

# COMBINED SCIENCE

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**Paper 5129/11**  
**Multiple Choice**

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

## General Comments: Biology Section

### Question 1

This question worked well but some weaker candidates confused the cell wall and the cell membrane.

### Question 2

This question worked well at discriminating between the candidates. Most candidates identified that water had moved out of the cells, but fewer knew whether this was a result of a higher or lower water concentration in solution X.

### Question 3

This question was answered quite well but some of the weaker candidates incorrectly opted for **D**.

#### Question 4

This question worked well at discriminating between candidates. Assimilation and digestion proved to be strong distractors for the weaker candidates.

#### Question 5

Candidates found this question relatively easy across the ability range.

#### Question 6

Candidates found this question quite difficult. More able candidates were distracted by options **A** and **C** so perhaps that they did not appreciate that the bicuspid and tricuspid valves would be in the same position. There was some evidence of guessing from the weaker candidates.

#### Question 7

This question worked well at discriminating between candidates. A significant number of weaker candidates incorrectly selected D as the correct answer.

#### Question 8

This question was well answered by some but **A** and **B** proved strong distractors for all candidates. This suggests confusion between those muscles that control lens shape for focussing and those muscles in the iris that control candidate size.

#### Question 9

Candidates found this question very difficult. Most opted for **B** or **C** perhaps assuming that alcohol and heroin would have different effects.

#### Question 10

This question discriminated well between candidates. C was a strong distractor for the weaker candidates.

#### Question 11

This question worked well although a significant number of weaker candidates opted for **A**. Cutting down the forest would of course lead to more carbon dioxide in the atmosphere, not less.

#### Question 12

This question was answered correctly by the majority of candidates.

#### Question 13

This question worked well although some weaker candidates selected vaccine as the correct treatment for syphilis.

### General Comments: Chemistry Section

#### Question 14

The majority of the candidates recognised that the water soluble impurity is removed by apparatus 3 and then dried using a drying agent in apparatus 2, however almost half of these candidates used apparatus 5 to collect the gas over water and chose option **C**.

#### Question 15

The definition of an isotope is well known by many of the candidates.

**Question 16**

Over half of the candidates thought that calcium fluoride is a covalent compound and chose option **C**. Candidates should know that compounds formed between a metal and a non-metal are ionic.

**Question 17**

This question was well answered by a majority of the candidates.

**Question 18**

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

**Question 19**

There was evidence of guesswork amongst the weaker candidates.

**Question 20**

The trend in the properties of Group VII elements is quite well known.

**Question 21**

The physical properties of metals are well known by many of the candidates.

**Question 22**

A large proportion of the candidates chose option **B**, which is the reverse of the reactivity series shown by the data given.

**Question 23**

This question was well answered by the better candidates but there was evidence of guesswork amongst the weaker candidates.

**Question 24**

The reaction of an ammonium salt with a hydroxide to produce ammonia gas is not well known. A large proportion of the candidates thought that ammonia is produced from an ammonium salt reacting with hydrochloric acid and chose option **C**.

**Question 25**

The characteristics of the alkane homologous series are not well known. Nearly half of the candidates chose option **B** which is an incorrect general formula for the alkanes.

**Question 26**

There was evidence of widespread guesswork amongst the candidates. Candidates should know that molecules containing a carbon to carbon double bond are able to undergo addition polymerisation.

**Question 27**

Many of the better candidates recognised that the conversion of ethene to ethanol involved an addition reaction but there was evidence of guesswork amongst the weaker candidates.

**General Comments: Physics Section**

Candidates found **Questions 31, 32 and 38** very challenging.

**Question 28 and 29** both showed good discrimination with option D, in both questions, favoured by weaker candidates.

There was some evidence of guesswork amongst the weaker candidates on **Question 30**.

All candidates found **Questions 31 and 32** very challenging.

Many of the weaker candidates chose option **C** of **Question 33** perhaps indicating that they divided frequency by speed rather than vice versa.

