

# COMBINED SCIENCE

**Paper 5129/11**  
**Multiple Choice**

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

## Key Message

Candidates need to read all of the options carefully before deciding which is the correct answer.

## Question 1

This question discriminated well, with the stronger candidates demonstrating a clear understanding of the link between the surface area of a cell and the rate of diffusion across its surface.

## Question 2

Many candidates found this question straightforward, although a significant number suggested that it is the sugar which moves into the cell.

### Question 3

Option **B** was a strong distractor for the weaker candidates, suggesting some misunderstanding about the effect of high temperatures on enzyme action.

### Question 4

This question worked well and the stronger candidates demonstrated a good understanding of leaf cell function. There was some evidence to suggest that the weaker candidates were guessing.

### Question 5

This question proved more difficult for the candidates. Options **B** and **C** were strong distractors for the weaker candidates suggesting some confusion about the absorption of glucose into the blood.

### Question 6

This question, which asked for the causes of wilting, proved to be easy for the majority of candidates.

### Question 7

This question was also relatively easy, although some of the weaker candidates suggested smoking is not linked to coronary heart disease.

### Question 8

Candidates found this question difficult. Option **A** was a strong distractor, suggesting some misunderstanding about the use of gaseous nitrogen in the body.

### Question 9

Candidates found this question relatively easy. Some weaker candidates suggested that the liver is the site of urea excretion from the body, perhaps confusing this with it being the site of urea production.

### Question 10

This question proved very difficult for all candidates. The majority thought the lens becomes thinner as the lion moves closer to its prey.

### Question 11

This question, which asked for the meaning of the word 'addictive', proved very easy for most of the candidates.

### Question 12

Many candidates answered this question correctly, although option **B** was the strongest distractor.

### Question 13

This question discriminated well between candidates, with the stronger candidates demonstrating a clear understanding of the function of the prostate gland.

### Question 14

The separation of ethanol by fractional distillation was well known by many of the candidates.

### Question 15

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

**Question 16**

There was evidence of guesswork even among the better candidates.

**Question 17**

The properties of covalent compounds are not well known by a majority of the candidates.

**Question 18**

There was evidence of guesswork particularly among the weaker candidates. Candidates are expected to be able to construct the formula of an ionic compound from the charges on the ions.

**Question 19**

A significant proportion of the candidates recognised that a neutral solution is produced when an acid and an alkali are mixed together but once again there was evidence of guesswork amongst the weaker candidates.

**Question 20**

This question proved to be difficult for many of the candidates. Candidates were expected to recognise that element X is an alkali metal and as such it reacts violently with water.

**Question 21**

The composition of brass is well known by a majority of the candidates.

**Question 22**

The effects of atmospheric pollutants on the environment are well known by many of the candidates.

**Question 23**

Most of the candidates knew the temperature and pressure used in the Haber process but the identity of the catalyst was less well known.

**Question 24**

Virtually all of the candidates recognised that the formula of the next alkane in the homologous series is  $C_3H_8$  but only half of these candidates were able to name the hydrocarbon correctly and chose option **B**.

**Question 25**

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

**Question 26**

There was evidence of guesswork amongst the weaker candidates.

**Question 27**

The fact that fermentation produces ethanol from a renewable resource is well known by a majority of the candidates.

**Question 28**

Was well-known and showed good discrimination, with weaker candidates favouring the micrometer, option **C**.

**Question 29**

Over half of the candidates chose to ignore the contribution from the second mass and opted for either distractor **C** or **D**.

**Question 30**

Most candidates chose the load needed for an **extension** of 9 cm, option **C**, rather than that needed to give a final **length** of 9 cm, option **B**.

**Question 31**

This was well answered with coal, option **A**, the most popular distractor.

**Question 32**

The structure of the liquid-in-glass thermometer influences the sensitivity of the thermometer. Option **D** proved the most popular distractor, attracting a significant number of the better candidates.

**Questions 33**

There was evidence of guesswork from the candidates on both of these questions.

