

# COMBINED SCIENCE

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Paper 5129/11  
Multiple Choice

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

## General comments

Candidates need to be able to reason from their knowledge as well as answer simple recall questions.

## Comments on specific questions

### Question 1

Most candidates were familiar with the structure of plant and animal cells.

#### Question 2

Candidates need to ensure that they are aware of the direction of movement of water diffusing through a partially permeable membrane

#### Question 4

Candidates need to be able to differentiate between the cuticle and the mesophyll.

#### Question 7

The majority of candidates answered this question about coronary heart disease correctly.

#### Question 8

Candidates need to be aware of the products of anaerobic respiration and be able to contrast them with the products of aerobic respiration.

#### Question 12

The majority of candidates answered this question correctly. Option **A**, burning fossil fuels, proved the strongest distractor for the weaker candidates.

#### Question 13

Candidates were confused as to the symptoms of HIV, gonorrhoea and syphilis.

#### Question 14

The interpretation of chromatograms is well understood by the candidates.

#### Question 15

Candidates are expected to be able to identify the three states of matter from descriptions of particle motion and their bunching.

#### Question 17

Many of the candidates did not use the fact that there were 7 protons and 10 electrons in the atom to select their answer, instead choosing option **D**, which contains 10 protons and 10 electrons.

#### Question 19

A few candidates were not aware of the significance of the brackets and the subscript in the formula of the compound and chose option **B**.

#### Question 21

The trends in the properties of the halogens were well known by the candidates, but the concept of diatomic molecules is not well understood by the weaker candidates.

#### Question 23

The idea of reactivity series is well understood by many of the candidates but a significant proportion of the even the better candidates chose option **D**, which is the reverse order for the reactivity of the metals. Candidates need to take care when reading the question.

#### Question 24

This question proved difficult for many of the candidates. Candidates were expected to recognise that the gas is acidic because it reacts with sodium carbonate. A large proportion of the candidates thought that the gas is carbon monoxide and chose option **C**.

**Question 26**

The general formula of alkenes and the fact that alkenes decolourise bromine water is well understood by the better candidates.

**Question 27**

Candidates need to know the conditions for the manufacture of ethanol from ethane.

**Question 28**

Candidates need to be aware that the period of a pendulum is both parts of the swing; the 'there' **and** the 'back'.

**Question 33**

Candidates should be able to relate the methods of heat transfer to their experiences in the 'real world'.

**Question 34**

Candidates need to be able to distinguish between longitudinal and transverse waves and give suitable examples.

**Question 35**

Candidates should be made aware that the angle of incidence is between the ray of light and the normal and **not** between the ray of light and the reflecting surface.

**Question 38**

Candidates need to be clear on the nature of induced magnetism and able to recognise examples of it.

**Question 40**

Candidates should be able to describe how radioactive materials are handled, used, stored and disposed of, in a safe way.

# COMBINED SCIENCE

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

## General comments

Candidates need to be able to reason from their knowledge as well as answer simple recall questions.

## Comments on specific questions

### Question 1

Candidates are very familiar with the parts of a plant cell.

### Question 2

Candidates should know that only water moves through a partially permeable membrane and that it moves towards the more concentrated solution, diluting it.

**Question 4**

Candidates should know the functions of chloroplasts, stomata and vascular bundles.

**Question 6**

There is some misunderstanding about the roles of xylem and phloem.

**Question 8**

Candidates need to be aware of the products of anaerobic respiration and be able to contrast them with the products of aerobic respiration.

**Question 9**

Candidates need to be aware that urine contains both urea and water.

**Question 11**

Candidates found this question easy.

**Question 12**

The majority of candidates answered this question correctly. Option **A**, burning fossil fuels, proved the strongest distractor for the weaker candidates.

**Question 14**

The interpretation of chromatograms is well understood by many of the candidates.

**Question 15**

Many candidates recognised that the particles in a solid crystal vibrate about a fixed point but the arrangement of the particles was less well known.

**Question 17**

Many of the candidates did not use the fact that there were 7 protons and 10 electrons in the atom to select their answer, instead choosing option **D**, which contains 10 protons and 10 electrons.

**Question 19**

Candidates need to be able to balance equations.

**Question 20**

The idea that excess copper(II) oxide is used to ensure that all the sulfuric acid is used up is not well understood.

**Question 21**

Candidates need to know the trends shown by the elements in Group I of the Periodic Table.

**Question 22**

The general properties of metals are well known by many of the candidates.

