COMBINED SCIENCE

Paper 5129/01
Multiple Choice

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

General comments

Candidates produced scores in the range 4 to 39 with a mean score of 17.98, a pleasing increase on the 16.10 of 2006, and a standard deviation of 5.16. Candidates found **Question 10** very easy, **Questions 6** and **8** very difficult while **Questions 2** and **3** posed difficulties for even the more able candidates.

Comments on specific questions

Question 1

This showed good discrimination with each of the incorrect options attracting the less able candidates in significant numbers.

Question 2 and **Question 3**

Both produced discrimination values below the design limit suggesting uncertainty and guessing from amongst the better candidates. In **Question 2** option **C** attracted more responses than the key and in **Question 3** option **B** attracted an almost equal number to the key.

Question 4

This also showed good discrimination with less able candidates favouring option **B**, amplitude correct, wavelength incorrect, over the more usual response of amplitude incorrect, wavelength correct, option **C**.

Question 5

This was correctly answered by 52% of candidates. The remainder, including more able candidates, were evenly distributed between the remaining options.

Question 6 and **Question 8**

These questions relied on simple knowledge recall. It was, therefore, surprising to find so few candidates answering correctly. Both showed more candidates choosing a distractor rather than the key, discrimination below the design limit and 'positive' distractors, all of which are indicative of guessing among the better candidates. In **Question 6** both options **A** and **C** attracted more responses than did the key, with a significant number of the better candidates choosing option **B**. In **Question 8**, option **A** attracted almost four times as many responses than the correct one, option **B**.

Question 7

Good discrimination with the majority of candidates divided equally between a distractor, option **B**, and the key, option **D**; the former attracting the less able and the latter the more able of the candidates.

Question 9

This also discriminated well.

Question 11

Components of the a.c. generator were well known by the majority of candidates.

Question 12

This was also well known, although a number of better candidates considered either option **A** or **D** to be the correct response. Among the incorrect options, **B** attracted the most responses.

Question 13

Half-life is not well understood, with all options eliciting a response from a large number of candidates, indicative of guessing on a large scale.

Question 14

An easy question for many of the candidates.

Question 15

The electronic structure of atoms and ions is not well understood by many of the candidates. Almost a third of the candidates chose option **D**, thinking that the nucleon number, 18, referred to the number of neutrons rather than the number of neutrons **and** protons. These candidates did not recognise that the question was about the ion of element X, X^{2-}.

Question 16

Over a third of the candidates chose option **D**, the combination of two non-metals, which bond together covalently. Candidates should know that ionic compounds are formed by the combination of a metal and a non-metal.

Question 17

Over 50% of the candidates simply counted the covalent bonds in the structure of sulphuric acid and chose option **B**. Candidates should know that a covalent bond is made by a pair of electrons being shared between two atoms.

Question 18

This was a difficult question for the majority of the candidates and there was evidence of guesswork amongst even the better candidates.

Question 19

Many of the better candidates recognised that the reaction between the hydrogen and hydroxide ions is a neutralisation reaction. Once again there was evidence of guesswork amongst the weaker candidates.

Question 20

The general properties of the alkali metals are not well known by the candidates. A large number of candidates thought that the alkali metals form oxides on reacting with water, whereas, in fact, they form hydroxides.

Question 21

Another disappointingly answered question even by the better candidates. Many candidates are not aware that copper, one of the least reactive metals, does not react with either water or steam. However, almost 70% of the candidates did know that the gas produced, when metals react with water, is hydrogen.

Question 22

The majority of the better candidates knew that metals have either one, two or three electrons in the outer electron shell and that hydrogen, a non metal, has only one electron.

Question 23

An easy question for the majority of the candidates.

Question 24

Another easy question, particularly for the better candidates.

Question 25

There was evidence of widespread guesswork by all the candidates. A significant number of candidates thought that ammonia is an element and chose option **B**.

Question 26

An easy question for the majority of the candidates.

Question 27

There was evidence of widespread guesswork amongst the candidates. Candidates did not seem to know that aqueous bromine is used to test for the presence of a carbon to carbon double bond.

