COMBINED SCIENCE

Paper 5129/01
Multiple Choice

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

General comments

Candidates taking this year's examination showed a significant increase over the entry in 2006. The decrease in the mean score shown last year is continued this year with a score of 14.26, down from 16.59. The standard deviation for 2007 was 4.16. No question proved to be very easy although **Question 11** on magnetic induction came very close. The most difficult Question was **Question 9** which showed widespread guessing among all candidates.

Comments on specific questions

Questions 1 to 13

Question 1

Did not discriminate well with options **A** and **D** attracting more candidates than did the key, option **B**.

Question 2

Acceleration was well known by the majority of candidates. **D** was the favoured incorrect option.

Question 3

Options **B** and **D** attracted responses from the majority of candidates with twice as many correctly choosing option **D**.

Question 4

Discriminated well with lower ability candidates evenly divided between the incorrect options **A**, **B** and **D**.

Question 5

Almost a third of candidates considered cork to be a good conductor!

Question 6

Refraction from a dense to a less dense medium was not well known; option **B** attracted more than twice as many responses than did the key, option **D**.

Question 7

C/s as an alternative to the ampere was well known.

Question 8

A significant 40% of candidates did not know the behaviour of the current in a series circuit!

Question 9

Showed widespread guessing among candidates with the majority divided fairly equally between options **B**, **C** and **D**. Option **B** appeared to attract a large number of more able candidates and option **D** collected slightly more responses than did the key, option **C**.

Question 10

Showed good discrimination although more than half of the candidates, using I = V/P, chose option **B**.

Question 11

Magnetic induction was well known with almost 80% of candidates correctly choosing option **B**.

Question 12

The majority of candidates were divided between options **B** and **C** with **B** attracting slightly more than **C**, the key.

Question 13

The most well known property of α-particles was known by the more able candidates. The less able candidates were equally divided between options **C** and **D**.

Questions 14 to 27

Question 14

Many candidates have difficulty interpreting chromatograms. Over 50% of the candidates thought that the ink contained dye 1 and dye 2 and chose option **A**. Candidates should be aware that a particular dye can be identified by the distance it travels up a chromatography paper.

Question 15

Only a quarter of the candidates recognised that a positive ion contains more protons than electrons.

Question 16

This proved to be a difficult question for majority of the candidates. Elements which form ionic chlorides are metals and have one, two or three electrons in their outer shell. There was evidence of widespread guesswork even amongst the better candidates.

Question 17

There was evidence of guesswork amongst the candidates. The good candidates were aware that a covalent bond represents a shared pair of electron.

Question 18

The majority of the candidates did not recognise that hydrogen is a gas and would not contribute to the final mass of the mixture. Over 50% of the candidates simply added the mass of calcium and water together and chose option **D**.

Question 19

It was disappointing to see that a high proportion of candidates thought that an oxide that reacts with both hydrochloric acid and sodium hydroxide is an acidic oxide and chose option **A**.

Question 20

The displacement reaction of the halogens are not well known. There was evidence of widespread guesswork in this question.

Question 21

A large proportion of the candidates thought that copper is a non metal and chose option **B**. As a metal, copper is a good electrical conductor and has a high melting point and a high density.

Question 22

The experiments that show the reactivity of metals are not well known by many of the candidates. Once again there was evidence of guesswork particularly amongst the weaker candidates.

Question 23

This question proved to be difficult for the majority of the candidates. A large number of candidates did not recognise that the carbon dioxide in the air is removed by the sodium hydroxide and chose option **B**. A significant proportion of the candidates did not notice that the air passing into the apparatus is **dry** air and does not contain water vapour and chose option **C**.

Question 24

The better candidates know the conditions for the Haber process.

Question 25

The better candidates knew that process **C** involved cracking, however, a large number of candidates chose option **D**, which is polymerisation.

Question 26

The test for an alkene is not well known. A significant proportion of the candidates thought that carbon dioxide decolourises bromine water. There was evidence of guesswork particularly amongst the weaker candidates.

Question 27

This was another question where there was evidence of guesswork even amongst the better ca
Candidates were not aware that when an organic compound burns in **a plentiful supply** of air, c
monoxide is not produced.

Questions 28 to 40

Question 28

This question worked well, although some candidates were confused by the idea that animal cells may contain small non-permanent vacuoles.

Question 29

This question also discriminated well. The better candidates could interpret the osmosis experiment successfully.

Question 30-31

Surprisingly, these straightforward questions (about the leaf and the gut) were correctly answered by a relatively small proportion of candidates.

Question 32

Few candidates were able accurately to apply their knowledge of the circulatory system to this question.

Question 33

This question required candidates to identify cause and effect in the control of breathing.

Question 34

Better candidates realised that urea is normally present in both blood and urine.

Question 35

Without a diagram to help them, weaker candidates were unsure of the relative positions of the different parts of the eye.