**Questions 34**

The components of the electromagnetic spectrum are not well known.

**Question 35**

A majority of candidates used the time in minutes, with option **B** the most popular distractor. The remaining candidates were divided equally between option **C** and option **D**, the key.

**Question 36**

A significant number of candidates chose option **B**.

**Question 37**

Another question where there was evidence of guesswork from the candidates.

**Question 38**

This was well known.

**Question 39**

A significant number of candidates chose a distractor, option **A**.

**Question 40**

Most candidates found this challenging. A large number of the candidates chose option **A**, possibly failing to recognise that denominator in the fraction indicates the number of times the initial number is halved rather than the fraction that must be applied.

# COMBINED SCIENCE

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Paper 5129/12  
Multiple Choice

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

## Key Message

Candidates need to read all of the options carefully before deciding which one is the answer.

## Question 1

This question discriminated well. Option **C** was a strong distractor for the weaker candidates, which incorrectly suggested that red blood cells contain chlorophyll.

## Question 2

This question also discriminated well. A significant number of weaker candidates suggested that it is the sugar which moves into the cell.

### Question 3

Option **B** was a strong distractor for the weaker candidates, suggesting some misunderstanding about the effect of high temperatures on enzyme action.

### Question 4

This question was more difficult although the stronger candidates demonstrated a good understanding of leaf cell function. There was some evidence to suggest that the weaker candidates were guessing.

### Question 5

This question proved difficult for the weaker candidates. Option **C** was a strong distractor.

### Question 6

This question, which asked for the causes of wilting, proved to be easy for the majority of candidates.

### Question 7

Option **C** was a very strong distractor in this question. Candidates may have selected the option which described the state of the valves in the diagram rather than as the blood leaves the heart.

### Question 8

This question discriminated well. Option **B**, glucose, was the strongest distractor. There was some evidence to suggest that the weaker candidates were guessing.

### Question 9

Option **B** was a very strong distractor, suggesting some misconceptions amongst candidates regarding the sites of excretion from the body.

### Question 10

This question proved difficult for all candidates. The ciliary muscles and the lens were both strong distractors suggesting some confusion between the changes in the eye due to the brightness of light and due to the eye focussing on an object.

### Question 11

This question discriminated well, although option **A** proved a strong distractor for the weaker candidates.

### Question 12

This question also discriminated well. Option **A** was a strong distractor for the weaker candidates suggesting that some may only have considered the direct impact of the rainforest destruction.

### Question 13

Candidates found this question difficult. There was some evidence to suggest that many were guessing and did not know the location of the prostate gland.

**Question 14**

There was some confusion amongst even the better candidates about the scales on a burette. About a third of the candidates read the scale from bottom to top and chose option **A**. Candidates should be aware that the scale on a burette goes from top to bottom.

**Question 15**

This proved to be an easy question particularly for the better candidates. A significant proportion of the candidates are unclear about the meaning of the nucleon number.

**Question 16**

There was evidence of guesswork even amongst the better candidates.

**Question 17**

Once again there was evidence of widespread guesswork. The fact that covalent compounds are not formed by metallic elements is not well known by the candidates.

**Question 18**

This question was well done by the better candidates but again there was evidence of guesswork by the weaker candidates. Candidates are expected to be able to construct the formula of an ionic compound from the charges on the ions.

**Question 19**

The colour of Universal Indicator in a neutral solution is well known by the better candidates.

**Question 20**

The relationship between the Periodic Table and electronic structure is not understood by the vast majority of the candidates. The fact that ions have the same electronic structure as a noble gas is not known by a large proportion of the candidates and option **C** proved to be the most popular answer.

**Question 21**

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

**Question 22**

The fact that oxygen makes up 21% of clean air is well known by the better candidates.

**Question 23**

A large proportion of the candidates correctly identified the use of hydrogen to make ammonia and the test for hydrogen; half of these candidates thought that zinc oxide and an acid produced hydrogen and chose option **C**.