Question 28

This question was fairly easy, but discriminated well.

Question 29

Candidates needed to spot that the optimum temperature for most enzymes is around body temperature.

Question 30

This was another easy question, but it worked well.

Question 31

Some candidates were evidently guessing here.

Question 32

This question worked well. Candidates had to look for the plant that was losing more water than it took up.

Question 33

Many candidates found the pressure graph of the heart difficult to interpret.

Question 34

Some candidates did not read the question properly, and looked for “inspired” rather than “expired” air.

Question 35

This straightforward question about accommodation proved difficult for some.

Question 36-37

These questions worked well, although they were quite difficult.

Question 38

Candidates needed to recognise that soil erosion will reduce agricultural yield.

Question 39

This question discriminated well, but some candidates misread “asexual” as “sexual”.

Question 40

This question worked well.

COMBINED SCIENCE

Paper 5129/02
Theory

General comments

The answers to the questions which involved practical work were poorly done and it is clear that some candidates have little experience of simple practical exercises specified by the syllabus. This was particularly true of **Question 4**, involving the preparation of copper(II) sulphate crystals. In the physics section of the paper candidates were able to attempt the calculation questions, but the knowledge of units was disappointing. The calculation involving density was particularly well done by many candidates and many answers included the correct unit. Candidates should learn the tests, and the results of these tests, used to identify the gases mentioned in the syllabus. It is pleasing to note that more and more candidates are able to calculate simple proportions using chemical equations.

Comments on specific questions

Section A

Question 1

(a) The majority of the candidates were able to identify component **P** as the fuse.

(b) (i) The colour of the earth wire in a mains plug was quite well known, but a significant number of candidates gave the colour as green or yellow rather than green and yellow. Candidates who gave the colour as green were awarded credit for their answer.

(ii) The colour of the live wire was less well known. Candidates who gave the answer red rather than brown were awarded credit for their answer.

Question 2

(a) The majority of the candidates were unable to read the vernier scale.

(b) More candidates were able to read the micrometer scale than the vernier scale. A large number of the candidates were able to work out that the answer is between 18 and 19 but were unable to work out the numbers after the decimal point. Other candidates reversed the numbers either side of the decimal point and gave the answer 34.18.

Many candidates did not seem to understand how readings are taken from these two scales.

Answers: **(a)** 2.3 **(b)** 18.34

Question 3

(a) (i) The majority of candidates knew that the process involving water movement in cells is osmosis.

(ii) The majority of candidates stated correctly that an animal cell does not have a cell wall but many were unable to state why the animal cells burst when they are put in water.

(b) (i) This question was well answered. The majority of the candidates knew that the function of red blood cells is to transport oxygen.

(ii) Many candidates knew that the red blood cells contain haemoglobin which helps the cells to transport oxygen. A number of the candidates made reference to the shape of the red blood cells and the fact that they do not have a nucleus.

Question 4

(a) A surprisingly large number of the candidates did not identify the gas given off as carbon dioxide. Many thought that the gas was oxygen.

(b) (i) The majority of candidates were not aware of the procedure used to make copper(II) sulphate crystals by adding copper(II) carbonate to sulphuric acid. Excess copper(II) carbonate is added to the acid in order to ensure that all the sulphuric acid is reacted. Only the better candidates were aware that when no more gas is given off then all the sulphuric acid has reacted.

(ii) A surprisingly large number of the candidates did not realise that the mixture is filtered in order to remove the unreacted copper(II) carbonate. The candidates' responses indicated a lack of familiarity with and understanding of the procedure for the preparation of a salt by this method.

(iii) A large number of the candidates thought that the evaporation of half the volume of the filtrate produces dry crystals. The solution is concentrated by evaporating some of the water in order to allow the crystals to form in the solution. Once again it was clear that the candidates did not understand the procedure.

(c) The better candidates were able to state an alternative starting material for the preparation of copper(II) sulphate but all too often candidates simply guessed a substance which frequently did not even contain copper.

