COMBINED SCIENCE

Paper 5129/11
Multiple Choice

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

General comments

Candidates answered **Questions 29**, **32** and **39** well with only **Question 38** proving more difficult.

Comments on specific questions

Question 1

Many candidates knew the adaptations of red blood cells to enable them to carry more oxygen.

Question 2

Most candidates knew that diffusion is the movement of molecules from a higher to a lower concentration with many knowing that the molecules move down a concentration gradient. However, a number of candidates chose option **A** stating that it was against the concentration gradient.

Question 3

Stronger candidates answered this well. Option **C**, which showed the effect of changing pH on an enzyme controlled reaction, was incorrectly chosen by many other candidates.

Question 4

While most candidates knew that there no chloroplasts in the upper epidermis, many thought that there would be more in the spongy mesophyll layer.

Question 5

The majority of candidates knew that carbohydrates break down to glucose and that the level of glucose in the blood would increase as it was absorbed.

Question 8

Most candidates knew that the many small blood vessels in the exchange surface helps the uptake of oxygen in humans but mistakenly thought that a high concentration of oxygen in the blood would also help uptake.

Question 9

This question was well answered and many candidates knew that the loss of urea from the blood occurred in the kidneys.

Question 10

The majority of candidates knew the pupil reflex.

Question11

Many candidates knew that as a drug heroin modifies chemical reactions in the body. However, many also thought that it was a stimulant.

Question 12

Many candidates knew which two arrows represented respiration.

Question13

Candidates were able to define asexual reproduction.

Question 14

Many candidates chose option **A** indicating that they thought that the cooling water entered at the top of the condenser rather than the bottom of the condenser.

Question 15

The movement and bunching of the particles during the change of state, solid to liquid, was not well understood by most candidates. There was a misconception that the particles in a liquid move about rapidly and occupy all the available space.

Question 16

Ideas about isotopes of the same element were well understood by a majority of candidates.

Question 17

Many candidates, particularly weaker ones, thought that negatively charged ions are formed by the loss of electrons and chose option **C**.

Question 19

A large proportion of the candidates were able to deduce the number of atoms present in a chemical formula.

Question 20

Candidates were expected to recognise that when acidic oxides are added to aqueous sodium hydroxide, the pH of the solution decreases and that non-metals form acidic oxides.

Question 21

The trends in melting point, colour and reactivity shown by the halogens were not well understood by many candidates.

Question 23

The property of aluminium that makes it useful for food containers was well known by most candidates.

Question 24

The processes that increase the global carbon dioxide concentration were well understood by almost all candidates.

Question 25

This question was almost always answered correctly.

Question 26

The structure of ethanol was well known.

Question 27

Most candidates recognised that bromine is element X but many of the weaker candidates thought that the hydrocarbon is methane and chose option **C**.

Question 28

While stronger candidates answered this correctly, a number of candidates incorrectly chose options **B** or **C**.

Question 30

This question was very well answered.

Question 31

Many candidates showed uncertainty about the order of the steps involved in the convection process. Options **A** and **D** were popular incorrect choices.

Question 33

This was correctly answered by many candidates but some candidates incorrectly chose option **B**. The amplitude of a wave is from equilibrium to the maximum displacement, not the distance from peak to trough.

Question 34

This question was correctly answered by many candidates but a significant number of other candidates incorrectly chose option **A**.

Question 35

Stronger candidates answered this correctly while weaker candidates chose either option **B** or **D**.

Question 36

A number of candidates chose option **C** rather than option **D**, the correct answer. At point **D** in the circuit, the currents in each branch are added together.

Question 37

The wiring of a mains plug was not well known with only stronger candidates correctly choosing the key, option **B**. Other candidates chose one of the other options with option **D** the most popular choice.

Question 38

This question proved challenging and only the strongest candidates answered correctly. Many other candidates chose option **B** or **C**.

Question 40

Option **B** was incorrectly chosen by many candidates. The particle that is most easily absorbed by the body is the one that does the most damage as it leaves the emitter, so **C** is the correct answer.

