COMBINED SCIENCE

Paper 5129/11
Multiple Choice

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

General comments

Candidates need to take different approaches to different types of question. Where an item involves calculation, candidates should first perform the calculation then check to see if one of the options given matches his or her answer. When an item involves discursive or diagrammatic options, candidates should examine all options carefully before selecting his or her best answer.

Comments on specific questions

Question 3

Candidates found this question very challenging. The starch has been broken down so candidates needed to identify the optimum conditions for the action of amylase.

Question 4

Most candidates identified nitrogen as the main element provided to make proteins.

Question 5

Most candidates correctly chose ‘peristalsis’, although a significant number chose ‘digestion’.

Question 6

This question discriminated well between candidates, with the stronger candidates demonstrating a very clear understanding of transpiration.

Question 8

Most candidates recognised that the amount of oxygen in expired air has decreased while the amounts of water vapour and carbon dioxide have increased.

Question 12

There was some confusion between the arrows representing respiration in plants and photosynthesis

Question 13

About half of the candidates identified X as an anther. Sepal was the strongest distractor.

Question 14

The apparatus used to obtain separate samples of sand and salt from a mixture of sand and salt solution was well known by many of the candidates.

Question 16

This question was well done by the better candidates. A large proportion of the weaker candidates thought that metals gain electrons when they form ions and chose option **A**.

Question 17

The better candidates knew that covalent bonding does not involve the transfer of electrons.

Question 18

The construction of a formula using the ionic charges was well done by the better candidates.

Question 19

Ideas about balancing chemical equations are not understood by many of the candidates.

Question 23

The uses of metals and the reason for that use are not well known by many of the candidates. There was evidence of guesswork, particularly amongst the weaker candidates.

Question 25

This question was well done by the better candidates although some of the candidates thought that magnesium hydroxide reacts with dilute hydrochloric acid to produce hydrogen.

Question 27

There was evidence of guesswork amongst the candidates. It would appear that the meaning of the word exothermic is unfamiliar to many.

Question 29

Some of the better candidates chose the incorrect distractor **B** rather than the key, option **D**. This is an example of a question that may have been better answered had candidates read all the options carefully before selecting their best answer.

Question 31

Candidates seemed unsure of how to calculate the weight in newtons of a mass expressed in grams. This led to many of even the better candidates choosing the distractors **A** and **D**.

Question 37

A significant number of better candidates chose distractor **B** rather than the key, option **A**.

Question 38

There was some confusion and guessing among the better candidates, with significant numbers choosing option **B** (obtained by the incorrect conversion of the time), rather than the key, option **D**. The simple expediency of multiplying all three numbers together, option **A**, appealed to nearly half of the candidates.

Question 39

The factors affecting the e.m.f. from a simple a.c. generator were well known with a 69 per cent response to the key, option **C**. Option **A**, the most popular distractor, attracted a significant number of the more able candidates.

Question 40

Half-life from a decay curve was well known, although options **A** and **B** attracted a number of more able candidates.

COMBINED SCIENCE

Paper 5129/12
Multiple Choice

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

General comments

Candidates need to take different approaches to different types of question. Where an item involves calculation, candidates should first perform the calculation then check to see if one of the options given matches his or her answer. When an item involves discursive or diagrammatic options, candidates should examine all options carefully before selecting his or her best answer.

Comments on specific questions

Question 2

Many candidates found this question difficult. Digestion and peristalsis proved to be strong distractors for the weaker candidates.

Question 3

This question also proved to be much more difficult. The starch has been broken down so candidates needed to identify the optimum conditions for the action of amylase.

Question 4

The majority of candidates correctly identified the parts of a leaf. Some confused the spongy mesophyll with the palisade cells.

Question 6

This question proved to be more challenging. Many of the weaker candidates described transpiration as the movement of water up through the xylem.

Question 7

Candidates also found this question more difficult. They did not appear to be confident about the features of capillaries.