Question 5

(a) Many candidates were able to calculate the weight of the metal cube but incorrect units were often seen with correct calculations.

(b) (i) The principle of moments is not well known by many of the candidates.

(ii) The calculation was quite well done by many candidates, even those who were unable to state the principle of moments correctly. These candidates clearly understood the idea of moment of a force but did not appreciate the idea that clockwise and anticlockwise moments are equal on a balanced lever.

Answers: **(a)** 0.5N **(b)(ii)** 0.25N

Question 6

(a) The equation was balanced correctly by the majority of the candidates.

(b) The test for oxygen was frequently confused with the test for hydrogen. A large number of candidates do not recognise the difference between a **glowing** and a **burning** splint. Candidates, who gave a burning splint as the test frequently stated the correct result, that the splint re-ignited, but they were not awarded credit as the test was incorrect.

(c) (i) This was a difficult question for many of the candidates. Candidates were expected to draw a pair of electrons shared between each hydrogen atom and the oxygen atom and show two lone pairs in the outer shell of the oxygen atom.

(ii) The better candidates found this question easy.

Question 7

(a) A poorly answered question. A large number of the candidates answered the question in terms of general digestion rather than the specific digestion of proteins required by the question.

(b) Another poorly answered question. Large numbers of candidates gave uses of proteins rather than amino acids, the products of digestion of proteins. Frequently the answers given by the candidates were too vague to be awarded credit, for example, growth on its own was insufficient.

(c) Candidates who knew the product of protein digestion invariably knew that the amino acids were deaminated in the liver, but the second part of the answer was spoilt by the inclusion of other products in addition to urea.

Question 8

(a) Quite a number of candidates were able to plot correctly the two points after 20 days and 40 days. The majority of these candidates were able to draw a smooth curve between the four points. However, it is clear from the responses that the concept of half-life is poorly understood by the majority of the candidates. This was shown by the fact that the most common response by the candidates was to draw the two points so that the resulting four points are in a straight line.

(b) The vast majority of the candidates answered this question in terms of general laboratory rules instead of safety precautions specific to the use of a radioactive source.

Question 9

(a) (i) Only a small number of the candidates recognised the presence of a double bond in the given structure of ethene.

(ii) Many candidates recognised that hydrocarbons contain hydrogen and carbon but the answer was frequently negated by the use of the word mixture rather than compound. Only a small number of candidates included in their answer the word “only”, which is essential for the correct definition of a hydrocarbon.

(b) Of the candidates, who knew that unsaturated hydrocarbons are identified by adding bromine water, a significant number indicated that the colour changed from colourless to orange rather than orange to colourless.

(c) This part illustrated the inability of many candidates to construct an equation for a reaction given the reactants and products. Many candidates were unable to write the formulae for ethene, oxygen, carbon dioxide and water.

Question 10

(a) The majority of the candidates correctly identified part **X** as the pupil.

(b) (i) Many candidates confused the cause and effect, therefore describing what happens to the muscles controlling the pupil rather than how this affects the amount of light entering the eye.

(ii) The majority of the candidates did not recognise the significance of the word change in the question, which required a response that stated how the environment changes. Candidates were expected to state that the light becomes brighter or there is a change from dark to light.

(c) (i) The parts of the eye were quite well known particularly the lens and the retina. A significant number of candidates confused the ciliary muscles and the suspensory ligaments.

(ii) Quite a number of candidates simply repeated the question in their answer. In **B** a significant number of candidates gave contradictory answers, for example, part **B** gets thinner and smaller or thinner and larger.

Question 11

(a) An easy question for the majority of candidates.

(b) (i) Well done by a large number of candidates although the scale on the measuring cylinder was confused by many candidates, who marked the new level at 46 rather than 48 cm^3.

(ii) Very well answered by the majority of the candidates. It was particularly pleasing to note that even those candidates who used the incorrect volume still gained credit for the correct unit for density.

Answers: **(a)** 22 cm^3 **(b)(ii)** 2.5 g/cm^3

Question 12

(a) This part was answered better than similar ones in previous years. Candidates are becoming more able to calculate the relative molecular masses of compounds.

