowly and those candidates who focus on both the results and the procedure were likely to obtain the highest marks. In general most candidates commented on the latter aspect but failed with the former. Ideas of accuracy and reliability were not always clearly understood.

Students should be encouraged to look at their graphs and see how well the individual data points relate to the best fit line and also to consider the agreement between any repeat measurements which were recorded.

A match to E.4a required a comment on the accuracy of the results and also the identification of any particular anomalous results if they were present.

A match to E.4b required comments about sensible ways of improving what was done.

For E.6a, candidates need to provide suitable explanations for any anomalous results and to give detailed and specific comments on the reliability of the evidence produced.

A match to E.6b should include suggestions, written in appropriate detail and depth, for obtaining more evidence to confirm the conclusion and not just simply suggesting another variable to study.
Vague general suggestions cannot be credited. It is necessary to identify weaknesses in the evidence collected, and suggest in detail what extra work should be done and why the additional evidence would be helpful.

Grade Thresholds

The boundary marks for each Grade, agreed between all the GCSE Examining Groups, were

A	B	C	D	E	F	G
51	45	39	33	27	21	15

These boundary marks are identical to those set in 1999.

Summary

All Centres have been provided with feedback comments on MOD/REP forms, which were distributed with the results. The information on these forms was related to each syllabus which the Centre had used and the comments were designed to focus on specific relevant points arising from the moderation. Many of these comments were provided in great detail and focussed specifically on aspects which required addressing by the Centre. If Centres have concerns about aspects of the teaching, learning and assessment of Sc1, then the appropriate subject officer can provide a contact to a senior moderator to provide detailed help and guidance.

Once again, it is clear that those Centres who sent representatives to INSET 'Sc1 Workshop' sessions organised by OCR (or *'bought-in'* the services of an

experienced OCR Trainer for Staff Training Days) were unlikely to have their coursework marks adjusted. Further details of the INSET available can be obtained from OCR Birmingham Office, Training and Customer Support Division, Mill Wharf, Mill Street, Birmingham, B6 4BU (Tel: 0121 628 2950).

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The number of candidates awarded each grade was as follows:

	A*A*	AA	BB	CC	DD	EE	FF	GG
Percentage in Grade	7.6	10.4	12.9	29.0	20.9	10.8	5.3	1.9
Cumulative Percentage in Grade	7.6	18.0	30.9	59.9	80.7	91.5	96.8	98.8

These statistics are correct at the time of going to publication.

The total entry for the examination was 39259

Component Threshold Marks

Component	Max Mark	A	B	C	D	E	F	G
1 Paper 1	90			61	52	43	34	25
2 Paper 2	105	67	57	48	31			
3 Paper 3	90			66	56	47	38	29
4 Paper 4	105	81	70	59	39			
5 Paper 5	90			51	41	32	23	14
6 Paper 6	105	65	55	45	28			
7 Coursework	63	51	45	39	33	27	21	15

Foundation Tier

	Max Mark	A*	A	B	C	D	E	F	G
Overall Threshold Marks	400				257	217	178	139	100
Percentage in Grade					28.2	28.7	21.7	14.1	6.5
Cumulative Percentage in Grade					28.2	56.9	78.6	92.7	99.2

The total entry for the examination was 22105

Higher Tier

	Max Mark	A*	A	B	C	D	E	F	G
Overall Threshold Marks	400	309	275	241	207	146	115		
Percentage in Grade		16.1	22.0	27.5	23.5	10.3	0.4		
Cumulative Percentage in Grade		16.1	38.1	65.6	89.1	99.4	99.8		

The total entry for the examination was 17152