Question 8

A significant number of candidates selected breathing as the function of the alveoli instead of gas exchange.

Question 9

This question was answered correctly by the majority of the candidates. Option **B** proved to be the strongest distractor suggesting some confusion about the role of the kidneys and the liver in this process.

Question 10

The majority of candidates found this question difficult. A significant number of weaker candidates incorrectly selected option **A** – the suspensory ligaments.

Question 13

Candidates were well prepared for this question.

Question 14

The apparatus used to obtain separate samples of sand and salt from a mixture of sand and salt solution was well known by many of the candidates.

Question 15

Atomic structure is well understood by a majority of the candidates.

Question 16

The differences between elements, compounds and mixtures are not well understood by even the better candidates.

Question 18

There was evidence of guesswork amongst the weaker candidates.

Question 20

Ideas about balancing chemical equations are not understood by many of the candidates.

Question 21

The properties of amphoteric oxides are not well known by many of the candidates. The vast majority of the candidates though that they react with either an acid or an alkali and chose options **B** or **C**.

Question 22

A majority of the candidates are aware of the relationship between the Group number in the Periodic Table and the number of electrons in the outer shell of an atom.

Question 23

There was evidence of guesswork particularly amongst the weaker candidates. The reactivity of particular elements with cold water and hydrochloric acid is not well known by many of the candidates.

Question 24

The uses of metals and the reason for that use are not well known by many of the candidates. Once again there was evidence of guesswork particularly amongst the weaker candidates.

Question 25

A significant proportion of even the better candidates thought that magnesium hydroxide reacts with dilute hydrochloric acid to produce hydrogen.

Question 26

There was evidence of guesswork amongst the majority of the candidates. It would appear that the meaning of the word exothermic is unfamiliar to many of the candidates. Candidates should be aware that any chemical reaction that produces energy is described as an exothermic reaction.

Question 29

Some of the better candidates chose the incorrect distractor **B** rather than the key, option **D**. This is an example of a question that may have been better answered had candidates read all the options carefully before selecting their best answer.

Question 32

Just over half of the candidates chose either option **C** or **D.** Of the remaining candidates, the better ones chose the key, option **A**, and the weaker ones option **B**.

Question 33

Option **C**, the key, only attracted a 25 per cent response. This is another example of a question where candidates would have benefitted by carefully reading the question and all of the options before selecting the best answer.

Question 34

The majority of candidates this year were able to correctly identify the wavelength, and hence the key, from the diagram. The remaining candidates were divided equally between the distractors.

Question 35

Many candidates still consider the incident angle to be the angle between the incident ray and the material surface. The better candidates knew that the incident angle is between the ray and the normal to the surface.

Question 36

The significant number of candidates who chose option **C** or **D** did not realise that the lamp in series with the resistor must take some of the potential difference supplied by the cell if the current through it is 0.5 A (If the lamp had negligible resistance, the current in the circuit would be higher).

Question 39

An increase in proton number also leads to a corresponding increase in mass number, giving option **D**.

COMBINED SCIENCE

Paper 5129/21
Theory

General comments

Candidates are becoming more aware that they should show their working in Physics calculations, but many are still not showing their complete working and presenting their answers to an appropriate number of significant figures, correctly rounded. Many candidates also seem confused when asked to work with standard notation.

The Chemistry section of the paper proved difficult for many of the candidates. Questions which required an explanation of an observation or phenomenon were less well done by the candidates. Candidates have a tendency to repeat the question in their response.

Key messages:

When showing working, candidates should:

- write the formula in their answer
- use the correct symbols in the formula
- show the substitution of the values in to the formula
- calculate the value to the appropriate number of significant figures, correctly rounded.

Candidates should also be able to use standard form with positive and negative indices.

Candidates should not simply repeat information given in the question stem in their answers.

Comments on specific questions

Question 1

Ideas about the human reproductive system are well known and understood by a majority of the candidates.