**Question 23**

The concept of reactivity series is well understood by many of the candidates.

**Question 24**

The better candidates noticed that the compound P turns limewater milky and therefore is carbon dioxide.

**Question 25**

Candidates needed to apply their knowledge of the structure of an ethanol molecule to this question. A large number of candidates thought that the molecule contains six carbon to hydrogen bonds.

**Question 26**

A majority of the candidates recognised that an unsaturated hydrocarbon contains a carbon to carbon double bond.

**Question 27**

The fact that the characteristic reaction of alkenes is an addition reaction is not well known by the candidates.

**Questions 28 and 29**

Both showed good discrimination with weaker candidates favouring option **D** in **Question 28** and almost equally divided between options **A** and **D** in **Question 29**.

**Question 30**

The moment of a force was well known by the higher-achieving candidates

**Question 31**

This was answered well.

**Question 32**

A significant number of candidates chose the melting and boiling points of mercury as the two fixed temperature points.

**Question 33**

This was answered well.

**Question 34**

When calculating wavelength from speed and frequency, candidates must take care to use the correct equation.

**Question 35**

As part of being able to describe the main components of the electromagnetic spectrum, candidates need to know how the elements of the electromagnetic spectrum are ordered in terms of frequency and wavelength.

**Questions 36 and 37**

When calculating resistance from current and voltage, candidates must take care to use the correct equation.

**Question 38**

Candidates need to be clear on the nature of induced magnetism and able to recognise examples of it.

**Question 39**

This was also well answered.

**Question 40**

There was evidence of guesswork amongst the candidates on this question.

# COMBINED SCIENCE

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Paper 5129/21  
Theory

## Key message

Candidates need to be able to explain an observations or a phenomenon in all aspects of the syllabus.

## General comments

More candidates are becoming aware that they should show their working in Physics calculations; candidates should also note that correct symbols should be used in these formulae.

There is a tendency for the candidates to repeat the question in their response.

## Comments on specific questions

### **Section A**

#### **Question 1**

- (a) The definition of mass and weight are not well understood by many of the candidates.
- (b)(i) A significant proportion of the candidates recognised that the hammer and the rocks should be placed equidistant from the pivot in order to weigh a mass of rock with the same mass as the hammer.
- (ii) The formula for calculating the acceleration of the hammer was well known particularly by the better candidates. The units of acceleration were less well known.

Answer: =  $1.67 \text{ m/s}^2$

#### **Question 2**

- (a)(i) The calculation of the molecular mass of carbon monoxide was well done by many of the candidates but some of the weaker candidates included the stoichiometry from the equation on their calculation.
- (ii) The ideas of proportion in chemical equations is well understood by many of the candidates.
- (b) The better candidates were able to explain that carbon monoxide is formed by the incomplete combustion of carbon containing substances.
- (c) Many candidates were able to balance the equation correctly.

Answers: (a)(i) = 28 (ii) = 56  
1.4



### Question 3

- (a) (i) The differences between the structure of arteries and of veins are well understood by many of the candidates.
- (ii) Many candidates are aware of the differences between the blood pressure and the direction of blood flow in arteries and veins.
- (b) The idea that the wall of a capillary is only one cell thick so that diffusion between the blood and cells can occur easily is not well understood by a large proportion of the candidates.
- (c) (i) The function of a valve in a vein is well known by a majority of the candidates.
- (ii) The fact that the blood pressure in arteries is so high that it prevents the backflow of blood is well understood by the better candidates.

### Question 4

The concept of static electricity is not understood by many of the candidates. Candidates were expected to state that the negatively charged electrons are transferred to the girl's hand from the door handle because opposite charges attract.

### Question 5

- (a) (i) Many candidates were able to state the name given to the Group VII elements.
- (ii) The trend in the melting points of the halogens is well known by the candidates.
- (b) Only a small proportion of the candidates knew the meaning of the term diatomic. Candidates were expected to state that a diatomic molecule is one that contains two atoms.
- (c) The fact that bromine displaces iodine from a solution of potassium iodide because it is more reactive than iodine is quite well known by the candidates.
- (d) The use of chlorine to kill bacteria in water supplies is well known by the candidates.

### Question 6

- (a) A majority of the candidates were able to draw the arrows on the food web.
- (b) (i) Many candidates were able to identify the source of the energy for the food web as the sun but there is a common misconception that the grass is the source of the energy.
- (ii) The vast majority of the candidates were able to identify a herbivore in the food web.
- (c) The effect of the eagles dying out on the finch population is well understood by many of the candidates.

