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FOREWORD

This booklet contains reports written by Examiners on the work of candidates in certain papers. **Its contents are primarily for the information of the subject teachers concerned**.

SCIENCE

GCE Ordinary Level

Papers 5124/01, 5125/01 and 5126/01
Multiple Choice

Paper 5124/01 - Physics/Chemistry

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

Paper 5125/01 - Physics/Biology

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

Paper 5126/01 – Biology/Chemistry

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

Comments on specific questions

Physics, Papers 5124/01 and 5125/01 - Questions 1 - 20

Question 1

A difficult question for many candidates. There was widespread guessing among candidates with both options **A** and **D** attracting more than the correct one, option **B**. Both options **A** and **C** attracted a number of more able candidates. The question showed good discrimination, the less able ones were equally divided between options **A** and **D**.

Question 2

This question provided good discrimination with the less able candidates preferring option **A** except in 5124 where option **B** was the preferred choice.

Question 3

This answer was well-known! Over 70% of all candidates choosing correctly, option **B**. The favoured alternative was option **D**.

Question 4

This question neatly divided candidates in two ‘camps’ with the more able candidates choosing option **D**, the correct one, and the less able choosing option **A**.

Question 5

Excellent discrimination with the less able candidates choosing either option **C** or **D**; the latter being preferred.

Question 6

This question was well known by the majority of candidates with option **A** being preferred by the less able.

Questions 7 and 17

These proved to be easy and gave an opportunity for all candidates to gain credit.

Question 8

This was another question which gave excellent discrimination and in which candidates either correctly used v/f, option **A**, or f/v and arrived at either option **B** or **D**, the latter being the most popular!

Question 9

This question caused most problems to all candidates. There was widespread guessing among 5124 candidates with twice as many choosing option **B** as did the correct option, **C**; more candidates also chose option **A**. The other Paper gave good discrimination, guessing was not as evident and **A** was the most favoured incorrect option.

Questions 10 and 12

These questions proved to be very easy for all candidates! For candidates answering incorrectly there was no preferred option in **Question 10** whereas in **Question 12** it was almost solely confined to option **A**.

Question 11

This question showed excellent discrimination between all candidates. Less able candidates showed a slight preference for option **A** over options **C** and **D**.

Question 13

This question also appeared to cause some problems with only 50% of candidates choosing correctly. It discriminated well between candidates with the less able ones evenly divided between the two options with a specific reference to a cell viz. **A** and **C**!

Question 14

This question also showed excellent discrimination, with most candidates either choosing correctly option **A** or incorrectly option **D** - ignoring or failing to appreciate the importance of the symbol W.

Question 15

The properties of series circuits were well known by the majority of candidates. Less able candidates chose either option **C** or **D** with an indication that some more able candidates opting for **C**.

Question 16

This was another good discriminating question. Incorrect options were either **A** or **B** with no overall preference for either one!

Question 18

This was well known by the majority of candidates and showed good discrimination.

Question 19

The less able candidates showed their lack of understanding of radioactive decay and were evenly divided between options **A** and **D**.

Question 20

This question once again demonstrated candidates' good grasp of nuclide notation, with more than 60% of candidates choosing correctly.

Chemistry, Papers 5124/01 and 5126/01 - Questions 21 - 40

Question 21

The majority of the candidates recognised option **C** as the process, which involved condensation and freezing but a large proportion of the candidates chose option **B** which involves only condensation.

Question 22

An easy question for the vast majority of the candidates. Interpretation of chromatograms is well understood.

Question 23

The link between type of bonding and electronic structure is not well known. A significant proportion of the candidates chose option **C**, thinking that the protons occupy the shells rather than the electrons.

Question 24

This proved to be an easy question for the better candidates. Option **D** was chosen by a number of the candidates. Candidates should able to recognise that the electronic structure of atoms determines the stoichiometry of compounds formed from the atoms.

Question 25

The better candidates could calculate the volume of hydrogen but the weaker candidates ignored the fact that 6g of magnesium was added to the hydrochloric acid and chose option **D**, 24dm^3 or option **C**, 12dm^3.

