COMBINED SCIENCE

Paper 5129/11
Multiple Choice

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

General comments

Most candidates found the questions on this paper accessible but **Questions 6**, **9**, **10**, **16**, **23**, **35**, **37** and **38** proved to be more challenging.

Comments on specific questions

Question 2

Most candidates knew that osmosis was the passage of water molecules from a region of their higher concentration to a region of their lower concentration through a partially permeable membrane. Candidates who did not select the correct answer identified the need for a partially permeable membrane but chose option **C**.

Question 4

Many candidates recognised that the rate of photosynthesis would be faster the closer the lamp was to the water plant. Candidates who did not select the correct answer often selection option **B** where the distance was 25 cm.

Question 5

Many candidates knew that food passed down the oesophagus by peristalsis. However, some candidates thought that the process was ingestion.

Question 6

This question proved challenging. Candidates had to identify the labelled tissues and link this information to the correct functions and this was not always done accurately.

Question 8

Candidates had to identify the time at which an athlete finished their race using a graph of lactic acid concentration. Many candidates recognised the correct time as being when the lactic acid concentration just starts to fall. The majority of candidates who did not select the correct answer thought that the end of the race would be when the lactic acid concentration returned to the same value as the start of the race.

Question 9

This proved to be a challenging question for most candidates. Candidates need to be aware that there should be no protein or glucose in the urine of a healthy person.

Question 10

This question proved to be very challenging for many candidates who were not able to identify that it is the retina which detects the light intensity, and that the iris muscles respond.

Question 13

Given a set of statements about asexual and sexual reproduction, candidates knew that sexual reproduction involves making zygotes and produces offspring that are genetically dissimilar.

Question 14

This question was answered well by stronger candidates. Weaker candidates did not recognise that distance travelled by a substance in a chromatogram is solvent dependent and chose option **C**.

Question 16

Ideas about electronic structure and the Periodic Table are not well understood and all options were chosen by candidates.

Question 17

Stronger candidates answered this correctly.

Question 18

Candidates were expected to be able to calculate relative molecular masses and use simple proportion to calculate the mass of reactants or products using an equation, but this proved challenging for many candidates.

Question 19

The reaction of different types of oxides were well known by stronger candidates.

Question 22

Most candidates were able to determine the most and least reactive of the metals. However, some of these candidates had difficulty determining the relative reactivity of elements R and T and chose option **C**.

Question 23

The idea that the ease of extraction of a metal from its ore depends on the relative reactivity of the metal was not well understood.

Question 25

Many candidates recognised the types of reaction in the question. Weaker candidates thought that the addition of hydrogen to ethene is an oxidation reaction and chose option **B**.

Question 27

Stronger candidates recognised that when natural gas is burned, energy is released and therefore the reaction is exothermic. Weaker candidates were possibly unaware of the meaning of the word exothermic.

Question 28

A large number of candidates mistook the edge of the callipers' movable arm for the zero of the vernier scale, choosing option **A** rather than the key, option **B.**

Question 29

This was often answered well but a significant number of candidates selected option **B.**

Question 30

Some candidates gave the incorrect answer of option **C** for this question.

Question 31

While most candidates answered this well, option **B** was a popular choice from weaker candidates.

Question 32

Stronger candidates used *mg h* and chose the key, option **D** but others used *m h* and so selected option **C**.

Question 33

This question was answered well with stronger candidates choosing the key, option **C**, but others selected option **D**.

Question 34

While most candidates answered this well, option **D** was a popular choice from weaker candidates.

Question 35

Many candidates found it challenging to choose the correct angle of incidence or used the angle value rather than its sine. These candidates selected either option **B** or option **C** rather than the key, option **A**.

Question 37

More candidates chose option **A** or **C** than the key, option **D**. Only stronger candidates answered correctly.

Question 38

Only stronger candidates answered this correctly. Both options **B** and **D** were common choices.

Question 39

A number of candidates chose option **C** or **D** rather than the key, option **B**.

COMBINED SCIENCE

Paper 5129/12
Multiple Choice

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

General comments

Most candidates were able to answer questions well but some found **Questions 6**, **9**, **12**, **15**, **18**, **19**, **32**, **33** and **37** more challenging.

