

# COMBINED SCIENCE

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

## General comments

Candidates who were thoroughly prepared, with a good recall of detail, did well on the multiple choice.

## Comments on specific questions

### Question 1

Candidates were familiar with the structure of plant and animal cells.

### Question 3

Some candidates were distracted by the graph that showed enzyme activity continuing to increase with a change in temperature instead of falling away as the temperature increases beyond the optimum zone.

### Question 4

Some of the less able candidates believed that carbon dioxide is produced in photosynthesis and released through the stomata.

### Question 7

While the better prepared candidates had no trouble with identifying which row described a vein, there was evidence that less able candidates are confused as to the difference between veins and arteries.

### Question 8

Candidates generally knew why athletes carry on breathing heavily when they have finished a race, but some of the less able candidates confused anaerobic respiration with aerobic respiration.

### Question 9

Most candidates knew how carbon dioxide is removed from the body.

### Question 13

The most able candidates were well able to classify the different types of contraception although the less able candidates were confused as to the difference between chemical, hormonal and surgical methods.

### Question 14

The arrangement of particles in a gas is well understood by the majority of the candidates.

### Question 16

The better candidates recognised that an ionic compound is formed between a metal and a non-metal.

### Question 17

Dot-and-cross diagrams are well understood by a large proportion of the candidates.

### Question 18

A significant proportion of the candidates chose option **C**. These candidates calculated the relative molecular mass of ammonia and doubled it according to the stoichiometry of the equation without taking account of the amount of nitrogen stated in the question.

### Question 19

Many of the candidates understand the alkalinity in terms of the pH scale.

### Question 20

The significance of the position of the elements in the Periodic Table is well understood by a large majority of the candidates.

**Question 21**

The majority of the candidates know the properties of metals.

**Question 22**

The idea that the apparent unreactivity of aluminium with water is caused by a protective oxide layer is well known by the better candidates.

**Question 23**

The uses of zinc are well known by many of the candidates.

**Question 24**

The fact that water and oxygen are required in order for iron to rust is well known by the majority of the candidates.

**Question 25**

The properties of a homologous series are well known by a large proportion of the candidates.

**Question 26**

There was evidence of guesswork even amongst the better candidates. The uses of the fraction obtained from the fractional distillation of petroleum are not well known by many of the candidates.

**Question 27**

The properties of alkanes and alkenes are not well known and there was evidence of guesswork by even the better candidates.

**Question 29**

Only the better candidates were aware of the effects of a force.

**Question 30**

This was well answered by the more able candidates

**Question 31**

Many candidates, including the more able, are confused about the difference between the length and the extension of a spring.

**Question 33**

There was evidence of guessing among the better candidates with most choosing the option that described heat being reflected back into the liquid.

**Question 34**

More than twice as many candidates chose vibrations on a guitar string as an example of a longitudinal wave as chose the right answer, the earthquake wave

**Question 35**

This was answered well.

**Questions 36 and 37**

These two electrical questions allowed the more able candidates to demonstrate a master of concepts. Less able candidates chose options demonstrating that they are unaware of the unit for voltage, confusing voltage with resistance.

**Question 38**

Only a few candidates knew that the fuse and switch must be located in the live wire.

**Question 40**

When selecting a nuclide for use in a device, candidates must consider not only the half-life but the ionising and penetration properties of the type of radiation given out, and safety in the environment in which the device is placed. The best choice for a smoke detector in a home is americium-241 which has a relatively long half-life and emits radiation that is easily absorbed and does not penetrate to distances where it can living beings.

# COMBINED SCIENCE

**Paper 5129/12**  
**Multiple Choice**

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

## General comments

Candidates who were thoroughly prepared, with a good recall of detail, did well on the multiple choice.

## Comments on specific questions

### Question 1

The candidates knew the parts of a cell very well and are able to distinguish an animal cell from a plant cell.

### Question 3

Some candidates were distracted by the graph that showed enzyme activity continuing to increase with a change in temperature instead of falling away as the temperature increases beyond the optimum zone.

### Question 4

Less able candidates believed that oxygen was required for photosynthesis.

### Question 5

Most candidates knew that the liver is responsible for the breakdown of alcohol in the body.

### Question 7

Poorer candidates were confused as to the difference between the structure and function of veins and arteries.

### Question 8

The better candidates knew why athletes carry on breathing heavily when they have finished a race, but the less able candidates confused anaerobic respiration with aerobic respiration.