Question 26

There was evidence of guesswork amongst the weaker candidates.

Question 27

This proved to be another easy question.

Question 28

A significant number of the weaker candidates focused on the fact that the substance to be identified was used in cooking rather than a substance that could be taken to neutralise excess acid in the stomach. Option **B** was the most popular distractor.

Question 29

A number of candidates chose option **B**, magnesium metal, despite the question asking for the substance that does not react with sulphuric acid.

Question 30

The majority of the candidates recognised correctly that the property is the number of electrons used in bonding. Option **B** proved to be a popular distractor particularly amongst the weaker candidates.

Question 31

There was evidence of guesswork amongst the weaker candidates. A surprisingly large number of candidates thought that astatine was a gas or a liquid and chose either option **A** or option **B**.

Question 32

This was another easy question.

Question 33

Less than half of the candidates correctly identified that zinc is used to galvanise iron because it is more reactive than iron. A large number of candidates chose option **B**, which stated that copper is used for electrical wiring because it is a good conductor of heat. Copper is used for electrical wiring because it is a good conductor of electricity.

Question 34

This proved to be an easy question for the better candidates.

Question 35

The majority of the candidates chose option **B**. Carbon monoxide is not a corrosive gas and does not damage lung tissue. It is poisonous because it forms a stable compound, carboxyhaemoglobin, with the haemoglobin in the blood.

Question 36

There was evidence of guesswork particularly amongst the weaker candidates. Candidates should recognise that a homologous series of compounds have the same general formula and chemical reactions but do not have the same physical properties.

Question 37

The product from the reaction of hydrogen and an alkene was well known by the better candidates, although a number of the weaker candidates chose option **D**, a polymer.

Question 38

A poorly answered question. The better candidates recognised that the fuel was hydrogen and that plastics can be made from ethene. A large number of candidates recognised that **Y** could be propene but thought that the fuel, **X**, was ethanol, which is not produced by the cracking of long chain hydrocarbons. Option **C** was also a popular distractor even amongst the better candidates, who recognised that methane was a fuel.

Question 39

Less than half of the candidates recognised that the macromolecule was *Terylene.* Option **C**, starch, was a popular distractor particularly amongst the weaker candidates.

Question 40

This question was well done by the majority of the candidates.

Biology 5125/01 and 5126/01 - Questions 21 - 40

Question 21

This straightforward question on cell structure was an easy introduction to the Biology section of the Paper.

Question 22

This should also have been straightforward, but many of the weaker candidates were unclear about the mechanisms of diffusion and osmosis, and were apparently guessing.

Question 23

Most candidates got this question right. However, a significant number thought that seeds simply absorb starch, rather than digesting it.

Question 24

This question was easy.

Question 25

This question also proved quite easy, but it did require some thought, and it discriminated well between candidates.

Question 26

A straightforward question, which however discriminated well.

Question 27

It was pleasing to see that the better candidates were able to interpret the data on digestive enzymes effectively.

Question 28

Again, it was pleasing that most candidates appeared to be familiar with photomicrographs.

Question 29

This question discriminated well. The better candidates were able to apply the information in the diagram to arrive at the correct answer.

Question 30

This question on anaerobic respiration proved to be quite easy.

Question 31

The commonest error in this question was to get the mechanism exactly the wrong way round.

Question 32

As has been true in the past, many candidates do not realise that both alcohol and heroin are depressants: approximately one-third of candidates said they are stimulants.

Questions 33 and 34

These straightforward questions on ecology were easy, but they nevertheless discriminated well between candidates.

Question 35

This question needed some thought, but many candidates were simply guessing at the answer.

Question 36

The better candidates recognised this as a question on acid rain. Weaker candidates simply guessed - and thought that insecticides would acidify the water.

Questions 37 and 38

These questions on plant reproduction worked well, but the majority of candidates answered correctly.

Questions 39 and 40

These questions were more thought-provoking, but also worked well.