### Question 7

Many of the candidates recognised that force is mass times distance and that the anticlockwise moment is equal to the clockwise moment and gained some credit. A large number of candidates did not take into account that there are two masses on the left hand side of the beam.

Answer: = 1.33 N

### Question 8

- (a) A majority of the candidates were able to calculate the number of protons and electrons in element Q.
- (b) A large proportion of the candidates were able to use the Periodic Table to identify element Q.

- (c) Many candidates recognised that the position of element Q in the Periodic Table means that it is Group III of the Periodic Table, the same group as aluminium and therefore has similar properties as aluminium.

#### Question 9

Many of the candidates were able to complete the sentences about plant reproduction correctly.

#### Question 10

- (a) Only a small proportion of the candidates recognised that the energy outputs added up to 100%, which demonstrates that energy is conserved.
- (b) The better candidates were able to explain that chemical energy is transferred to heat energy during the combustion of the fuel and this is transferred to kinetic energy in the turbines, which in turn is transferred to electrical energy in the generator.

#### Question 11

- (a) (i) The ion which causes acidity is well known by many of the candidates.
- (ii) The link between pH and the colour of Universal Indicator is well understood by a majority of the candidates.
- (b) (i) Only the better candidates were able to identify two substances that produce zinc sulfate when they react with sulfuric acid. Candidates are expected to know the general reactions of acids with metals, metal oxides, metal hydroxides and metal carbonates.
- (ii) A large proportion of the candidates simply restated the question rather than in terms of the relative reactivity of copper and hydrogen.

#### Question 12

- (a) This was an easy question for a majority of the candidates.
- (b) (i) Many of the candidates recognised that student Q has the highest average number of villi/cm<sup>3</sup> but did not state that the villi are responsible for the absorption of digested food.
- (ii) Candidates were expected to explain that diffusion occurs continuously because the absorbed substances are continuously being removed by the blood.

#### Question 13

- (a) (i) The formula for calculating the resistance is well known by a majority of the candidates. Some of the candidates did not gain full credit for the calculation because they did not use the correct voltage.
- (ii) This calculation was less well done by the candidates. The formula for calculating the energy transferred was known only by the better candidates.
- (b) (i) A majority of the candidates calculated the current in the battery correctly.
- (ii) Many candidates were aware that the difference in the values of the current is due to the fact that this is a parallel circuit.

Answers: (a)(i) = 150  $\Omega$  (ii) = 28.8 J (b)(i) = 0.88 A

#### Question 14

- (a) Process **B** was identified by the candidates more often than reagent **A**.
- (b) The concept that the addition of hydrogen is a reduction reaction is not well understood by the candidates.
- (c) The use of bromine to distinguish between alkanes and alkenes is not well known by the candidates.
- (d)(i) Only the better candidates were able to draw the structure of ethanol.  
(ii) The uses of ethanol are well known by the candidates.

#### Question 15

- (a) The parts of the male reproductive system are well known by a large proportion of the candidates.
- (b) The function of the prostate gland and the scrotum are not understood by many of the candidates.
- (c) A large majority of the candidates were able to indicate where a surgeon makes the cut during a vasectomy.

#### Question 16

- (a) The better candidates were able to indicate one quarter of a wave on the diagram.
- (b)(i) Candidates were expected to recognise that the distance *L* on the diagram represented a quarter of a wavelength and this distance is multiplied by four. A number of the candidates did not notice that the answer was required in metres.  
(ii) The calculation to determine the frequency of the sound wave was well done by the better candidates. Error carried forward was allowed from part **(b)(i)**.

Answers: **(b)(i)** = 1.2 m **(b)(ii)** = 275 Hz

#### Question 17

- (a) The essential elements for the growth of plants are well known by many of the candidates.
- (b) The better candidates were able to name the substance added to the blast furnace to remove impurities as calcium carbonate.
- (c) The fact that oxygen is the gas that makes up about 21% of the air is well known by the candidates.
- (d) Only the better candidates were able to identify nitrogen dioxide as the gas that produces an acidic solution when it is dissolved in water.
- (e) The use of nitrogen in the manufacture of ammonia was not well known by the candidates.

**Question 18**

- (a) This question proved difficult for the majority of the candidates. Candidates were expected to describe that the alternating current in the primary coil causes a change in the magnetic field which connects to the secondary coil and induces an e.m.f. in the secondary coil.