**Question 24**

A large proportion of the candidates recognised that the formula of the next alkane in the homologous series is  $C_3H_8$ ; only half of these candidates were able to name the hydrocarbon correctly and chose option **B**.

**Question 25**

The relationship between size of molecules and boiling points of different fractions, and their position in the fractionating column is not well understood by many of the candidates.

**Question 26**

There was evidence of guesswork particularly amongst the weaker candidates.

**Question 27**

The uses of ethanol are well known by the better candidates.

**Question 28**

This was answered well by the better prepared candidates.

**Question 29**

Also showed very good discrimination although option **A** attracted a greater response than the key, option **B**, suggesting guessing among the better candidates.

**Question 30**

This showed excellent discrimination, with option **D** attracting almost as many responses as the key.

**Questions 31**

The weaker candidates favoured coal or natural gas as the energy source for nuclear power stations

**Question 32**

Candidates found this question challenging, with all options being chosen equally.

**Question 33**

Candidates found this difficult. There was evidence of guesswork amongst the weaker candidates. The higher-achieving candidates often chose the wrong option **C**, indicating that they had failed to notice that the speed of the wave was given in km /s.

**Question 34**

This showed good discrimination with option **D** the most popular distractor.

**Question 35**

This was another question where the well-prepared candidates found it easy; the poorly-prepared candidates, less so.



**Question 36**

Current and voltage characteristics of a series circuit were not well known.

**Question 37**

This question discriminated well.

**Question 38**

This showed good discrimination, although some better candidates chose option **C**.

**Question 39**

Candidates need to be aware that the nucleon number is the sum of the protons and neutrons in the nucleus, and that beta decay involves the conversion of a proton to a neutron.

**Question 40**

Most candidates found this challenging. A large number of the candidates chose option **A**, possibly failing to recognise that denominator in the fraction indicates the number of times the initial number is halved rather than the fraction that must be applied.

# COMBINED SCIENCE

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Paper 5129/21  
Theory

## General Comments

There are still a number of candidates who do not show their working when doing calculations. Candidates who do show their working may gain partial credit for the correct equation, even when the calculation is incorrect. Candidates should also note that correct symbols should be used in these formulae.

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

Candidates struggled with the organic Chemistry questions.

## Comments on Specific Questions

### Question 1

(a) (i) A large proportion of the candidates were able to calculate the weight of the helicopter.

Ans = 0.43 N

(ii) The calculation of work done was well done, particularly by the better candidates.

Ans = 0.215 J

(b) A large proportion of the candidates answered the question in terms of lifting the helicopter rather than stating that the extra energy is lost as heat or sound.

### Question 2

(a) (i) Many of the candidates were able to correctly identify structures **A**, **B** and **C** but structure **D** was only known by the better candidates.

(ii) As a consequence of not identifying structure **D** correctly, the idea that the cuticle prevents the loss of water from the leaf was rarely seen.

(b) This proved to be an easy question for the vast majority of the candidates, with most gaining partial credit. However, the idea that water vapour is lost by the leaf in bright conditions is not well known by the candidates.

(c) The fact that xylem transfers water and minerals up the plant is well known by many of the candidates. The function of phloem is less well known. Candidates should be aware that the phloem transfers glucose both upwards and downwards. Candidates needed to use specific words, such as 'glucose', rather than vague words, such as 'food', to gain credit.

### Question 3

- (a) (i) The calculation of the relative molecular mass of sulfur dioxide was well done by many of the candidates. A significant number of the candidates included the stoichiometry from the equation in their calculation and obtained 160 rather than 80.

Ans = 80

- (ii) The calculation was done well by many of the candidates.

Ans =  $\frac{32}{4} \times 180$

- (b) This question proved to be difficult for even the better candidates. Candidates are expected to be able to construct a balanced symbol equation given the names of the reactants and products.
- (c) A large proportion of the candidates gave copper as the answer to this question. The candidates should know that copper does not react with acids as it is unreactive, and that salts are produced when an acid reacts with basic oxides, alkalis and carbonates.
- (d) That sulfur dioxide is produced by the combustion of sulfur-containing fossil fuels is not well understood by the candidates.