### Question 9

Some of the less able candidates continued to be confused about respiration, believing that the kidneys remove lactic acid from the body rather than urea.

### Question 10

The majority of candidates were challenged by this question about the response of an eye to bright light. A significant fraction of candidates confused the ciliary muscles with the muscles in the iris.

### Question 11

Most candidates knew the definition of a drug.

### Question 14

The arrangement of particles in a solid is well understood by the vast majority of the candidates.

### Question 15

Many of the better candidates knew the properties of an electron and neutron. However, a significant proportion of the candidates thought that an electron has a relative mass of one.

### Question 16

The better candidates recognised that an ionic compound is formed between a metal and a non-metal.

### Question 17

The properties of ionic and covalent compounds are not well understood by a significant proportion of the candidates. A significant proportion of the weaker candidates selected option **B**, compounds P and S which show the properties of an ionic compound.

### Question 18

This proved to be an easy question for the better candidates.

### Question 19

Many of the candidates understand the alkalinity in terms of the pH scale.

**Question 20**

The significance of the position of the elements in the Periodic Table is well understood by a large majority of the candidates.

**Question 21**

Many candidates, including some of the better candidates thought that the ability to form alloys is not a property of metals and chose option C.

**Question 22**

The idea that the apparent lack of reactivity of aluminium with dilute sulfuric acid is caused by a protective oxide layer is not understood by many of the candidates.

**Question 23**

The reasons for the using aluminium for particular uses are well known by the better candidates.

**Question 24**

The fact that water and oxygen are required in order for iron to rust is well known by a majority of the candidates.

**Question 25**

The uses and test for hydrogen are well known by a large proportion of the candidates however a significant proportion of these candidates thought that copper and dilute hydrochloric acid produce hydrogen and chose option B.

**Question 26**

A large proportion of the candidates recognised that members of an homologous series have similar properties however the fact that they have the same general formula was less well known.

**Question. 27**

The fact that aqueous bromine react with compounds that contain a carbon to carbon double bond is well known by the better candidates however there was evidence of guesswork amongst the weaker candidates.

**Question 28**

Candidates were unclear about the effects of a force on an object already moving at constant velocity. A force applied to this object can change the direction of movement or the size of the movement..

**Question 29**

Candidates performed poorly here, with many candidates at all levels ignoring the effect of the frictional forces.

**Question 30**

This question was well answered..

**Question 31**

Candidates demonstrated a confusion between length, total length and extension.

**Question 32**

Candidates who answered this incorrectly usually used mass to calculate work done rather than weight..

**Question 33**

Candidates need to be familiar with the action of a converging lens on a parallel beam of light.

**Question 36**

This question asked candidates to determine the increase in resistance, not the final resistance. Candidates who selected the option detailing the final resistance did not gain credit.

**Question 37**

This detailed calculation needed candidates to convert 2 hours to seconds correctly before multiplying by the voltage across the lamp and current.

**Question 39**

A number of candidates confused the atomic and mass numbers of a nuclide.

**Question 40**

This is a challenging question. The candidates need to work out how many half-lives in 9.3 minutes, and then halve the original 100 g of Thallium that number of times to find out how much of the original Thallium is left. The rest of the sample will have decayed to lead. Only the most able candidates were able to complete this.



# COMBINED SCIENCE

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<p>Paper 5129/21 Theory</p>
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## Key message

Candidates must show all working and round calculations correctly in order to gain full credit.

## General comments

Those Biology questions which required recall were well answered by many of the candidates, particularly the question on the food chain and the question about hormones. Many of the candidates understand how to use a chemical equation to calculate the amounts of reactants and products in a chemical reaction.

## Comments on specific questions

### Question 1

- (a) A majority of the candidates were able to complete the food chain. Some of the weaker candidates omitted the arrows.
- (b) This question was well answered by a large proportion of the candidates.
- (c) The source of energy for the food chain was known by a majority of the candidates.

### Question 2

- (a) Candidates should be able to give the definition of acceleration. Candidates were expected to state that acceleration is the change in velocity per unit time.
- (b)(i) The vast majority of the candidates were able to draw the line of best fit through the points on the graph.
  - (ii) This proved to be an easy question for a great many of the candidates.  
*Answer: 7.7 cm/s*
  - (iii) A significant proportion of the candidates answered the question in terms of the speed rather than acceleration.

