COMBINED SCIENCE

Paper 5129/01
Multiple Choice

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

Comments on individual questions (Physics)

A total of 1407 candidates produced scores in the range 5 to 40 with a mean score of 16.99 and a standard deviation of 4.06.

Question 1 proved to be very easy with **Questions 6** and **7** very difficult.
Widespread guessing was largely absent with **Question 4** the only one to squeeze into this category.
However, **Questions 2**, **3** and **11** did indicate guessing from among the more able candidates. A number of questions (**Questions 5**, **8**, **9**, **10** and **12**) gave lower ability candidates an opportunity for positive achievement.

Question 2 had the majority of candidates divided, almost equally, between option B (incorrect) and option C (correct). A significant minority chose option D.

Question 3
The length of spring v load plot attracted a number of the more able candidates.

Question 4
Indications of widespread guessing with options B (correct) and D each attracting a 30% response with the remaining 40% divided almost equally between A and C.

Question 5
Most recognised that the question was concerned with expansion and correctly chose option D. Of the remainder, however, most favoured option A, 'the air pressure in the jar falls', rather than the more obvious 'the glass expands', option B!

Question 6 and **Question 7** both showed good discrimination with only the more able candidates choosing correctly option A in **Question 6** and option D in **Question 7**.
However in both questions significantly more candidates chose an incorrect option than did the correct one. In **Question 6** the majority of candidates, having divided the first figure by the second, chose option C. **Question 7** highlighted the popular misconception that, in optics, the measured angles are between the **surface** and the ray of light. Thus option A attracted a response from almost 50% of candidates with option B also proving more popular.

Question 8
More than 1/3 of candidates believe the charge carriers in a metal wire to be either atoms or molecules.

Question 9 and **Question 12** were both very well known with more than 70% of candidates making the correct choice in both questions.
Question 12 the candidates choosing incorrectly were equally divided between options B and D.

Question 10
Most candidates answering incorrectly chose option A (V x I) with options B and C attracting a number of the more able.

Question 11
Although 53% of candidates answered correctly (option B) the question discriminated poorly because option C attracted a significant number of the more able.

Question 13
The incorrect option A was almost as popular as the correct one, option B.

Comments on individual questions (Chemistry)

Question 14
There was evidence of widespread guesswork even amongst the better candidates. Over 50% of the candidates thought that substance X could be separated from water by either distillation or fractional distillation, and chose options A or B, despite both X and water having the same boiling point.

Question 15
An easy question for the majority of the candidates.

Question 16
Over half of the candidates thought that the bonding in calcium fluoride is covalent and chose option A. Candidates should be aware that when a metal combines with a non-metal the bonding is ionic.

Question 17
Almost 70% of the candidates recognised that the diagram shows electrons being shared between elements Y and Z and therefore the bonding in YZ_2 is covalent, however the weaker candidates thought that the elements X and Z are carbon and oxygen.

Question 18
There was evidence of widespread guesswork even amongst the better candidates.

Question 19
The term amphoteric oxide is not well understood by the majority of the candidates. Once again there was evidence of guesswork amongst the candidates.

Question 20
The use of argon in light bulbs is well known by the majority of the candidates.

Question 21
This question proved to be very difficult for the vast majority of the candidates. The better candidates identified X as the most reactive element rather than the least reactive and chose option B. There was evidence of a certain amount of guesswork, particularly amongst the weaker candidates.

Question 22
It was disappointing to note that less than a third of the candidates were able to identify that zinc is used for galvanising iron. A significant proportion of the better candidates chose iron perhaps misunderstanding the question.

Question 23
There was evidence of widespread guesswork by all of the candidates.

Question 24
The majority of the better candidates recognised that the element present in ammonium sulphate that is important for plant growth is nitrogen. There was evidence of guesswork amongst the weaker candidates.

Question 25
This question was quite well done by the better candidates but a significant proportion of the candidates thought that the members of the same homologous series contain the same number of carbon atoms and chose option D.

