

# CONTENTS

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FOREWORD .....	1
COMBINED SCIENCE .....	2
GCE Ordinary Level .....	2
Paper 5129/01 Multiple Choice .....	2
Paper 5129/02 Theory .....	6

## FOREWORD

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This booklet contains reports written by Examiners on the work of candidates in certain papers. **Its contents are primarily for the information of the subject teachers concerned.**

# COMBINED SCIENCE

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## GCE Ordinary Level

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

### General comments

Candidates seem to have found the Physics questions more demanding than in previous years and it is, therefore, not surprising that the candidates produced a relatively low mean score of 15.64 with a standard deviation of 4.52. Only **Question 7** proved to be particularly difficult but another six questions showed uncertainty and possible guessing among even better candidates. **Question 8** was the only one to prove to be very easy.

The questions on Organic Chemistry were poorly answered. It appears that the candidates are unaware of the definitions and simple reactions of the compounds named in the syllabus.

### Comments on specific questions

#### **Question 1**

Acceleration is not understood. Poor discrimination, a positive distractor, large and roughly equal numbers of candidates choosing each of options **A**, **B** and **D** with slightly more choosing **D** than the correct option **B**, shows uncertainty and widespread guessing even among more able candidates.

### **Question 2**

Again illustrated the less able candidates lack of understanding of the difference between mass and weight in preferring option **C** rather than the correct option **D**; a large number also thought density would be zero!

### **Question 3**

Discriminated well among candidates.

### **Question 4**

More candidates chose option **A** than did the correct option **D**, including a number of more able candidates.

### **Question 5**

An indication that some more able candidates opted for either option **A** or **D**.

### **Question 6**

Well known by the majority of candidates but option **D** proved to be a positive distractor to some more able ones.

### **Question 7**

Discriminated well and again illustrated the problems many candidates have in changing the subject of an equation. Here 65% of candidates incorrectly opted for either **B** or **D**, the majority favouring **B** but a number of more able candidates chose **D**.

### **Question 9**

Showed widespread guessing among candidates with more choosing option **A** than did the correct one, option **D**. A large number also chose option **C** which also made reference to a cell!

### **Question 10**

Pleasing to note that almost 90% of candidates knew something correct about series circuits but only 54% of candidates chose the correct option **B**.

### **Question 11**

It is worrying that only 39% of candidates knew the correct positions of fuse and switch.

### **Question 12**

Showed good discrimination, with option **A** the most popular option with less able candidates.

### **Question 13**

Lack of understanding of radioactive decay and half-life resulted in widespread guessing among candidates with more than twice as many choosing incorrect options as did the correct one, option **C**. Of those choosing incorrectly option **A** was the most popular.

### **Question 14**

Good discrimination with the less able candidates more or less evenly spread over the incorrect options.

### **Question 15**

Approximately half of the candidates recognised option **C** as the process, which involved condensation and freezing but a large proportion of the candidates chose option **B** which involves only condensation.

### **Question 16**

This proved to be an easy question.

### Question 17

The link between type of bonding and electronic structure is not well known. Over half of the candidates chose option **C**, thinking that the protons occupy the shells rather than the electrons.

### Question 18

There was evidence of guesswork in this question, particularly by the weaker candidates. Option **D** was chosen by over a third of the candidates. Candidates should be able to recognise that the electronic structure of atoms determines the stoichiometry of compounds formed from the atoms.

### Question 19

A large number of candidates focused on the fact that the substance to be identified was used in cooking rather than a substance that could be taken to neutralise excess acid in the stomach. Option **B** was the most popular even amongst the better candidates.

### Question 20

There was evidence of guesswork even amongst the better candidates. A large number of candidates chose option **B**, magnesium metal, despite the question asking for the substance that does not react with sulphuric acid.

### Question 21

This question was well answered by the better candidates, however there was evidence of guesswork amongst the weaker candidates.

### Question 22

Less than 20% of the candidates correctly identified that zinc is used to galvanise iron because it is more reactive than iron. The majority of candidates chose option **B**, which stated that copper is used for electrical wiring because it is a good conductor of heat.

### Question 23

There was evidence of guesswork particularly amongst the weaker candidates. The better candidates recognised that zinc and hydrochloric acid produce hydrogen when reacted together.