COMBINED SCIENCE

Paper 5129/12
Multiple Choice

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

General comments

Candidates found many questions challenging and **Question 28**, **34** and **40** to be very difficult.

Comments on specific questions

Question 1

This was a straightforward question on comparisons between plant and animal cells. Over half of the candidates were able to correctly identify the features found only in the plant cells.

Question 2

Most candidates knew that diffusion is the movement of molecules from a higher to a lower concentration with many knowing that the molecules move down a concentration gradient. **A** proved to be a strong distractor stating that it was against the concentration gradient.

Question 3

Many of the candidates knew that germination of seeds would be affected by temperature. Some candidates found the distractors quite challenging and opted for light as a factor affecting germination.

Question 4

It was good to see that candidates knew that both temperature and light intensity would both affect the rate of photosynthesis and had linked these to the plant which would photosynthesise the least.

Question 5

The majority of the candidates knew that the level of the molecule would decrease as it was absorbed. **B** proved to be a strong distractor as candidates used the graph relating to amino acid concentration rather than glucose concentration.

Question 6

This was a well answered question with many candidates knowing that plants wilted when the amount of water lost during transpiration is greater than the water uptake through the roots. **B** proved to be a strong distractor which stated that wilting occurred when the amount of water lost during transpiration is less than the water uptake through the roots.

Question 7

This question proved to be more challenging for candidates. They all knew which valves worked together, however, many were confused as to which opened and which closed during contraction of the ventricles.

Question 8

The question on anaerobic respiration proved quite challenging for many of the candidates with a lot of them thinking that anaerobic respiration produced carbon dioxide.

Question 9

This question was well answered and many of the candidates knew that the loss of urea from the blood occurred in the kidneys.

Question 10

This question wanted candidates to state the function of the ciliary muscles of the eye. This proved challenging and whilst some knew that they were to change the shape of the lens, many thought that they were to enlarge the size of the pupil.

Question 11

Most candidates knew that drugs altered the chemical reactions of the body, however, many were confused about the different between externally administered and internally administered.

Question 12

Many candidates knew which two arrows represented respiration, however, a significant number thought that the arrow for photosynthesis was also representing respiration.

Question 13

Candidates found this question challenging and need to ensure that they understand the differences between asexual and sexual reproduction.

Question 14

While a majority of the candidates were aware that hot vapour enters the condenser at point P a large proportion of these candidates thought that the cooling water enters the top of the condenser rather than the bottom of the condenser and chose option **A**.

Question 15

The arrangement and movement of the particles in a solid are well known and understood by the better candidates.

Question 16

Ideas about isotopes of the same element are well understood by the better candidates. There was evidence of guesswork amongst the weaker candidates.

Question 17

There was evidence of widespread guesswork even amongst the better candidates. Candidates should be able to recognise that particles W and Y do not contain the same number of electrons as protons and are ions.

Question 18

The idea that there is a double covalent bond between the carbon atom and the oxygen atoms is not well known by many of the candidates.

Question 19

The better candidates were able to deduce the number of atoms present in a chemical formula.

Question 20

Candidates were expected to recognise that substance X is an alkali and therefore produces ammonia when it is reacted with ammonium chloride.

Question 21

The better candidates recognised the electronic structure of non-metal.

Question 22

This question was well done by a large number of the candidates.

Question 23

The use of zinc to make brass was well known particularly by the better candidates.

Question 24

The processes that increase the global carbon dioxide concentration are well understood by the vast majority of the candidates.

Question 25

The fact that iron is used as the catalyst in the Haber process is well known by many of the candidates.

Question 26

The better candidates recognised the general formula of the alkane homologous series.

Question 27

There was evidence of widespread guesswork even amongst the better candidates. Ideas about the fractional distillation of petroleum and the used of the fractions are not well understood by the candidates.

Question 28

Over half the candidates, correctly working out the displaced volume of water, chose option **A** which, while correctly representing the amount of water displaced, represented only half the volume of the cork, as stated in the stem. The question asked the candidates for the volume of the cork, not for the volume of water displaced.