There is a misconception amongst many of the candidates that the current passes through the soft iron core to the secondary coil.

- (b) Many of the candidates gained credit for stating the formula for calculating the potential difference ( $V = IR$ ), however a significant proportion of the candidates did not take into account the fact that the resistance stated in the question is for 1km of cable.

Answer: (b) = 0.1 V

# COMBINED SCIENCE

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Paper 5129/22  
Theory

## Key message

Candidates need to be able to explain observations from experiments in all aspects of the syllabus.

## General comments

More candidates are becoming aware that they should show their working in Physics calculations; candidates should also note that correct symbols should be used in these formulae.

Candidate should be made aware of the need for accuracy when drawing ray diagrams.

## Comments on specific questions

### Question 1

The uses of the elements were well known by the vast majority of the candidates.

### Question 2

A large proportion of the candidates understand the function of the blood but some candidates were less secure with the plasma bring the liquid part of the blood and the fact that urea is produced in the liver.

### Question 3

- (a) The majority of the candidates were able to score some marks on this question. Candidates were expected to describe the motion of the ball after  $t = 1.2$  s. The information in the table shows that the ball slows down; candidates were expected to recognise that the ball eventually stops and rolls back down the slope with increasing speed.
- (b) Many of the candidates answered this question in terms of speed rather than in terms of potential and kinetic energy. There was some confusion even amongst the better candidates about the relationship between kinetic energy and speed.

### Question 4

- (a) The calculation was well done by the better candidates. Those candidates who were able to calculate the relative molecular masses of copper(II) oxide and carbon dioxide were usually able to use the equation to calculate the mass of copper(II) oxide produce by 3.1 g of copper(II) carbonate.

Answer: = 80 44  
2

- (b) Candidates need to know the differences in properties between ionic and covalent compounds. Many candidates simply compared how ionic and covalent compounds are constituted. Candidates were expected to refer to properties such as volatility, solubility in water and ability to conduct electricity.
- (c) The test for carbon dioxide is well known by a majority of the candidates.

### Question 5

- (a) This definition of osmosis was well known by a majority of the candidates.
- (b) (i) The names of the structures in a plant cell were well known by many of the candidates although cytoplasm was confused with chloroplast by some of the candidates.
- (ii) The vast majority of the candidates were able to label the nucleus correctly.
- (c) (i) The majority of the candidates recognised that the plant cell increased in size.
- (ii) The responses to this question were disappointing. A large proportion of the candidates simply restated the definition of osmosis and diffusion without any specific reference to where these processes occurred in the plant cell. Candidates were expected to state that water diffuses through the cell wall and the cytoplasm by diffusion and through the cell membrane and into the vacuole by osmosis.

### Question 6

Many of the candidates recognised that force is mass times distance and that the anticlockwise moment is equal to the clockwise moment and gained some credit. A large number of candidates did not take into account that there are two masses on the right hand side of the beam.

*Answer.* = 2.4 N

### Question 7

- (a) (i) The general name of the Group I elements is not well known by the candidates.
- (ii) The trend in melting point down the elements of Group I is known only by the best candidates.
- (b) (i) An easy question for most of the candidates.
- (ii) The electronic structure of a potassium atom is well known by many of the candidates
- (c) (i) The formulae of the ions present in potassium oxide were not well known by a large proportion of the candidates.
- (ii) The relationship between the colour of Universal Indicator and the pH of a solution is not well understood by a majority of the candidates.

### Question 8

- (a) Candidates are expected to know that the arrows in a food web represent the transfer energy from one organism to another.
- (b) Most of the candidates were able to identify grass or the acacia tree as the producer in the food web.
- (c) This question was well done by a large proportion of the candidates.
- (d) A majority of the candidates were able to identify a decomposer.

### Question 9

- (a) (i) Candidates need to know that the normal is formed at  $90^\circ$  to the mirror where the incident ray strikes the mirror, and that the angle of incidence of the ray is equal to the angle of reflection. The virtual image is found by extending the reflected rays behind the mirror and is formed where the two lines meet.
- (ii) A greater number of candidates recognised that the virtual image is formed at the same distance behind the mirror as the distance between point P and the mirror.

- (b)(i) The transfer of heat by radiation from the candle flame to the thermometer was not well known.
- (ii) Many candidates thought that they were required to state how the thermometer reading could be reduced, and answered in terms of cooling the thermometer in water or ice.