Question 26
The order in which the fractions distil off during factional distillation is not well known by the candidates. The candidates responses indicate that there is some confusion over the boiling points of gasoline and kerosene.

Question 27
The candidates responses indicate either widespread guesswork or that they did not read the question carefully. The question asked what does **not** happen in the combustion of ethane in a plentiful supply of air. Over a third of the candidates chose option D, water is produced, which always occurs during the combustion of a hydrocarbon.

Comments on individual questions (Biology)

Question 28
This was a straightforward start to the Biology section.

Question 29
Significant numbers of candidates failed to notice that the table referred to water concentration, and so they chose the answer that was the reverse of the correct one.

Question 30
Many candidates were evidently guessing here.

Question 31
This question worked well, but weaker candidates found the unfamiliar diagram confusing.

Question 32
Candidates needed to make a connection between wilting and the prevention of water uptake due to damaged root hairs.

Question 33
This question worked well.

Question 34
The question appears to require a value judgement, but in reality there is only one valid answer.

Question 35
This was a straightforward question.

Questions 36-37
In both these questions, candidates apparently read what they expected rather than what the question actually said! In **Question 36**, over half the candidates chose the structure (ciliary body) that changes the shape of the lens, and in **Question 37** candidates forgot that a reduction in reaction time is an improvement in reaction speed.

Questions 38-39
These questions discriminated well.

Question 40
A surprisingly large number of candidates believe that the umbilical cord is the site of exchange between mother and fetus.

COMBINED SCIENCE

Paper 5129/02
Theory

General comments

The candidates responses to calculation questions involving electricity and moments from the Physics part of the syllabus were disappointing. Calculations from chemical equations were well answered by many of the candidates. Candidates found questions involving experiments, particularly in Biology, difficult and appeared to lack the experience of experimental Science.

Comments on specific questions

Question 1

(a) A large majority of the candidates were able to identify a producer and a herbivore from the organisms shown in Fig.1.1.

(b) Whilst many candidates were able to identify organism 2, snail, in the food chain, fewer candidates were able to name the hawk as the predator of the small bird.

(c) A large number of candidates identified the Sun as the energy source for the food chain, however it was disappointing to note that a significant number of candidates thought that the energy source was one of the organisms in the food chain.

(d) This question was poorly answered by the vast majority of the candidates. Candidates seemed unaware of the fact that amount of energy in a food chain is limited and that energy is lost at each stage of the food chain because energy is used or lost by the organisms in the chain.

Question 2

This question was well done by many of the candidates. **Parts (a)** and **(c)** were very well known but **parts (b)** and **(e)** were less well known. A significant proportion of the candidates did not recognise that copper, the least reactive metal, does not react with sulphuric acid.

Question 3

(a) (i) The calculation was poorly done by many of the candidates. Most were unable to state the equation used to calculate the charge, Q = It. Of those candidates who were able to quote the equation many failed to convert the time into seconds and obtained the answer 0.6C, whilst others used the resistance rather than the current and obtained an answer 21C.

(ii) Many candidates were unaware of the equation linking potential difference, current and resistance. The better candidates found this question easy.

(b) This question was poorly done even by the better candidates. The majority of the candidates did not recognise that all that was required was to subtract the answer to **part (a)(ii)** from 2V.

Answers: **(a) (i)** 36C **(ii)** 1.4V
(b) 0.6V

Question 4

(a) It is disappointing to note that a large number of candidates did not know the test for carbon dioxide. Many candidates incorrectly stated the test for either hydrogen or oxygen.

(b) (i) Many candidates are able to calculate the relative molecular masses of chemical compounds.

(ii) A large number of candidates were able to use the chemical equation to calculate the mass of carbon dioxide produced by burning 4g of methane. A number of candidates were awarded credit for correctly using incorrect relative molecular masses obtained in **part (i)**.

