CO-ORDINATED SCIENCES

Paper 0654/01

Multiple Choice

Question Number	*Key*	*Question Number*	*Key*
1	**C**	21	**A**
2	**A**	22	**B**
3	**A**	23	**A**
4	**B**	24	**D**
5	**D**	25	**B**
6	**B**	26	**B**
7	**B**	27	**B**
8	**D**	28	**B**
9	**B**	29	**A**
10	**B**	30	**D**
11	**D**	31	**C**
12	**C**	32	**B**
13	**D**	33	**C**
14	**A**	34	**B**
15	**C**	35	**D**
16	**A**	36	**B**
17	**B**	37	**C**
18	**D**	38	**A**
19	**D**	39	**B**
20	**C**	40	**A**

General comments

Candidates achieved a mean mark of 28.7, with a standard deviation of 6. The paper satisfactorily discriminated across the ability range. Candidates did seem to be rather better prepared than has sometimes been the case in the past; so comments on individual questions generally focus on the responses of the less able

Comments on specific questions

Question 5

There was some guessing here amongst the less able candidates who did not realise that a thin large surface area would be the most efficient at gaseous exchange.

Question 6

The knowledge of the better candidates was very sound, but that almost a fifth of the candidates believe that starch would travel in the xylem exposes flaws in their biological as well as their chemical knowledge.

Question 8

That vitamin C is required to protect against scurvy and vitamin D to protect against rickets is usually well-understood. To identify symptoms from a picture seems to have been altogether more demanding since almost a quarter felt that the symptoms shown were the result of vitamin C deficiency.

Question 16

Only about a third of the less able answered correctly. Nearly 30% of each of this group of candidates chose either **B** or **D**. Choice of **D** is understandable if a candidate is confused about which type of element forms which type of oxide but one would have thought that recall of metals being on the left of the Periodic Table would be almost automatic. In addition, the question paper itself has a copy of the Periodic Table on the back page!

Question 17

Just over a third of the less able candidates chose correctly but 50% in total chose either **C** or **D**. Cellulose is made up of glucose monomer units so that, in the context of this question, cellulose gives only one chromatographic spot. Proteins, on the other hand, are made up of more than one amino acid so would give several spots.

Question 19

Less than a quarter of the less able candidates chose the key, **D**, but over a third chose **C** and another quarter chose **A**. These data suggest some difficulty with the concept of oxidation and reduction.

Question 20

Most candidates found this question easy.

Question 21

The equal popularity of responses **B**, **C** and **D** suggests guessing and this seems surprising for a question that is essentially 'recall'.

Question 23

The most popular choice was **C**, both for the more and less able. The concept of an emulsion seems not to have been well grasped.

Question 26

Amongst the less able, response **A** was the most popular choice (43%) but there is no sulphur in methane.

Question 27

As in **Question 26**, over 40% of the less able chose **A** rather than the key, **B**. This seems to point, a little surprisingly, to confusion about which type of element gives which type of oxide.

Question 29

This was well done by most candidates, but it is interesting to observe that the most common mistake was to choose the length PQ to give the distance travelled.

Question 31

Many candidates were guilty of not reading this item carefully, because nearly half chose option **D** which was the only one with the same figures in the same order as those shown in the diagram, no attempt had been made to use the other information in the question to find the density.

Question 34

The hot water system caught some candidates. Just over half chose the correct option **B**, but a third of candidates chose **C** which might be regarded as the next most logical choice.

Question 39

Two thirds of all candidates chose the correct description of a beta–particle, but a number still confused it with an alpha-particle.

Paper 0654/02

Paper 2 (Core)

General comments

There was a wide range of marks, showing that many Centres were preparing their candidates well and helping them to achieve high marks. All candidates, even the weakest were able to gain marks on most of the questions. A few candidates scored full marks on a number of questions. The most able candidates scored 90 or more marks and the least able usually gained 15- 20 marks.

Few questions seemed to pose problems of understanding for most of the candidates and there was no sign of candidates running out of time.

It was noted that a few candidates were still using correction fluid to alter answers. This should not be used. There were also a few candidates who did not write in either blue or black. These are the only colours, which should be used.

Comments on specific questions

Question 1

This question was well answered, but discriminated well.

(a) Most candidates gained both marks.

(b) Most candidates appreciated that the type of chemical reaction was one in which iron combined with oxygen, but a number failed to state that it was an oxidation reaction.