Papers 5124/02 and 5125/02

Paper 2 - Physics

General comments

The general standard was disappointing, with a significant number of candidates being unprepared for an examination at this level. Basic points about units were not understood by such candidates, and knowledge of experimental procedure and fundamental scientific laws was sparse. The Papers from able candidates came as a notable contrast to the more commonly met answers.

Comments on specific questions

Section A

Question 1

(a) Few candidates were able to name the two forces – weight and air resistance.

(b) As the feather is accelerating at 0.5 s the resultant force must be in the direction of the acceleration. Therefore the weight is the bigger force.

(c) To reach a constant speed the resultant force must be zero. Therefore the two forces named in **(a)** must be equal under these circumstances.

(d) A surprising number of candidates could not read the value of the maximum speed from the graph.

Answer: **(d)** 1.2 m/s.

Question 2

The most frequent source of error in this question was the description of the method for finding the volume of the spheres. The use of a measuring cylinder, partially filled with water, was the obvious method to choose. Vague references to jars or bottles lack the precision needed in the answers. Most candidates knew that density is calculated by dividing mass by volume. Answers that described measurements on a single sphere were penalised.

Question 3

(a) The resultant force must be zero if there is no acceleration. Therefore the friction force must be the same size as the force exerted by the man.

(b) Although the kinetic energy was usually known to be calculated from $1/2mv^2$, correct substitution and calculation proved too difficult for most candidates.

(c)(i) Force multiplied by distance is needed here.

(ii) The work done per second gives the power. Units were a problem here.

(iii) Surprisingly few realised that heat is the main form of energy into which the work is converted.

Answers: **(a)** 200 N; **(b)** 7.5 J; **(c)(i)** 100 J, **(ii)** 100 W.

Question 4

(a) In a transverse wave the direction of travel of the wave is perpendicular to the direction of the vibrations. Most candidates know this, but some had difficulty in expressing the idea. The phrase “direction of the wave” does not convey a clear meaning.

(b) There were few convincing arguments to show that a distance of 3 wavelengths had to be marked on Figure 4.1.

Question 5

Quite well done, but several candidates failed to realise that every ray from **O** passed through **I** after going through the lens.

Question 6

(a) The equation Power = *VI* is needed here. A number of candidates were not able to calculate the current from this equation; the reciprocal of the correct answer was usually produced in those cases.

(b) There were fewer problems here.

(c) A frequent error was to fail to convert the time into seconds before calculating electrical energy in standard units.

Answers: **(a)** 0.25 A; **(b)** 960 Ω; **(c)** 18 000 J (0.005 kWh).

Question 7

It was not generally recognised (or stated) that the only sure test for magnetism of two bars is to find repulsion between them. The third steel bar must then be the unmagnetised one, and it would be attracted to the other two.

Question 8

(a) Few candidates understood that $\mathbf{L_1}$ would not light when short-circuited by a closed switch. With a smaller circuit resistance, the current would increase. As a result, $\mathbf{L_2}$ would increase in brightness.

(b) Opening $\mathbf{S_2}$ breaks the circuit. Therefore there would be no current, and both lamps would be unlit.

Section B

Question 9

(a) Good labelled diagrams were helpful in describing the experiment.

Explanations of the meaning of *limit of proportionality* were usually missing or unclear.

(b) Few candidates were able to see that each spring had a load of 500 g, so each was extended by 1.6 cm.

Answer: **(b)** 3.2 cm.

Question 10

(a) The answers to this question were very poor. Some candidates simply drew a straight line from the initial to the final temperature. Even when the correct shape of graph was given, the horizontal sections appeared at random temperature values instead of at 0° C and 100° C. There was no penalty for reference to “solid and liquid” instead of “ice and water”.

(b) This fairly difficult calculation was handled well by a pleasing number of candidates.

Answer: **(b)** 62.5°C.

