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## 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

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

### General comments

The paper produced a mean score of 17.91 with a standard deviation of 5.04. Candidates found no question easy, while **Questions 10** and **12** proved particularly difficult.

### Comments on specific questions

#### Question 1

This did not discriminate well, with the incorrect responses attracting a significant number of candidates, including some of the more able, to options **A** and **B** in particular.

#### Question 2

Option **D** was almost as popular as the correct one, option **C**.

**Question 3**

Answers here showed guessing on a large scale, with roughly equal numbers of candidates choosing options **B** (the correct one), **C** and **D**.

**Question 4**

A choice between two options with the less able choosing the incorrect one, option **C**.

**Question 5**

Good discrimination, with option **A** attracting more responses from the less able. A more favoured distractor is usually indicative of guessing amongst even the more able candidates but, on this occasion, their uncertainty appeared to be between options **B** and **D**.

**Question 6**

Poor discrimination, with better candidates guessing and choosing option **C**.

**Question 7**

Properties of electromagnetic waves were not well known, with guessing among candidates, some of the more able opting for **C** and the less able evenly divided between options **A** and **B**.

**Questions 8 and 9**

These both discriminated well, with the less able candidates divided evenly between options **A** and **C** in **Question 8**. The misconception that a variable resistance changes the battery e.m.f., option **B** in **Question 9**, was favoured by the less able candidates.

**Question 10**

Electrical power was not understood by the majority of the candidates, including some of the more able, who chose either option **A** (69%) or option **B** (6%). Better candidates also opted for response **D**, perhaps applying the selection rule for a fuse?

**Question 11**

This also discriminated less well than expected, with many better candidates choosing option **C**.

**Question 12**

This question showed uncertainty and guessing amongst even the more able candidates, with all options attracting a significant response.

**Question 13**

Nuclide notation was well known.

**Question 14**

The weaker candidates chose option **B**, suggesting a misunderstanding of the term diatomic.

**Question 15**

The majority of the candidates chose option **B**, the pipette, which is the apparatus used to measure the volume of alkali, but the question required the candidate to choose the apparatus used to measure the volume of acid required to neutralise the alkali.

**Question 16**

An easy question, particularly for the better candidates.

**Question 17**

The majority of the candidates recognised that chlorine gains an electron when it forms the chloride ion. The weaker candidates chose option **C**, where chlorine loses an electron.

**Question 18**

There was evidence of guesswork, even amongst the better candidates. The question depended on the candidates being able to balance the equation as well as perform the calculation.

**Question 19**

A significant number of candidates thought that copper(II) hydroxide is soluble in water and chose option **A**. The best candidates knew that the one soluble metal hydroxide is potassium hydroxide.

**Question 20**

A majority of the candidates correctly identified the reaction between acidic soil and calcium hydroxide as a neutralisation, although the weaker candidates thought that calcium hydroxide is a fertiliser.

**Question 21**

Almost two thirds of the candidates chose option **A**, which is an order of reactivity suggested by considering the information about the reaction of the metal with dilute hydrochloric acid. Element Z is more reactive than X and Y because it is not reduced by carbon.

**Question 22**

There was evidence of widespread guesswork, even amongst the better candidates in this question. Air is made up of 20% oxygen, which reacts with the iron filings causing them to rust, and this will lead to the oxygen being used up and the water level rising to the 40 mark.

**Question 23**

This question was well answered by the better candidates. The weaker candidates chose option **B**, nitrogen and water vapour, only forgetting the fact that carbon dioxide is breathed out by animals and must be present in unpolluted air.

**Question 24**

The better candidates knew that members of an homologous series do not have the same empirical formula but a common distractor was option **A**.

**Question 25**

A majority of the candidates were able to recognise the test for a carbon to carbon double bond.

**Question 26**

There was evidence of guesswork, particularly amongst the weaker candidates. A significant proportion of the candidates thought that it is essential for a fuel to have a low boiling point.

**Question 27**

An easy question, particularly for the better candidates. A number of candidates chose option **D**, where the methyl group and chlorine atom were on the same carbon atom rather than on alternate carbon atoms.

**Questions 28 to 30**

These were straightforward questions, but nevertheless discriminated well between candidates. In **Question 28**, more than a quarter of candidates forgot that chloroplasts are not found in roots.