### Question 3

- (a)(i) The pH of a solution that turns universal indicator red was well known by many of the candidates.
- (ii) The effect of an acidic solution on the environment was less well known by many of the candidates.
- (b)(i) The calculation of the relative molecular mass of carbon monoxide was well done by many of the candidates  
*Answer: 28*
  - (ii) Calculations from the chemical equation using simple proportion are well understood by a majority of the candidates.  
*Answers: 112 g, 28 g, 0.56g*

#### Question 4

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

#### Question 5

- (a)(i) A majority of the candidates were able to calculate the moment of the force applied by the newton-meter about the pivot.

*Answer:* 13 Nm

- (ii) Most candidates were able to calculate the force from the wind.

*Answer:* 2.6 N

- (b) Most candidates described that the spring extends but the weaker candidates did not state that the spring returned to the original length.

#### Question 6

- (a) The test for hydrogen was known by the stronger candidates.

- (b) The vast majority of the candidates were able to deduce the order of reactivity of the metals.

- (c)(i) A majority of the candidates were able to state the formula of carbon dioxide and then balance the equation.

- (ii) This question proved challenging for many of the candidates. Candidates should be aware that acids react with metal oxides and metal hydroxides to produce salts.

#### Question 7

- (a)(i) A significant proportion of the candidates stated the breathing rate of student A rather than the increase in breathing rate.

*Answer:* 28 breaths per minute

- (ii) Many candidates recognised that during exercise more oxygen is required in order to increase the amount of respiration leading to an increase in energy.

- (b)(i) The stronger candidates were able to interpret **Fig. 7.1** and state the differences between the changes to the breathing rates of student A and student B.

- (ii) The reason why the breathing rates of student A and student B are different is less well understood by the candidates.

- (c) This question was well answered by a majority of the candidates.

#### Question 8

- (a) Only the strongest candidates were able to describe an experiment to determine that material **C** is the best thermal conductor. Candidates were expected to put the materials between the ice cube and the heater in order to measure the amount of time taken for the ice cube to melt.

- (b) The stronger candidates were able to label the y-axis and draw the line graph to show that the thickness of the material is inversely proportional to rate of thermal energy transfer.

#### Question 9

- (a) The idea that isotopes contain the same number of protons but different numbers of neutrons is well understood by a large majority of the candidates.
- (b) A large proportion of the candidates were able to complete the electronic structure.
- (c) The vast majority of the candidates identified the element as oxygen.

**Question 10**

- (a) The relationship between plant structure and its function during photosynthesis was extremely well known.
- (b) The dependency of animals on plants carrying out photosynthesis is well understood by a majority of the candidates.

**Question 11**

- (a) The idea of homologous series is not well understood by many of the candidates. Candidates should be aware that members of the same homologous series have the same general formula and have similar chemical properties.
- (b)(i) A majority of the candidates were able to deduce the formula of the compound and complete the equation.
  - (ii) Many of the candidates recognised that the process where a hydrocarbon is broken down by heat in the presence of a catalyst is called cracking.
- (c) The use of bromine to identify an unsaturated hydrocarbon is well known by the stronger candidates.

**Question 12**

- (a) Many of the candidates were able to calculate the time taken for the sound to travel 1 m.  
*Answer: 0.0029 s*
- (b)(i) The stronger candidates were able to calculate the wavelength of the wave.  
*Answer: 0.7 m*
  - (ii) The idea that the waves all travel at the same speed is well known by the stronger candidates.
- (c) The reason why the pulse of sound induces an e.m.f. in the coils of wire is not well understood by many of the candidates.

**Question 13**

- (a) The vast majority of the candidates were able to identify the structures in the alimentary canal.
- (b) A large proportion of the candidates did not recognise that amylase is an enzyme and the effect of acidic conditions on the activity of the enzyme

#### Question 14

- (a) The stronger candidates were able to explain that current is the movement of charge per unit time.
- (b) Many candidates were able to identify the correct set of readings on the ammeter.
- (c)(i) The vast majority of the candidates were able to name the voltmeter as the instrument used to measure the potential difference.
- (ii) A large proportion of the candidates knew that the units of the potential difference are volts but many of the candidates did not take into account that there are two lamps in the circuit.

*Answer:* 5.5V

#### Question 15

- (a) The reason why the base line is drawn in pencil is well known by a large proportion of the candidates.
- (b) The fact a substance that is insoluble in the solvent will remain on the base line in a chromatography experiment is understood by a large proportion of the candidates.
- (c)(i) The stronger candidates recognised that those mixtures that contained two different dyes were those that had two spots on the chromatogram.
- (ii) A large proportion of the candidates did not understand that those substances that travel the same distance up the chromatography paper are the same substance.