(c) Many candidates correctly stated that it was an absence of water and oxygen, which was the reason why the core does not rust. A number of candidates gave answers, which were too vague.

(d) Many candidates gained at least 1 mark here. Common incorrect answers were iron sulphide instead of iron sulphate and water or oxygen instead of hydrogen.

Question 2

There were 14 marks available on this question. Many candidates scored well on this question gaining full marks or almost full marks. It was pleasing to see so many candidates successfully carrying out calculations.

(a) Most candidates appreciated the possible methods of increasing the speed of the coil, but some of the answers lacked accuracy in the terms used.

(b) Many candidates correctly suggested that the current needed to be reversed but a number suggested that the magnetic field should be reversed, which had been suggested in the question. Another common wrong answer was to use alternating current.

(c) There were many correct answers here. However a number of candidates gave the energy conversion in reverse. A number of candidates also seemed to be trying to explain the energy conversion in the electrical cell as well.

(d)(i) There were many candidates who gained full marks here. Common problems were the candidates who showed no working or formula or who forgot to state the units in their answer. It must be noted that when formulae are quoted, the symbols used must be those, which are recognised. For example C should not be used as the symbol for electric current.

(ii) Many candidates gained both marks here.

(e) This was a complex calculation as it involved two steps. It was acceptable to roll both calculations into one as long as the working showed the correct ideas.

(f) Surprisingly many candidates were unable to explain the differences as being due to energy losses/inefficiency.

Question 3

Many candidates found this question quite difficult. There were virtually no candidates who scored full marks.

(a)(i) Very few candidates realised that it is the retina which converts light energy into an electrical impulse. Most candidates suggested that it was the optic nerve.

(ii) Whilst many candidates did gain both marks here, a large number only managed to score 1 mark. Lens was better known than cornea.

(b) Very few candidates were able to correctly describe a real image. Many answers only repeated the question.

(c)(i) This was quite well answered by the majority of candidates. The main error was in not understanding the term phenotype.

(ii) Surprisingly only about half the candidates realised that the ratio was 1:1.

Question 4

(a)(i) The idea of weathering or erosion was quite well understood although a number of candidates used the term corrosion.

(ii) Few candidates gained both marks here. There were many good answers about the effect of the wind on the rocks but many candidates failed to go into enough detail. Sometimes this was due to the candidates not having read the question carefully enough and not extracting all the information they could from the question.

(iii) Although most candidates realised that the time scale was important, many gave vague answers, which did not suggest that they realised that erosion took thousands/millions of years whilst a human lifetime was much shorter.

(b)(i) Carbon dioxide and sulphur dioxide were quite well known but many candidates suggested an incorrect gas and sometimes a compound which was not even a gas.

(ii) Most candidates knew that the reaction would be affected by heat, concentration or surface area, but many failed to suggest that the conditions would need to be hotter etc.

(c) Almost all candidates gained at least one mark here.

Question 5

Most candidates gained at least half marks on this question, showing a good knowledge and understanding of a number of physics topics.

(a)(i) Many candidates correctly identified the two forces as weight and air resistance, although a number attempted to give two answers relating to the weight for example weight and gravity. Another common wrong answer was upthrust.

(ii) Even though a number of candidates did not successfully identify the two forces acting on the raindrop, they were able to successfully explain that the forces would be balanced. There were a few candidates, who clearly did not understand the concept of terminal velocity, suggesting that the raindrop had reached the ground.

(b) The calculation was generally well done showing that the majority of the candidates had good data handling skills. The major error was that many candidates did not appreciate the significance of the mass being quoted in grams, thereby meaning that the mass had to converted to kilograms before the calculation could be completed properly. This error cost many candidates one mark.

(c)(i) This part was well answered. The only major error was that a number of candidates described dispersion rather than the idea of refraction.

(ii) Almost all the candidates gained the one mark available here. One or two candidates attempted to draw extra lines around the prism.

Question 6

This question was well answered with many candidates gaining good marks.

(a) This was well answered. The most common wrong answer was chloroplasts, which were not on the diagram.

(b) The vast majority of candidates correctly drew the label line. A few drew very unclear lines where it was impossible to tell where the line ended.

(c) Most candidates gained the first and third marking points, but many gave less as the second marking point. Many candidates clearly do not appreciate the subtle differences between osmosis and diffusion.