Question 29

Candidates knew that constant speed is shown by a horizontal line. A small minority of candidates chose 'a vertical line' for their answer..

Question 30

A significant proportion, if not the majority, of candidates know the difference between mass and weight and which measurement is affected by the strength of a gravitational field.

Question 32

Candidates found this a challenging question. They needed to realise that as the object was moving at constant speed, the kinetic energy would be staying constant, even if the gravitational potential energy was increasing.

Question 34

Many candidates did not remember that, of all the transverse waves possible, only electromagnetic waves can pass through a vacuum.

Question 35

About half of the candidates were able to answer this correctly.

Question 36

Candidates need to be able to recall how to calculate a current from charge passed and time taking for passing.

Question 37

Candidates needed to be able to rearrange formulae to be able to answer this question.

Question 38

The core metal of an electromagnet was not well known.

Question 39

Candidates know the structure of an atom very well.

Question 40

Candidates still struggle to calculate half-lives.

COMBINED SCIENCE

Paper 5129/21
Theory

Key Messages

- Candidates should be aware that the correct symbols for the quantities in the formula should be used.

General comments

Candidates' responses to recall questions, particularly in the biology section of the paper were often correct. The questions in the physics section of the paper that required a description of an experiment were frequently vague and often did not answer the question asked.

In physics calculations, most candidates showed their working and wrote the formula used in the calculation.

There are certain areas of the syllabus that are not well understood by candidates, most notably half-life, reactivity series, energy loss at each trophic level in a food chain and some aspects of electrical circuits.

Comments on specific questions

Question 1

(a) (i) The structures in an animal cell were well known by a majority of candidates.

(ii) The function of the cell membrane was well known by many candidates.

(b) (i) The differences between an animal cell and a plant cell were well known by candidates.

Question 2

(a) Most candidates knew the use of nitrogen and hydrogen to make ammonia.

(b) Stronger candidates identified hydrogen as the gas that is used in the manufacture of margarine.

(c) Only stronger candidates knew that methane is the main constituent of natural gas.

(d) Many candidates identified carbon dioxide as the gas that is produced during the fermentation of glucose.

(e) Many candidates thought that nitrogen is the most abundant noble gas in the atmosphere rather than argon.

Question 3

Many candidates were able to show the constant speed from 0 s to 10 s on the speed-time graph and also recognised that the speed of the car is constant between 13 s and 17 s. Some candidates thought that between 10 s and 13 s the speed decreased at 2 m / s rather than a deceleration of 2 m / s^2 and drew the line from 8 m / s to 6 m / s instead of 8 m / s to 2 m / s. Only the very strongest candidates were able to indicate on the graph that the car accelerates in a non-constant way between 17 s and 25 s.

Question 4

(a) (i) Most candidates were able to calculate the relative molecular mass of carbon dioxide.

(ii) Stronger candidates understood how to calculate the reacting masses from the stoichiometry of the equation. A significant proportion of candidates were able to calculate the mass of carbon dioxide produced from 4 g of copper oxide.

(b) Candidates needed to be aware that a test to show that a substance is a metal is that it conducts electricity in the solid form.

(c) The fact that copper(II) oxide is reduced by carbon because carbon is more reactive than copper was not well understood by many candidates. Some candidates who recognised that the reason is about differences in reactivity, thought that the carbon was more reactive than copper(II) oxide rather than copper.

Question 5

(a) Most candidates were able to indicate the passage of food from the mouth to the anus.

(b) Most candidates were able to name some of the functions of the liver.

Question 6

(a) The description of the experiment to show that the amount of friction depends on the roughness of the surface was answered well by stronger candidates. However, many others simply described the experiment using a single surface.

(b) (i) Many candidates were able to calculate the volume of the block of wood.

(ii) The formula for calculating the mass of the wooden block was well known by almost all candidates.

Question 7

(a) Most candidates were able to complete the sentences about photosynthesis.