#### Question 16

- (a)(i) The ore haematite was well known by the candidates.
- (ii) A large proportion of the candidates were able to define reduction as the loss of oxygen.
- (b) The fact that oxygen and water are required for iron to rust is well known by many of the candidates.
- (c) The process of galvanising is understood by a majority of the candidates.

#### Question 17

- (a)(i) The conditions required for germination are well known by the overwhelming majority of the candidates.
- (ii) The idea that using more seeds increases the reliability of the experiment is less well understood by many of the candidates.
- (b) Many of the candidates have the misconception that light is required for germination to occur and predicted that the seeds did not germinate in a dark room.

#### Question 18

Ideas about electromagnetic waves are well understood a majority of the candidates.

**Question 19**

- (a) A large proportion of the candidates recognised that the balance reading increases as the second magnet moves closer to the magnet on the balance and suggested an appropriate balance reading.
- (b) The idea that the magnets repel one another and that the force of repulsion becomes greater as the magnets become closer is not well understood by many of the candidates
- (c) The calculation of the work done by the force was well done by a majority of the candidates.

*Answer:* 0.011 J

# COMBINED SCIENCE

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<p><b>Paper 5129/22</b> <b>Theory</b></p>
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## **Key message**

Candidates must show all working and round calculations correctly in order to gain full credit.

## **General comments**

More candidates are showing their working in Physics calculations. However, candidates should ensure that they write the formula in their answer and use the correct symbols in the formula. In addition, candidates should show the substitution of the values into the formula and then calculate the value to the appropriate number of significant figures correctly rounded.

The Chemistry section of the paper proved challenging for many of the candidates particularly the questions about bonding and the properties of substances and the differences between elements, compounds and mixtures. 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.

Questions on the Biology parts of the syllabus were well answered by many of the candidates.

## **Comments on specific questions**

### **Question 1**

- (a)(i) The vast majority of the candidates were able to plot the points in the graph correctly.
  - (ii) Most candidates were able to join the points with a smooth curve.
  - (iii) The stronger candidates recognised that the acceleration increases as the as the cylinder rolls down the curved slope.
- (b) Stronger candidates were able to explain what is meant by velocity. Candidates were expected to state that velocity is the change in displacement per unit time.

### **Question 2**

- (a)(i) Candidates need to ensure that they know the formulae of common ions. The formulae of the two ions were not well known. Candidates need to know what is meant by the word formula.
  - (ii) The stronger candidates understood the fact that the ions are stable because the outer shell of electrons is full or complete.
- (b) Few candidates knew the properties of an ionic compound.
- (c) The relationship between group number and the number of electrons in the outermost shell of an atom is understood by the stronger candidates.

### **Question 3**

The functions of the components of the blood are well known by a large proportion of the candidates.

#### Question 4

- (a) The calculation of the lifting force was well done by the stronger candidates. Candidates needed to recognise that the calculation involved the idea that the clockwise moment equals anti-clockwise moment.

Answer : 60 N

- (b) The strongest candidates were able to explain the effect of extending the handle on the lifting force, L. Candidates were expected to explain that the lifting force is decreased because the increased distance from the pivot causes the same force to produce a greater moment.

#### Question 5

- (a)(i) A large proportion of the candidates were able to calculate the relative molecular mass of nitrous oxide.

Answer : 44

- (ii) The use of equations to calculate the amounts of products in a chemical reaction is well understood by the stronger candidates. Candidates must pay attention to the stoichiometry of the equation.

Answers : 88 72  
2.2

- (b) The meaning of exothermic should be known by candidates.

- (c) A large proportion of the candidates understand that oxides of nitrogen are a cause of air pollution. Candidates also needed to be aware of the effect of air pollution on the environment.

#### Question 6

- (a) The effect of darkness on the pupil of the eye was well known by the vast majority of the candidates.

- (b)(i) Many of the candidates were able to name the retina but the cornea and the optic nerve were less well known.

- (ii) The strongest candidates were able to describe how the parts of the eye focus on a distant object. Candidates were expected to state that the ciliary muscles relax and the suspensory ligaments tighten causing the lens to become thinner.

#### Question 7

- (a)(i) A majority of the candidates recognised C as the best conductor; candidates also needed to explain why they had chosen C using the data in the table.

- (ii) The strongest candidates were able to identify a physical property of a material that changes when it is heated.