(d) A good number of candidates gained two marks here. Many gained one mark for mentioning transpiration but did not explain it. A number of candidates explained the role of water in photosynthesis.

Question 7

(a)(i) Many candidates gained at least two marks here. Marks were generally lost due to lack of clarity in their answers.

(ii) Most candidates appreciated that solution Q had to be an acid. Some gave the names of specific acids, which was accepted.

(b)(i) The vast majority of candidates failed to read the question carefully. The question asked for two physical properties. There were far too many answers describing either chemical properties or the electronic structure of the atoms.

(ii) Most candidates successfully identified one of the products for this reaction.

Question 8

This question was not answered well. Candidates failed to use their knowledge and the information provided to produce correct answers.

(a)(i) Alcohol/ethanol was widely known.

(ii) Emulsion/colloid was less widely known. There were many different wrong answers here.

(b)(i) Many candidates appreciated that fats were broken down to fatty acids and glycerol. A number of candidates failed to accurately state that the fats were broken down and a number could not remember both products.

(ii) Considering that many candidates correctly stated that fatty acids were produced in part **(i)**, few linked the formation of fatty acids with the lowering of pH. Many incorrectly tried to describe temperature changes here.

(iii) Few candidates were able to make the link between lower temperatures and slower rates of reaction.

(iv) Whilst a number of candidates were able to explain that the enzyme would be denatured due to the high temperature, very few candidates then went on to describe how this would stop the reaction and stop the pH changing.

Question 9

(a) This question was not well answered by the majority of candidates. A number of candidates did gain full marks, but very few gained 2 or 3 marks. This suggests that many candidates may not have studied this sufficiently.

(b)(i) Many candidates managed to gain both marks by describing observations relating to poor lather production and scum formation. However a number of candidates did get confused with limescale formation here.

(ii) Generally it was the candidates who had gained full marks in **part (a)** who got this right.

(c) Almost all candidates managed to give a correct description here. A number of candidates only suggested that the water should be heated, with no qualification as to what temperature should be reached.

Question 10

(a) All 3 parts were generally well answered.

(b)(i) Only the better candidates were able to do this. Many candidates described what might have happened to the knee rather than the ankle/foot.

(ii) The majority of candidates were able to work out which muscle relaxed, showing good data handling skills.

(c) Many candidates gained full marks by describing the synovial fluid and cartilage at the knee joint. Many also correctly described lubrication at the joint.

(d) Although there were many good answers here, weaker candidates gave vague answers in terms of burning food rather glucose combining with oxygen during respiration.

Question 11

This question was well answered. There was a fairly wide range of physics knowledge and understanding required. Many able candidates gained full marks and even the least able usually managed half marks.

(a) Almost all candidates gained full marks here.

(b) Although many candidates gained full marks here, many candidates lost at least 1 mark due to diagrams, which were not clear enough for the Examiner to be sure that the candidate knew the correct meaning of the term amplitude.

(c) Both parts were well answered.

(d)(i) Yellow was a very common wrong primary colour, usually replacing green.

(ii) Although many candidates correctly suggested either frequency or wavelength, many other suggested the speed or velocity of the wave.

Paper 0654/03

Paper 3 (Extended)

General comments

Many candidates performed very well throughout this paper, showing a high degree of understanding and knowledge of the range of syllabus content that was tested. However, a significant proportion appeared to have no knowledge at all of some areas. There was some indication that candidates ran short of time, as **Question 10** was often answered less well than would be expected.

For candidates of all abilities, marks were often lost because of a failure to read the question carefully or to make sure that the answer matched the question. In particular, it was extremely common for the two diagrams in **Question 2 (c)** to show *atoms*, despite the use of the word 'ion' five times, including twice in bold and twice as headings for the spaces in which the drawings were to be made. Similarly, in **Question 7 (a)(iii)**, answers frequently described an atom becoming an ion, rather than the other way around.

Comments on specific questions

Question 1

Most candidates were able to give at least some correct answers on this question. The expected answer to **(a)** was arthropods, but almost every other animal group appeared here, including reptiles and amphibians. Most knew that *A* was an insect and could give a valid reason; quite a few could state that *B* was an arachnid (although there was often confusion between this word and 'arthropod') and use the number of legs to support this answer; and many knew that *C* was a crustacean. However, only a minority of candidates could state a correct feature of *C* which identified as belonging to this class.