### Question 24

Almost 60% of the candidates chose option **B**. Carbon monoxide is not a corrosive gas and does not damage lung tissue. It is poisonous because it forms a stable compound, carboxyhaemoglobin, with the haemoglobin in the blood.

### Question 25

There was evidence of guesswork even amongst the better candidates. Candidates should recognise that a homologous series of compounds have the same general formula and chemical reactions but do not have the same physical properties.

### Question 26

The reactions of alkenes are not well known. Once again there was evidence of guesswork with over 25% of the candidates choosing option **D**.

### Question 27

Another poorly answered question. The better candidates recognised that the fuel was hydrogen and that plastics can be made from ethene. A significant number of candidates recognised that **Y** could be propene but thought that the fuel, **X**, was ethanol, which is not produced by the cracking of long chain hydrocarbons.

**Question 28**

This straightforward question on cell structure nevertheless caused problems for some candidates.

**Question 29**

A significant number of candidates thought that seeds simply absorb starch, rather than digesting it.

**Question 30**

This question required some thought, and it discriminated well between candidates.

**Question 31**

A straightforward question, which also discriminated well.

**Question 32**

This question on heart action was answered well. The better candidates were able to apply the information in the diagram to arrive at the correct answer.

**Question 33**

This question on anaerobic respiration proved to be quite easy.

**Question 34**

Many candidates in this question were guessing at the right answer.

**Question 35**

As has been true in the past, a significant number of candidates do not realise that both alcohol and heroin are depressants not stimulants.

**Questions 36 and 37**

These straightforward questions on ecology were easy, but they nevertheless discriminated well between candidates.

**Question 38**

This question needed some thought, but many candidates were simply guessing at the answer.

**Question 39**

This simple question on plant reproduction worked well.

**Question 40**

This question was more thought-provoking, and some candidates were evidently guessing.

### General comments

The majority of the candidates made some attempt at all the questions. The candidates responses to some of the Biology questions were good, particularly **Questions 3** and **15 (b)**. The Chemistry questions were found to be more difficult than in previous years. The calculations in the Physics questions were poorly done even when the candidates could correctly state the equation for the calculation. A number of candidates had difficulty writing scientific notation for numerical answers to questions, for example, the answer,  $9 \times 10^{-4}$  was written incorrectly as  $9^{-04}$ , as it is shown on some calculators. Once again candidates were penalised for not giving units or giving incorrect units for their numerical answers. Explanations were frequently imprecise and some candidates experienced difficulty with science specific terminology particularly in the Biology questions.

### Comments on specific questions

#### Question 1

- (a) Many candidates used length instead of extension and obtained the answer 13.5N, which gained one mark for the correct working. Candidates were expected to calculate the extension of the spring and use this to find the force by either calculation or reading from the graph.
- (b)(i) A number of candidates correctly calculated the anticlockwise moment but the units were frequently omitted or were incorrect. There was confusion amongst many candidates between the spring's force and the weight of the object. The word moment is not well understood by a large number of candidates.
- (ii) Many candidates did not recognise that the fact that the wooden strip was horizontal meant that the anticlockwise moment was equal to the clockwise moment. Those candidates who stated the same answer as in part (a)(i) were given credit even if their answer to that part was incorrect.
- (iii) The majority of candidates were unable to calculate the weight of the object. Of those candidates who correctly divided the answer to (b)(i) by 4 many were unable to give the correct unit.
- (c) The vast majority of the candidates realised that the gravity and/or the weight of the object on the Moon was different to that on Earth but many did not gain credit as they did not state how the weight of the object was different. A number of candidates thought that there was no gravity on the Moon.

Answers: (a) 6N; (b)(i) 48Ncm, (ii) 48Ncm, (iii) 4N.

#### Question 2

- (a) It was disappointing that many candidates did not recognise the bonding in sodium chloride as ionic. A large number of candidates stated that it was covalent, despite the charges shown on the diagram.
- (b) Many candidates could correctly state the formula of sodium chloride.
- (c) The reason why solid sodium chloride does not conduct electricity was not well known. Only a small number of candidates recognised that the ions in the solid are unable to move. Many candidates stated that the reason was because sodium chloride was a non-metal.
- (d) Hydrochloric acid was correctly identified by a significant number of candidates but sodium hydroxide as the alkali was less well known.

