

# COMBINED SCIENCE

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

## Comments on specific questions (Biology)

### Question 1

Some less able candidates confused which cell would burst and which would shrivel, and incorrectly opted for **B**.

### Question 2

Candidates found this question difficult. The majority incorrectly selected cellulose, but chlorophyll was also a strong distractor for the weaker candidates.

### Question 3

This question was answered quite well but many of the weaker candidates incorrectly opted for **C** or **D**.

#### Question 4

Candidates across the ability range found this question relatively easy.

#### Question 5

This question worked well although a significant number of weaker candidates incorrectly thought that the teeth are damaged by artificial flavourings in the sweet.

#### Question 6

This question discriminated extremely well between candidates. Option **A** was a very strong distractor for the weaker candidates with about half of these thinking that plasma does not carry urea.

#### Question 7

This question also worked well at discriminating between candidates. A roughly equal number of the weaker candidates selected each option, perhaps indicating that they were guessing.

#### Question 8

This question was correctly answered by the majority of the candidates.

#### Question 9

This question discriminated well between candidates. The majority of the more able candidates knew the answer, but options **A** and **C** were strong distractors for the weaker candidates, demonstrating some confusion about this topic area.

#### Question 10

This question was well answered by the majority, although many of the weaker candidates did not view depression as an effect of excessive alcohol consumption.

#### Question 11

Candidates found this question relatively easy.

#### Question 12

This question worked well at discriminating between candidates. Some weaker candidates confused the gas that would increase in the atmosphere and opted for **C**.

#### Question 13

Candidates did not perform very well in this question and option **C** was a strong distractor for all. This might suggest that the candidates misread the question and thought that it asked which combination of factors was *most* likely to stop menstruation.

#### Question 14

The majority of candidates recognised that the resulting solution needed to be evaporated in order to obtain the crystals of magnesium sulfate, but a large proportion of these chose option **D** because they did not realise that the reaction mixture has to be filtered before evaporation.

#### Question 15

The relationship between proton number and nucleon number with the structure of the atom was well understood by the majority of candidates.

#### Question 16

Many candidates recognised that an ion with a 2+ charge loses two electrons and forms a noble gas electronic configuration.

#### Question 17

The formation of a covalent molecule by the combination of two non-metallic elements was not understood by many of the candidates. The responses indicated that many of the candidates do not recognise metals and non-metals from their electronic configurations.

#### Question 18

This proved to be an easy question for the more able candidates, but there was evidence of guesswork amongst the weaker candidates.

#### Question 19

The majority of the candidates did not know that an amphoteric oxide reacts with both acids and alkalis.

#### Question 20

The relationship between the position of an element in the Periodic Table and its metallic or non-metallic nature was not understood by a large number of the candidates.

#### Question 21

This question proved difficult even for the more able candidates. Only a small proportion of candidates were able to recognise a diagrammatic representation of an alloy. More than half thought that the representation of an ionic substance was an alloy, and so chose option C.

#### Question 22

This proved to be a difficult question and there was evidence of guesswork even amongst the better candidates. Candidates should be able to interpret how a metal reacts with water, steam and dilute hydrochloric acid from its position in the reactivity series.

#### Question 23

The gaseous pollutants in the atmosphere were well known by the vast majority of the candidates.

#### Question 24

The conditions used in the Haber process were well known by the better candidates but there was evidence of guesswork amongst the weaker candidates.

#### Question 25

The concept of homologous series was well understood by many of the candidates.

#### Question 26

The properties of alkenes were not well known by many of the candidates, and there was evidence of guesswork.

**Question 27**

The properties of ethanol were well known by a large proportion of the candidates.

**Question 28**

This showed good discrimination with weaker candidates favouring option **C**.

**Question 29**

This also showed good discrimination, with weaker candidates failing to note the column headings, and so choosing option **B**.

**Question 30**

This also showed good discrimination with each distractor attracting a significant number of the weaker candidates.

**Question 31**

Significantly more candidates chose option **A** than the correct answer, option **B**.

**Question 32**

There was some confusion among candidates, with option **C** attracting almost as many responses as the key, option **A**. A significant number of the better candidates chose option **B**.

**Question 33**

The process of convection was well known.

**Question 34**

This showed very good discrimination with each distractor attracting a significant number of responses from weaker candidates, suggesting guesswork.

**Question 35**

This question showed excellent discrimination with most of the weaker candidates taking the first step towards the correct answer, but choosing option **B**.

**Question 36**

Attraction and repulsion between charged objects was well known and the majority chose the correct option.

**Question 37**

This showed excellent discrimination with most of the weaker candidates, perhaps not fully understanding the question, choosing option **C**.

**Question 38**

There was some uncertainty and possible guessing among candidates in their attempt to determine the correct fuse to be used. Option **A** attracted almost as many responses from weaker candidates as the key, option **B**, did from the more able candidates, a significant number of whom chose option **D**.

**Question 39**

The majority of responses were equally divided between the key, option **D**, and a positive distractor in option **A**. Clearly, with many better candidates choosing option **A**, the principle of operation of a basic iron cored transformer is not well understood.

**Question 40**

This showed very good discrimination with each distractor attracting a significant number of responses, probably due to weaker candidates guessing.