(b) Stronger candidates interpreted the graph and explained why the rate of photosynthesis changes as the temperature is increased.

Question 8

(a) (i) Many candidates were able to identify gas and colourless liquid as carbon dioxide and water.

(ii) Only stronger candidates recognised that the ethanol is oxidised in reaction **C.** Candidates were expected to understand that reaction **C** produces a solution that turns universal indicator yellow indicating an acidic solution which contains ethanoic acid.

(iii) Stronger candidates knew that a solution that turns universal indicator yellow has a pH value in the range 5–6.5.

(b) The structure of ethanol was known by stronger candidates.

(c) Most candidates knew that the name of the liquid that dissolves substances is a solvent.

Question 9

(a) (i) Many candidates recognised the source of energy when atoms regroup as chemical energy.

(ii) Most candidates recognised the source of energy when nuclei of atoms rearrange as nuclear energy.

(iii) The source of energy that passes through a vacuum was only known by stronger candidates.

(b) The idea that kinetic energy in the turbine is converted to electrical energy was known by a significant proportion of candidates. There was a misconception that the first conversion is from potential energy to kinetic energy amongst some candidates.

Question 10

The vast majority of candidates were able to identify the correct statements about the heart.

Question 11

(a) (i) Most candidates were able to determine the number of protons in the nucleus of a magnesium atom.

(ii) The formation of a magnesium ion from a magnesium atom was only understood by stronger candidates. Candidates were expected to state that the magnesium atom loses two electrons in order to achieve a stable full outer shell of electrons.

(b) (i) Only stronger candidates were able to identify black solid **A**. However, salt **B** was identified more frequently.

(ii) A significant proportion of candidates were able to state that the reaction between magnesium oxide and nitric acid is a neutralisation reaction.

(c) The reason why hydrogen does not react with magnesium oxide was only understood by stronger candidates. Candidates needed to know that magnesium oxide does not react with hydrogen because magnesium is more reactive than hydrogen.

Question 12

(a) Stronger candidates were able to state the similarities between gamma-rays and radio waves.

(b) Many candidates knew that the frequency is calculated using the formula $v = f\lambda$ but others had difficulty using standard notation.

Question 13

(a) The parts of the male reproductive system were well known.

(b) Many candidates knew the functions of the structures. The least well known was the function of the prostate gland.

Question 14

(a) Only stronger candidates were able to indicate the level of the water at the start of the chromatography paper.

(b) The reason why a pencil is used to mark the base line was well known by most candidates.

(c) Most candidates recognised that the blue dye is the most soluble in water but some of these candidates did not explain their answer correctly.

Question 15

(a) Many candidates recognised that the charge remained on the sphere because the thread acts as an insulator.

(b) Most candidates were able to explain that the sphere moves away from the rod because they carry the same charge and are therefore repelled.

Question 16

(a) Almost all candidates were able to state the number of herbivores in the food web.

(b) Most candidates were able to complete the food chain that contains four organisms from the food web.

(c) Only the strongest candidates were able to explain how energy is lost between trophic levels in a food chain.

Question 17

(a) Most candidates were able to substitute values of current and potential difference into the formula V = IR and calculate a value of resistance that is equal to approximately 9 Ω.

(b) (i) Only stronger candidates were able to calculate the potential difference across the resistor in the circuit. Candidates needed to be aware that the voltage is shared by the components in the circuit.

(ii) Stronger candidates recognised that the formula V = IR is used to calculate the resistance of the resistor. Candidates who used the incorrect answer to **(i)** in the correct formula were awarded credit.

(iii) This question proved to be difficult for many candidates. Candidates were required to calculate the ratio of potential differences in the two different cells (0.71) and use the result to find the e.m.f. of cell **Y**.

Question 18

(a) Candidates needed to know that reactions that release energy are called exothermic reactions.

(b) The uses of the fraction obtained from the fractional distillation of petroleum were only known by stronger candidates.