Question 11

(a) Good candidates saw that an experiment was needed here with a source, G-M tube and the appropriate absorbing materials. Mention of background count and initial count rate appeared in good answers. Too many candidates simply wrote a list of properties of alpha, beta and gamma radiation, making no mention of experimental procedure.

(b) Although most candidates appreciated that 12 minutes represents 3 half-lives, not many were able to follow through with a correct calculation.

Answer: **(b)** 1500 counts per second.

Papers 5124/03 and 5126/03
Paper 3 - Chemistry

Comments on specific questions

Section A

Question 1

Identification of substances

Very well answered. Some candidates categorised oxygen as an oxide: few realised that lime is an oxide.

Question 2

Photosynthesis

(a) Most candidates knew that it is the chlorophyll in green plants that is essential for the process of photosynthesis to take place.

(b) Water and carbon dioxide were the two substances required. As 'name' was included in the question those candidates that gave the formula only for these two substances failed to gain the marks available to them.

(c) Light energy is converted into chemical energy during photosynthesis.

Question 3

Salt preparation and crystallisation

(a) Many candidates chose insoluble substances, as given in the question's table, as substances that will react in aqueous solution to form lead(II) carbonate. Some candidates did not include a lead compound in the pair that they had chosen.

(b)(i) Sulphuric acid and either sodium carbonate or sodium hydroxide were the correct choice for the production of sodium sulphate. Hydrochloric acid was often given as an incorrect answer.

(ii) Many candidates knew how to prepare crystals from a solution of sodium sulphate. Some described in detail the production of the sodium sulphate using, in the first instance, an indicator, even though this was not what the question required of them. The question asked only for a description of crystallisation, i.e. concentration, separation and drying - (normally by warming to concentrate, leaving to stand, filtering and drying between filter papers).

Question 4

Nuclear structures and what may be determined from them

By no means an easy question which, on the surface, appears simple but requires some time for correct answers to be determined.

(a) Most candidates realised that the nucleon number is calculated by finding the total number of protons and neutrons in a nucleus.

(b) As the first shell of electrons contains two electrons, then the nuclei to be identified must contain five protons in total. Many candidates chose for one of these answers a nuclei with only three protons, and hence an atom with only one electron in its outermost shell.

(c) Only two nuclei had equal numbers of protons and these, of course, were the atoms that had to be identified. This section was well answered.

(d) The atom that had only one proton, and so that which must be an isotope of hydrogen, was often picked out correctly.

Question 5

Periodic Table - use and understanding

(a) There are very many ways in which the Group I elements differ from Group VII elements, all of the following were accepted: metallic/non-metallic, various physical properties (including shiny, even though solid iodine has a shine), high/low melting/boiling point (even though this is only relatively the case), various chemical properties, and various descriptive properties (including number of electrons in outermost shell and relative chemical reactivity). A common misconception was that Group I contains elements which are more reactive than Group VII elements.

(b)(i)(ii) Well answered. Only Group I contains only elements which are relatively soft and only Group VII contains only elements which are diatomic non-metals.

(c)(i)(ii) Many candidates failed to realise that hydrogen and helium are in a Period of their own in the Periodic Table and so arsenic was often described as the element in Group V and Period 3, rather than phosphorus. Most candidates picked out gold as having a proton number of 79, proving that they could use the Periodic Table included at the end of the Examination Paper.

Question 6

Chemical analysis

This type of question has appeared very regularly over the past years. It is a good test of knowledge of very elementary chemical analysis and also the ability to write correctly balanced chemical equations. The better candidates scored very highly on this question. Either iron(III) hydroxide or iron(III) oxide were accepted for the brown precipitate. If a candidate gave iron(II) or Fe^{2+} for section **(ii)** and iron (III) or Fe^{3+} for section **(iii)**, she/he earned one mark for realising that this was the-result of oxidation.

Question 7

Acid/alkalis- with a calculation

(a) Somewhat surprisingly, this first part of this section was not answered well. Candidates did not know the colour of Universal Indicator in strongly acid, strongly alkali and neutral solutions. The range of colours given indicated that many candidates were guessing the answer to this section.