Comments on specific questions

Question 2

Most candidates knew that osmosis was the passage of water molecules from a region of their higher concentration to a region of their lower concentration through a partially permeable membrane. Many candidates who did not select the correct answer had correctly identified the need for a partially permeable membrane and opted for **C**.

Question 4

Many candidates recognised that the rate of photosynthesis would be faster the closer the lamp was to the water plant. Option **B** was the most common incorrect answer selected.

Question 5

In this question, candidates had to identify the correct order in which food travels through the alimentary canal after it enters the mouth and many candidates answered correctly. Other candidates incorrectly selected option **A**.

Question 6

This question proved challenging for some candidates with only stronger candidates answering correctly.

Question 7

Many candidates knew that contraction of the left ventricle would cause blood to move up into the aorta labelled **C**. However, other candidates linked the contraction to movement of blood into the pulmonary artery labelled **D**.

Question 8

Candidates had to identify the time at which an athlete finished their race using a graph of lactic acid concentration. Many candidates recognised the correct time as being when the lactic acid concentration just starts to fall. Other candidates incorrectly thought that the end of the race would be when the lactic acid concentration returned to the same value as the start of the race.

Question 9

This proved to be a challenging question for most candidates. Candidates need to be aware that there should be no protein or glucose in the urine of a healthy person.

Question 10

Most candidates knew that hormones were produced by glands and altered the activity of target organs. However, many thought that they were destroyed in the kidney rather than the correct response of the liver.

Question 12

This question linked the carbon cycle to the production of oxygen by photosynthesis and proved to be challenging for many candidates. Only stronger candidates recognised that it would be photosynthesis with many other candidates opting for respiration in green plants.

Question 14

This question was answered well by stronger candidates. Weaker candidates did not recognise that distance travelled by a substance in a chromatogram is solvent dependent and chose option **C**.

Question 15

Ideas about the arrangement of particles in a liquid were not well understood and this question was challenging for many candidates.

Question 16

Most candidates recognised that the nucleon number is made up from the number of protons in the nucleus. However, many of these candidates thought that the nucleon number is the sum of the protons and electrons rather than the sum of the protons and neutrons.

Question 17

There was a misconception amongst many candidates that methane is an ionic substance.

Question 18

Candidates were expected to be able to calculate relative molecular masses and use simple proportion to calculate the mass of reactants or products using an equation, but many candidates were not able to do so.

Question 19

The fact that carbon dioxide is produced when magnesium carbonate reacts with dilute hydrochloric acid was not well known by many of the candidates.

Question 20

Stronger candidates recognised that element X is a halogen and therefore it is placed in Group VII of the Periodic Table.

Question 22

Almost all candidates were able to determine the most and least reactive of the metals. However, a significant proportion of these candidates had difficulty determining the relative reactivity of elements R and T and chose option **C**.

Question 23

There was a misconception among some weaker candidates that mild steel rather than aluminium is used in the manufacture of aircraft bodies.

Question 24

Most candidates though that hydrogen rather than oxygen is used with acetylene in welding. However, some of these candidates recognised that carbon monoxide is produced during the incomplete combustion of methane.

Question 27

Most candidates recognised that compounds Q and R are alkanes. However, the fact that alkanes produce carbon dioxide and water when they burn completely was not well known by many of these candidates.

Question 29

Many candidates found this question challenging and chose option **A** rather than the key, option **C**.

Question 31

Stronger candidates used *mg h* and chose the key, option **D**, but others used *m h* and so selected option **C**.

Question 32

This was a challenging question for many candidates and all options were selected.

Question 33

Only stronger candidates answered this correctly, with weaker candidates selecting one of the other options.

Question 34

This question was usually well answered, but option **B** was the most popular incorrect option.

Question 35

The laws of electrostatics were not well known with many candidates choosing option **C** rather than the key, option **B**.

Question 36

Many candidates overlooked the effect of the parallel resistor arrangement and chose option **A.**

Question 37

The need for a fuse rating to be just higher than the circuit current was not widely known with each option attracting a large number of responses.

Question 38

Only the strongest candidates answered this correctly.

Question 39

This question was challenging for many candidates with a significant number selecting option **C** instead of the key, option **A**.

Question 40

Only the strongest candidates answered this correctly.