**Question 34** was well known.

**Question 35** excellent discrimination with most weaker candidates choosing option C, perhaps indicating a confusion between resistance and voltage.

**Question 36** showed evidence of guesswork amongst the weaker candidates.

**Question 37** was correctly answered by over half the candidates.

All candidates found **Question 38** challenging and there was evidence of guesswork at all levels.

**Question 39** the nucleon number of a nuclide was well known with distractors A and D proving equally popular with some weaker candidates.

**Question 40** was well answered with option A the more popular distractor.

# COMBINED SCIENCE

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**Paper 5129/12**  
**Multiple Choice**

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

## General Comments: Biology Section

### Question 1

Half of the candidates got this question correct but a significant number of the weaker candidates confused the cell wall and the cell membrane.

### Question 2

Candidates found this question difficult. The majority identified that water had moved out of the cells, but fewer knew whether this was a result of a higher or lower water concentration in solution X.

### Question 3

This question was difficult and candidates struggled to interpret the information. **B** was a strong distractor for many candidates across the ability range which was surprising since the P and Q in the diagram show the same results.

#### Question 4

Candidates found this question difficult as well. The majority of candidates opted for wilting of the leaves instead of the correct answer. **B** was also a strong distractor for the weaker candidates.

#### Question 5

This question causes candidates some difficulties. Many of the weaker candidates thought that glucose levels would increase and urea levels would decrease.

#### Question 6

This question worked well at discriminating between candidates but there much confusion amongst weaker candidates with many of them opting for **A**.

#### Question 7

Candidates found this question difficult and may not have missed that it asked for the oxygen content of expired air. Many candidates opted for 20% which is the approximate oxygen content of inspired air.

#### Question 8

This question proved very difficult for candidates, with evidence that many of the candidates guessed the answer.

#### Question 9

This question was difficult with most candidates opting for **B** or **C** perhaps assuming that alcohol and heroin would have different effects.

#### Question 10

This question discriminated well between candidates. **C** was a strong distractor for the weaker candidates.

#### Question 11

This question worked well, although **A** was a strong distractor for the weaker candidates.

#### Question 12

Half the candidates answered this correctly, with many of the other candidates opting for 5 days instead of the correct 7 days.

#### Question 13

This question proved very difficult with the majority of candidates opting for **B** which describes the symptoms of gonorrhoea, not syphilis.

### **General Comments: Chemistry Section**

#### Question 14

Over 60% of the candidates recognised that the water soluble impurity is removed by apparatus 3 and then dried using a drying agent in apparatus 2, however over half of these candidates used apparatus 5 to collect the gas over water and chose option **C**.

#### Question 15

The definition of an isotope is well known by many of the candidates.

### Question 16

Almost half of the candidates thought that calcium fluoride is a covalent compound and chose option **C**. Candidates should know that compounds formed between a metal and a non-metal are ionic.

### Question 17

There was evidence of widespread guesswork even amongst the better candidates. Candidates should know that a line in the structure of a compound represents a shared pair of electrons.

### Question 18

A disappointingly large number of candidates thought that the formula of ammonia is  $N_2H_6$  and chose option **B**.

### Question 19

There was evidence of widespread guesswork amongst the candidates. Less than a third of the candidates recognised that in order to neutralise acidity a substance with a pH greater than 7 is required.

### Question 20

Once again there was evidence of widespread guesswork amongst the candidates. The candidates were required to locate lead in the Periodic Table and recognise that the atom has four electrons in its shell because it is in Group IV and is a metal because it is below lead in the table.

### Question 21

The fact that copper conducts electricity was well known by many of the candidates.

### Question 22

A large proportion of the candidates chose option **B** which is the reverse of the reactivity series shown by the given data.

### Question 23

There was evidence of widespread guesswork even amongst the better candidates. Candidates should know that oxygen is used up when iron rusts and that oxygen makes up about 20% of the air.