Question 2

Many candidates had no difficulty with **(a)**, working out that there was 12.5 g of calcium carbonate present and that this represents 25% of 50 g. Some made work a little harder for themselves, calculating first the mass and then percentage of sodium chloride, then the mass and percentage of the residue, and obtaining the percentage of calcium carbonate by subtracting the sum of these percentages from 100.

Part **(b)(i)** was generally at least partly correct, although quite a few answers included H_2CO_3 rather than CO_2 and H_2O, and it was relatively rare to see the correct formula for $CaCl_2$. In **(ii)**, the calculation of the relative molecular mass of $CaCO_3$ was frequently correct, but many candidates did not know what to do next. Even those who did often took the wrong value for the mass, using 50 instead of 12.5. This, of course, not only affected their answer to **(ii)** but also to **(iii)**, but so long as they manipulated their incorrect answer appropriately they lost no more than the one mark in **(ii)**. However, relatively few candidates knew how to work out the number of moles of hydrochloric acid required in **(iii)**.

As already mentioned, it was very common to see two perfectly correct *atoms* drawn in **(c)**. Where this occurred, a mark could still be obtained for each drawing if the electrons were arranged correctly.

Question 3

(a) and **(b)** were often well answered, although as expected **(b)** proved more difficult. A few candidates correctly calculated the two resistors required, but failed to say that the first pair would be in series and the second in parallel. Quite a few were not able to add fractions.

The identification of the gates in part **(c)** was generally done well, and better candidates were able to give clear reasons for their answers.

Question 4

Most answers to **(a)** were correct, but **(b)** provided a wide range of responses. There is still much confusion about which muscles contract during breathing in, what effect this has on thoracic volume, and how this brings about a flow of air into the lungs. Some answers were entirely back to front, explaining that the inflation of the lungs causes the rib cage to expand. Others attempted to describe both breathing in and breathing out. However, there were numerous excellent answers, entirely correct and accurately described.

Part **(c)** was disappointing, with relatively few candidates understanding that cigarette smoke stops the action of cilia, so that mucus is not brought upwards and so collects in the lungs where it can become a breeding ground for bacteria. Very many answers did not mention bacteria at all, describing cancer, nicotine addiction, emphysema and a myriad other ailments.

In **(d)**, some candidates did appreciate that, while the data do show a correlation between the number of cigarettes smoked and the incidence of heart disease, this does not prove that one causes the other. However, most did not and their answers did little more than repeat the information given above the table. However, they did much better in **(ii)**, where most suggested taking regular exercise, or cutting down the amount of fat in the diet. 'Eating a balanced diet' was not credited, unless something more specific (either about what should or should not be eaten in quantity) was mentioned.

Question 5

Part **(a)** was well answered, although a few candidates thought that helium atoms have 8 electrons in their shell. Most answers to **(b)(i)** were correct, but **(ii)** often caused difficulties. Many candidates thought that petroleum would be *too* reactive, with explosions often mentioned. However, almost all candidates were able to answer **(iii)** correctly and to give a suitable molecular formula in **(iv)**. The second mark for **(iv)** was only very rarely awarded, with a high proportion of answers suggesting that the *bonds within the molecule* are broken when the alkane boils. Better answers focused on the lower mass of the molecule and related this to the energy needed for boiling to occur, or described the forces of attraction *between* molecules.

Unfortunately, many candidates either did not understand, or did not carefully think about, the term 'composition' in **(iv)**, and described differences in density and temperature. The expected answer was that there would be less oxygen and more carbon dioxide, because of the combustion taking place.

Many candidates had no difficulties with **(c)(i)**, correctly drawing a row of two squares alternating with two ovals, connected by lines with nothing else between them. However, the shapes sometimes retained varying numbers of H and OH groups between them, while in others some very strange things seemed to happen. Many candidates correctly named water in **(ii)**.

Question 6

Part **(a)** was very well answered, as was **(b)**. Most candidates were also able to answer **(c)** entirely correctly, although some tried inappropriate tactics such as dividing 228 by 5.7 three times over. It was part **(d)** of this question that proved surprisingly difficult, with relatively few candidates understanding that nuclear fission involves the splitting of a nucleus.

Question 7

Many candidates began their answer to **(a)(i)** by incorrectly stating that 'metals are positive', rather than metal *ions*. However, most then went on to describe that they were therefore attracted to the negative cathode. Part **(ii)** was more difficult, and relatively few knew that hydrogen would be produced at the cathode.