(b) The most common error in causing candidates not to gain this mark occurred when candidates gave the relative molecular mass a unit, e.g. grams.

(c) Well answered.

Question 8

Oxidation and reduction

A conceptually difficult topic. This question was rarely answered perfectly, with the ionic equation causing the greatest difficulty. Few candidates realised that this ionic equation represents an example of oxidation and reduction. Many candidates considered that a neutralisation reaction is an example of oxidation and reduction.

Question 9

Displayed organic structures

Most candidates gained high scores on this question. The only real weakness lay in the realisation that an organic acid will react with an alcohol to form an ester, as exemplified by structure 5.

Section B

Question 10

Covalent and ionic bonding

(a) A description of the correct structure of a covalently bonded molecule was often supplied and earned full marks. A correct diagram was accepted in lieu of a written description for full marks.

(b) There was much confusion in candidates' minds regarding their recall of the differences in solubility and in electrical conductivity of covalent and ionic compounds.

Question 11

Collection of gases as a means of demonstrating rate of reaction.

(a) A very simple diagram earned full marks here. Collection by upward or downward displacement of air was penalised as no indication had been given in the question of whether the gas was heavier or lighter than air. Collection over water or in a gas syringe earned full marks.

(b) Some method involving timing was essential for the full marks to be awarded. Some means of measuring the volume of gas evolved was sought, though counting bubbles over periods of time was accepted only for a maximum of two out of the three marks.

(c) Most candidates gave a graphical method of displaying these results, showing, usually by means of a diagram, a graphical plot of volume against time that showed the reaction slowing down over time and then stopping. Some candidates plotted rate against time and were penalised as they invariably showed a graph that indicated a rate that gradually increased with time and then suddenly stopped.

Question 12

Iron and its manufacture

(a) Good descriptions supplied of the blast furnace and the chemical reactions that proceed within. Few candidates could name haematite as an ore of iron. The two chemical equations were often written correctly.

(b) Candidates normally indicated that they had used the equation for the decomposition of limestone to determine the mass of carbon dioxide that could be produced when 25 tonnes of limestone undergoes thermal decomposition. Incorrect units were penalised though working in tonnes did not appear to create a problem.

Papers 5125/04 and 5126/04

Paper 4 - Biology

General comments

Many of the more able candidates showed a good knowledge of the subject in ***Section A***, but fewer were able to use this knowledge to good effect in ***Section B***. The structuring of questions in ***Section A*** helped many weaker candidates to achieve marks, but in ***Section B*** these candidates often had little idea of how to construct an answer. Many candidates did not understand the requirements of some questions, particularly in ***Section B***. The general standard of written English was good, although it was clear that some candidates misunderstood the meaning of some questions. Few candidates answered more or less than the required two questions in ***Section B***, though some failed to answer all parts of questions in this section.

Comments on specific questions

Section A

Question 1

(a) The majority of candidates gained two or three marks. Common errors were ingestion instead of digestion, ingestion instead of absorption and excretion instead of egestion.

(b) More able candidates explained that only small molecules could pass through the ileum wall/into the blood or that they were more soluble, but few gave both answers. Less able candidates gave vague answers referring to absorption with no location or destination, and did not score.

(c)(i) Most candidates correctly gave bile as the secretion.

(ii) Most candidates who correctly answered **(i)** knew that bile emulsifies fats. Few gave the second function of bile: to neutralise acid from the stomach. Less able candidates gave a variety of incorrect suggestions for the secretion or suggested that bile digests fats. Some candidates incorrectly thought bile digests proteins.

Question 2

(a) The majority of candidates gained a couple of marks, usually for stoma and guard cell. Most of the more able candidates recognised epidermis but few knew palisade cells.

(b)(i) Almost all candidates knew either that chloroplasts absorb sunlight or that they are involved in photosynthesis, but few gave the two ideas to gain both marks.

(ii) Only the most able candidates scored well. Most simply described the difference in numbers of chloroplasts instead of giving a reason.

