

# COMBINED SCIENCE

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**Paper 5129/01**  
**Multiple Choice**

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

## General comments on whole paper

A total of 1431 candidates produced scores in the range 4 to 40 with a mean score of 15.44 (15.69 in 2009) and a standard deviation of 4.99 (4.67 in 2009).

## Comments on individual questions (Physics)

No question proved to be very easy. However, only **Question's 10** and **11** proved to be difficult, with evidence of guessing even amongst the better candidates.

**Question 1** was well answered with less able candidates favouring either option B or C.

**Question 2** was also well answered with the majority of candidates choosing option C (correct) and most of the remainder option A.

**Question 3** Candidates who appreciated that the rock was irregular correctly chose option A; those who did not, chose either option B or C with the latter attracting some of the better candidates.



**Question 4** discriminated well with less able candidates choosing option D.

**Question 5** The energy source used in a nuclear reactor was not well known with each incorrect option attracting a significant response which, for option A, included some of the better candidates!

**Question 6** showed some uncertainty among candidates, with almost as many incorrectly choosing option B as correctly chose option A. Option C also attracted a significant response.

**Question 7** and **Question 8** were both answered well, with the most popular incorrect responses being option B in **Question 7** and option D in **Question 8**.

**Question 9** A number of more able candidates incorrectly chose option A, perhaps guilty of jumping to the conclusion that it was a  $V=IR$  question.

**Question 10** and **Question 11** showed uncertainty and guessing, even among the better candidates, with all options attracting a significant response. In **Question 10**, the tendency of candidates to use the time unit of the question was again evident, with twice as many candidates choosing option B compared with the numbers choosing the correct response, option D. In **Question 11** a significant number of the more able candidates chose option B.

**Question 12** showed good discrimination with option D attracting the majority of the incorrect responses.

**Question 13** the choice of three quarters of the candidates gave either the electron (38%), or the proton, (37%) as their response, with the remainder of the candidates almost equally divided between the two remaining options.

#### **Question 14**

The majority of the candidates hold the misconception that the volume of the distillate increases in a linear way, and these candidates chose option C.

#### **Question 15**

Over 50% of the candidates, including many of the better candidates, chose option A, which is the electronic structure of a sulfur atom rather than the electronic structure of a sulfide ion.

#### **Question 16**

This was an easy question for many of the better candidates, but there was evidence of guesswork amongst the remaining candidates.

### **Comments on individual questions (Chemistry)**

#### **Question 17**

The better candidates knew that there are two shared pairs of electrons between the two carbon atoms in an alkene.

#### **Question 18**

There was evidence of guesswork amongst even the better candidates.

#### **Question 19**

Almost 50% of the candidates chose option A. Reacting potassium and chlorine together is not the most appropriate method of preparing potassium chloride in a laboratory. Candidates should know that a soluble salt is prepared by reacting an acid and an alkali together.

### Question 20

The relationship between the Periodic Table and the type of oxide is not well understood by the candidates. There was evidence of widespread guesswork amongst the candidates.

### Question 21

Almost a third of the candidates, including many of the better candidates, chose option **C**, implying that these candidates think that copper reacts with hydrochloric acid.

### Question 22

The reactions that occur in the blast furnace are not well known by the majority of the candidates. There was evidence of widespread guesswork.

### Question 23

This question proved difficult for over 70% of the candidates, who chose option **B**. These candidates did not recognise that both inhaled air and exhaled air is made up of largely nitrogen, which is not used by the body.

### Question 24

A large number of candidates were able to select the most appropriate fertiliser for growing potatoes.

### Question 25

The better candidates correctly identified the product of complete combustion but there was evidence of guesswork by the weaker candidates.

### Question 26

A disappointing number of candidates chose option **B**, which was the substance that is cracked to give hydrogen and gas Y. Over 50% of the candidates knew that aqueous bromine is used to detect a double bond but unfortunately quite a number of candidates chose option **D**, which cannot be produced from ethane.

### Question 27

This question was quite well answered by the better candidates but almost a third of the candidates saw the word vinegar in the question and chose option **C**, ethanoic acid.

### Comments on individual questions (Biology)

#### Question 28

This was a straightforward question, but weaker candidates found it surprisingly difficult.

#### Question 29

Although some candidates were evidently guessing, it is pleasing that many were able to interpret the data in this question correctly.

#### Question 30

A common misconception was that chewing breaks up the large molecules in food.

#### Question 31

This question worked well. Again, the better candidates were able to interpret the data correctly.

**Question 32**

A common mistake was to confuse the artery and the vein.

**Question 33**

Evidently, some candidates were guessing here.

**Question 34**

The commonest error was to think of the removal of undigested food as excretion.

**Question 35**

This straightforward question discriminated well between candidates.

**Question 36**

There was plenty of guessing here – candidates are not clear that alcohol and heroin are both depressants.

**Question 37**

Again, there was evidence that many candidates were guessing.