- (b)(i) Candidates needed to read the information given in the question carefully; the lowest temperature stated in the given information is room temperature.

- (ii) Candidates need to be familiar with the idea that the resistance or conductivity of the sensor changes with temperature.

#### Question 8

- (a) Many of the candidates were able to balance the equation.

- (b) The stronger candidates recognised that carbon dioxide is given off during fermentation and that the limewater would go milky.

- (c) Some of the candidates recognised that the ethanol is separated from water by distillation. Candidates also needed to state that the yeast should be removed from the reaction mixture by filtration before the distillation.
- (d) The idea that the ethanol in the wine is oxidised by the air is not well known by the majority of the candidates but the pH indicated by the yellow colour of universal indicator was known by many of the candidates.

#### Question 9

- (a) The differences between expired and inspired air were well known by many of the candidates.
- (b) Many candidates recognised that anaerobic respiration produces lactic acid, produces less energy and occurs in muscles; the fact that it occurs when oxygen is not available was less well known.

#### Question 10

- (a) The stronger candidates were able to name the type of wave as longitudinal.
- (b)(i) Many of the candidates were able to calculate the difference in time.
- (ii) A majority of the candidates were able to use the formula given to calculate the speed of the wave.
- (c) Candidates need to ensure that they understand what is meant by the amplitude, frequency and wavelength of a wave. The display on the computer screen shows a difference in amplitude and this difference is caused by the difference in energy of the wave at points **A** and **B**.

#### Question 11

The use of chlorine in the purification of water supplies and the use of bromine to distinguish between saturated and unsaturated hydrocarbons are well known by many candidates but the other substances were less well identified.

#### Question 12

This question was well done by the vast majority of the candidates.

#### Question 13

- (a) The correct readings for the ammeters were identified by a majority of the candidates.
- (b)(i) The use of a voltmeter to measure the e.m.f. of a battery was not well known by many of the candidates.
- (ii) Candidates need to understand the concept of e.m.f. They should be aware that e.m.f. is defined as the energy used to drive charge around the circuit.
- (c) The calculation of the e.m.f. of the battery was well done by a majority of the candidates.

Answer : 3.01 V

#### Question 14

- (a)(i) The gases which have a variable composition in clean air were well known by the stronger candidates. Candidates must follow the rubric of the question which asked for a gas other than nitrogen and oxygen.
- (ii) Candidates need to remember that the inert gases have a constant composition in clean air.
- (b) Candidates need to understand that liquid mixtures can be separated by fractional distillation because the components have different boiling points.
- (c) The use of ammonia to manufacture fertilisers is well known by many of the candidates.



- (d) The stronger candidates recognised the similarities between the combustion of fossil fuels and respiration. The fact that both produce carbon dioxide was quite well known but the fact that both produce energy was less well known.

#### Question 15

- (a) A large proportion of the candidates were able to interpret the information in the table.
- (b) The changes to the environment in the glass house that would increase the rate of photosynthesis were not well known by the candidates. Candidates were expected to use their knowledge of the conditions required for photosynthesis to occur and then say how these conditions can be achieved in a glass house, e.g. the use of artificial light during the hours of darkness and maintain the temperature at the optimum value.

#### Question 16

- (a)(i) A majority of the candidates were able to read the scales correctly.
- (ii) A majority of the candidates were able to calculate a value for the extension of the spring even when they had been unable to determine the readings on the scale.
- Answer : 3.3
- (b) Many of the candidates recognised that the head of the screw has a larger surface area however the idea that this causes more of the steel to be magnetised was less well understood.
- (c)(i) The vast majority of the candidates were able to name another magnetic material.
- (ii) The idea that the force of attraction between the steel nail and the magnet is caused by induction is not understood by many of the candidates. Candidates should be discouraged from using the idea of charges when answering questions on magnetism. The force of attraction is between opposite poles rather than opposite charges.

#### Question 17

- (a) Candidates need to understand the difference between elements, compounds and mixtures. A common misconception is that compounds are mixtures of two or more elements rather than two or more elements chemically combined together. Candidates should be aware that elements are made up of only one **type** of atom.
- (b) The idea that the particles in ice, a solid, only vibrate about a fixed point and have less energy than the particles in steam was well known by the stronger candidates.

#### Question 18

- (a) The name of the chemical that amylase digests was less well known than the product of the digestion.
- (b) The stronger candidates understand that the rate at which the amylase digests starch is affected by either the pH or the temperature.