Part **(a)(iii)** very often caused problems because candidates did not think about ions taking electrons, but rather about atoms losing them. They therefore picked up one mark for the correct number, but did not get the second mark for their explanation. Some clearly had difficulties with the term 'Deduce'. (This is one of the words listed in the 'Glossary of Terms' towards the back of the syllabus, and candidates need to be familiar with it.)

Both parts of **(b)** were well done on the whole, although some weaker candidates suggested electrolysis for **(i)** and drew complex diagrams of atoms with all their electron shells for **(ii)**. This was relatively rare, however, and most of the diagrams and explanations in **(ii)** were entirely correct. However, many answers were much too long and involved - it was not infrequent for the whole of the space of the page to be used - suggesting that an inappropriate length of time had been spent on them. For three marks, candidates would be expected to spend no more than about three minutes on an answer.

Question 8

Although most candidates knew that the waves in **(a)** were transverse, by no means all were able to explain their answer. They had similar problems with **(b)(i)**, with many answers indicating poor understanding of the differences between a digital and an analogue signal. They fared better in **(ii)**, where the most common correct answer was that an analogue signal is more susceptible to interference.

All sections of **(c)** proved very difficult for the majority of candidates, although a significant number still scored full marks. It was hoped that they would recognise a 3,4,5 triangle in **(c)(i)**, but most did not even realise that they needed to know the length of **AB**, and the majority of those who did had to work through the calculation of squares and square roots. Even if this answer was wrong, so long as the answer to **(ii)** was obtained by dividing it into 10, then at least one mark could be gained - and often was. Part **(iii)** proved difficult, but nevertheless was quite often calculated correctly, although not infrequently a mark was lost because it was nowhere stated, or even clearly implied, that $m_1v_1 = m_2v_2$.

Question 9

This question was pleasingly well done, with almost all candidates able to answer at least some sections well. Part **(a)** was usually correct - either wind pollination or self pollination was accepted, together with the reason that the flowers or petals are small or colourless. However, a few answers confused pollination with seed dispersal.

Many candidates also answered **(b)** entirely correctly, although some still think that the pollen *grain* passes down the pollen tube. Part **(c)(i)** was also done well, although some candidates forgot that they needed to say *where* photosynthesis took place; something more precise than 'leaves' was expected, such as reference to palisade cells and chloroplasts. In **(ii)**, most could name phloem vessels (often with incorrect spelling, but this was accepted if it could not be confused with any other term such as 'phylum'); fewer stated that the sugar was transported in solution, or as sucrose.

Part **(d)** was also answered well. Most used the word 'control' or 'comparison' in **(i)**, and many were also able to explain that the same field was used to make sure that conditions were the same in **(ii)**; many used the term 'fair test', and suggested a condition which might vary, such as soil fertility or availability of water. Most were also able to calculate the value in **(iii)** correctly. Part **(iv)** proved to be the sting in the tail, however, with many answers much too vague to earn marks. Statements such as 'the fungicides would ruin the soil', 'they might affect the food chain' or 'they would contaminate the crop' were not credited. Possible correct answers included harming other organisms (including human consumers) or the better market that might be expected for pesticide-free rice. Some candidates also described bioaccumulation. Unfortunately, many apparently confused fungicides with fertilisers, and wasted considerable time in describing eutrophication.

Question 10

This question proved more difficult than expected, perhaps because it was at the end of the paper and candidates felt rushed.

A number of possibilities could gain marks in **(a)**, and many answers earned both marks. In a significant number, however, no *change* was offered, just two types of energy.

Most correctly calculated a value of 0.8N in **(b)**, but very few answers explained that the force would need to be larger than this.

In **(c)**, very few candidates used both the information at the beginning of the question - that the force on the rocket was 2.4 N - and their answer to **(b)**, to calculate the resultant force. However, even if the value of 2.4 N was used, one mark was still available for a correct answer using this figure. Even so, this mark was rarely given because units were frequently missing or incorrect.

Part **(d)** was better answered, with many answers correctly stating that the mass of the rocket would decrease; as a constant force was acting on it then, as F = ma, the acceleration would increase.

In **(e)**, very many candidates simply multiplied 25 by 0.5, forgetting that they needed to use the average speed in the calculation, or that the area of a triangle is *half* base x height. Some read the graph incorrectly, while others calculated the distance travelled in 0.8 seconds.