### Question 4

- (a) This proved to be challenging, even for the better candidates. Candidates should recognise that the zero on the lower scale of the vernier caliper is shown between 1.4. and 1.5 and therefore the reading is between these two values.

Ans = 1.46 cm

- (b) A large proportion described the use of the formula *speed = distance divided by time* rather than describing how the time is measured. Candidates were expected to state that the stopwatch is started as the ball passes X and stopped as the ball passes Y.

### Question 5

- (a) The substances produced by the liver were well known by the better candidates.
- (b) The substances broken down by the liver were less well known by the candidates.

### Question 6

- (a) The production of carbon monoxide by incomplete combustion of methane was well known by many of the candidates.
- (b) Most candidates recognised that nitrogen is the most abundant gas in the air.
- (c) The fact that ammonia produces a solution with pH 9 was well known by the candidates.
- (d) There is a misconception amongst many of the candidates that oxygen is not present in polluted air.
- (e) The use of argon in lamps is well known by many of the candidates.

### Question 7

- (a) A large proportion of the candidates recognised that the water flowing away from the panel at **A** is hotter or less dense than the water returning to the panel at **B**.
- (b) (i) The fact that copper is a good conductor of heat or does not corrode is well known, particularly by the better candidates. Candidates should be aware that corrosion refers to all metals and 'rusting' only refers to iron.
- (ii) This question was well answered by the vast majority of the candidates.
- (c) Candidates were expected to state that the water enters towards the middle of the tank because the heated water has a lower density than cold water and therefore rises up the tank by convection. Most candidates struggled with this question. .

### Question 8

The action of a thin converging lens on a beam of light is not understood by the majority of the candidates.

### Question 9

- (a) (i) The vast majority of the candidates identified the farm worker as the person with the highest daily energy requirement.
- (ii) The vast majority of the candidates were able to find the daily energy requirement of the female office worker from the bar chart.

Ans = 10 000

- (b) A significant proportion of the candidates repeated the question rather than give an explanation as to why the male office worker is likely to become overweight. Candidates were expected to recognise that a daily a daily energy intake of 15 000 kJ is higher than the required daily energy intake and that the excess food is converted to fat which is stored in the body.
- (c) A large proportion of the candidates realised that age, gender and occupation are factors which affect the daily energy requirements of a person.

### Question 10

- (a) This question was well done by many of the candidates.
- (b) A majority of the candidates recognised that elements **S** and **V** are in the same group of the Periodic Table.
- (c) (i) Candidates were expected to realise that element **T** is a metal in Group II and that element **U** is a non-metal in Group VII and therefore the formula of the compound is  $TU_2$ .
- (ii) Very few candidates recognised this bonding as ionic.

### Question 11

- (a) (i) The name of the region of the electromagnetic spectrum between infra-red and ultraviolet was well known by the better candidates.
- (ii) A large proportion of the candidates stated the numerical value of the speed of electromagnetic waves in a vacuum; only a small proportion of the candidates stated the unit.

Ans =  $3 \cdot 10^8$  m/s

- (b) The better candidates were able to name the frequency as the property that increases from infra-red to ultraviolet.
- (c) A significant proportion of the candidates named an electromagnetic wave rather than a different example of a transverse wave.

### Question 12

A large proportion of the candidates were able to complete the sentences about hormones correctly.

### Question 13

- (a) (i) The meaning of the word *exothermic* is not well known by many of the candidates.
- (ii) Many of the candidates stated that one of the products of the complete combustion of methane is carbon dioxide. The other product, water, is less well known.
- (b) The characteristics of a homologous series are not well known by the candidates. Candidates are expected to know that members of the same homologous series have the same general formula; that the same functional group or the members differ from the next in the series by  $\text{CH}_2$ ; and that they have the same chemical properties.
- (c) This question was well done by a minority of candidates.