### Question 3

- (a) A large number of candidates identified the gas correctly as oxygen.
- (b) The graph was plotted correctly by the vast majority of the candidates but only a small number of candidates drew a smooth curve through the points.
- (c) Many candidates could derive the relationship between the rate of photosynthesis and the distance of the lamp from the water plant from the data given in the question.
- (d) A large number of candidates recognised that few water plants grow at depths greater than 20m because of the lack of light at these depths. Credit was not given to those candidates, who thought that there was also a lack of oxygen or carbon dioxide at these depths.

### Question 4

- (a) This question was poorly understood by many of the candidates. Only the best candidates stated that the droplets spread out as they leave the nozzle because the positively charged particles repel each other. A large number of candidates thought that gravity caused the droplets to spread out.
- (b) A few more candidates were aware that opposite charges attract one another so the droplets move towards the plant. A significant number of candidates answered the question in terms of the plant needing water to grow.
- (c) The calculations in this question were poorly done by all but the best candidates. The charge carried by the droplets is calculated by multiplying the number of droplets by the charge carried by each droplet. The charge carried away by the droplet in 1s is calculated by dividing the answer to part (i) by 20. Candidates who correctly divided an incorrect answer to (i) by 20 were given credit. Only the best candidates knew that the current was the charge carried away in 1s expressed in amps. Those candidates who stated the same incorrect answer to part (ii) expressed in amps were given credit.

Answers: (c)(i)  $9 \times 10^{-4}$  C, (ii)  $4.5 \times 10^{-5}$  C, (iii)  $4.5 \times 10^{-5}$  A.

### Question 5

- (a) Gas, X, was correctly identified as oxygen by the majority of the candidates.
- (b) The volume of gas, X, was stated as  $60 \text{ cm}^3$  by a significant proportion of the candidates. The percentage by volume of gas, X, in the air was poorly done by many candidates with a large number of candidates using  $60 \text{ cm}^3$  as the total volume rather than  $75 \text{ cm}^3$ .
- (c) The vast majority of the candidates knew that argon was in Group 0 of the Periodic Table but only a minority could suggest why argon does not react with copper. Candidates were expected to state that argon is a noble gas or state that argon has a full outer shell of electrons.

Answers: (b)(i)  $15 \text{ cm}^3$ , (ii) 20%.

### Question 6

- (a) A large number of candidates knew that the function of red blood cells was to transport oxygen around the body although a significant number stated that the function was to carry blood.
- (b) The adaptations of the red blood cells were not well known. Candidates were expected to state that red blood cells either contain haemoglobin or have no nucleus or have a large surface area or a biconcave shape. The fact that these adaptations allow the red blood cells to carry more oxygen around the body was not linked to the answer in part (i) by many of the candidates.
- (c) More candidates could identify A as white blood cells than could identify B as platelets. The functions of A and B were not well stated by many candidates. A large number of candidates stated that white blood cells kill germs rather than stating that they produce antibodies, which kill bacteria. Those candidates who correctly identified B as the platelets were able to state its function as causing the blood to clot.

### Question 7

- (a) Many candidates were unable to complete the sentences and did not appreciate the energy changes, which occur in a hydroelectric power station. The conversion of potential energy to kinetic energy to electrical energy was rarely stated correctly. Only a small number of candidates realised that heat or sound energy is the result of friction in the generators.
- (b) The equation for calculating power was not well done. Candidates should be encouraged to use words in the equations rather than inventing their own symbols. A number of candidates stated the units of energy and time for the equations and were not given credit. The calculation was poorly done, with only a small number of candidates realising that the time had to be converted into seconds. Candidates, who used 12 minutes in the calculation and obtained the answer 600 000W were given some credit. A large number of candidates were penalised for stating the wrong units in their answer.

Answer: (b)(ii) 100 000W.

### Question 8

- (a) The graph was very well drawn by almost all the candidates.
- (b) The majority of the candidates were able to use the graph to find the solubility of ammonia at 25°C.
- (c) Most candidates could determine the mass of ammonia that can be dissolved in 100g of water at 20°C using either the graph or the data given in the question. The mass of ammonia given off when the solution was heated to 40°C was almost invariably given as 31g, which is the amount of ammonia, which remains dissolved in the water at 40°C. The calculation was less well done. Candidates who gave the answer 31g in part (ii) and used this correctly in the calculation were given credit for the answer 43.8dm<sup>3</sup>.