Question 36

This was a fairly easy question, but it discriminated well.

Question 37

Candidates need to understand that, for any natural food web, the energy input is sunlight.

Question 38

The better candidates realised that the carbon cycle includes both absorption and excretion of carbon compounds.

Question 39

This question worked well.

Question 40

Most candidates understood the menstrual cycle, and were able to answer this question correctly.

COMBINED SCIENCE

Paper 5129/02

Theory

General comments

In general the paper was more accessible than in previous years. Candidate found the questions involving experimental situation difficult due to the inability to apply scientific knowledge to practical situations, particularly in the Biology questions. There was an improvement in some of the calculations in the Physics questions with the candidates becoming more aware of the necessity for units in their answers.

Comments on specific questions

Question 1

(a) A large number of the candidates were able to correctly state the number of protons in the nucleus and hence calculate the number of neutrons.

(b) Once again the majority of the candidates could calculate the values of A and Z.

Question 2

This question proved difficult for many candidates. Only a small number of candidates knew that light waves are transverse and travel at a speed of 3×10^8 m/s. A larger number of candidates were able to identify the wavelength and the frequency.

Question 3

(a) The vast majority of the candidates were able to calculate how far up the test-tube the water rises.

(b) The fact that oxygen gas is used up during rusting was well know by the candidates.

(c) A smaller number of candidates could correctly identify that water is the other substance required for iron to rust.

(d) (i) Only a small number of candidates were able to explain the meaning of the term *galvanising*. Candidates should know that the process of galvanising involves coating iron with zinc in order to prevent contact between iron and oxygen and water.

(ii) Most candidates were able to suggest another method that could prevent iron from rusting; the most common answers were by painting or covering with grease or oil.

Answer: **(a)** 25 mm

Question 4

(a) A majority of the candidates knew that the indicator solution became yellow when a person breathes through the solution

(b) (i) Many candidates found it difficult to use the information about the hydrogen carbonate in the question and could not state the colour change which occurred during the experiment.

(ii) The majority of candidates recognised that the process which occurs in the plant when it is in light as photosynthesis, and it was pleasing to note that many of these candidates were able to write an equation to represent the process. Candidates were expected to state that one of the products of photosynthesis is glucose rather than the general statement that it is a sugar or a carbohydrate. Only a small number of candidates were able to state how the hydrogen carbonate indicator colour changed during photosynthesis. There would be less carbon dioxide in the apparatus and therefore the indicator changes from yellow to red.

(iii) Many candidates were aware that excretion was the removal of toxic waste products. A surprisingly small number of candidates recognised the waste product generated during photosynthesis as oxygen, even those candidates who had correctly written the equation for photosynthesis. A large number of candidates answered the question in terms of mammalian excretion instead of plant excretion and named the waste product as urea or carbon dioxide. Only the best candidates were able to state that oxygen is not excreted because it is used in respiration.

Question 5

(a) The majority of the candidates identified lamp **P** would be lit

(b) (i) Many candidates were able to correctly state the equation for calculating the resistance of lamp **Q** but either had difficulty manipulating the equation or calculating the value of the resistance from the ratio 230/0.5. The unit of resistance was well known.

(ii) This was poorly done by many of the candidates. A significant number of candidates simply stated the number calculated in **(b)(i).**

(iii) Another poorly answered question, the vast majority of the candidates gave the current as 0.5A, ignoring lamp **P** in the circuit.

(c) Many candidates stated the original form of energy as 'chemical' ignoring the question which was about the energy changes 'inside the bulb'. Many candidates were aware that the energy was being converted into heat and light.

Answer: **(b) (i)** 460Ω
(ii) 230V
(iii) 1A

Question 6

(a) Large numbers of candidates were unable to calculate the relative molecular masses of simple substances and incorrect answers did not fit a clear pattern. Some candidates used atomic numbers instead of relative atomic masses. Of those candidates who could do the calculation some gave the relative molecular mass of carbon monoxide as 56, presumably because of the stoichiometry of the equation.

(b) Candidates who used the correct process for calculating the answer using incorrect relative atomic masses from **(a)** were awarded credit.

(c) (i) This question was poorly done. Most candidates stated that carbon monoxide was ... cars or factories. Candidates were asked to explain how the carbon monoxide gets into ... state the source of the gas. Candidates were expected to state that the carbon mon... caused by the incomplete combustion of fuels.

(ii) The poisonous nature of carbon monoxide was not well known. Candidates who explained how carbon monoxide combines with haemoglobin forming carboxyhaemoglobin were given credit for their answer. A large number of candidates thought that carbon monoxide was responsible for global warming or destruction of the ozone layer.

Answer: **(a) (i)** 44
(ii) 28
(b) 2.8 g

Question 7

(a) A large number of candidates were able to state the letters and names of the two parts of the cell that show it is a plant cell.

