

# COMBINED SCIENCE

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<b>Paper 5129/01</b> <b>Multiple Choice</b>
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<i>Question Number</i>	<i>Key</i>	<i>Question Number</i>	<i>Key</i>
1	<b>B</b>	21	<b>C</b>
2	<b>C</b>	22	<b>A</b>
3	<b>A</b>	23	<b>C</b>
4	<b>A</b>	24	<b>A</b>
5	<b>D</b>	25	<b>D</b>
6	<b>A</b>	26	<b>B</b>
7	<b>C</b>	27	<b>D</b>
8	<b>D</b>	28	<b>A</b>
9	<b>C</b>	29	<b>B</b>
10	<b>B</b>	30	<b>D</b>
11	<b>C</b>	31	<b>B</b>
12	<b>A</b>	32	<b>A</b>
13	<b>D</b>	33	<b>B</b>
14	<b>A</b>	34	<b>C</b>
15	<b>C</b>	35	<b>A</b>
16	<b>B</b>	36	<b>B</b>
17	<b>D</b>	37	<b>C</b>
18	<b>B</b>	38	<b>B</b>
19	<b>A</b>	39	<b>C</b>
20	<b>B</b>	40	<b>D</b>

## General comments

This paper produced a mean score of 16.59 and a standard deviation of 5.06, last year the corresponding figures were 17.39 and 4.74 respectively. Guessing among candidates, including some of the more able, was once again evident in a number of questions, in particular **Question 8**.

### **Question 1**

In choosing option **A**, 15% of candidates consider that acceleration produces no change in speed!

### **Question 2**

Good discrimination, with the majority of less able candidates choosing option **D**.

### Question 3

Three-quarters of all candidates chose either option **C** or **D**, **D** attracting over twice as many as **C**. The remaining candidates, consisting mainly of the more able, were roughly divided equally between options **A** and **B**.

### Question 4

Discriminated well with 54% of candidates correctly choosing option **A** and the remainder, mostly lower ability candidates, evenly spread over the remaining options.

### Question 5

Most candidates were divided between options **B** and **D** with the majority correctly choosing option **D**. Some able candidates appeared to choose option **C**.

### Question 6

Properties influencing the radiation of heat from a surface continues to be well known.

### Question 7

Demonstrated the usual uncertainty of candidates has to whether 2 parameters in an equation are to be multiplied or divided. Slightly more candidates, including some of the more able, incorrectly chose option **A**.

### Question 8

With more candidates choosing each of the incorrect options than did the correct one, option **D**, this is an area of the syllabus that is clearly not well known. A significant number of more able candidates were attracted to option **B**.

### Question 9

Discriminated well with the majority of less able candidates choosing the easiest combination of voltmeter and ammeter readings to give 24, option **D**!

### Question 10

Candidates responses indicated a level of uncertainty as to the behaviour of current entering a junction with almost as many, including more able candidates, choosing the distractor option **A** as did the correct option, **B**.

### Question 11

It is pleasing to note that 81% of candidates appreciated that the core material of an electromagnet needed to magnetise easily, option **C** and **D**. However, almost half of these candidates considered the second property was to retain its magnetic strength.

### Question 12

Reasonably well known with 56% choosing correctly, option **A**. The remaining candidates were almost equally spread over each of the remaining distractors.

### Question 13

Uncertainty and guessing among candidates was apparent with large numbers choosing each of the four options.

### Question 14

Almost 50% of the candidates chose option **A** recognising that a gas that is less dense than air and insoluble in water cannot be collected by downward delivery. There was evidence of guesswork amongst the weaker candidates.

### Question 15

Only the better candidates were able to combine the two pieces of information about the number of electrons and neutrons. Significant numbers of candidates opted for option **B**, which has 12 electrons and 12 neutrons, or option **D**, which has 10 electrons and 11 neutrons.

### Question 16

This question proved to be difficult for the vast majority of the candidates. Candidates did not recognise that Q and J form an ionic compound with Q losing two electrons and 2 atoms of J gaining one electron each to give a formula  $QJ_2$ . Almost 60% of the candidates chose option **D**.