### Question 24

The better candidates knew that ammonia is produced by reacting a base with an ammonium salt but there was evidence of significant guesswork amongst the weaker candidates.

### Question 25

The characteristics of a homologous series are not well known. A significant proportion of the candidates thought that the boiling point increased as relative molecular mass decreases and chose option **A**.

### Question 26

There was evidence of widespread guesswork amongst the candidates. Candidates should know that molecules containing a carbon to carbon double bond are able to undergo addition polymerisation.

### Question 27

Many of the better candidates recognised that the conversion of ethene to ethanol involved an addition reaction but there was evidence of guesswork even amongst the better candidates.

### **General Comments: Physics Section**

A total of 4899 candidates produced scores in the range 2 to 40 with a mean score of 13.39 and a standard deviation of 5.70. Candidates found no question to be very easy but **Questions 29, 31, 36, 37 and 40** were very difficult and, along with **Question 35**, showed uncertainty and guessing among candidates, including the better ones.

The better candidates were able to answer **Question 28** correctly, but many of the weaker candidates chose option **D**, possibly indicating a confusion between speed and acceleration.

Although very good candidates were able to answer **Question 29** correctly, there was widespread evidence of guessing at all levels.

Option **D** of **Question 30** was the most popular incorrect response.

**Question 31** showed some evidence of guessing among candidates. A large number chose the incorrect option **A**.

**Question 32** discriminated well although some better candidates chose either option **A** or **D** rather than the key, option **C**.

**Question 33** showed a clear division in responses with weaker candidates choosing either option **A** or **B** and better candidates the key, option **C**, although some did chose **D**.

**Question 34** The principles of electrostatics were well known by the better candidates, who correctly chose option **B**, but not by weaker candidates who were mainly divided between options **C** and **D**.

**Question 35** option **C** attracted a greater response than did the key, option **D**, showing uncertainty and guessing among the better candidates with some choosing option **A**.

Many candidates chose the distractor; option **B** in **Question 36**, indicating that they needed to read the question more carefully to note that time was given in minutes, not seconds.

**Question 37** was challenging for all candidates. Many candidates chose option **A**, perhaps not realising that a compass needle is already magnetised.

**Question 38** discriminated well, with weaker candidates choosing either option **B** or **C**.

**Question 39** showed very good discrimination with the better candidates choosing the key, option **A**, and the weaker candidates either option **B** or **C**.

Candidates struggled to answer **Question 40**, with some evidence of guessing. The most popular answer was the time interval between readings, not the time that equated approximately to a half-life.



# COMBINED SCIENCE

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Paper 5129/21

Theory

## Key Messages

Candidates should be aware that questions which ask for an explanation should be answered with an explanation involving the appropriate scientific principles.

## General Comments

Candidates should be able to construct and use chemical equations when they are given the relevant information about a chemical reaction. Candidates should be encouraged to show all their working and state the formula used in all calculations in the Physics section of the paper. In addition candidates should be able to manipulate formulae in order to use them in these calculations.

## Comments on Specific Questions

### Question 1

This question was well done by many of the candidates. A number of candidates thought that the formation of urea occurred in the kidneys rather than the liver.

### Question 2

- (a) The general name for the Group I elements was not well known by many of the candidates. A large proportion of the candidates simply stated that the elements are metals or alkalis rather than the alkali metals.
- (b) The majority of the candidates thought that the melting point of the Group 1 elements increases as the proton number increases.
- (c) The test for hydrogen was well known by the better candidates. A number of other candidates stated that the test for hydrogen is a glowing splint rather than a lighted splint.
- (d)(i) Only the very best candidates were able to construct a fully balanced chemical equation for the formation of rubidium chloride.
- (ii) The type of bonding present in rubidium chloride was well known by a majority of the candidates.

### Question 3

- (a) The calculation was well done by many of the candidates. A significant number of the candidates lost marks by not converting the time into seconds and also giving an incorrect unit.
- (b) Many of the candidates correctly stated that the electrical energy is converted into kinetic energy. A significant proportion of the other candidates repeated one of the forms of energy stated in the question.
- (c) This proved to be an easy question for a majority of the candidates.