COMBINED SCIENCE

Paper 5129/21
Theory

General comments

Questions about electromagnets and magnetism, physics calculations and chemistry calculations proved difficult for a significant proportion of the candidates.

Responses to questions requiring recall were answered very well but questions that required an explanation were less well understood and lacked the required detail.

Comments on specific questions

Question 1

(a) (i) Most candidates were able to identify the two foods that contain no fat from the bar chart.

(ii) Most candidates were able to identify the food that contains 20 per cent carbohydrate from the bar chart.

(iii) Most candidates were able to determine the percentage composition of protein in meat from the bar chart.

(b) The importance of fibre (roughage) in a diet well known by many candidates.

(c) Many candidates recognised how a balanced diet varies with age and activity in terms of the energy and the protein requirements.

Question 2

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

(ii) Stronger candidates understood how to calculate the reacting masses from the stoichiometry of the equation using simple proportion.

(b) The uses of aluminium and the property which determines those uses were well known by all candidates.

Question 3

(a) (i) Most candidates were able the identify the structures in the human eye.

(ii) Most candidates knew that the pupil has a smaller diameter when a bright light is shone into the eye.

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

Question 4

(a) Few candidates were able to read the vernier caliper to determine the width of the bolt thread.

(b) (i) Most candidates were able to measure the thread length and the diameter of the bolt on the diagram and then calculate the ratio, R, using the equation.

(ii) Candidates who used their incorrect values from **(a)** and **(b)(i)** to calculate the actual length of the bolt thread were given credit for a correct calculation.

(c) Most candidates were able to describe how to use a measuring cylinder to determine the volume of the bolt.

Question 5

(a) (i) The name given to the elements in Group VII of the Periodic Table was well known by many candidates.

(ii) Only stronger candidates were able to define an element.

(b) Almost all candidates were able to state the electronic structure of the chlorine atom.

(c) (i) Most candidates recognised the trend in colour as Group VII is descended.

(ii) This question was answered correctly by most candidates.

(d) This question was also answered correctly by most candidates.

Question 6

(a) Stronger candidates could recall the equation to calculate the moment of the force about the centre of the bolt. Weaker candidates had difficulty expressing their answer in standard notation and giving the unit. Candidates who converted the length of the bolt into meters or centimetres were given credit for the calculation.

(b) Only stronger candidates were able to calculate the height through which the motor lifts the wrench. Candidates were expected to calculate the energy using the formula $E = P \times t$ and to use this value in the formula $W = F \times d$ to calculate the height.

Question 7

Many candidates were able to complete the table and match the name of the organ to the function of the organ. The function of the pancreas was the least well known of the functions. There was a misconception that the function of the anus is excretion rather than egestion.

Question 8

(a) (i) A large proportion of candidates were able to deduce the formula of octene.

(ii) Candidates should be made aware that an unsaturated compound contains a carbon to carbon double bond in its structure. It was insufficient to state that it contains a double bond alone.

(b) (i) Many candidates were able to identify the errors shown in the diagram of the chromatography experiment.

(ii) The idea that a pure compound produces only one spot on a chromatogram was not understood by many candidates.

Question 9

(a) Few candidates recognised that the process by which thermal energy is transferred through the wire is conduction.

(b) Many candidates knew that the load moves downwards due to expansion in the wire. However, only stronger candidates explained the expansion in terms of the particles in the wire.

(c) The idea that radiation is the process by which thermal energy is transferred through the air was not well known by many candidates.

(d) The explanation of a convection current in heated air was not well understood by many candidates. Candidates were expected to explain that when the air is heated it becomes less dense and therefore the air rises. Candidates who indicated that heat is rising gained no credit.

Question 10

The functions of the structures in a flower were well known by most candidates.

Question 11

(a) The outer electron structure in a molecule of hydrogen chloride was well known by many candidates.

(b) Compound **A** and reactant **C** were identified correctly by many candidates. Only stronger candidates were able to identify reactant **B** as ethene.

(c) The definition of oxidation was not well known by many candidates.

Question 12

(a) (i) Many candidates answered this question in terms of the voltmeter readings rather than the temperature difference between melting ice and boiling water.

(ii) Candidates who answered **(i)** in terms of the voltmeter readings were given credit for predicting a reading a hundred times the answer to **(i)**.

