

COMBINED SCIENCE

Paper 5129/11
Multiple Choice

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

Comments on specific questions (Biology)

Question 1

Most candidates found this question reasonably straightforward.

Question 2

This question worked well although option was a strong distractor for some of the weaker candidates.

Question 3

This question discriminated very well between candidates.

Question 4

Most candidates were able to do this question.

Question 5

C was a strong distractor for the weaker candidates whilst some of the more able candidates incorrectly opted for **A**.

Question 6

This question discriminated well. **B** was the most popular incorrect option. This suggests that candidates know that one set of valves are open and one set are closed when the ventricles are contracting, but they easily confuse which is which.

Question 7

This question generally worked well with options **B** and **C** proving to be strong distractors for the weaker candidates.

Question 8

Candidates found this question fairly easy with a significant majority of the most able candidates selecting the correct answer.

Question 9

A significant number of candidates selected option **B**.

Question 10

Candidates were confused by the description of a producer as that which takes in simple inorganic materials.

Question 11

The majority of the weaker candidates opted for **B** and were therefore confusing the role of the animals and the decomposers in the carbon cycle.

Question 12

A significant number of candidates suggested that sexual reproduction produces genetically identical offspring.

Question 13

Candidates performed well on this question.

Comments on specific questions (Chemistry)

Question 14

Candidates were required to identify the compound that is a liquid at the temperature of cold water. A large proportion of the candidates chose option **D**, ammonia, which is a gas at room temperature.

Question 15

This question was well done by the better candidates. There is a misconception, particularly amongst the weaker candidates, that the nucleon (mass) number represents the number of electrons in an atom.

Question 16

A significant number of the candidates chose option **C**, which gave the electronic structure of the calcium and chlorine atoms rather than the ions specified in the question stem.

Question 17

Candidates struggled to recognise that one atom of Y combined with three atoms of X.

Question 18

The better candidates recognised that the complete combustion of 'meta-fuel' will produce only water and carbon dioxide and chose option **C**.

Question 19

Candidates need to be aware of the properties of a base.

Question 20

The trend in properties of the halogens is not well known by the candidates. A large proportion of the candidates thought that astatine is more reactive than iodine, displacing iodine from potassium iodide and chose option **D**.

Question 21

The physical properties of a metal, platinum, are well understood by the better candidates.

Question 22

There was evidence of guesswork even amongst the better candidates.

Question 23

This proved to be an easy question for a majority of the candidates.

Question 24

Most of the candidates recognised that ammonium sulphate and nitric acid contain nitrogen but many of these candidates chose option **C**, nitric acid, which is not used as a fertiliser.

Question 25

Candidates struggled with this question. Candidates should be familiar with the difference between a saturated and an unsaturated hydrocarbon.

Question 26

Candidates need to be familiar with these names for different types of chemical reactions. A large proportion of the candidates chose option **D**, polymerisation.

Question 27

The products of fermentation are well known by the better candidates. A significant proportion of the weaker candidates thought the products were starch and carbon dioxide and chose option **D**.

Comments on specific questions (Physics)

Question 28

Many of the better candidates were able to read the vernier scale correctly, with option **C** the most popular of the distractors.

Question 29

The distractor option **A** attracted a significant response.

Question 30

This question required careful reading on the part of the candidates. Many candidates chose option **C** rather than the key, option **D**.

Question 31

This question required careful thought on the part of the candidates, who needed to recognise that the car has kinetic *and* potential energy at point Y and only potential energy when at rest at point X. The distractor option **B** was chosen by a significant proportion of the candidates.

Question 32

The consequences of thermal expansion were well known, enabling most candidates to correctly choose the key, option **C**.

Question 33

Some candidates struggled to identify a longitudinal wave, with more choosing option **A** or option **C** than the key, option **B**.

Question 34

Many candidates demonstrated that they are unsure as to which angles should be used in refractive index calculations, with the distractor option **A** a popular choice.

Question 35

This question discriminated well. Option **B** was the most popular distractor.

Question 36

This was another question that showed very good discrimination with the better candidates choosing the key, option **A**, and the weaker candidates option **C**.