### Question 14

- (a) A majority of the candidates found this question difficult. Some candidates recognised that a voltage reading is observed on the voltmeter. Only a small number of candidates knew that the voltmeter returns to zero when the wire stops moving between the poles of the magnet.
- (b) The higher-achieving candidates were able to state a factor that affects the magnitude of the induced e.m.f.
- (c) The formula for calculating the current is well known by the candidates. Many candidates ignored the unit of mV given for the induced e.m.f. and calculated the current as though the induced e.m.f. was given in volts.

Ans =  $3.33 \cdot 10^{-5}$  A or 0.0333 mA

### Question 15

- (a) The fact that light is the type of energy used by the producers in the food web is well known by the candidates.
- (b) A large proportion of the candidates answered this question correctly.

### Question 16

- (a) The concept of reactivity series is well understood by many of the candidates,
- (b)(i) The better candidates understand the concept of reduction.
- (ii) The idea that a difference in reactivity between **W** and hydrogen means that the oxide of **W** is reduced by hydrogen is not understood by many of the candidates.
- (c) The physical properties of metals are well known by many of the candidates.

### Question 17

- (a)(i) The better candidates had no difficulty identifying the wire labelled **X** as the neutral wire.
- (ii) A large proportion of the candidates identified component **Y** as the fuse but they were unclear as to the conditions which cause the fuse to melt, Candidates are expected to know that the fuse melts when the current exceeds the fuse rating.
- (b) The concept of double insulation is not understood by a large proportion of the candidates.
- (c) Many of the candidates chose the 5A fuse, unaware that the fuse would then melt under normal use. Candidates were expected to choose the 7A fuse because it has the smallest rating above the current that the appliance uses.

### Question 18

This question was well answered by many of the candidates although there is a misconception amongst some of the candidates that fertilisation occurs in the ovary.

### Question 19

- (a) The dot and cross diagram was well done by many of the candidate. Some candidates lost marks as they omitted the electrons not involved in bonding on the selenium atom. The question asked for the arrangement of outer-shell electrons.
- (b)(i) Many of the candidates recognised that the ion that causes the solution to be acidic is the hydrogen ion.
- (ii) The pH of a solution that causes Universal Indicator to turn orange is well known by the better candidates. Candidates are expected to be able to relate the colour of Universal Indicator with pH of the solution and vice versa.

### Question 20

- (a) The fact that gamma radiation is unlikely to penetrate a reasonable thickness of lead is not well known by a majority of the candidates.
- (b)(i) A large proportion of the candidates were able to determine the activity of the source after 12 years from the graph.

Ans = 20000 counts/sec

- (ii) The concept of half-life is not understood by the majority of the candidates. Candidates were expected to know that the half-life is the time taken for the source to reach half the initial activity and then use the decay-curve graph to find the half-life.

Ans = 5,25 years

# COMBINED SCIENCE

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Paper 5129/22  
Theory

## General Comments

There are still a number of candidates who do not show their working when doing calculations. Candidates who do show their working may gain partial credit for the correct equation, even when the calculation is incorrect. Candidates should also note that correct symbols should be used in these formulae.

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

Candidates struggled with the organic Chemistry questions.

## Comments on Specific Questions

### Question 1

- (a) A large proportion of the candidates do not know how to take a reading from a micrometer. Many of the candidates recognised that the reading is between 5 and 6 but many candidates were not aware of how to use the vertical scale to obtain the final reading.

Ans = 5.91 mm

- (b) The calculation to find the density of the piece of metal was well done by a majority of the candidates.

Ans = 9.6 g/cm<sup>3</sup>

### Question 2

- (a) (i) The majority of the candidates were able to correctly identify the structures **C** and **D**.
- (ii) A large proportion of the candidates identified the structures that produce acid and bile.
- (b) The function of amylase was not well known by many of the candidates. Candidates should know that function of amylase is to break down starch to maltose. There is a misconception that amylase makes food easier to swallow among many of the candidates.
- (c) The function of bile in the digestion of fats is known only by the better candidates. Bile is responsible for the emulsification of fats which increases the surface area of the fat and therefore speeds up the digestion of the fat.