(b) Only stronger candidates were able explain the meaning of joule per coulomb. Candidates were expected to explain that it is the energy per unit charge.

Question 13

(a) The identity of the layer of cells labelled **A** was well known by most candidates.

(b) Almost all candidates were able to describe the function of the chloroplasts.

(c) The function of the cuticle was not well known by many candidates. Candidates were expected to state that it reduces or prevents the loss of water from the upper part of the leaf.

(d) Many candidates knew that carbon dioxide is taken into a leaf and oxygen is given out by the leaf in bright daylight. However, the fact that water vapour is given out by the leaf was less well known.

Question 14

(a) Stronger candidates were able to state the relative charge and relative mass of an electron.

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

Question 15

(a) Ideas about parallel circuits were not well understood by many candidates.

(b) (i) The formula for calculating the e.m.f. of a cell ($V = IR$) was well known by many candidates.

(ii) Few candidates recognised that the fact that potential difference across the variable resistor in parallel with the lamp is the same as the potential difference across the lamp, means that the resistance of the variable resistor is the same as the resistance across the lamp.

Question 16

The ways in which the human immune-deficiency virus can be spread were well known by many candidates.

Question 17

(a) Stronger candidates were able to identify the product of the reaction between magnesium and dilute sulfuric acid.

(b) Only a small proportion of candidates were able to state that the piece of apparatus used to separate the excess magnesium from the reaction mixture is a filter funnel.

(c) Most candidates recognised that the type of reaction that gives out heat energy is an exothermic reaction.

(d) Many candidates did not recognise that the pH of the reaction mixture increases as the sulfuric acid is used up.

Question 18

(a) Ideas on magnetism were not well understood by many candidates. Candidates were expected to understand that magnetic fields have direction and that the magnet aligns with the Earth's magnetic field and therefore the float returns to its original position.

(b) The differences between a permanent magnet and an electromagnet were not well known by many candidates.

Question 19

This question was answered well by a majority of candidates.

COMBINED SCIENCE

Paper 5129/22
Theory

General comments

The physics questions and in particular questions about electromagnets, radioactivity and light, proved to be demanding for many candidates. In physics calculations, some candidates showed their working, indicating the formulae used in their calculations, but candidates should be aware that they should be using the correct symbols for the quantities in the formulae.

The responses to questions in the biology section of the paper, particularly those requiring recall, were answered very well but questions that required some explanation were less well understood and lacked required detail.

Chemistry questions were less well answered, particularly those that required recall of information.

Comments on specific questions

Question 1

(a) Stronger candidates were able to name the structures. Structure C proved to be most well-understood part of the question.

(b) The function of xylem was well known by many candidates. The function of phloem was less well understood.

(c) Most candidates were able to name carbon dioxide as one of the gases produced by green leaves when there is no light. However, water vapour was less well known. There was a misconception amongst many candidates that oxygen is produced when there is no light.

Question 2

(a) (i) Stronger candidates were able to calculate the relative molecular mass of potassium chloride.

(ii) The calculation proved to be challenging for a significant proportion of candidates. Candidates were expected to be able to use the stoichiometry of an equation to calculate masses by simple proportion.

(b) The test for oxygen was well known by stronger candidates but there was some confusion amongst some candidates between the test for oxygen and the test for hydrogen.

Question 3

(a) How to use a micrometer was not well understood by a large number of candidates.

(b) (i) Stronger candidates were able to substitute the numbers into the equation and calculate the volume of the piece of wire. A number of candidates used an incorrect number obtained in **(a)** and successfully calculated a value for the volume.

(ii) Most candidates stated that the apparatus used to measure the length of the wire was a ruler. However, many of these candidates did not take into account that the length of the wire was 850 mm and therefore did not state that the apparatus used was a metre rule with a millimetre scale.

Question 4

(a) Many candidates were able to identify the structures in the plant call.

(b) Most candidates were able to draw the nucleus within the cytoplasm.

(c) Only stronger candidates knew that the process which makes the cell increase in size is osmosis.

(d) Most candidates were able to state that plant cell does not burst because of the cell wall.

Question 5

(a) This question was answered well by many candidates but a number of candidates gave no response to the question.

(b) Most candidates identified hydrogen as the gas produced when alkali metals react with water. The number of electrons in the outer shell and the fact that alkali metals are soft were less well known.