### Question 17

The better candidates recognised that the compound  $XZ_2$  was a covalent compound formed from sulphur and chlorine. The majority of candidates recognised the covalent nature of the compound but with the weaker candidates there was evidence of guesswork as to which elements combined together.

### Question 18

Once again the better candidates were able to perform the calculation correctly but there was evidence of guesswork from the weaker candidates.

### Question 19

There was evidence of widespread guesswork even amongst the better candidates. It was disappointing to note that a third of the candidates thought that an alkali turns blue litmus red, which is the test for an acid.

### Question 20

An easy question particularly for the better candidates.

### Question 21

The reactivity series is well understood by the better candidates. Candidates should be aware that an element displaces elements below it in the reactivity series. A significant number of candidates chose option **B**, which are elements above zinc in the reactivity series.

### Question 22

An easy question for the majority of candidates.

### Question 23

Candidates did not appreciate the importance of the evidence provided by tube 3. The boiled water does not contain any air and therefore the fact that iron does not rust in tube 3 but does rust in tube 2, which contains dissolved oxygen/air shows that air is required for iron to rust.

### Question 24

Many candidates could not recall the conditions used in the Haber process. There was evidence of guesswork even amongst the better candidates.

### Question 25

Almost 40% of the candidates chose option **B**, which is the formula of ethane, an alkane. Candidates should be able to recognise types of hydrocarbon from the molecular formula.

### Question 26

The better candidates knew that aqueous bromine is used to test for an alkene and that alkenes contain a carbon to carbon double bond and chose option **B**. Over a third of the candidates, particularly the weaker candidates, chose option **C**, which is an alkane, propane.

### **Question 27**

This question proved difficult for many of the candidates. Option **C** was chosen by 50% of the candidates, which shows the hydration of ethene by water to form ethanol. Option **D** shows the oxidation of ethanol to ethanoic acid.

## **Biology**

### **Question 28**

This question proved more difficult than expected, with many candidates thinking that a partially permeable membrane (rather than a single large sap vacuole) is a feature that distinguishes animal and plant cells.

### **Question 29**

This question discriminated well, but again many candidates thought that the plant cell wall is selectively permeable.

### **Question 30**

This was a straightforward question, which was relatively easy.

### **Question 31**

Better candidates recognised the chloroplast as the place where light energy is converted into chemical energy, but weaker candidates were guessing.

### **Question 32**

Very few candidates understood that bacteria in the mouth release acids.

### **Question 33**

This simple question was answered correctly by two-thirds of candidates.

### **Question 34**

This question discriminated well. The weaker candidates seemed to be guessing.

### **Question 35**

This was a straightforward question about anaerobic respiration, but it proved to be surprisingly difficult.

### **Question 36**

Many candidates do not understand the meaning of excretion. Food egested from the gut is not a waste product.

### **Question 37**

Some of the better candidates did not realise that the pupil reflex is a quick response – so, a change taking place over 50 seconds must be caused by a slow change in light intensity.

### **Question 38**

Most candidates knew the damaging effects of alcohol, although a few do not realise that it is a depressant.

### **Questions 39-40**

These questions worked well in discriminating between candidates.

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Paper 5129/02

Theory

## General comments

In many cases candidates demonstrated poor mathematical skills particularly in the manipulation of equations and sometimes in simple arithmetic. The paper showed that candidates are more able to answer questions which require simple recall of knowledge but have some difficulty in applying that knowledge to specific situations particularly in the Biology question, demonstrated by the pupil responses to **Questions 4** and **16**. The level of chemical knowledge was disappointing with some questions proving difficult for many of the candidates. In the Physics questions candidates have problems with the units in the calculation questions.

## Comments on specific questions

### **Section A**

#### **Question 1**

- (a) (i) Haematite was not well known as the ore of iron. Many candidates simply restated the substance given on the diagram without realising that all three substances are added to the blast furnace.
- (ii) Limestone is added to the blast furnace in order to remove the acidic impurities to form slag. Candidates seem to be unaware of the chemical reactions that occur in the blast furnace.
- (b) A significant number of candidates knew that sodium is a reactive metal but only the best candidates stated that sodium is more reactive than carbon. The candidates should be aware that the method used to extract a metal is related to the relative reactivity of that metal.
- (c) (i) A large number of candidates knew that alloys are made up of metals but many of candidates were penalised because they stated that alloys are a combination of metals rather than a **mixture** of metals. Metals do not combine together to form alloys.
- (ii) Unfortunately a large number of candidates stated that stainless steel was used to make knives, forks and spoons. Credit was not given for this response as it was given in the question. Candidates were expected to state another use of stainless steel such as chemical plant, car exhausts or medical instruments.
- (d) The two metals present in brass were quite well known but a number of candidates thought that iron was one of the metals.