### Question 3

- (a) There is some confusion amongst the candidates about the difference between mass and weight. The formula  $\text{weight} = \text{mass} \cdot \text{gravitational field strength}$  is known by many of the candidates. However a significant proportion of the candidates substituted the incorrect values into the formula and produced the answer 4.3kg

Ans = 0.043kg

- (b) (i) A very common mistake was to interpret the area of constant speed as being the area of constant non-zero acceleration. Candidates are expected to recognise that non-zero and constant acceleration produces a steady increase in the speed, or a graph with a constant non-zero gradient.

- (ii) Many candidates who used the correct formula ( $F = ma$ ) gained some credit. Some of these candidates then went on to substitute incorrectly, losing the substitution and calculation part of the credit.

Ans = 0.0172N

- (c) Many of the candidates knew the formula for calculating the distance ( $d = s \cdot t$ ) and those who wrote it down correctly gained some credit. Many candidates quoted an incorrect value for the time that the helicopter is travelling at constant speed, which they were required to find from the speed-time graph.

Ans = 60m

### Question 4

- (a) (i) The calculation of the relative molecular mass of potassium nitrite was well done by the better candidates. A significant number of the candidates included the stoichiometry from the equation in their calculation and obtained 170 rather than 85.

Ans = 85

- (ii) A significant number of the candidates were confused by the stoichiometry of the equation. Many were able to calculate the mass of potassium nitrite as a fortieth of the mass of potassium nitrite given in the first sentence and gained credit for error carried forward.

Ans =  $\frac{170}{32} = 4.25$

- (b) (i) This question was well done by the better candidates.

- (ii) A number of the candidates were confused by the question. Candidates were expected to state that the charge on the oxide ion is  $-2$ . Many candidates simply stated the charge as negative.

- (c) Only a small minority of the candidates were able to state that the gas mixed with oxygen in a welding torch is acetylene.

### Question 5

This question proved to be easy for a large proportion of the candidates.



### Question 6

- (a) Acid **B**, colourless liquid **C** and metal **D** were identified correctly by many of the candidates. However green solid **A** was only identified by the better candidates. Candidates were expected to realise that a solid that reacts with an acid and produces carbon dioxide is a carbonate.
- (b) Candidates needed to recognise that copper is a solid and therefore is removed from the magnesium sulfate solution by filtration.
- (c) The test for carbon dioxide is quite well known by the candidates.

### Question 7

- (a) There is a misunderstanding amongst a large majority of the candidates about what is meant by a *longitudinal wave*. Candidates are expected to explain that energy is transferred in the same direction as the vibration of the particles of the medium through which a longitudinal wave is passing.
- (b) The calculation of the speed of a wave was very well done by a large proportion of the candidates.

Ans = 5.4 m/s

### Question 8

- (a) The formula for calculating refractive index is well known by many of the candidates.
- (b) Many of the candidates found this question difficult. A ray of light through a water-air boundary is bent through a smaller angle than a ray of light refracted through a glass-air boundary.

### Question 9

This question was extremely well done by a large majority of the candidates. There was some confusion amongst the weaker candidates about the differences between sexual and asexual reproduction.

### Question 10

- (a) The differences in properties of metals and non-metals are not well known by a large proportion of the candidates. The differences in melting point and electrical conductivity were given correctly more frequently than the differences in malleability and type of oxide.
- (b) The responses to this question were disappointing. Candidates should be aware that aluminium is used to make aircraft parts due to its low density and is used to make food containers because it is resistant to corrosion.

### Question 11

- (a) (i) Many of the candidates knew the formula for calculating the moment of the weight but unfortunately used the incorrect value for the distance; 7 rather than 5.