Answers: **(b) (i)** 16 (methane); 44 (carbon dioxide)
(ii) 11g

Question 5

(a) Many candidates had difficulty interpreting the information presented in the question. This was demonstrated by the number of candidates who did not use the colours associated with cobalt chloride paper, given in the question, in their answers. Many of the candidates confused cobalt chloride paper with Universal Indicator paper and stated colours associated with it.

(b) Many candidates knew that the process by which water is lost from a leaf is transpiration but very few were able to explain why water is more readily lost from the lower layer of the leaf. Candidates should be aware that the upper part of a leaf has a waxy surface and fewer stomata than the lower surface thus preventing the loss of water through the upper surface of the leaf.

(c) Only a small number of candidates were able to correctly identify the cell through which most water enters a plant as the root hair cell, however many more candidates knew that the process involved is osmosis.

Question 6

(a) Many candidates did not recognise that oxygen is lost by copper(II) oxide during the reaction and therefore the type of reaction the copper(II) oxide undergoes is reduction.

(b) The general properties of metals are not well known by many of the candidates. General properties of metals identified by the candidates included the conduction of both heat and electricity and high boiling and melting points.

(c) Only a small number of candidates were aware that the test for **pure** water is either it boils at 100^{o}C or freezes at 0^{o}C. A large number of candidates thought that the purity of water could be shown using Universal Indicator or using cobalt chloride paper, which only detects the presence of water not the fact that it is pure.

Question 7

(a) Many candidates correctly stated that the energy lost by the parachutist as he falls is potential energy but far fewer candidates identified the downward force acting on the parachutist as gravity.

(b) Many candidates attempted to describe why the rate of descent changed rather than how the graph shows that the acceleration is not constant. Candidates did not recognise that the fact that the acceleration is not constant because the line on the graph is a curve.

(c) The calculation was well done by many of the candidates, however the units of acceleration are not well known. A small number of candidates knew the equation F = ma but were unable to manipulate it to obtain a correct equation to calculate the acceleration.

Answer: **(c)** 3.75 m/s^2

Question 8

(a) This question was well answered by many candidates but unfortunately a significant proportion of the candidates spoilt their correct answers by writing that matt black was either a good conductor or emitter in addition to matt black being a good absorber of heat.

(b) The answers to this question were disappointing. Many candidates thought that both the mass and density of water increased when it is heated. Candidates should know that the mass of a substance does not change but its volume increases when it is heated. This results in a decrease in the density of the substance.

(c) Many candidates were able to state that the two components of the electromagnetic spectrum that have longer wavelengths than infra-red radiation are radio waves and microwaves.

Question 9

(a) Many of the candidates' responses to this question were related to what happens to the food after it has been swallowed. The question required an answer concerning the process of chewing. The expected responses were that chewing converts large pieces of food into smaller pieces and also helps to mix the food with saliva.

(b) Candidates one again focused on the process of digestion in the stomach rather than the function of the salivary gland. Candidates were expected to state that the salivary gland produces saliva, which lubricates the food and secretes enzymes, which convert starch into maltose.

(c) A minority of the candidates knew that bacteria grow between the teeth but many more were aware that tooth decay was a consequence of the acid produced by the bacteria.

Question 10

(a) The name of the ion responsible for acidity was quite well known. Many of the candidates who tried to give the formula of the ion gave the formula of an anion rather than the cation, H^+.

(b) The colours shown by Universal indicator when it is added to strong and weak acids are not well known by the majority of the candidates.

(c) (i) Too many candidates attempted to give the word equation rather than the symbol equation. Candidates are expected to know the formulae of substances stated in the syllabus and construct balanced chemical equations.

(ii) The answers to this question were very disappointing. A large number of candidates appeared to write random names of chemicals. Compounds that produce magnesium sulphate when they are added to sulphuric acid must be compounds of magnesium.

Question 11

(a) This question was well answered by many candidates although there was some confusion regarding charge and magnetic polarity.

(b) This question was very well answered by the majority of the candidates.

Question 12

The unit for the period of a pendulum was quite well known but many candidates used λ, the symbol used to denote frequency rather than the symbol for the unit Hz.