**Question 31**

A significant proportion of candidates had muscle contraction and relaxation in peristalsis the wrong way round.

**Question 32**

It was pleasing to see that most candidates could apply their knowledge of red blood cell function effectively to this situation.

### Question 33

In this question, candidates often seemed to be confusing oxygen supply and demand.

### Question 34

This question caused confusion. Candidates evidently did not understand that the focusing of light in the eye occurs mainly at the corneal surface.

### Question 35

Most candidates could identify the withdrawal symptoms associated with heroin abuse.

### Questions 36 and 37

Each of these questions required candidates to interpret a diagram, and in both cases this proved surprisingly difficult. In **Question 36**, candidates may have been trying to answer the question without really looking at the food web at all.

### Question 38

Many candidates, even the better ones, apparently believed that light (and not oxygen) is needed for seed germination.

### Question 39

This was a straightforward question, although not everyone could distinguish between radicle and plumule.

### Question 40

It was pleasing to see that the majority of candidates could distinguish between the functions of the testes and the prostate gland.

<p><b>Paper 5129/02</b> <b>Theory</b></p>
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### General comments

The calculations in the Physics questions were poorly done by many candidates and even those candidates who correctly calculated the numerical answer to the question were often unable to state the correct units. The Biology questions proved difficult for many candidates particularly those which involved explaining biological concepts such as reproduction. Questions which required factual recall were answered well by the better candidates but those questions involving interpretation of experimental results were found difficult by a large proportion of the candidates.

### Comments on specific questions

#### Question 1

- (a) Many candidates were unable to describe how the ball moves on the surface of the water.
- (b) The definition of a transverse wave was not well known. The majority of the candidates did not distinguish clearly between the direction of the vibration and the direction of the wave.
- (c) The majority of good candidates stated an example of a longitudinal wave but a large number of candidates stated an example from the electromagnetic spectrum.

**Question 2**

- (a) The majority of the candidates correctly calculated the weight of the object on the Earth but then did not state the correct units.
- (b) The majority of the candidates were able to state the formula for calculating the density of the object but there was confusion between mass and weight. A number of candidates found difficulty in converting kilograms into grams and stated the incorrect numerical answer but gave the correct units.
- (c) The majority of the candidates did not know that the density of an object on the moon stayed the same.

Answers: (a) 25 N; (b)  $0.0025 \text{ kg/cm}^3$ .

**Question 3**

- (a) The majority of candidates correctly stated a difference between red blood cells and typical animal cells.
- (b)(i) A large number of candidates correctly stated the process as osmosis but a significant number of candidates stated their answer as diffusion.
- (ii) The explanations of what causes the cell to swell were frequently vague. Many candidates did not state clearly enough to which concentration they were referring in answers involving high and low concentrations. Candidates were simply required to state that the water entered the red blood cells.
- (iii) Many candidates knew that plant cells do not swell because of the cell wall.

**Question 4**

- (a) The idea of displacement of one metal by another was not well known. A number of candidates could state that the blue solution is copper nitrate but disappointingly copper sulphate was a quite common response. Only the better candidates recognised that silver was the solid produced in the reaction.
- (b) A majority of the candidates correctly deduced the order of reactivity of the three metals.
- (c) The apparent lack of reactivity of aluminium compared to iron was not well known by the candidates. Only the better candidates knew that the aluminium is prevented from corroding by a protective layer of aluminium oxide.

**Question 5**

- (a) Only a small number of candidates were able to correctly state the speed of electromagnetic waves.
- (b) Many candidates confused frequency with wavelength and did not realise that a reference to time is required to define frequency.
- (c) This question was answered correctly by many candidates. Gamma was a common answer amongst the weaker candidates.

**Question 6**

- (a)(i) This question was poorly done, many candidates stated the name of a fuel rather than the raw material, crude oil, from which they are obtained.
- (ii) The majority of the candidates correctly stated the method of separation as fractional distillation.
- (iii) A large number of candidates stated a list of the physical properties of the different fractions rather than referring to the boiling point as the property that allows fractional distillation to separate the fractions.

- (b)(i) The general formula of the homologous series was quite well known although a significant number of candidates stated the formula as  $C_nH_{2n}$ .
- (ii) The name of the homologous series was not well known by many candidates.
- (c)(i) A large number of candidates knew that the complete combustion of hydrocarbons produces water but carbon dioxide was less well known.
- (ii) Carbon monoxide was well known by a large number of candidates. A significant number of candidates stated that the gas was carbon dioxide or soot, which is a solid product of incomplete combustion.