Question 2

(a) (i) A majority of the candidates were able to plot the points on the graph correctly and draw the line of best fit.

(ii) Most of the candidates were able to use the graph to find the mass of nitrogen dioxide produced by 1.88 g of copper(II) nitrate.

(iii) The concept of proportionality show by the stoichiometry of the equation was less well understood by the candidates.

(b) The test for oxygen was well known by a majority of the candidates.

Answers: **(a)(ii)** 0.92 **(iii)** 184

Question 3

(a) A large proportion of the candidates had difficulty describing the position of the ammeter and voltmeter. Candidates were expected to state that the voltmeter is placed in parallel with the resistor and the ammeter is placed in series in the circuit.

(b) (i) A majority of the candidates were able to read the two meters correctly.

(ii) The formula $V = IR$ is well known by most of the candidates and were able to rearrange the formula to calculate the resistance R of the resistor. The unit of resistance was not well known by a significant proportion of the candidates.

Answers: **(b)(i)** 5 V 0.5 A **(ii)** 10 Ω

Question 4

(a) The requirements of a balanced diet are well known by many of the candidates.

(b) The function of fibre in a balanced diet is not well understood by a large proportion of the candidates. Fibre provides bulk to the contents of the alimentary canal which allows for efficient peristalsis and therefore prevents constipation.

Question 5

(a) Only the better candidates were able to describe a test to show that magnesium is a metal. The test for any metal is that it conducts electricity in the solid state.

(b) Ideas about the electronic structure of atoms are well understood by the vast majority of the candidates.

(c) (i) An easy question, particularly for the better candidates.

(ii) Only the best candidates were able to determine the formula of the phosphate ion from the formula of magnesium phosphate shown in the equation.

(iii) The colours of Universal Indicator in an acidic and a neutral solution are not well known by the candidates

Question 6

(a) (i) Only the very best candidates were able to read the vernier calipers to find the external diameter of the test-tube from the diagram.

(ii) Most of the candidates recognised that in order to calculate the thickness of the wall of the test-tube the value of the internal diameter should be subtracted from the value of the external diameter of the test-tube determined in part **(a)(i)** of the question. However, only the better candidates took into account that the external diameter included two walls of the test-tube.

(b) (i) A large proportion of the candidates were able to take the readings on both measuring cylinders to determine the volume of the test-tube.

(ii) The formula for calculating the density is well known by the better candidates.

Answers: **(a)(i)** 16.3 mm **(ii)** 1.15 mm **(b)(i)** 6 cm^3 **(ii)** 2,52 g/cm^3

Question 7

(a) The differences between a root hair call and a red blood cell are well known by the candidates.

(b) (i) The functions of a root hair cell are well known by a majority of the candidates.

(ii) Many of the candidates had difficulty explaining how the shape of the root hair cell helps the cell perform its function. The better candidates recognised that the shape of the cell increased the surface area of the cell but then did not state that this increased the ability of the cell to carry out osmosis.

Question 8

The better candidates understand the fractional distillation of petroleum and how the process works.

Question 9

(a) Many of the candidates did not recognise wire **B** as the earth wire.

(b) The function of the neutral wire is not well understood by many of the candidates. Candidates should know that the neutral wire carries the current at a voltage of zero volts. Candidates often incorrectly refer to the current as electricity.

(c) (i) The better candidates knew the formula $P = VI$ and were able to rearrange the equation to calculate the current.

(ii) A significant proportion of the candidates did not realise that a fuse rating is expressed in amps and chose a value in terms of volts or ohms.

Answer: **(c)(i)** 1.3 A

Question 10

This question was answered well by a majority of the candidates although there was a tendency for the weaker candidates to omit drawing a line from one or two of the processes on the left.

Question 11

(a) The identity of acid **A** was well known but the identity of gas **B** was less well known.