Answer: (a) 480C (c) 3.2 m/s

#### Question 4

- (a) Many of the candidates were able to state the formula for calculating the refractive index but unfortunately a number of the candidates used the values of the angles rather than the sines of the angles in their calculation.
- (b) Candidates were expected to subtract the angle of incidence from  $90^\circ$  in order to find the angle **A**.
- (c) The speed of light in a vacuum was well known by many of the candidates.

Answer: (a) 1,447 (b)  $68^\circ$

#### Question 5

- (a) This question was well answered by the majority of the candidates.
- (b) This was another question well answered, particularly by the better candidates.
- (c) The vast majority of the candidates were able to state a reason why cereals are a better food source than meat; the very best answers gave the reason that this is because energy is lost at each trophic level of a food chain.

Answer: (b)(i) 1% (b)(ii) 10%

#### Question 6

- (a) The responses to this question were disappointing. Candidates were expected to draw on the diagram two bonding pairs of electrons between the silicon and the hydrogen and two lone pairs on the silicon atom.
- (b) This proved to be well done by the better candidates. A significant proportion of the candidates were unable to correctly calculate the relative molecular masses of hydrogen sulfide and sodium sulfide. However, some of these candidates were able to use incorrectly calculated values in the right way in the later part of the question, and gained some credit for this.

Answer: (b)    34    78  
                 3.4    7,8  
                         1.95

#### Question 7

- (a) The majority of the candidates correctly identified ammonium chloride as one of the substances but the reaction of this compound with sodium hydroxide was less well known.
- (b) The reaction of sodium hydroxide and hydrochloric acid to produce a salt and water only is well known by many of the candidates.
- (c) The fact that sulfur dioxide is acidic and turns Universal Indicator red was not well known by the candidates.
- (d) The use of calcium carbonate to reduce the acidity of soil was well known by the better candidates.

### Question 8

The idea that droplets with opposite charges attract one another and droplets with the same charge repel one another is well understood by the majority of the candidates. A number of the candidates referred to magnetic poles rather than charges.

### Question 9

- (a) Many candidates were able to state that maximum of the voltage output and the frequency of the voltage output both increase as the coil of the a.c. generator is rotated at twice the original speed. The best candidates included a qualitative statement; both the quantities are doubled.
- (b) The vast majority of candidates simply restated the question. Candidates need to understand the conditions necessary for a transformer to work.

### Question 10

- (a) The processes involved in the carbon cycle are not well known by the candidates. The most commonly known were **C**, photosynthesis and **E**, respiration.
- (b)(i) Those candidates who correctly identified **E** as respiration were able to do well on this question.
- (ii) The fact that respiration occurs during both night and day was not well known by many candidates,

### Question 11

- (a) The structure of the atom and the number of protons, neutrons and electrons present in an atom are well understood by the vast majority of the candidates.
- (b) Only the better candidates were able to state that the properties of isotopes of the same element are the same because the number of electrons in the outer shell of the atoms is the same. Many candidates knew that it was the number of electrons that determines the properties of an atom but needed to state that it was the number of electrons in the outer shell that is significant.
- (c) The vast majority of the candidates were able to correctly identify the element X.

### Question 12

- (a) Most candidates were unable to draw a diagram of a viable experiment to determine the extension-load graph.
- (b) The majority of the candidates were able to draw a smooth curve through the points.
- (c) Almost all of the candidates were able to calculate the extension from the graph; however only a small minority of the candidates added the original length of the rubber band to the value obtained from the graph.

### Question 13

- (a) This question was well answered by the candidates.
- (b) Many candidates were able to quote the formula  $V=IR$  but a significant proportion of the candidates lost marks by rearranging the formula incorrectly.