Question 37

The most popular distractor was option **B** (a resistor). It may be those candidates choosing option **B** saw a rectangle and assumed that the component must be a resistor without reading all of the options provided. Candidates should be reminded to read all of the options presented in a question before selecting one.

Question 38

Many candidates struggled with this question that tested not only the relationship between energy and power, but knowledge of watts as J/s. Option **C** was the most popular distractor.

Question 39

The better candidates chose option **A**, the key. Many other candidates chose the composition of the uranium atom, option **C**. Again, careful reading would have helped here.

Question 40

The safe disposal of radioactive material was not well known with option **C**, 'cooling the source quickly to a very low temperature' the most popular distractor.

COMBINED SCIENCE

Paper 5129/12
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| 13 | A | 33 | B |
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| 17 | D | 37 | D |
| 18 | C | 38 | D |
| 19 | B | 39 | A |
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Comments on specific questions (Biology)

Question 1

Options **C** and **D** proved strong distractors, especially for the weaker candidates.

Question 2

Options **A** and **B** proved strong distractors for some of the weaker candidates.

Question 3

This question discriminated very well between candidates.

Question 4

Most candidates were able to do this question.

Question 5

C was a strong distractor for the weaker candidates whilst some of the more able candidates incorrectly opted for **D**.

Question 6

B was the most popular incorrect option. This suggests that candidates know that one set of valves are open and one set are closed when the ventricles are contracting, but they easily confuse which is which.

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This question discriminated well between candidates. **B** was a strong distractor for the weaker candidates.

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Candidates found this question fairly easy with many candidates selecting the correct answer.

Question 9

A significant number of candidates selected option **B**.

Question 10

Candidates were confused by the description of a producer as that which takes in simple inorganic materials.

Question 11

The majority of the weaker candidates opted for **B** and were therefore confusing the role of the animals and the decomposers in the carbon cycle.

Question 12

This question proved challenging. Wrong answers were equally distributed amongst all of the distractors.

Question 13

C proved a strong distractor for the weaker candidates.

Comments on specific questions (Chemistry)

Question 14

Candidates were required to identify the compound that is a liquid at the temperature of cold water. A significant proportion of the candidates chose option **D**, ammonia, which is a gas at room temperature.

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This question was well done by the better candidates. There is a misconception, particularly amongst the weaker candidates, that the nucleon (mass) number represents the number of electrons in an atom.

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Candidates need to be aware of the properties of a base.

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The trend in properties of the halogens is not well known by the candidates. A large proportion of the candidates thought that astatine, a non-metallic element, forms a basic oxide and chose option **A**.

Question 21

The physical properties of a metal, platinum, are well understood by the better candidates.

Question 22

This question was well answered by the better candidates.

Question 23

This proved to be an easy question for many of the candidates.

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Most of the candidates recognised that ammonium sulphate and nitric acid contain nitrogen but many of these candidates chose option **C**, nitric acid, which is not used as a fertiliser.

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This question required careful thought on the part of the candidates, who needed to recognise that the car has kinetic *and* potential energy at point Y and only potential energy when at rest at point X. The distractors, options **B** and **C**, were chosen by a significant proportion of the candidates.

Question 32

This question discriminated well. Weaker candidates were divided equally between the distractor options **A**, **B** and **D**.

Question 33

Some candidates struggled to identify a longitudinal wave, with more choosing option **D** than the key, option **B**.

Question 34

This question discriminated well. Weaker candidates were divided evenly amongst the three distractors, suggesting that they may struggle to identify which angles should be used in refractive index calculations.

Question 35

This question also discriminated well. Option **B** was the most popular distractor.

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This was another question that showed very good discrimination with the better candidates choosing the key, option **A**, and the weaker candidates option **C**.

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The most popular distractor was option **B** (a resistor). It may be those candidates choosing option **B** saw a rectangle and assumed that the component must be a resistor without reading all of the options provided. Candidates should be reminded to read all of the options presented in a question before selecting one.

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Question 39

Many candidates chose the composition of the uranium atom, option **C**, rather than the key, option **A**. Again, careful reading would have helped here.