(c) Almost all candidates were able to balance the equation.

Question 6

(a) This question proved challenging for most candidates with responses simply referring to the forces being balanced rather than the clockwise and anticlockwise moments being balanced.

(b) Only stronger candidates were able to calculate the time taken to lift the beam to a height of 0.2 m. Candidates were expected to calculate the work done using the formula $W = F \times d$ and to use this value in the formula $E = P \times t$ to calculate the time.

Question 7

(a) Most candidates knew that oxygen and water are required for germination to occur, but the fact that the seeds should be at a suitable temperature was less well known. There was a misconception amongst weaker candidates that light is a necessary environmental condition.

(b) Many candidates were able to interpret the graph to describe the effect of pH on the germination of a seed.

Question 8

(a) The processes involved in the transfer of thermal energy through a metal and through water were not well known.

(b) Many candidates did not explain the process of convection in water. Candidates were expected to state that heated water becomes less dense and therefore rises in the beaker so the water at the top of the beaker becomes hotter.

(c) There was a misconception amongst many candidates that particles expand when they are heated rather than a liquid expanding because the particles in the liquid move faster and therefore move further apart.

Question 9

(a) The organs associated with the alimentary canal were very well known by most candidates.

(b) The processes carried out by the structures in the alimentary canal were well known by many candidates.

Question 10

Many candidates were able to link the properties with ammonia, chlorine, oxygen. There was a misconception amongst some candidates that nitrogen is a noble gas or a component of natural gas.

Question 11

(a) The structure of ethene was well known by stronger candidates.

(b) Only stronger candidates were able to identity of three reactants in the reaction scheme.

(c) The definition of reduction was not well known by candidates.

Question 12

(a) Only the strongest candidates were able to describe how to determine the angle of incidence for one of the rays shown on the diagram. Candidates were expected to state that a normal line is drawn where the ray meets the mirror and then measure the angle between the normal and the incident ray. Those candidates who used the diagram to illustrate their description were given full credit for their answer.

(b) Very few candidates drew any reflected rays. Candidates were expected to draw a reflected ray to show that the angle of incidence is the same as the angle of reflection at one of the rays and then to extend this ray back to the point **I** on the diagram.

Question 13

This question was answered well by many candidates but there was some confusion about the production and excretion of urea.

Question 14

(a) Ideas about elements, compounds and mixture were well understood only by stronger candidates.

(b) (i) Stronger candidates were able to state that a sample of sodium chloride can be obtained from the mixture by filtering to remove the sand and then evaporating the water.

(ii) The use of melting point to determine the purity of a substance was not understood by most candidates.

Question 15

(a) (i) This question was answered very well.

(ii) Most candidates were able to determine the total voltage of the battery.

(b) Candidates were expected to use the values of resistance and voltage obtained in **(a)** in the formula $V = I \times R$ to determine the current in the circuit and to quote their answer to two significant figures.

Question 16

Stronger candidates answered this correctly. Candidates should be reminded that the direction of the arrows in a food chain are important.

Question 17

(a) The relationship between group number and number of electrons in the outermost shell of an atom was not understood by many candidates.

(b) Only the strongest candidates were able to deduce the formula for lead nitrate.

(c) Most candidates did not recognise that lead nitrate is an ionic substance and therefore will conduct electricity when it is molten and when it is in aqueous solution.

(d) Only the strongest candidates were able to deduce the charge on a sulfate ion.

Question 18

(a) Ideas about electromagnets were not well understood by most candidates. Candidates were expected to draw a coil around the iron bar with the ends of the coil connected to a power source.

(b) Only the strongest candidates understood that iron is a suitable material for the core of an electromagnet because it is easily magnetised and demagnetised by passing an electric current through the coil, which means that it can be turned on and off.

(c) Most candidates were not aware that a permanent magnet always has its own magnetic field or retains its magnetism whereas an induced magnet is only a magnet in the presence of a magnetic field.

Question 19

(a) Most candidates determined the nucleon number and proton number thorium rather than the emitted α-particle.

(b) This question proved to be challenging for most candidates. Candidates needed to know that the emission of a β-particle increases the proton number by 1 and does not change the nucleon number. Therefore, the proton number of the protactinium isotope is 91 and the number of neutrons is 143.