Candidates were expected to state that the thermometer should be moved away from the flame with an added valid reason.

- (iii) The idea that a clinical thermometer is not suitable for this experiment because it only has a limited range was known by the better candidates. Many candidates simply stated that a clinical thermometer is used to measure body temperature.

#### Question 10

- (a) A majority of the candidates were able to determine the boiling point of heptanes from the graph.
- (b) The general formula of the alkane homologous series is well known by the better candidates.
- (c) The better candidates were able to balance the equation. A significant proportion of the candidates were able to determine the stoichiometry of the carbon dioxide and the water but had difficulty determining the number of oxygen molecules required.
- (d)(i) The better candidates were able to name the process as cracking.
- (ii) A majority of the candidates were able to complete the diagram of the structure of ethene. A few candidates omitted the double bond between the two carbon atoms.
- (iii) The flammable nature of hydrogen was not well known by the candidates.

Answer: (a) = 99 °C

#### Question 11

- (a)(i) An easy question for the vast majority of the candidates.
- (ii) Another easy question for the majority of the candidates.
- (b) Many candidates had difficulty expressing the idea that the volume of air inhaled in each breath increased during exercise. The weaker candidates stated a form of exercise that increases breathing rate.
- (c) A large proportion of the candidates referred to the lack of oxygen leading to the formation of lactic acid. Candidates were expected to state that increased breathing rate means that more oxygen is inhaled as more energy is required during exercise and increased breathing rate provides that oxygen.

#### Question 12

- (a) The idea that air expands when it is heated and becomes less dense and rises due to a convection current is not well understood by many of the candidates.
- (b) Many of the candidates recognised that the smoke particles were attracted to the positive plate but did not explain that the negatively charged grid gives the smoke particles a negative charge and hence opposite charges attract.
- (c)(i) Many candidates were able to calculate the current between the grid and the collecting plate.
- (ii) Candidates who chose the incorrect current in (c)(i) gained credit from a correct calculation using the incorrect value of the current. The equation  $V = IR$  is well known by a large proportion of the candidates.

Answers: (c)(i) 1.5 A (ii) 30 000  $\Omega$

### Question 13

- (a) This question was well done by the better candidates.
- (b)(i) Many candidates do not know the approximate percentage of oxygen in the air.
- (ii) That a reaction that produces energy is an exothermic reaction is known only by the better candidates.
- (c) The use of acetylene in a welding torch is not well known.
- (d) The use of zinc to galvanise iron is not well known by many of the candidates.

### Question 14

- (a) The reason why there are more chloroplasts in the upper mesophyll cells of a leaf is not understood by many of the candidates. Candidates were expected to state that the upper part of the leaf usually receives more light.
- (b) The idea that there are air spaces between the cells in the lower mesophyll layer to make transpiration or gaseous exchange easier is not understood by many candidates.
- (c) There is a misconception amongst many of the candidates that the stomata are responsible for water gain rather than transpiration. Candidates are expected to know that the stomata are on the lower surface of the leaf because they are then out of direct sunlight and therefore do not lose as much water as they would if they were in direct sunlight.

### Question 15

- (a) The equation to calculate the density is well known by a majority of the candidates. A significant proportion of the candidates did not gain full credit for their answer because they did not allow for the mass of the water in their calculation.
- (b) Only the better candidates were able to calculate the power used by the heating element.

Answer: (a) =  $1.055 \text{ g / cm}^3$

### Question 16

- (a) This question was answered well by a majority of the candidates.
- (b) The concept that the melting point of a substance is decreased by impurities is not well known by the vast majority of the candidates.

### Question 17

- (a)(i) A large proportion of the candidates answered the question in terms of the bimetallic strip rather than the heating element.
- (ii) The fact that the difference in thermal expansion of the two metals causes the bimetallic strip to bend is not appreciated by a large number of candidates. Many candidates placed a tick in more than one of the boxes and could not be awarded credit.
- (b)(i) There is a misconception amongst a large number of candidates that the fuse controls the electricity flowing into the appliance rather than preventing too much current reaching the appliance and damaging it.
- (ii) The idea that the switch is placed in the live lead to isolate the appliance when it is switched off is not appreciated by many of the candidates.
- (c) The explanation that appliances that have double insulation do not need an earth wire because the casing of the appliance cannot become live is not well understood even by the better candidates.



**Question 18**

A majority of the candidates were able to match the examples of birth control with the method of birth control.