Question 40

The safe disposal of radioactive material was not well known with option **C**, 'cooling the source quickly to a very low temperature' the most popular distractor.

COMBINED SCIENCE

Paper 5129/21

Theory

Key Message

Candidates should be encouraged to include their working in the answers to calculations and quote formulae using the accepted symbols for the quantities involved.

General Comments

It is pleasing to note that the quality of the candidates' work in Physics calculations continues to improve. Nonetheless, candidates can still struggle when asked to manipulate formulae as the basis of a calculation. Ideas about clinical thermometers and laboratory thermometers are not well understood by the candidates.

In the Biology section of the paper the candidates' responses to questions requiring explanations of specific observations were often insufficient. All too often, an answer simply restated the question and offered no explanation. Candidates should be reminded that credit cannot be awarded for simple restatements of the stem of a question.

In the Chemistry section of the paper the candidates' responses to the calculation question demonstrated that candidates need a better understanding of stoichiometry.

Comments on Specific Questions

Question 1

A large number of candidates were able to name the processes osmosis and transpiration and state that the lack of water causes the plant to wilt. The fact that transpiration takes place through the stomata was less well known by the candidates.

Question 2

- (a) (i) The calculation of relative molecular masses is poorly understood by the weaker candidates. There is a misunderstanding about the subscripts in formulae and the stoichiometry of the equation in relation to the relative molecular mass; many candidates omitted to allow for the subscript two and obtained an answer 28 for carbon dioxide and then included the two from the equation to obtain a value of 80 or 64 for magnesium oxide.
- (ii) Many of the candidates ignored the stoichiometry of the equation and simply included the numbers calculated in (a)(i). This meant that the candidates who had included the stoichiometry in (a)(i) earned credit by error carried forward.
- (b) The difference in reactivity of magnesium and carbon as a means of explaining the lack of reactivity is not well known by the many of the candidates, All too often the candidates simply restated the question and said that magnesium does not react with carbon.
- (c) Candidates are expected to know that when a substance loses oxygen the reaction is known as a reduction.

Answers: (a)(i) 44
40
(a)(ii) 22 40

Question 3

- (a) The formula $V = IR$ is well known by the majority of the candidates. Some candidates found difficulty rearranging the equation so that the resistance is the subject of the formula ($R = V/I$).
- (b) Many candidates were able to state the current at point **B**. Many of the answers given for the current at points **A** and **C** suggested that the candidates need a greater awareness of how current conservation in parallel circuits.

Answers: (a) 20Ω
(b) point **A** = 0.5
point **B** = 0.2
point **C** = 0.5

Question 4

- (a) Many of the candidates were able to identify **A** as red blood cells; some identified **B** as platelets or plasma rather than white blood cells.
- (b) The function of red blood cells and platelets is well known by a large number of the candidates. There is a misconception amongst some of the candidates that the white blood cells contain antibodies rather than produce them.
- (c) Many of the candidates knew that carbon dioxide is transported in the plasma. A significant proportion of the candidates gave the cells stated in the question rather than other substances transported by the plasma.

Question 5

- (a) (i) The best candidates answered this well, but a significant proportion simply copied the electronic structure of the magnesium.
- (ii) Some of the candidates knew that a magnesium ion is positively charged; a few candidates also knew that the charge on the ion is $2+$.
- (b) This was well done by many of the candidates. Some of the candidates ignored the nucleon number (25) given in the question and used the number from the Periodic Table (24) stating 12 as their answer rather than 13.
- (c) (i) This question was extremely well answered by the candidates.
- (ii) The candidates' responses to this question were disappointing. Quite a number of the candidates gave responses that did not contain magnesium. Candidates are expected to know that acids react with metal oxides, carbonates and hydroxides to produce salts of that acid.

Question 6

- (a) This question proved difficult challenging for all candidates. Many candidates used the incorrect formula $F = ma$ rather than $F_1 \times d_1 = F_2 \times d_2$ to calculate the clockwise and anticlockwise moments.
- (b) (i) This question was well answered by a large number of candidates. A majority of the candidates correctly stated the formula, *work = force x distance*, and the units. Some used an incorrect value for the force.
- (ii) A significant number of the candidates answered this question in terms of the energy gained by the boy rather than the energy lost by the boy.