(b) Ideas about the relative reactivity of metals are not well understood by many of the candidates. Candidates were expected to state that nickel is more reactive than copper or compare the relative position of nickel in the reactivity series.

(c) (i) Many candidates, particularly the better ones, were able to state the names of the processes as reduction and oxidation.

(ii) The fact that metal oxides are basic oxides is not well known by many of the candidates.

Question 12

The way that a lens, glass block and a plane mirror affect a ray of light is understood by a large proportion of the candidates.

Question 13

(a) (i) A large proportion of the candidates did not identify a mesophyll cell and therefore the line showing the path of the carbon dioxide molecule to a mesophyll cell was frequently incorrect.

(ii) Many of the candidates knew that the process by which the carbon dioxide moves within a leaf is diffusion.

(b) (i) Most candidates are aware that chloroplasts contain chlorophyll.

(ii) The role of chlorophyll in photosynthesis is well known by a majority of the candidates.

(c) The way in which animals depend on plants to survive is extremely well known.

Question 14

(a) Many candidates are aware of specific reactions that produce energy but the general term given to all these reactions is less well known.

(b) A majority of the candidates know that the hydrogen ion is the ion which causes a solution to be acidic.

(c) (i) The better candidates were able to state that the reaction between an acid and an alkali is a neutralisation reaction.

(ii) A significant number of candidates are not aware that potassium reacts with acids explosively and therefore it would be unsafe to add potassium to phosphoric acid.

(d) A majority of the candidates identified the other element present in fertilisers as nitrogen.

Question 15

(a) This question proved to be difficult for a majority of the candidates. The physical property of air measured by a gas syringe is the volume of the air.

(b) Many candidates were able to label the x-axis as temperature and recognised that the initial gas syringe reading is zero and that the volume of the gas is proportional to the temperature.

(c) Many candidates recognised that the gas syringe plunger is pushed to the right but the explanation that the force exerted by the air in the plunger is sufficient to overcome the friction was only given by the better candidates.

Question 16

(a) (i) The symptoms of gonorrhoea and syphilis are not well known by many of the candidates.

(ii) The use of antibiotics to treat these diseases is well known but candidates should know that answers such as *pills* or *medicine* are insufficient to gain credit.

(b) The fact that using a condom prevents the spread of the HIV virus is extremely well known.

Question 17

(a) The fact that bromine is changed from brown to colourless by ethene is well known by the better candidates.

(b) The reaction between an ammonium salt and sodium hydroxide is less well known by the candidates.

(c) The gas produced during the incomplete combustion of hydrocarbon fuels is well known by a majority of the candidates.

(d) The better candidates recognised that nitrogen dioxide rather than carbon dioxide dissolves in water to produce a solution with a pH value of 2.

(e) The combustion of carbon monoxide to only one product, carbon dioxide, is not understood by a majority of the candidates.

Question 18

(a) A large proportion of the candidates knew the formula $F = ma$ but a majority of the candidates found difficulty using numbers in standard form and negative indices.

(b) (i) The fact that a helium nucleus contains two protons was not well known by the candidates.

(ii) This question proved to be difficult for all but the very best candidates.

Answers: **(a)** 3.6×10^{12} m/s^2 **(b)(ii)** 3.2×10^{-19}

COMBINED SCIENCE

Paper 5129/22
Theory

General comments

Candidates are becoming more aware that they should show their working in Physics calculations, but many are still not showing their complete working and presenting their answers to an appropriate number of significant figures, correctly rounded. Many candidates also seem confused when asked to work with standard notation.

The Chemistry section of the paper proved difficult for many of the candidates particularly the questions about the blast furnace and the organic section of the syllabus. Questions which required an explanation of an observation or phenomenon were less well done by the candidates. Candidates have a tendency to repeat the question in their response.

Key messages:

When showing working, candidates should:

- write the formula in their answer
- use the correct symbols in the formula
- show the substitution of the values in to the formula
- calculate the value to the appropriate number of significant figures, correctly rounded.