Answer: (a)  $3\Omega$   
(b)  $0.5A$

#### Question 14

- (a) (i) The question required the candidates to explain why the ball does not pass through the ring which required them to explain that the ball **expands** when it is heated.
- (ii) Similarly candidates were expected to explain that cooling the metal ring causes it to **contract**.
- (c) The fact that wood is a poor conductor of heat was well known by the candidates.

#### Question 15

- (a) (i) The conditions used in the fermentation of glucose to form ethanol were not widely known by the candidates. Most candidates were aware that yeast is used to provide enzymes for the fermentation but the fact that oxygen/air should be excluded and the temperature should be between 25 and 40°C was known only by the best candidates. A significant number of the candidates stated that the temperature used had to be controlled. Ambiguous answers such as *heat* or *use the optimum temperature* could not gain credit.
- (ii) The better candidates were able to balance the equation correctly.
- (b) The type of reaction occurring when ethene reacts with steam was not well known by the candidates.
- (c) (i) The presence of a carbon to carbon double bond in an unsaturated hydrocarbon was well known by many of the candidates.
- (ii) The effect of an unsaturated compound on bromine water was less well known.

#### Question 16

- (a) This question proved difficult for many of the candidates. A significant number of candidates calculated the force exerted by the bucket but did not take into account that distance from the pivot where force F is applied is 1.2 m.
- (b) The formula  $P=E/t$  was well known by many of the candidates.

Answer: (a) 40N (b) 120W

#### Question 17

- (a) The candidates' responses to this question were disappointing. The fact that both processes use oxygen was quite well known but the fact that carbon dioxide and energy are produced was known only by the better candidates. There was a degree of confusion amongst some of the candidates who thought that carbon dioxide and energy are **used** in both of the processes, rather than produced.
- (b) Most candidates were able to identify an air pollutant but the effect of named air pollutants on the environment was less well known.

#### Question 18

- (a) A large number of the candidates were able to correctly identify the three parts of the digestive system.
- (b) The functions of the parts of the digestive system were not well known by the candidates. Only the function of the stomach was identified correctly by a significant proportion of the candidates.
- (c) (i) Candidates were expected to draw a line to the liver and label it X. A majority of the candidates identified the gall bladder which is where bile is stored rather than produced.
- (ii) The function of bile in digestion needs to be better understood by the majority of the candidates. Candidates were expected to explain that bile emulsifies fats, which increases the surface area of the fats which increases the rate at which the fat is digested by lipase.

**Question 19**

- (a) This was an easy question particularly for the better candidates.
- (b) The proton number was more frequently correct than the nucleon number.

*Answer:* (a) 137 (b) 56

# COMBINED SCIENCE

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Paper 5129/22

Theory

## Key Messages

Candidates should be aware that questions which ask for an explanation should be answered with an explanation involving the appropriate scientific principles.

## General Comments

Candidates should be able to construct and use chemical equations when they are given relevant information about a chemical reaction.

Candidates should be encouraged to show all their working and state the formula used in all calculations in the Physics section of the paper. In addition candidates should be able to manipulate formulae in order to use them in these calculations.

Candidates' responses to questions which require direct recall of information are quite well done but those questions which required the use of the information in order to explain an observation were less well answered.

## Comments on Specific Questions

### Question 1

The candidates' responses to this question were disappointing. The only part of the question that was answered well was the fact that red blood cells contained haemoglobin. There was a degree of confusion over the function of capillaries, arteries and veins.

### Question 2

- (a) The fact that chlorine displaces bromine from an aqueous solution of potassium bromide was not well known by the candidates.
- (b) Candidates were expected to identify either chlorine or hydrogen as a diatomic gas not present in unpolluted air. A surprisingly large number of candidates thought that nitrogen was not present in air.
- (c) The test for oxygen is well known by the better candidates. Some candidates gave hydrogen as their answer.
- (d) The use of hydrogen and nitrogen is quite well known by the candidates.