Question 13

(a) Only the better candidates were able to construct a correct diagram for a molecule of ammonia. Too many candidates did not know that an ammonia molecule contains three hydrogen atoms and simply drew the molecule as NH rather than NH_3.

(b) The conditions of temperature and pressure used in the manufacture of ammonia are not well known by the majority of the candidates. Candidates should know specific values of temperature and pressure for the Haber process and not simply high or low. Perhaps surprisingly the catalyst, iron, was also not well known.

(c) Another poorly answered question. The majority of the candidates stated the factors which influence the growth of plants such as, light and water, rather than state the elements, potassium and phosphorus, which are essential for the growth of plants.

Question 14

(a) A large number of the candidates were unable to state what is meant by the term famine. Disappointingly many candidates thought that famine was a disease or in some way related to HIV/AIDS.

(b) There were some good answers to this question but unfortunately the explanations were frequently too vague to gain credit. Candidates should know the causes of famine and why certain conditions lead to famine. For example, flooding causes famine because the plants/crops are washed away and drought causes famine because the lack of water causes crop failure.

Question 15

(a) The majority of candidates were able to draw a sinusoidal curve with equal positive and negative values, however many candidates did not score the third mark for completing the diagram to show two complete rotations of the coil.

(b) This question was poorly answered by many candidates. The majority of answers referred to increasing the current or voltage rather than increasing the number of turns in the coil or increasing the strength of the magnet.

Question 16

(a) The calculation proved very difficult for the majority of the candidates. Most candidates used the reading of the position of the lead weight from the metre rule and used a value of 70 in the calculation, rather than working out the distance of the lead weight from the knife edge. Similarly the distance of the iron rod from the knife edge was frequently given as 20 rather than 30.

(b) The vast majority of the candidates recognised that the rule becomes unbalanced but the direction of movement was frequently stated in vague terms, such as the rule goes downwards, without indicating that it was the left hand side of the rule which went downwards. Many candidates incorrectly thought that the iron rod becomes heavier due to the addition of the magnet rather than the iron rod being attracted towards the magnet.

Question 17

(a) (i) This question was done well by the better candidates, who realised that the aluminium atom loses three electrons to become an ion.

(ii) Too many candidates simply referred to the charge on the aluminium ion as being positive. The question required the candidates to state the value of the charge on the ion. Some candidates misunderstood the question and simply stated the electronic structure of aluminium or answered in terms of the nucleon or proton numbers.

(b) The vast majority of the candidates knew that aluminium is in Group 3 of the periodic table but very few then went on to state that metals appear on the left hand side of the periodic table. Despite having being given the electronic structure of aluminium in Fig. 17.1, many candidates did not refer to this information in their answer as the question required.

(c) Only the better candidates were aware that aluminium is corrosion resistant due to the formation of a protective oxide layer on the surface of the metal.

Question 18

(a) Whilst many candidates knew the name of the parts of a germinating seed they were unable to identify them correctly on the diagram.

(b) Many candidates were able to state that water and oxygen are conditions which affect the germination of a seed but too many candidates did not identify that the temperature had to be a suitable temperature. Some candidates misread the question and answered in terms of a plant rather than a seed and gave the conditions as sunlight or soil or fertiliser. Candidates should be aware that air is not an alternative to oxygen in this type of question.

Question 19

(a) This question required candidates to read the volumes from the diagram and subtract the two values. Most candidates were able to score at least one mark for reading one of the volumes and the candidates, who correctly read both volumes, invariably performed the subtraction correctly.

(b) This question was well done by many candidates.

Answers: **(a)** $12cm^3$
(b) $0.24cm^3$

Question 20

(a) The vast majority of the candidates were able to read the correct value of the extension from the graph.

(b) Those candidates who correctly worked out the extension were able to use the graph to find the load. A number of candidates calculated the extension and then tried to perform some sort of calculation rather than read the value of the load from the graph.

Answers: **(a)** 5 cm
(b) 4 N