**Question 38**

This was a fairly easy question.

**Question 39**

Many candidates do not realise that the cotyledons are part of the embryo of a seed.

**Question 40**

As in previous years, candidates show uncertainty about birth control methods. More than half thought that a vasectomy prevents sperm production.



# COMBINED SCIENCE

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Paper 5129/02

Theory

## General comments

The Chemistry sections of the paper were not as well answered as in previous examinations, in particular questions involving the Periodic Table, the purification of water supplies and the combustion of hydrocarbons. In the Biology section of the syllabus the structure and function of a leaf and the carbon cycle were not well known by the majority of the candidates. Candidates continue to have difficulty supplying the correct units for the results of Physics calculations.

## Comments on specific questions

### Question 1

- (a) The majority of the candidates knew the symbol for a voltmeter but fewer candidates were able to place it correctly in parallel with the  $6\Omega$  resistor.
- (b)(i) The calculation was well done by many candidates. However, the unit given was frequently incorrect.
- (ii) This calculation was extremely well done by the majority of the candidates.

Answer: (b)(i) 1.2V  
(b)(ii)  $9\Omega$

### Question 2

- (a) Many candidates were able to identify the two elements as magnesium and aluminium, and were able to categorise them as metals in order to explain their electrical conductivity.
- (b) The nature of the oxides of magnesium and phosphorus was not well known. Candidates are expected to know that the oxides of metals are basic and the oxides of non-metals are acidic and would therefore cause Universal Indicator to change to a colour indicating acidity or alkalinity as appropriate.
- (c) A large number of candidates simply restated the question and made no reference to the similarity in the outer shell electronic structure which causes these elements to have similar chemical properties.

### Question 3

- (a) Only the more able candidates were able to interpret the graph correctly.
- (b) A large number of candidates thought that the ciliary muscles were responsible for bringing about the changes in pupil size, rather than the iris.
- (c) A large number of candidates were able to show how the diameter of the pupil of the left eye would change with time if the eye stayed in the dark.
- (d) The more able candidates knew that the receptors are found in the retina.

#### Question 4

- (a) This question was answered correctly by a majority of the candidates.
- (b) Only a small number of candidates were able to state the nature of a beta-particle.
- (c) This was another question answered correctly by the majority of the candidates.
- (d) The majority of the candidates were unable to demonstrate an understanding of the concept of half life.

Answers: (a) 27  
(c) 32  
(d) 11 400 years

#### Question 5

The formation of urea and the route of its excretion are not well known by the candidates.

#### Question 6

- (a) This question was poorly answered by the majority of the candidates. A large number of the candidates simply stated the product of the reaction between ammonia and nitric acid rather than the type of reaction.
- (b) The more able candidates were able to correctly calculate the relative molecular masses.
- (c) A significant proportion of the candidates who were able to calculate the relative molecular masses in part (b) were able to calculate the mass of ammonia. Candidates who incorrectly calculated the relative molecular masses but used their incorrect values to calculate an answer using the correct method were given credit.

Answers: (b) 17  
80  
(c) 0.425 kg

#### Question 7

- (a) A large number of candidates stated that a matt black surface was a good absorber of heat, which is a correct statement but it is not an explanation as to why the temperature of water falls more quickly in can B than in can A. Candidates were expected to state that the matt black surface is a better emitter than the silver surface of heat radiation.
- (b) The majority of the candidates were unable to state that heat is transferred through the metal of the cans by conduction. The most common response was 'by convection'.
- (c) Few candidates answered this question correctly. Candidates stated simply that hot air rises and cool air sinks without offering any explanation as to why hot air rises.

#### Question 8

- (a) The majority of candidates were unable to state the two processes involved in the purification of water supplies. Candidates were expected to give the answers 'filtration' and 'chlorination'. Those candidates, however, who suggested sedimentation were also given credit. Candidates who gave the answers 'distillation' or 'boiling' were not given credit, as the question was set within the context of the purification of water from reservoirs.
- (b) This question was poorly answered by even those candidates who correctly stated the processes in part (a). A significant number of candidates were aware that chlorination kills the bacteria in the water but many candidates did not explain fully how filtration makes the water fit to drink. A number of candidates thought that filtration removes both soluble and insoluble material.

### Question 9

- (a) Only the most able candidates were able to identify the tissues **X** and **Y**.
- (b) Once again, only the most able candidates were able to state that the spongy mesophyll was the tissue with the most air spaces.
- (c) A significant number of candidates identified the importance of stoma during photosynthesis but very few candidates were able to state that the process by which carbon dioxide enters the leaf is diffusion. A large number of answers were limited to describing the process of photosynthesis.
- (d) The majority of candidates were unable to explain why a leaf is thin. Candidates were expected to state that the shape of the leaf means that the diffusion of carbon dioxide is over a short distance and that light is able to penetrate to all parts of the leaf.