### Question 3

- (a) Many of the candidates found this question challenging.
- (b) A number of the candidates gave no response to this question. Of those who answered the question, a proportion indicated the motion of the bob, rather than the force of gravity.
- (c) This question was well answered by the vast majority of the candidates.

Answer: (a) 3 (c) 0.14N

#### Question 4

- (a) A significant number of the weaker candidates struggled to extract numerical data from a bar chart and then manipulate that data. Of those candidates who were able to calculate that the components in the bar chart accounted for 12% of the composition, only the best candidates went on to subtract this from a hundred to find the percentage of water in breast milk.
- (b) The candidates' responses to the question indicated that they had not read the question carefully. The question specifically asked for the advantages **to the baby** of breast feeding over bottle feeding. A large number of candidates stated advantages to the mother or simply stated that breast milk contains nutrients required by the baby. A number of candidates referred to the baby's brain development being enhanced by breast milk rather than formula milk, this may be due to a confusion arising from one difference between the benefits of breast milk and cow's milk.

#### Question 5

- (a) Candidates need to understand the relationship between electronic structure and an element's position in the Periodic Table. The better candidates were able to identify particle **F** as an inert gas. Only the very best candidates knew that a positive ion contains more protons than electrons and identified particle **D** as the positive ion.
- (b) Candidates were expected to identify that an element in period 3 of the Periodic Table has three electron shells and that atoms have the same number of protons and electrons.
- (c) Candidates should know that the atoms in compounds have full electron shells and that an element that forms a compound **XH<sub>2</sub>** has six electrons in its outer shell and is two electrons short of a full shell.

#### Question 6

- (a) A large number of the candidates divided the weight by the distance rather than multiply the two numbers together.
- (b) Many of the candidates recognised that power = energy / time, but then lost some marks by using the time in minutes and not knowing the correct units of power.

Answer: (a) 6000000J (b) 50000W

#### Question 7

- (a) It is clear from the candidates' responses that many do not know the meaning of the words 'physical property'.
- (b) Many candidates had difficulty explaining the meaning of both sensitivity and range of a thermometer. Candidates were expected to explain that sensitivity is the ability to detect small changes in temperature and that the range of a thermometer is the difference between the minimum and maximum reading on the thermometer. Many of the candidates either repeated the question or quoted a range for either a clinical or a laboratory thermometer.

#### Question 8

Many candidates scored well on this question. A number of candidates did not gain credit because their responses did not include both ticks and crosses.

### Question 9

- (a) (i) The vast majority of the candidates were able to write the molecular formula of hexane.
- (ii) Far fewer candidates were able to estimate the boiling point of heptanes. Candidates should be aware that the difference between the boiling points of members of homologous series decrease as the size of the molecules increases.
- (b) The characteristics of an homologous series are not well known by many of the candidates. Candidates should know that the members of an homologous series have the same **general formula**, the same functional group and exhibit similar chemical properties.
- (c)(i) The structure of ethane was well known by the vast majority of the candidates.
- (ii) Candidates should be aware that all hydrocarbons produce carbon dioxide and water as the products of complete combustion.

### Question 10

- (a) A large proportion of the candidates were able to describe the motion of the cork.
- (b) Many of the candidates did not gain credit for their responses because they either confused amplitude with wavelength or simply stated the 'height of the wave'. The latter response is imprecise, as it could mean the distance from the trough to the crest rather than the displacement from rest to the peak of the crest.
- (c) The calculation was well done by a many of the candidates. Some candidates were unable to state the correct units for frequency.

Answer: (c) 1.33Hz

### Question 11

- (a) Colourless liquid **B** and gas **C** were more frequently correct than salt **A**.
- (b) This question was well done by the vast majority of the candidates.
- (c) (i) The relationship between the colour of Universal Indicator and the pH of a solution is not well known by many of the candidates.
- (ii) Candidates need to be able to suggest the ions present in dilute acids.