Question 3

(a) Most candidates realised that nutrients in the soil would be used up and so gained one mark. Few named the main nutrient as nitrate.

(b) Most candidates realised that the smoke from burning trees would cause pollution and so gained both marks. A number of equally valid suggestions were accepted.

(c) A few candidates made clear in their answer that the effect was international. Many less able candidates gave almost identical answers for **(b)** and **(c)**. Release of sulphur dioxide and formation of acid rain were common errors for either question. A number of candidates incorrectly suggested lack of oxygen or too much carbon dioxide for **(b)** or depletion of the ozone layer for **(c)**. In **(c)** more able candidates suggested smoke would blow over to other countries to cause air pollution or that burning would lead to more carbon dioxide in the air and hence global warming.

Question 4

(a) Most candidates labelled the diagram well. Common errors were ureter for **D**, urethra for **A** and gall bladder for **C**.

(b) Most candidates scored a couple of marks, usually for correct functions of the ureter in transporting urine to the bladder and of the bladder in storing urine. A common error here was use of the term urea instead of urine (or urea and water). Few candidates correctly described the function of the kidney, since most did not include removal of water and/or did not say removal is from the blood. Most candidates failed to score the mark in **D** since they wrote about expulsion of urea instead of urine.

Question 5

(a) Many candidates scored full marks for this question. Only the less able made errors in completion of the diagram. Some candidates wrote phenotypes in the boxes instead of giving genotypes.

(b) Some candidates included at least one B or did not appreciate that the answer to the question should be a genotype and instead gave a phenotype description.

Question 6

(a) Very few candidates could gain all three marks. Most managed one or two marks, with a variety of incorrect answers seen.

(b)(i) Only a few of the most able candidates realised that contraction of the heart muscle moves the blood. Many answers referred vaguely to pumping and did not gain the mark.

(ii) Most candidates gave valves to gain the mark.

(c)(i) Most candidates knew two differences between the structure of an artery or a vein, though weak candidates often gave vague answers about thickness without mention of the wall, or simply stated which transported oxygenated and deoxygenated blood.

(ii) Answers often consisted of descriptions of the functions of these vessels instead of relating structure to function.

Section B

Question 7

(a) All but the weakest candidates had enough knowledge of the menstrual cycle to score at least a couple of marks. Common errors were to omit the numbering of days in the cycle and to confuse the day of ovulation. Many candidates gave vague references to breaking down of the uterine wall without linking it to the correct part of the cycle or giving a destination for the broken lining. Most candidates knew the factors that can affect the length of the cycle.

(b) Methods of birth control were also well known, with many candidates scoring full marks. Less able candidates gave vague descriptions and so lost one or two marks.

Question 8

(a) More able candidates had clear ideas of how to set up a suitable experiment, though many did not include details of how to test for starch/sucrose or of what to keep constant during the experiment. Even quite able candidates failed to put together a logical and coherent plan. Less able candidates gained one or two marks for vague and rambling descriptions. Some candidates chose to use sugar instead of starch as the substrate for the enzyme, and many made no mention of adding amylase.

(b) Many candidates mentioned optimum pH but did not fully describe the effect of other pH values on the enzyme. A few weak candidates thought that the pH was being measured as time progressed during the experiment. Most of even the weakest candidates gained a mark for knowing that enzyme activity is affected by temperature.

Question 9

(a) Many candidates gave a long and detailed description of osmosis and the passage of water into a plant, which was not required for this part. Most candidates gained two marks for correct function of xylem and phloem, but did not describe the complete pathways for water or sugar. Nearly all candidates suggested putting a plant in coloured water, but few suggested using a cut stem. Most candidates did suggest cutting open the stem to observe the pathway.

(b) Many candidates confused the instructions to explain and to describe. Most gained a mark for knowing that osmosis is involved, and a second for root hairs having a large surface area. Only more able candidates could expand on these ideas for the remaining marks. Common errors were the omission of water when writing about concentration gradients and a failure to explain why a large surface area is an advantage to root hair cells.