### Question 10

- (a) This question was well answered by the majority of the candidates. Some candidates mistakenly thought that carbon is a magnetic material.
- (b)(i) Most candidates stated that plastic is a poor electrical conductor.
- (ii) The majority of the candidates knew that iron is used for the core of a transformer. Less able candidates gave steel as their answer.

### Question 11

- (a) A significant number of candidates could name the ore of iron as haematite.
- (b)(i) Only a small proportion of the candidates were able to balance the equation correctly.
- (ii) The chemical definition of reduction was not well known. The majority of the candidates gave a non-scientific response, for example: "to make smaller or less".
- (iii) This question was answered inaccurately by many of the candidates. It was evident from the responses that candidates were not aware of the chemical reactions that occur in a blast furnace. Candidates were expected to state that the coke in the furnace reacts with oxygen in the air to form carbon dioxide which further reacts with coke to form carbon monoxide.
- (c) Only the more able candidates were able to suggest that the high reactivity of sodium was the reason for it not being extracted using the same process as iron.

### Question 12

- (a)(i) A large proportion of the candidates were able to read the wavelength of the wave from the graph. A number of the weaker candidates stated that the wavelength is 30 rather than 60.
- (ii) The amplitude of the wave was correctly stated by the majority of the candidates.
- (b) The definition of a transverse wave was not well known.

### Question 13

- (a) A large proportion of the candidates were able to explain that the function of the teeth is to break down large pieces of food into smaller pieces but fewer candidates were able to state why it is necessary for the food to be in smaller pieces. Credit was not given to those candidates who referred to chemical digestion rather than mechanical digestion.



- (b)(i) Many candidates incorrectly identified town A, rather than town B, as having the higher water fluoride concentration. Of those candidates who correctly identified town B, many stated simply that fluoridation prevents tooth decay rather than using the information from the bar chart to state that the occurrence of tooth decay in town B is lower than in town A.
- (ii) A large proportion of the candidates did not gain credit for their answers because they did not state to which town they were referring in their answers.

#### Question 14

- (a) A significant proportion of the candidates were unable to identify **A** as infra-red. It was disappointing to see responses which were not regions of the electromagnetic spectrum.
- (b) This question was well answered by the majority of the candidates.
- (c) This question was well answered by the more able candidates.

#### Question 15

- (a) The stages in the carbon cycle are not well known by the majority of the candidates, although this question was answered correctly by the most able candidates.
- (b) The processes in the carbon cycle are less well known than the stages. Only processes **X** and **Y** were stated correctly by the candidates on a regular basis

#### Question 16

- (a) The more able candidates are aware of the general properties of metals.
- (b) Many responses to this question were incorrect. Weaker candidates did not recognise that a liquid has a melting point below room temperature and a boiling point above room temperature.
- (c) Candidates were often unable to identify the covalent solid from its melting and boiling points.

#### Question 17

- (a) More able candidates were able to answer this question correctly. A number of the candidates were able to state the formula for calculating the time but were unable to correctly substitute the numbers into the equation.
- (b) This calculation was well done by a significant proportion of the candidates but many had difficulty stating the correct units.

Answers: (a) 4.0s  
(b) 3.2J

#### Question 18

- (a) A large number of candidates were able to state that carbon dioxide is produced when a hydrocarbon burns completely but fewer candidates knew that the other product is water. Many candidates suggested incorrectly that hydrogen or carbon monoxide is one of the products of complete combustion.
- (b) The concept of incomplete combustion appears not to be well understood by the majority of the candidates. When a hydrocarbon is burnt in a limited supply of air, carbon monoxide is produced and this gas is poisonous. A large number of the candidates stated that the danger of burning methane in a poorly ventilated room was that it would cause an explosion.
- (c) The characteristics of an homologous series are not well known by the majority of the candidates.



**Question 19**

- (a) This question was well answered by many of the candidates although there were a number of answers which gave the forms of energy in the reversed order.
- (b) The definition of the period of a pendulum is not well known. Consequently the most common answer to this question was 1s.

*Answer:* (b) 0.5s

**Question 20**

- (a) The changes in the thickness of the uterus lining during the menstrual cycle were generally not well understood and the candidates' choices for the dates were therefore almost invariably incorrect.
- (b)(i) A small number of candidates were able to state that the average length of a menstrual cycle is 28 days.
- (ii) Only the more able candidates were able to suggest two factors which cause the length of the menstrual cycle to be longer or shorter than the average. The most common responses were stress, pregnancy and diet.

**Question 21**

- (a) Many candidates were unable to give the name of the process.
- (b)(i) Only the most able candidates were able to explain that yeast provides enzymes which catalyse fermentation.
- (ii) Only a minority of the candidates were able to relate the fact that ethanol is oxidised by air to the need to carry out fermentation in an air-free environment.
- (c) A significant number of candidates knew that two liquids are separated by fractional distillation.
- (d) Only the most able candidates were able to draw the structure of ethanol.