### Question 12

- (a) The majority of candidates gained some credit on this question. Structure **B** was most commonly identified correctly as the nucleus, closely followed by structure **F**, the cell membrane, whereas structure **E** was less well known.
- (b) The responses to this question were disappointing. Candidates were expected to state that a root hair cell has a different shape and does not contain chloroplasts. Even those candidates who were able to state the differences were challenged to explain the significance of the differences.



### Question 13

- (a) Many candidates struggled to explain the meaning of *double insulation*. Candidates were expected to state that there is no contact between the electrical parts and the outer casing of an appliance, or that the outer case cannot become live.
- (b)(i) The majority of the candidates made vague statements about the dangers without any attempt to point out the differences between the properties of plastic and metals. In order to explain the importance of a plastic case candidates were expected to state that plastic is an insulator of either heat or electricity.
- (ii) The majority of the candidates lost marks by making vague statements such as '*to avoid electrocution*'. Candidates need to be more specific about the cause of the danger referred to e.g. by specifying that water can conduct electricity.
- (c) This question was well answered by a large proportion of the candidates.

### Question 14

- (a) This question was well answered by the better candidates.
- (b)(i) The presence of the chemical chlorophyll in chloroplasts was not well known.
- (ii) The concept of light energy from the Sun being converted into chemical energy during photosynthesis is not understood by many of the candidates.
- (c) The loss of water from a leaf cell by transpiration is quite well known by the candidates.

### Question 15

- (a) Candidates were expected to draw four bonding pairs between the silicon atom and the four hydrogen atoms. The candidates' responses to the question demonstrated a lack of understanding of covalent bonding and the significance of a full outer shell of electrons in covalent molecules.
- (b) This proved to be an easy question for the better candidates. A significant proportion of the candidates were unable to correctly calculate the relative molecular masses of silane and hydrogen. A number of the candidates failed to take into account the stoichiometry of the equation when calculating the mass of hydrogen. Candidates who were able to use incorrectly calculated values correctly later in the question gained some credit.

Answer: (b)    32     8  
                  3.2    0,8  
                             0.4

### Question 16

- (a) The vast majority of the candidates were able to correctly state the number of neutrons present in the uranium atom.
- (b) A large proportion of the candidates were unaware of the effect of the emission of an alpha particle on the nucleus of the uranium atom. Candidates should know that an alpha particle consists of two protons and two neutrons and therefore the emission of an alpha particle from an atom causes the number of neutrons and protons in that atom each to decrease by two. Many candidates thought that the number of neutrons decreased by four and gave the answer 142 rather than 144.

Answer: (a)    146  
                  (b)    90  
                             144

- (c) Candidates need to be able to use the concept of half-life in simple calculations such as this. A majority of the candidates thought that the number of alpha particles increased with time and calculated a simple proportion to obtain the answer 30000. Candidates were expected to calculate

that there are three half-lives in 13.5 billion years and therefore the starting number of alpha particles is halved three times.

Answer: (c) 1250

(d) The least ionising type of radioactive emission was well known by many of the candidates.

#### Question 17

(a) Many candidates did not gain credit for their response because they stated a symptom of gonorrhoea which is common to both males and females.

(b) The treatment of gonorrhoea by antibiotics is not well known by a large proportion of the candidates.

#### Question 18

(a) Candidates need to be able to explain the process of galvanisation. A large number of the candidates simply restated the question.

(b) The alternative ways of protecting iron from rusting are well known by many of the candidates.

(c) Many of the candidates were aware that both oxygen and water are the substances present in the air which cause iron to rust.

#### Question 19

(a) This question was poorly answered.

(b) The unit of charge was quite well known by many of the candidates.

(c) Only the best candidates were able to state the name given to the rate of flow of charge.

#### Question 20

(a) Many candidates were able to state the name a component of the electromagnetic spectrum with a frequency higher than ultraviolet radiation.

(b) A number of candidates were able to state that sound is an example of a longitudinal wave but many of the candidates gave the name of an electromagnetic wave.