Answers: (a) 2500N
(b)(i) 600J

Question 7

- (a) (i) A number of the candidates confused diffusion with osmosis.
- (ii) This question was well answered.
- (b) (i) The vast majority of the candidates were unable to state a cause for the irritation of the cells in the alveoli. Candidates were expected to state that the irritation can be caused by smoking, inhalation of dust or animal hair or pollutant chemicals in the air.
- (ii) Only the higher-scoring candidates stated that the rate of diffusion is decreased. Candidates were expected to state that the rate of diffusion is decreased because the gases have a greater distance to diffuse. Candidates should be reminded that no credit is available for simply restating the information given in the stem.
- (c) The best answers stated that less diffusion occurs because the surface area of the alveoli is decreased.

Question 8

- (a) (i) Candidates need to be familiar with the decomposition of long chain alkanes by cracking.
- (ii) The better candidates were able to deduce the formula of the hydrocarbon X. A number of candidates gave C_4H_8 as their response rather than C_3H_8 .
- (iii) Candidates need to understand the concept of a homologous series.
- (b) Candidates need to be aware of the use of the reaction of aqueous bromine to distinguish between an alkane and an alkene.
- (c) This question was extremely well done by the candidates.
- (d) The reaction of ethene and steam is not well known by a large proportion of the candidates.

Question 9

- (a) Many candidates misunderstood the question and gave the name of the liquid in the thermometer rather than a property of the liquid.
- (b) The candidates were expected to state that a narrower bore in the thermometer means that there is a larger increase in the length of the mercury for the same increase in temperature. Many of the candidates answered the question in terms of the constriction in the clinical thermometer.
- (c) (i) The temperature of pure boiling water was known by the majority of the candidates.
- (ii) The best answers explained that the maximum temperature a clinical thermometer is able to measure is below the boiling point of water. A large proportion of the candidates simply stated that a clinical thermometer is used to measure body temperature or that the thermometer would break. Those candidates who stated that a clinical thermometer has a small range did not gain credit unless the range was stated, as it is possible for a non-specified small range to include the boiling point of water.

Question 10

- (a) The higher-scoring candidates recognised that the balloon is positively charged
- (b) The majority of the candidates who stated that the balloon is positively charged realised that the first balloon is repelled.

Question 11

- (a) (i) Many of the candidates were able to correctly identify the petal and the anther; the carpel was less well known. The diagram of the flower indicates that part **F** is the whole of female part of the flower. A large number of candidates gave as their answer one of the individual components of the carpel.
- (ii) The functions of the anther and the sepal are quite well known. Candidates should be aware that the anther *produces* the pollen grains; it does not *contain* pollen grains.
- (b) (i) The conditions required for the germination of a seed are quite well known by the candidates. There is a misconception amongst some of the candidates that light is required for the germination of a seed.
- (ii) The candidates' responses to this question were often insufficient. Some candidates recognised that amylase converts starch. The candidates were expected to state that the seed contains starch and explain that the starch is digested by the amylase during respiration to provide energy for growth of the seed.

Question 12

- (a) This was well answered.
- (b) (i) Only the higher-scoring candidates recognised that a Group 1 metal reacts with water.
- (ii) Candidates who did not correctly recognise that **Z** is the Group 1 metal invariably gave their reason as one of the general properties of metals, such as high melting point.
- (c) (i) This question was answered well by the higher-scoring candidates.
- (ii) Candidates should know that ionic compounds generally have a high melting point and conduct electricity when they are molten but not when they are solid.

Question 13

- (a) (i) Many of the candidates knew that the metal ring expands when it is heated.
- (ii) Candidates needed to state that when a metal cools it contracts. Too many of the candidates simply stated that the metal ring returns to its original size, which was insufficiently detailed to gain credit.
- (b) A large number of the candidates knew that wood does not conduct heat.
- (c) Both methods of heat transfer were quite well known by the candidates.