Candidates should also be able to use standard form with positive and negative indices.

Candidates should not simply repeat information given in the question stem in their answers.

Comments on specific questions

Question 1

(a) (i) A large proportion of the candidates were able to label the petal correctly but the anther was less well known.

(ii) This question was quite well done by many of the candidates.

(b) The conditions required for germination of seeds are well known by the better candidates; however, there is a misconception that sunlight affects the germination of seeds.

(c) Many candidates simply stated how pollination occurs rather than answer the question posed. The best answers stated that some seeds are grown under the same conditions and then describe the observation that the plants grown from the seeds are different from each other or the parent plant indicating that the seeds are produced by sexual reproduction.

Question 2

(a) (i) A significant proportion of the candidates included the stoichiometry from the equation in the calculation of the relative molecular mass. Candidates should know that the relative molecular mass is the sum of the relative atomic masses of the elements in the formula of the substance.

(ii) The better candidates were able to use the stoichiometry of the equation to calculate the masses of the substances produce in the reactions. The understanding of proportionality of chemical equations allowed the weaker candidates to earn dome credit for the calculation.

(b) The pH of a solution that turns Universal Indicator purple is not well known by a majority of the candidates.

(c) The fact that sodium oxide is a compound of a metal and a non-metal and therefore is an ionic compound is appreciated by many of the better candidates.

Answers: **(a)** 62 **(b)** 32 124 6.2

Question 3

(a) The symbols for an ammeter and a voltmeter are well known by a majority of the candidates, however whilst the ammeter is in series in the circuit is well known the fact that the voltmeter is in parallel with the lamp is less well understood.

(b) (i) A large proportion of the candidates correctly read the readings on the two meters.

(ii) The calculation of the resistance of the lamp was well done by many of the candidates. The unit of resistance is known by many of the candidates.

Answers: **(b)(i)** 0.5 A 2.5 V **(ii)** 5 Ω

Question 4

This question was answered well by a majority of the candidates although there was a tendency for the weaker candidates to omit drawing a line from one or two of the processes on the left presumably because there were only four specialised cells shown on the right hand side.

Question 5

(a) This question showed that the vast majority of the candidates have a very good understanding of atomic structure.

(b) (i) A majority of the candidates recognised that a metal is found on the left hand side of the Periodic Table and therefore has two electrons in the outer shell.

(ii) A majority of the candidates recognised that an element that forms a single negative ion is found on the right hand side of the Periodic Table and is one electron short of a full outer shell.

(iii) The better candidates recognised that an element that forms covalent bond with two atoms of fluorine is found on the right hand side of the Periodic Table and is two electrons short of a full outer shell.

Question 6

(a) (i) A majority of the candidates were able to name the homologous series to which methane and ethane belong.

(ii) The general formula of the homologous series was not well known by the candidates.

(iii) The trend in melting point shown by the compounds in a homologous series as the number of carbon atoms increases is known by the better candidates.

(b) Many candidates are aware of specific reactions that produce energy but the general term given to all these reactions is less well known.

(c) A large proportion of the candidates knew that carbon dioxide is a product of the complete combustion of methane, however the fact that water is also a product is less well known.

Question 7

(a) (i) Only the very best candidates were able to read the vernier calipers to find the external diameter of the glass boiling tube from the diagram.

(ii) Most of the candidates recognised that in order to calculate the thickness of the wall of the boiling tube the value of the internal diameter should be subtracted from the value of the external diameter of the boiling tube determined in part **(a)(i)** of the question. However, only the better candidates took into account that the external diameter included two walls of the boiling tube.

(b) (i) A large proportion of the candidates were able to take the readings on both measuring cylinders to determine the volume of the test-tube.

(ii) The formula for calculating the density is well known by the better candidates.