Ans = 0.5Ncm

- (ii) A significant proportion of the candidates are aware that the beam is balanced when the clockwise moment is equal to the anticlockwise moment. Many candidates went on to substitute incorrect values into the formula.

Ans = 0.25N

- (b) A large proportion of the candidates recognised that the strength of the electromagnet is increased by increasing the number of turns on the coil. Other ways of increasing the strength were less well known.

### Question 12

- (a) Only a minority of the candidates recognised that the Sun is the source of energy for the food web.
- (b) This question was well answered by a large proportion of the candidates. There was some confusion about the name of a herbivore.
- (c) Candidates were expected to state that energy is lost at each level as either heat or in movement or during excretion; therefore only a proportion of the energy is available for the next level; therefore there is insufficient energy to support a long food chain. A significant number of candidates failed to gain credit here.

### Question 13

- (a) Candidates are expected to know that a hydrocarbon is a compound or a molecule containing only carbon and hydrogen. Many candidates struggled to explain the meaning of the term *hydrocarbon*.
- (b)(i) The better candidates were able to balance the equation correctly.
- (ii) The idea that carbon monoxide is produced during combustion when there is limited supply of oxygen is quite well known by the candidates.
- (c)(i) Many candidates recognised that ethene contains a double bond but did not state that the double bond is between two carbon atoms.
- (ii) Only the better candidates recognised that the reaction between ethene and hydrogen is an addition reaction and the product of the reaction is ethane.

### Question 14

A significant proportion of the candidates realised that the charge at point **P** is positive but then spoiled their answer by stating that the positively charged ball is attracted to point **Q** because point **Q** is negatively charged.

### Question 15

- (a) The majority of the candidates simply restated the information in the question rather than explain the results of the experiment. Candidates were expected to explain that transpiration is the loss of water through the stomata of the leaf; that the stomata are on the underside of the leaf; and that on shoot **L**, the stomata are blocked by the grease, preventing transpiration.
- (b) Again, most of the candidates repeated the information in the question rather than answer it. Candidates were expected to state that there are no stomata on the upper side of the leaf; therefore on both shoots **M** and **N** the stomata are not blocked and transpiration occurs at the normal rate.

### Question 16

Many of the candidates found this question difficult. Some candidates recognised that the elements in Group I of the Periodic Table are called the alkali metals; the fact that the elements contain one electron in the outermost shell was less well known. The products of the reaction of these elements with water were known by very few candidates. The most commonly seen correct answer in this question was that the elements become more reactive as the group is descended.

### Question 17

- (a) Many candidates recognised that chemical energy is converted to light energy in the bulb but the fact that kinetic energy is associated with the movement of the aluminium strips was less well understood.
- (b) The effect of reversing the current on both the brightness of the bulb and the movement of the aluminium strips is not understood by the candidates.
- (c) The formula for calculating the current is well known by the many of candidates. Some of the candidates found some difficulty in rearranging the formula from  $V = IR$  to  $I = V/R$ .

Ans = 0.5 A

### Question 18

Many candidates were able to identify the parts of the flower on the diagram that contain seeds and produce pollen. The part that protects the developing flower was less well known.

### Question 19

- (a) (i) Only the better candidates were able to identify that the hydroxide ion causes a solution to be alkaline. A significant proportion of the candidates stated that the ion is hydrogen.
- (ii) The relationship between the colour of Universal Indicator and pH is not well known by many of the candidates.
- (b) The use of nitric acid to make ammonium nitrate was well known by the better candidates.
- (c) The responses to this question were disappointing in that a significant proportion of the candidates stated the name of a compound rather than an element indicating that there is some misunderstanding of the terms element and compound.

### Question 20

- (a) A large proportion of the candidates were able to state that alpha particles are stopped by paper. The majority of the candidates only gave gamma radiation as an answer to the part asking which of the emissions are stopped by lead.
- (b) Many candidates correctly calculated the mass number and atomic number of the missing particle but only the better candidates identified the particle as a helium nucleus.