Question 14

- (a) (i) The fact that nitrogen is the most abundant gas in the air was known only by a small proportion of the candidates. It is disappointing to note that too many of the candidates think that hydrogen is a component of the air.
- (ii) Only the better candidates recognised that oxygen is removed from the air by the hot copper.
- (b) Candidates struggled to produce a correct answer here. Candidates were expected to know that air contains about 20% oxygen and that the final volume of gas in the syringe would be 80% of the original volume.
- (c) (i) Candidates are expected to know that the major pollutants of the air caused by the combustion of fossil fuels are carbon monoxide, sulfur dioxide or oxides of nitrogen.
- (ii) Only a small number of the candidates were able to explain how the pollutant stated in (c)(i) is produced during the combustion of fossil fuels.

Question 15

- (a) Many of the candidates were able to identify the two components of the electromagnetic spectrum.
- (b) (i) The fact that gamma rays are emitted from the nucleus of the atom is not well known by the candidates.
- (ii) The better candidates knew that the best absorber of infra-red radiation is a black surface. Many of the weaker candidates thought that the best surface is red.
- (c) A significant number of candidates knew the formula for calculating the speed of the light but then had difficulty using scientific notation.

Answer: (c) 2×10^8 m/s

Question 16

This question was well done by many of the candidates.

Question 17

This was another question that differentiated well between candidates.

Question 18

- (a) A large majority of the candidates knew the formula $F = ma$ and were able to use it correctly to calculate the acceleration of the car.
- (b) This question proved difficult for the majority of the candidates. The candidates were expected to draw a line with a positive gradient from the origin and continue the graph so that the gradient decreases until the line becomes horizontal.

Answer: (a) 2.5 m/s^2

COMBINED SCIENCE

Paper 5129/22
Theory

Key Message

Candidates should be encouraged to include their working in the answers to calculations and quote formulae using the accepted symbols for the quantities involved.

General Comments

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A large number of candidates were able to name the processes osmosis and transpiration and state that the lack of water causes the plant to wilt. The fact that transpiration takes place through the stomata was less well known by the candidates.

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- (a) (i) The calculation of relative molecular masses is poorly understood by the weaker candidates. There is a misunderstanding about the subscripts in formulae and the stoichiometry of the equation in relation to the relative molecular mass; many candidates omitted to allow for the subscript two and obtained an answer 28 for carbon dioxide and then included the two from the equation to obtain a value of 80 or 64 for magnesium oxide.
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- (c) Both methods of heat transfer were quite well known by the candidates.

Question 14

- (a) (i) The fact that nitrogen is the most abundant gas in the air was known only by a small proportion of the candidates. It is disappointing to note that too many of the candidates think that hydrogen is a component of the air.
- (ii) Only the better candidates recognised that oxygen is removed from the air by the hot copper.
- (b) Candidates struggled to produce a correct answer here. Candidates were expected to know that air contains about 20% oxygen and that the final volume of gas in the syringe would be 80% of the original volume.
- (c) (i) Candidates are expected to know that the major pollutants of the air caused by the combustion of fossil fuels are carbon monoxide, sulfur dioxide or oxides of nitrogen.
- (ii) Only a small number of the candidates were able to explain how the pollutant stated in (c)(i) is produced during the combustion of fossil fuels.

Question 15

- (a) Many of the candidates were able to identify the two components of the electromagnetic spectrum.
- (b) (i) The fact that gamma rays are emitted from the nucleus of the atom is not well known by the candidates.
- (ii) The better candidates knew that the best absorber of infra-red radiation is a black surface. Many of the weaker candidates thought that the best surface is red.
- (c) A significant number of candidates knew the formula for calculating the speed of the light but then had difficulty using scientific notation.

Answer: (c) 2×10^8 m/s

Question 16

This question was well done by many of the candidates.

Question 17

This was another question that differentiated well between candidates.

Question 18

- (a) A large majority of the candidates knew the formula $F = ma$ and were able to use it correctly to calculate the acceleration of the car.
- (b) This question proved difficult for the majority of the candidates. The candidates were expected to draw a line with a positive gradient from the origin and continue the graph so that the gradient decreases until the line becomes horizontal.

Answer: (a) 2.5 m/s^2