Answers: **(a)(i)** 26.2 mm **(ii)** 1.1 mm **(b)(i)** 15 cm^3 **(ii)** 2.23 g/cm^3

Question 8

(a) The word equation for aerobic respiration is well known only by the better candidates.

(b) (i) This proved to be an easy question for the vast majority of the candidates.

(ii) This proved to be an easy question for the vast majority of the candidates.

(iii) This proved to be an easy question for the vast majority of the candidates.

(iv) Most candidates recognised that the energy requirement for males is greater than for females. However, many candidates thought that the energy requirement increased with age which is not shown by the information shown in Fig. 8.1.

Question 9

(a) Many of the candidates recognised lead **A** as the earth wire.

(b) The function of the live wire is not well understood by many of the candidates. Candidates should know that the live wire carries the current to the appliance at a high voltage. Candidates often incorrectly refer to the current as electricity.

(c) (i) The better candidates knew the formula $P = VI$ and were able to rearrange the equation to calculate the current.

(ii) A significant proportion of the candidates did not realise that a fuse rating is expressed in amps and chose a value in terms of volts or ohms.

Answers: **(c)(i)** 3.0 A **(ii)** 5 A

Question 10

A significant proportion of the candidates referred to short term effect of excessive consumption alcohol rather than the long term effects specified in the question.

Question 11

(a) A minority of the candidates were able to name an ore of iron.

(b) The responses to this question showed that there is a lack of knowledge and understanding of the reactions involved in the extraction of iron in the blast furnace.

Question 12

The way that a lens, glass block and a plane mirror affect a ray of light is understood by the better candidates.

Question 13

(a) The better candidates were able to complete the label on Fig. 13.1. There was some confusion amongst the weaker candidates between the pulmonary vein and the pulmonary artery.

(b) Only the best candidates were able to describe and explain what happens to the valve when the heart muscle relaxes. Candidates were expected to state that the valve closes and that this controls the direction of blood flow or prevents the backflow of blood.

Question 14

(a) A majority of the candidates were able to draw the dot and cross diagram to show the outer electrons in a molecule of hydrogen chloride.

(b) The better candidates were able to construct the formula of the product of the reaction, $CuCl_2$, and then balance the equation.

(c) Candidates found this challenging. Candidates were expected to state that copper does not react with hydrochloric acid because it is less reactive than hydrogen.

Question 15

(a) The responses to this question suggest that candidates have a misunderstanding of the term 'physical property'. Candidates were expected to identify that the volume or the density of the oil varies with temperature.

(b) This proved to be a difficult question even for the better candidates. The label on the *y*-axis should be the dependent variable (time) and the label on the *x*-axis should be the independent variable (temperature). As the temperature increases the time taken decreases therefore the graph should show a negative gradient approaching zero.

(c) The equation $W = Fd$ is well known by the candidates and many of the candidates completed the calculation correctly.

Answers: **(c)** 0.24 J

Question 16

(a) The environmental condition that causes a plant to wilt is well known by the better candidates. There is a misconception amongst the weaker candidates that sunlight causes a plant to wilt.

(b) The better candidates were able to describe that a plant wilts because the loss of water through transpiration is greater than the uptake of water through the roots of the plant. This causes the plant to lose turgor.

Question 17

The better candidates were able to identify the representations shown in Fig. 17.1.

Question 18

(a) The formula $F = ma$ is well known by many of the candidates. However, a large proportion of the candidates had difficulty with a calculation in standard form with positive and negative indices.

(b) (i) The majority of the candidates did not recognise that an alpha particle contains two protons and therefore the answer to the question was the number stated in the question divided by two. Some of the candidates answered the question in terms of relative charge rather than using the data given in the question.

(ii) Some candidates recognised that the charge on an electron is the same as the charge on a proton and gained credit for their answer.

Answers: (a) 6.64×10^{-27} (b)(i) 1.6×10^{-19} (ii) 1.6×10^{-19}