(b) As with part **(a)** this question was well answered by many of the candidates. Some of the candidates who did not correctly calculate the relative molecular masses were able to use the incorrect numbers to produce a consequentially correct answer.

(c) The use of calcium carbonate/limestone in the blast furnace is not well understood by the vast majority of the candidates.

Answers: **(a)(i)** 100 **(ii)** 56 **(b)(ii)** 2.8 g

Question 13

(a) The vast majority of the candidates knew that alcohol is a drug and that it damages the liver. Less well known was that alcohol slows a person's reactions and is addictive.

(b) This part was poorly answered by a large number of the candidates. Despite the use of the word **addictive** in **(a)**, only a small number of candidates stated that a problem associated with the drug heroin is addiction. The most common correct answers were that it led to an increase in crime and an increase in the risk of contracting AIDS due to sharing of needles.

Question 14

(a) This part was easy for the better candidates, although there was confusion between conduction and convection amongst a number of the candidates.

(b) Many candidates did not understand the significance of the insulation of the tank. Frequently candidates referred to insulation as means of preventing people burning themselves rather than to prevent heat loss from the water tank.

(c) Often candidates were distracted by the diagram and answered the question in terms of convection current in the water rather than the surrounding air. Of those candidates who discussed the air many realised that warm air is less dense than cold air but did not understand that this was due to the expansion of the air as it becomes hot.

Question 15

(a) Many candidates recognised the acid as sulphuric acid but ammonia was less well known as the alkali. A significant number of candidates did not gain credit for the alkali because they referred to ammonia as ammonium. A number of candidates got the answers the wrong way round, giving the alkali as sulphuric acid.

(b) This part was poorly answered. Candidates did not appear to be able to combine symbols for ions to construct the formula of a compound.

(c) (i) It was disappointing to see so many candidates answer this question with substances that are not elements. Ammonia was often given instead of nitrogen.

(ii) The use of calcium carbonate in fertilisers to reduce the acidity of the soil is not well understood. Many candidates focused on the fertiliser aspect and referred to increased growth in plants or made reference to an increase in fertility of the soil.

Question 16

(a) The majority of candidates were able to state that copper is used for electrical wiring in a house, but significantly less candidates were aware that iron is extracted from haematite.

(b) The two metals used to make brass were not well known. It was common for one of the metals to be correctly identified but only a small number of candidates scored full marks on this question.

Question 17

(a) The principle of gravity is not well understood. The majority of candidates drew the arrow on the diagram to indicate the swing of the pendulum bob.

(b) Most candidates drew more than one pendulum bob in various positions on the diagram and therefore credit could not be given even when one of the pendulum bobs was in the correct position.

(c) The answers in this question were the same as in part **(b)**.

Question 18

(a) A large number of candidates were able to state the three conditions required for seeds to germinate. Some candidates had difficulty with regard to the temperature mark. Quite a number of candidates thought that photosynthesis was required for seeds to germinate and included sunlight in their answer.

(b) (i) The word equation for aerobic respiration was well known by quite a number of candidates, however some candidates did confuse respiration with photosynthesis.

(ii) The fact that germination produces heat and causes the temperature in the flask to rise was not known by the vast majority of candidates, even when the production of energy had been stated in the equation in part **(b)(i)**. Many candidates thought that the seeds require heat to germinate or answered in terms of the lack of oxygen or carbon dioxide.

Question 19

(a) (i) It would appear that many of the candidates did not understand the term ‘at rest’. Only rarely was the answer between 0 and 5 seconds given by the candidates.

(ii) This part was answered well by many candidates, although some candidates had difficulty reading the graph and gave the answer between 5 and 16.5 seconds rather than between 5 and 17 seconds.

(b) The difference between speed and velocity was not well known by the candidates. Many candidates confused velocity and acceleration.

(c) The calculation was well done by the majority of candidates, however a significant number spoilt their answer by stating incorrect units, not realising that the units were not required as they were stated in the question.