### Question 7

This question proved very difficult for many of the candidates. Candidates seemed unable to interpret experimental information presented in graphical form.

- (a)(i) Only the best candidates knew that *amylase* is an enzyme.
- (ii) Candidates seemed unaware that *amylase* causes the hydrolysis of starch changing it to maltose.
- (b)(i) A number of candidates interpreted the graph correctly stating that the amount of starch decreases in both beakers.
- (ii) A large number of candidates simply stated the information given in the question. Candidates were required to state that the change in beaker **B** was faster due to the larger surface area of the bean seed. Even those candidates who recognised that the change was faster did not realise the significance of chopping up the bean seed in beaker **B**.
- (iii) Only a small number of candidates stated that all the starch had been hydrolysed. Many candidates simply repeated the question and stated that there was no starch left in beaker **B**.
- (iv) The majority of candidates thought that water or bean paste was the product of the reaction reflecting the lack of understanding of the reaction occurring in the beakers.
- (c) Only the very best candidates recognised the link between this question and the earlier parts of the question. The fact that the cotyledon of the bean seed contains stored starch, which is converted to soluble sugars during germination, was not well known.

### Question 8

- (a) The majority of the candidates stated the equation for calculating the work done but the units were invariably incorrect.
- (b) A surprisingly large number of candidates did not know that potential energy is lost as the weight falls to the floor.
- (c) Candidates were unaware that the gain in kinetic energy was the same as the potential energy lost by the weight and therefore the answer to this part of the question was numerically equal to the answer to part (a).

Answers: (a) 6.0 J; (c) 6.0 J.

### Question 9

- (a) A majority of the candidates knew that the unit of electrical charge was the coulomb. Candidates who simply gave the symbol for coulomb were not given credit as the question asked for the name of the unit.
- (b) Many candidates stated the equation for calculating the charge of the lightning strike but some candidates had difficulty with the numbers involved. Once again the units of a numerical answer were stated incorrectly even by some of the candidates who had correctly named the unit of charge in part (a).

Answer: (b) 20 C.

**Question 10**

- (a) Many candidates correctly identified the elements in the same group of the Periodic Table as **B** and **D**. A significant number of candidates thought that elements **C** and **D** were in the same group because they had the same number of electrons in the outermost shell. These candidates did not recognise that helium, element **D**, is in Group 0 of the Periodic Table.
- (b)(c)(d) These questions were well answered by a large number of candidates.
- (e) This proved to be the most difficult part of this question. The better candidates knew that an ionic compound is formed between a metal and a non-metal and chose elements **C** and **E**.

**Question 11**

- (a)(i) Many candidates thought that the main food substance in butter was carbohydrate rather than fat.
- (ii) A large number of candidates could state that one of the uses of fat in the body was as a source of energy but only the best candidates were able to state that fat acts as an insulator and keeps the body warm.
- (b)(i) Many candidates simply stated the word "fat" as their answer to this question. The form of malnutrition is obesity or overweight.
- (ii) The question required the candidates to be specific as to which blood vessels are especially affected by too much of the nutrient and therefore the vague answer "arteries" was not awarded credit. Only the best candidates stated the correct answer "coronary arteries".
- (iii) Once again candidates were vague in their answers and were unable to explain clearly how an excess of the nutrient may lead to death. Candidates were expected to explain that fat is deposited in the arteries and this causes narrowing of the blood vessels which leads to less oxygen or blood reaching the heart muscles.

**Question 12**

- (a) The majority of candidates were unable to read the vernier scale.
- (b) The micrometer reading was more frequently correct than the vernier reading but for the majority of candidates the question proved very difficult.

**Question 13**

- (a)(i) Many candidates knew that the type of reaction between ammonia and sulphuric acid is a neutralisation reaction.
- (ii) A large number of candidates correctly stated the colour of Universal indicator in aqueous ammonia as blue or purple.
- (iii) Only a small number of candidates correctly identified the ion which causes the ammonia solution to be alkaline as the hydroxide ion,  $\text{OH}^-$ . A large number of candidates thought that it was the ammonium ion,  $\text{NH}_4^+$ .
- (b) A majority of the candidates could state that there are 4 different elements in ammonium sulphate.
- (c) A large number of candidates knew that a fertiliser is added to the soil to increase the yield of a crop but many of these candidates thought that ammonium sulphate contained all three essential elements: nitrogen, potassium and phosphorus rather than just nitrogen. A number of candidates thought that sulphur and hydrogen were also essential elements. It is a popular misconception amongst the candidates that a fertiliser neutralises acidic soil.