#### **Question 2**

- (a) A large number of candidates were able to interpret the speed-time graph and state correctly when the car was at rest.
- (b) The calculation was well done by many of the candidates however a significant number of candidates correctly stated the relationship speed equals distance divided by time and then incorrectly manipulated the equation to produce distance equals speed divided by time.
- (c) Many candidates were unable to interpret the speed-time graph. Candidates should be aware that constant acceleration is shown by a straight line on the speed-time graph.

Ans : (b) 200 m

### Question 3

- (a) Candidates answered this question by stating the difference between speed and velocity. The explanation required was that the direction of the satellite changes as it orbits the Earth.
- (b)(i) The majority of the candidates correctly suggested that the colour of the satellite should be white or silver.
- (ii) Candidates were expected to state that white was the chosen colour because it is a good reflector or poor absorber of light. Candidates who stated that white reflects light without the qualification that it is a **good** reflector were not given credit.
- (c) This was poorly answered. Candidates seemed unaware of the regions of the electromagnetic spectrum.
- (d) Another poorly answered question. There was some confusion amongst the candidates between sound and radio in this part of the question.

### Question 4

- (a) It was disappointing to see that so many candidates could not identify the vein and artery from diagrams. Many candidates answered the question in terms of red and white blood cells.
- (b)(i) Only the better candidates could name the red substance in P as haemoglobin.
- (ii) In contrast to the name of the red pigment the majority of candidates knew that the function of cell P was to transport oxygen.
- (c) Many candidates did not recognise that cell Q is a white blood cell and consequently were unable to state its function. The candidates who correctly identified the cell invariably were able to state that its function was to engulf bacteria or produce antibodies.

### Question 5

- (a) Many candidates were able to identify the gas in tube A as carbon dioxide and the gas in tube D as oxygen, however the gases in tubes B and C were frequently the wrong way round. It would appear that many candidates ignored the fact that the gas in tube C extinguishes a lighted splint and therefore is argon.
- (b)(i) It is disappointing to see that so many candidates were unable to state the formulae of hydrogen, oxygen and water. Many candidates were unaware that the formula of oxygen is  $O_2$  and not O, similarly hydrogen is  $H_2$  and not H.
- (ii) The equation was poorly done by many candidates, however a number of candidates who could not obtain the equation were aware of the correct state symbols and they were given credit.

### Question 6

This question was poorly answered by the majority of the candidates.

- (a) This was frequently the only part of the question that was answered correctly.
- (b)(i) Most candidates did not know that diffusion was the process by which carbon dioxide moves from blood into the air.
- (ii) Even the candidates who stated that the process was diffusion were only rarely able to say that the concentration of carbon dioxide in the blood is higher than in the air so it moves from a higher to a lower concentration. Most candidates simply stated that the carbon dioxide is exhaled.

### Question 7

- (a) Many candidates were able to state the position at which the pendulum has the least potential energy.

- (b) A significant number of candidates correctly calculated the period of the pendulum, but it was clear from some of the answers that some of the candidates did not understand the meaning of “period”.

Ans : (b) 3.2

### Question 8

This question was one of the best answered questions on the whole paper.

- (a) The majority of candidates were aware of the equation linking mass, volume and density and were able to use it correctly. Some candidates stated the correct equation for density and then were unable to manipulate the equation to find the mass.
- (b)(i) The calculation was well done by most of the candidates.
- (ii) Some candidates did not state the units of work done as joules.

Ans : (a) 2 kg

(b) 150 J

### Question 9

This question was very poorly done by most of the candidates. It appeared that candidates did not know or understand the two processes by which ethanol is produced.