Question 19

(a) A significant number of candidates were able to calculate the proton number for molybdenum. However, the numbers on the electron were less well known.

(b) The concept of half-life was not well understood by most candidates. Stronger candidates calculated the number of hours in 14 days and then divided this number by the half-life of molybdenum to show the number of half-lives is five. Using this value it can be shown that after 5 half-lives 3.12 per cent remains after 14 days.

COMBINED SCIENCE

Paper 5129/22
Theory

Key Messages

- Candidates should be aware that the correct symbols for the quantities in the formula should be used.

General comments

Candidates' responses to questions in the biology section of the paper that required some explanation were less well understood and often lacked the required detail. In addition, the questions in the physics section of the paper that required a description of an experiment were frequently vague and often did not answer the question asked. The chemistry questions proved challenging for many candidates, particularly those questions that required recall of information.

There are certain areas of the syllabus that were not well understood, most notably radioactivity, organic chemistry and the function of the valves in the heart..

Comments on specific questions

Question 1

(a) (i) This question was well answered by most candidates. Some of the weaker candidates had difficulty reading the scale on the *y*-axis of the bar chart.

(ii) Most candidates were able to name an organism at the start of the food chain.

(b) (i) The difference between a herbivore and a carnivore was well understood by many candidates.

(ii) Almost all candidates either repeated the question or misunderstood the focus of the question. Candidates were expected to state that there was more energy available for herbivores and that energy is lost between each trophic level through movement, respiration, etc.

(iii) Stronger candidates were able to state that dead organism are decomposed by decomposers or a named decomposer such as fungi.

Question 2

(a) (i) Many candidates knew that carbon monoxide is produced by the combustion of the fuel in a car engine but only the strongest candidates were able to state that carbon monoxide is produced by the incomplete combustion of the fuel.

(ii) The poisonous nature of carbon monoxide was not well known.

(b) (i) Most candidates were able to balance the equation.

(ii) The test for carbon dioxide was well known by stronger candidates.

(c) (i) Many candidates were able to name the ore of iron as haematite.

(ii) The concept of reduction in a chemical reaction was misunderstood by most candidates.

Question 3

Many candidates were able to show on the speed-time graph the constant acceleration from 0 s to 5 s and also recognised that after 12 s the speed of the cyclist is constant. Only the very strongest candidates were able to indicate that the speed is non-constant between 5 s and 9 s on the graph. Many candidates thought that between 9 s and 12 s the speed increased at 1 m / s rather than an acceleration of 1 m / s^2 and drew the line from 4 m / s to 5 m / s instead of 4 m / s to 7 m / s.

Question 4

Many candidates knew which substances are transported by the structures.

Question 5

(a) (i) This question was well answered by stronger candidates but many other candidates included the stoichiometry from the equation and obtained an answer twice the actual answer.

(ii) Stronger candidates understood how to calculate the reacting masses from the stoichiometry of the equation. Other candidates were able to calculate the mass of potassium oxide produced from 3.9 g of potassium.

(b) (i) Only stronger candidates recognised the fact that the hydroxyl ion causes the alkalinity of a solution.

(ii) Candidates needed to know that the pH of a solution that turns universal indicator purple is between 12 and 14.

Question 6

(a) Most candidates answered this question by drawing straight lines and gained no credit. Candidates were expected to draw an arc from the ramp to the floor and then a second arc with the height of the bounce being less than initial bounce.

(b) This question was well answered by most candidates.

Question 7

(a) Only stronger candidates were able to name the tissue found at **C** as muscle.

(b) Many candidates were able to draw arrows to indicate that the flow of blood in blood vessels **A** and **B** is away from the heart.

(c) (i) Only the strongest candidates were able to label one of the flaps between an atrium and a ventricle. Candidates should be made aware that a label line should end on the structure.

(ii) Many candidates knew that the valve prevents the backflow of blood from the ventricle to the atrium but were unaware of how the valve prevent the backflow. Candidates were expected to state that the valve opens to allow flow of blood from the atrium to the ventricle and then ventricle contracts so the valve closes and therefore prevents the backflow of blood.