**Question 14**

- (a)(i) This question was poorly answered. The majority of candidates were unable to clearly define asexual reproduction. Many answers were vaguely expressed and were frequently in terms of pollination. Only the best candidates stated that asexual reproduction produces an offspring without the fusion of gametes.
- (ii) The majority of candidates were unable to state an advantage of asexual reproduction to an organism. The expected answer was that only one organism is required to reproduce or that no genetic variation occurred in the offspring.
- (b)(i) Only the very best candidates were able to state that sexual reproduction produces genetic variation whereas asexual reproduction produces offspring that are genetically identical. Many candidates' answers were vague and referred only to the "looks" of the offspring.
- (ii) The advantages of sexual reproduction were not well known. Candidates were not aware that sexual reproduction allows a species to adapt to changing habitat and evolve. Many candidates simply referred to the development of a new generation.
- (c)(i) Many candidates knew that a human zygote is formed by fertilisation or the fusion of a sperm and an egg.
- (ii) The fact that a zygote becomes a foetus or an embryo was well known by many candidates.

**Question 15**

- (a) This was well answered by the majority of the candidates.
- (b) The calculation was well done by a large number of candidates but many were penalised because they were unable to state the units correctly.
- (c) This question was poorly answered. The majority of candidates simply restated the question instead of stating that the velocity depends on direction whereas speed does not.

Answer: (b) 30 m.

**Question 16**

- (a) A majority of candidates were able to name one physical property of matter that changes with temperature. Some candidates thought, incorrectly, that e.m.f stands for electromagnetic force rather than electromotive force.
- (b) Many candidates were aware that the constriction in a clinical thermometer prevents the liquid from returning to the bulb, but the majority did not carry on to say that this means that the reading on the thermometer is maintained so that it can be read.
- (c) Ideas about the sensitivity of a thermometer were not well known. A large majority of the candidates referred to the speed with which the thermometer responds rather than the fact that a sensitive thermometer allows smaller changes in temperature to be measured.

**Question 17**

- (a) A majority of the candidates knew that a catalyst speeds up a chemical reaction. A significant proportion of the candidates thought that the catalyst was an enzyme.
- (b) The test for oxygen was quite well known by a large number of candidates. Some candidates confused the test for oxygen with the test for hydrogen and used a burning splint rather than a glowing splint.
- (c)(i) The calculation of the relative molecular mass of hydrogen peroxide was poorly done by many of the candidates whereas the calculation of the relative molecular mass of oxygen was more frequently correct.
- (ii) The calculation of the mass of oxygen produced from 17 g of hydrogen peroxide proved difficult for a number of candidates. Those candidates who incorrectly calculated the relative molecular masses of hydrogen peroxide and oxygen in (c)(i) gained credit if the method of calculation was correct.

**Question 18**

This question was well answered by the vast majority of the candidates. The section of the syllabus on sexually transmitted diseases is well known.

**Question 19**

- (a) The labels *earth* and *live* were known by the majority of the candidates.
- (b) The colour of the neutral wire was less well known.
- (c) Many candidates were unable to explain the meaning of a fuse having a rating of 3A. A significant number of candidates thought that the fuse controlled the current flowing through the electrical plug. Candidates should be aware that a fuse allows a current of up to the rating to pass through but when this current is exceeded then the fuse will melt breaking the circuit.

**Question 20**

- (a) The number of electrons in the outermost shell of the three elements was well known by the majority of the candidates.
- (b) The trend in the boiling points of the elements was not well known. Candidates were expected to state that the boiling point of the elements decreases as the group is descended.
- (c) This question was poorly answered. Candidates were unable to state the similarities between the three reactions. The most commonly correct answer was that a gas, hydrogen, is produced by the reactions. Candidates are expected to know that the alkali metals react with water producing the metal hydroxide, hydrogen and heat and that during the reaction the metal floats on the surface of the water before dissolving. Many candidates did not answer the question and simply stated the physical properties of the metals.