- (a)(i) The process of fermentation for the production of ethanol is poorly understood. Only the best candidates were aware that the temperature of the process is controlled because at high temperatures the enzymes in the yeast are denatured.
- (ii) The process of fermentation is carried out in the absence of air because oxygen causes the ethanol produced in the process to be oxidised to ethanoic acid.
- (b) The hydration of ethene by steam is not well known by the candidates. Candidates should know that the process is carried out at a temperature between 250–400°C and that the catalyst used is phosphoric acid.
- (c) The separation of crude oil by fractional distillation and the subsequent production of ethene by cracking was not well known by the candidates.

### Question 10

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

### Question 11

- (a) Many candidates were unaware of the properties of the three types of radiation.
- (b) Only the best candidates recognised that the best source for an experiment to determine the half-life is B because its half-life is a suitable time for the duration of an experiment.

### Question 12

- (a)(i) Many candidates were unable to state the formula for calculating the electrical power mainly because they did not use the correct symbols for power,  $P$ , voltage,  $V$ , and current,  $I$ .
- (ii) Many candidates could calculate the current when the iron was working normally even though they could not state the formula in part (a)(i).
- (b) The majority of the candidates knew that plastic is used for the handle of the iron so that the user does not burn their hand because plastic is a poor conductor of heat, however some candidates incorrectly thought that the handle was made of plastic because the plastic is a poor conductor of electricity.

- (c) Many candidates could correctly complete the sentence about the energy changes in the iron.

Ans : (b) 6A

### Question 13

- (a) The petal and the sepal were well known by many candidates as parts of a flower but the stamen and ovary were less well known.
- (b) Many candidates knew that the function of the petals was to attract insects but the function of the sepal was known only by the better candidates. The functions of the stamen and the ovary were frequently confused by the candidates or not known at all.
- (c) Surprisingly few candidates could state the three conditions required for germination to occur. Candidates were expected to state that water, oxygen and a suitable temperature were required. Air, moisture and temperature were not accepted as answers because they are considered too vague.

### Question 14

- (a) In this part of the question candidates were expected to draw vertical lines on the diagram from the boy and the support. Frequently candidates lost marks due to the inaccuracy of their drawing.
- (b) The calculation was well done by many candidates.

Ans : (b) 750 Nm

### Question 15

- (a)(i) The formula of chlorine was not well known. The vast majority of the candidates simply stated the symbol for chlorine,  $Cl$ , or for the ion,  $Cl^-$  rather than the formula  $Cl_2$ .
- (ii) The number of electrons in the outermost shell of chlorine was quite well known.
- (b)(i) A significant number of candidates recognised that the other product of the reaction was potassium chloride.
- (ii) Only a small number of candidates identified that chlorine had displaced the iodine from potassium iodide and therefore that chlorine is more reactive than iodine.
- (c) The use of chlorine in water purification was well known by the majority of the candidates.

### Question 16

This question was poorly answered by many candidates. A number of candidates recognised that the volume of sugar solution increased due to osmosis. Osmosis is not well understood by the majority of the candidates. There is much confusion about whether the water travels from a low concentration to a high concentration or vice versa. Candidates should be encouraged to explain osmosis as the movement of water from a low concentration of sugar solution to a high concentration of sugar solution.

### Question 17

- (a) Only rarely did candidates state that the physical property used for the measurement in the thermometer is expansion.
- (b) The better candidates were able to state that a thermometer is made more sensitive by having a narrower capillary tube.
- (c) Many candidates described what the thermometers were used for rather than a physical difference between the thermometers. Candidates were expected to state that a clinical thermometer measures temperature over a smaller range or has a constriction in the capillary tube.



### Question 18

- (a) The piece of apparatus was identified as a burette by a significant number of candidates.
- (b) The type of reaction was only identified correctly as neutralisation by the better candidates although many more candidates knew that the pH of the solution is 7 when the reaction is complete.
- (c)(i) The calculation of the relative molecular mass of ammonium nitrate was quite well done, particularly by the better candidates.
- (ii) It is pleasing to note that, even though the calculation was not well done by many candidates, more candidates are becoming proficient in performing simple proportion calculations from chemical equations.

Ans : (c) (i) 80

(ii) 32g