Question 8

(a) Many candidates drew the shared pair of electrons between the two atoms but the fact that there are six unpaired electrons on each chlorine atom was less well known.

(b) (i) Only stronger candidates knew the link between group number and the number of outer shell electrons.

(ii) The decrease in reactivity down Group VII of the Periodic Table was understood by stronger candidates. However, others simply stated a single colour rather than how the colour changes as the group is descended.

(c) The concept of state symbols in chemical equations was not understood by many candidates.

(d) Most candidates knew that chlorine is used to kill bacteria in the treatment of water supplies.

Question 9

(a) Most candidates did not answer the question that was asked. Many described the experiment to find the extension of the spring rather than how to measure the length of the spring. Candidates were expected to know how a ruler is used to measure the length of the spring.

(b) Many candidates described a different experiment to the one asked in the question. Candidates were expected to state that the length of the spring is measured, then a mass is added to the mass hanger and remove the mass. The spring is elastic because it returns to its original length.

Question 10

(a) Most candidates recognised that carbon dioxide and urea are waste products but in order to gain credit candidates needed to state that the waste products are toxic.

(b) Most candidates recognised the organ responsible for the excretion of carbon dioxide as organ 2, the lungs, but the organs responsible for the excretion of urea and water were less well known.

Question 11

(a) Process **K** and process **L** were identified by stronger candidates. Of the two reagents, reagent **N** was identified the most frequently.

(b) Many candidates were able to evaluate y but the value of z was less frequently correct.

Question 12

Many candidates were able to identify the features described. There was some confusion about the description of X-rays and radio wave and the description of longitudinal and transverse waves.

Question 13

(a) (i) The fact that lack of fibre causes constipation was not well understood by many candidates. A significant number simply wrote “fibre” and did not gain credit.

(ii) The cause of obesity was well known by many candidates. Some candidates described obesity rather than stating what part of an unbalanced diet causes obesity.

(b) (i) Many candidates understood that drought is the lack of sufficient water but the effect of lack of water were less well understood.

(ii) A number of candidates did not follow the instruction to state another cause of famine and gave the answer “drought” or explained the meaning of famine.

Question 14

The uses of some of the listed metals were not well known by some candidates. However, many candidates recognised that aluminium is used to make food containers.

Question 15

(a) (i) Many candidates thought that the resistor with the lowest resistance is the resistor with the lowest current and chose resistor **X** rather than the resistor with the largest current, resistor **Z**.

(ii) The calculation of the resistance of resistor **Y** was well done by many candidates.

(b) (i) The idea that because the resistance is the same, that then doubling the voltage will also double the current was only understood by stronger candidates.

(ii) Most candidates did not understand that the definition of current is the charge flow in one second.

(iii) Stronger candidates recognised that power is the voltage multiplied by the current. Candidates who used the incorrect answer to **(a)** in the correct formula were awarded credit.

Question 16

A significant proportion of candidates completed the sentences and gained full credit. The functions of the liver and the function of amylase in the stomach were the most common correct answers

Question 17

(a) (i) Many candidates identified **B** as the liquid at room temperature from the melting point and boiling point values.

(ii) The fact that metals conduct electricity when they are solid was well understood.

(iiii) Only stronger candidates recognised that **C** is an ionic substance and dissolves in water because it conducts electricity when it is molten and has a high melting and boiling point.

(b) Only stronger candidates answered this correctly.

Question 18

(a) The properties of an alpha-particle, beta-particle and gamma-rays were known by stronger candidates.

(b) (i) Most candidates used the information from **(a)** to answer the question rather than describing the nature of the alpha-particle. Some candidates indicated that the alpha-particle is helium but they did not state that it is a helium nucleus. Those candidates who gave the nuclide notation usually omitted the charge on the symbol.

(ii) In the same way as **(i)**, the vast majority of candidates used the information from **(a)** to answer the question.

(iii) In this question too, most candidates used the information from **(a)** to answer the question.