Paper 0654/04

Coursework

General comments

Nature of tasks set by Centres

The number of Centres submitting coursework for the June examination remains fairly constant. Many of these Centres have made an entry before, and seem to have found the comments made at that time useful.

In some Centres the weaker candidates had been given some help, in order to allow them to make progress. This is a good idea as long as such help is noted and it is realised that this can prevent them attaining the highest grades.

Overall the standard of work was comparable with that of previous years, indeed some of it was outstanding, a full range of marks was received.

Teacher's application of assessment criteria

The majority of Centres showed that the assessment criteria were well understood and that they had been well applied to their entry.

Perhaps it is still worth emphasising the following points:

- skill C1 and skill C4 should not be assessed in the same investigation;
- candidates should not be restricted to too many limited grade exercises as this restricts their opportunity to access the higher grades.

Recording of marks and Teacher's annotation

Again the Moderator was greatly helped by the annotation of candidates' scripts carried out by some Centres. Indeed some systems were quite sophisticated and provided useful insight into the marking.

Good practice

As before, some Centres made very useful comments about individual candidate's performances on a summary sheet. Such additional guidance was both helpful and appreciated.

Paper 0654/05

Practical Test

General comments

Little or no change in the standard of performance from previous years. **Questions 1** and **3** appeared of equal difficulty whilst **Question 2** was made more difficult by the candidates' inability to record units as requested. For some time now questions have included a part where candidates need to apply their knowledge to a new and slightly unusual situation. More practice is required at this type of question. Candidates should also pay attention to the number of marks for each part of a question and appreciate that for each mark there will be a scoring point.

Comments on specific questions

Question 1

The first part of this question was well done. Although potassium hydrogencarbonate is not very soluble in cold water, it was allowed. One mark was awarded for the decision and one mark for a brief description. A solution of the hydrogen carbonate has a pH of about 8 or 9 and the colour of UI should be green. The mark was awarded for the pH value rather than the colour. On boiling, the hydrogencarbonate converts to the carbonate. The pH increases and the colour changes. Many candidates were more interested in the boiling process. Part **(c)** was well done, as was part **(d)** although some did not record the effervescence. The statement 'A gas given off' is not an observation and is not allowed. Some thought chlorine was evolved and others recorded carbon dioxide in **(e)**. It was necessary to state that red litmus turned blue to score the first of the two marks. Although many scored all the marks in the last part a significant minority recorded what should be done and gave no evidence that they had actually performed the experiment. A small number decided to heat the solution and hence deduce that it was exothermic and others were interested in the effervescence when the acid was added. Needless to say, neither attempt scored.

Question 2

A very large number of candidates either are unable to convert centimetres to millimetres or think they can change the question. The same comment is made with reference to the measurement of current. Recording different units to those asked for is unacceptable and in this instance the whole question was made that much more difficult. The fact that the ammeter was not calibrated in milliamps is irrelevant and there was no advantage to those who used digital meters. The trend in current values was marked, not each individual value. A good spread of values for the length was required, essentially at least two values either side of 400mm. A very large number of candidates probably measured in centimetres and lost at least one mark. The Examiner marks what is written and not what a candidate may have meant.

Graph plotting was good with a handful of reversed axes. Since most candidates had a very small range of length they did not include 1000mm on the length axis and so could not read off the corresponding current. Part **(f)** required a correct substitution and evaluation for a mark. The second mark was awarded for a result within 10% of the Supervisor value. Few were able to score this because of the mA factor and the intercept on graph.

Part **(g)** was very poorly answered. Knowledge of Ohm's Law was not required; it was stated on the paper. Basically candidates need to know which instrument measures current, which measures voltage and where to place them in a circuit. It was clear that few knew any of this.

Question 3

Light or temperature was the common correct answer to the first part and most scored the mark. Far too many did not construct a table and of those who did, many did not construct a column for each of germination and growth. Many stated that acid rain affected growth without saying how and failed to distinguish between the effect of dilute and concentrated rain. The final mark in this part was allocated for a statement that the acid denatured or destroyed enzymes in the seed. Not surprisingly, the quality of drawings varied greatly. It was often difficult to discover what distance had been measured. Some appeared to measure length in two different directions and then add them together. The mark for the length of the seedling provided was awarded to most candidates. The calculation of magnification was usually correct. Finally, the most common answer to part **(d)** suggested lack of nutrients, which was perfectly acceptable.

Paper 0654/06

Alternative to Practical

See Paper 0653/06 above.