Answers: (b) 46-48g; (c)(i) 53g, (ii) 22g, (iii) 31.1dm<sup>3</sup>.

### Question 9

- (a) The majority of the candidates recognised that excretion involves the removal of waste from the body but only the better candidates stated that this waste was produced by metabolism. Candidates, who stated that the waste was removed as faeces gained no credit.
- (b) Many candidates named the organ through which carbon dioxide was excreted as the nose or the mouth rather than the lung. Both the mouth and nose are not organs. Only the better candidates recognised that the process that produces the carbon dioxide is respiration. A number of candidates confused respiration and photosynthesis. The majority of the candidates did not recognise that respiration occurs in all living cells and many simply stated that the process occurs in the lungs.
- (c) The vast majority of the candidates did not answer the question that was asked. The question asked for three differences between the *blood* in an artery and a vein and not three differences between arteries and veins.

### Question 10

- (a) Most candidates gained some credit for this question. Most candidates knew that the ray is diffracted towards the normal but less knew that the diffraction is more than **A**. Only a small number of candidates correctly drew the emergent ray parallel to the incident ray.
- (b) The angle was frequently stated as 20° rather than 70°.
- (c) The equation for calculating the refractive index was well known by many candidates but many had problems substituting the correct numbers into the equation and then calculating the refractive index. Candidates should be encouraged to write down all their working. Some candidates were penalised for quoting a unit for refractive index.



### Question 11

- (a) The majority of candidates could not state the essential conditions for the fermentation of glucose. A number of candidates knew that yeast or enzymes were involved in the process but could not state that the glucose is dissolved in water at between 25 and 40°C in the absence of air. Some candidates gave the conditions for the hydration of ethene rather than fermentation.
- (b) Many candidates correctly balanced the equation.
- (c) Only a small number of candidates knew that ethanol was used in industry as a solvent or a fuel. A significant number of candidates thought that ethanol was used as a perfume. Candidates should be aware that ethanol is present in alcoholic drinks but it is not used to make them and therefore it is not an industrial use of ethanol.

### Question 12

This was the most poorly answered question on the Paper. Candidates were unable to name the pollutants produced by burning coal, oil, wood or cigarettes. Some candidates were able to name sulphur dioxide as a pollutant but could only state that it caused acid rain rather than answer the question asked, which was to explain the way in which the lungs were affected. It was disappointing to see that many candidates gave carbon dioxide as the pollutant and that it caused damage to the lungs. The effects of the pollutants were poorly expressed by many candidates. Many answers simply repeated the question or stated that breathing would be difficult.

### Question 13

- (a) The colours of the wires in a mains cable were known by a large number of candidates but the live and neutral wire were frequently confused. The colour of the earth wire was quite well known.
- (b) Many candidates thought that the fuse should be connected to the earth wire.
- (c) The calculation was not well done by the majority of the candidates. The equation to calculate the current was frequently inverted giving an answer of 115A. Candidates who correctly stated the equation frequently did not appreciate that the power had to be converted into W by multiplying by 1000. The expected fuse rating was 10A. The candidates who obtained an incorrect answer to part (i) and suggested a sensible fuse were given credit for their answer.

Answer: (c)(i) 8.69A.

### Question 14

- (a) This question was poorly done by many candidates. The process of fractional distillation was not well known.
- (b) Many candidates could not name the homologous series as the alkanes. Only a small number of candidates knew that an homologous series is a series of compounds with the same general formula and similar chemical properties.
- (c) The type of bonding present in a molecule of butane was well known by the majority of the candidates.

### Question 15

- (a) A majority of the better candidates knew the day on which ovulation and menstruation occurred but only the best candidates could indicate when an egg is most likely to be fertilised. Some of the candidates lost the mark in part (iii) the word fertile was not written accurately under the correct days.
- (b) This question was answered well by the majority of the candidates.

### Question 16

- (a) A large number of candidates gave the fertiliser, ammonium sulphate as their answer rather than the substance, which is used to make a fertiliser, nitric acid.
- (b) Few candidates could identify calcium carbonate as the substance, which reacts with dilute sulphuric acid.
- (c) Calcium carbonate was only rarely identified as the substance used to control the acidity of soil. Many candidates thought that the fertiliser, ammonium sulphate, was used.
- (d) Many candidates correctly identified chlorine.
- (e) This part was the most commonly correct answer in this question.