(b) An easy question for many candidates the names of parts of plant and animal cells are well known.

Question 8

(a) Only a small number of candidates were able to draw a correct reflected ray in line with the image of the pin. Many candidates drew a line from the image of the pin to the mirror (at the correct angle) but did not include the reflected ray on the correct side of the mirror. Some answers did not give an arrow on this "behind mirror" line but labelled it as "reflected ray".

(b) (i) Many candidates were able to state the equation for calculating the refractive index.

(ii) Only a minority of the candidates could use the stated equation for the refractive index to calculate the angle **X**. Many candidates simply subtracted the angle of refraction from 90 to give the answer 55.

Answer: **(b) (ii)** 56^{o}

Question 9

(a) This question was quite well done by many of the candidates, however the use of paraffin for jet aircraft fuel and heavy oils for waxes and polishes were less well known.

(b) (i) Many candidates do not know the general characteristics of a homologous series. Candidates should be aware that members of a homologous series all share the same general formula, have the same chemical properties and show a gradation in physical properties.

(ii) Quite a large number of candidates were able to deduce the molecular formula of octane. Some candidates drew the structural formula of octane suggesting that there is some confusion between the terms structural and molecular formula.

Question 10

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

Question 11

(a) The majority of the candidates identified the gas produced when metals react with acids.

(b) This part of the question was very poorly answered. The majority of the candidates gave the test for hydrogen rather than the test to show that hydrochloric acid is acidic.

(c) Another well answered question. Many candidates are aware of the differences in reactivity of metals and hydrochloric acid.

Question 12

(a) (i) Many candidates did not know that the blood vessel that carries blood from the heart to the lungs is an artery. Many candidates stated that it was red blood cells suggesting that candidates are not aware of the meaning of the expression 'blood vessel'.

(ii) There is a great deal of misunderstanding amongst the candidates about the gaseous exchange that occurs in the lungs. Candidates should know that the concentration of oxygen in the blood increases and the concentration of carbon dioxide decreases as the blood passes through the lungs. A large proportion of the candidates recognised that oxygen is carried by the blood but thought that it was oxygenated in the heart. A number of candidates simply described that blood passes through the lungs without mentioning any of the changes that occurred.

(b) The role of the platelets in the blood in the event of a cut was not well known. Some of the candidates realised that the platelets are responsible for the blood clotting but they could not continue their explanation to say how the clotting occurs. Many candidates did not know that the white blood cells engulfs bacteria and thereby prevent infection in the cut. The fact that the white blood cells also produce antibodies was only rarely stated by even the very best candidates.

Question 13

(a) The majority of the candidates were able to correctly label the poles of the bar magnet and the piece of iron. This part of the syllabus is well understood.

(b) Many of the candidates identified steel as another magnetic material, although a number of the candidates gave the names of familiar household objects.

(c) A large number of candidates were able to state that the strength of an electromagnet is increased by changing the number of turns on the coil, however the other two methods of changing the strength, changing the current and changing the size of the core, were less well known.

Question 14

(a) A surprisingly large number of the candidates answered the question in terms of the total number of electrons in a potassium atom rather than the number of electrons in the outer shell of a potassium atom.

(b) This question was very poorly done, the majority of the candidates did not know the formula of chlorine gas and therefore gained no credit. The candidates should be able to deduce balanced chemical equations for simple chemical reactions.

(c) The type of bonding present in a compound formed from a metal and non metal was stated as ionic only by the better candidates. Some candidates simply described it as chemical bonding.

Question 15

(a) This was well answered by the majority of the candidates. Most candidates who did not obtain credit misread the scale on the x-axis.

(b) This question was surprisingly very poorly done. All the candidates were required to do was add the answer to part **(a)** to 10.2 in order to calculate the length of the spring. Many candidates went through complicated calculations which were difficult to understand.

(c) Quite a large number of candidates stated that the length of the spring is measured by the use of a ruler, however the majority of the candidates did not know that the load on the spring is measured by either a spring balance or a newton meter.

Question 16

(a) A surprisingly small number of candidates were able to state that the name given to atoms of the same element with different nucleon numbers is isotope.

(b) (i) A significant number of the candidates were able to identify the particles in the nucleus of the boron atom.

(ii) Many candidates were able to complete the diagram to show the electronic structure of boron.

Question 17

(a) This question was poorly answered by many of the candidates. A variety of answers were seen, however 14 days and 7 days were frequently stated by the candidates, rather than 28 days.

(b) Another poorly answered question. Many candidates were unaware of when ovulation and menstruation occurred in the cycle. Candidates cannot link the two processes to the variation in the thickness of the uterus lining.

(c) The vast majority of the candidates were able to identify that the mechanical method of contraception was a condom and that this prevented the sperm entering the vagina. However, only a very small proportion of the candidates recognised that the natural method of contraception was abstinence. The majority of the candidates thought that this method of contraception was vasectomy.