# COMBINED SCIENCE

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

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

## Comments on specific questions (Biology)

### Question 1

Candidates found this question difficult. The majority incorrectly thought that the large surface area of a red blood cell meant that it could carry more oxygen.

### Question 2

Candidates also found this question quite difficult. Many incorrectly thought that the sugar would move into the cells and cause them to burst.

### Question 3

This question was answered reasonably well, but a roughly equal number of the weaker candidates selected each option, perhaps indicating that they were guessing.

#### Question 4

This question was answered quite well but over half of the weaker candidates incorrectly opted for **C** or **D**.

#### Question 5

This question caused some difficulties. The correct answer was in fact the least popular answer, with the majority of candidates selecting photosynthesis.

#### Question 6

This question was answered well by the more able candidates but options **A** and **D** were strong distractors for less able candidates.

#### Question 7

This question discriminated well. The majority of the more able candidates answered correctly, but options **A** and **C** were strong distractors for the weaker candidates, demonstrating some uncertainty about this topic.

#### Question 8

Candidates found this question difficult. A roughly equal number of candidates selected each option, suggesting that they were guessing.

#### Question 9

This question discriminated well between candidates. There was some evidence that the weaker candidates may have been guessing, as approximately equal numbers of candidates selected each option.

#### Question 10

This question worked well, although **A** and **C** were strong distractors for the weaker candidates.

#### Question 11

This question caused the candidates some difficulties, with each option selected by a reasonable number. The strongest distractor was **D**, with many candidates incorrectly thinking that alcohol is a stimulant.

#### Question 12

Candidates across the ability range found this question relatively easy.

#### Question 13

This question proved difficult with many candidates confusing the carpel and stamen and therefore incorrectly opting for **A**.

#### Question 14

Fewer than half of the candidates recognised that for a successful chromatography experiment, the chromatography paper should be in the solvent and the sample should be placed above the surface of the solvent.

#### Question 15

The meaning of the atomic notations was not well understood by many of the candidates, many of whom thought that the nucleon number refers to the number of neutrons in the nucleus and so chose option **C**.

#### Question 16

A large proportion of the more able candidates recognised that an ion with a 2+ charge loses two electrons and forms a noble gas electronic configuration.

**Question 17**

The formation of a covalent molecule by the combination of two non-metallic elements was not understood by many of the candidates. The responses indicated that many of the candidates do not recognise metals and non-metals from their electronic configurations.

**Question 18**

Many of the better candidates selected the correct balanced equation, but there was evidence of guesswork amongst all the candidates.

**Question 19**

The concept of pH and the properties of acids were not well understood by many of the candidates.

**Question 20**

Many of the candidates knew the relationship between the position of an element in the Periodic Table and its metallic character.

**Question 21**

This question proved difficult even for the more able candidates. Only a small proportion of candidates were able to recognise a diagrammatic representation of an alloy. More than half thought that the representation of an ionic substance was an alloy, and so chose option **C**.

**Question 22**

This proved to be a difficult question and there was evidence of guesswork even from the better candidates. Candidates are expected to be able to deduce a reactivity series from experimental results.

**Question 23**

The gaseous pollutants in the atmosphere were well known by the majority of candidates.

**Question 24**

There was evidence of widespread guesswork, particularly amongst the weaker candidates.

**Question 25**

Many of the candidates were able to interpret the general formula of the alkane homologous series. This was an easy question, particularly for the better candidates.

**Question 26**

The properties of alkenes were not well known by many of the candidates.

**Question 27**

The products of the combustion of ethanol were not well known by the candidates. There was evidence of widespread guesswork even amongst the better candidates.

**Question 28**

This question showed very good discrimination, with most of the weaker candidates selecting option **C**.

**Question 29**

There was some uncertainty and guessing among the better candidates, with more choosing option **A** than the key, option **B**.



**Question 30**

This question showed that weaker candidates, who were equally divided between the distractors, have difficulty understanding the difference between mass and weight.

**Question 31**

There was evidence of confusion among candidates, with option **C** attracting almost as many responses as the key, option **A**. Better candidates were also attracted to option **D** as well as option **C**.

**Question 32**

This discriminated well, with many weaker candidates choosing option **D**.

**Question 33**

The process of convection was well known by the better candidates, but significant numbers of weaker candidates chose each of the distractors.

**Question 34**

This was answered correctly by around half of the candidates, but a significant number of better candidates chose option **A**.

**Question 35**

The majority of candidates incorrectly chose option **D** and some of the better candidates chose option **A**.

**Question 36**

Slightly more candidates chose options **A** and **B** than the key, option **D**. Distractor **A** was favoured by a significant number of the better candidates.

**Question 37**

This showed excellent discrimination, with option **A** attracting most of the weaker candidates.

**Question 38**

This was well known, with option **B** by far the most popular distractor.

**Question 39**

There was uncertainty and possible guessing among better candidates in their attempt to determine the correct fuse to be used. More chose option **A** than the key, option **B**.

**Question 40**

This question showed good discrimination, with weaker candidates choosing option **C**, and some better candidates choosing option **A**.

# COMBINED SCIENCE

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Paper 5129/21

Theory

## Key Messages

Candidates should be encouraged to show all the working in their calculations, particularly in the Physics section of the paper. They should also be encouraged to use the correct symbols for the quantities in the formulae they use in the calculations rather than just random letters. Credit is awarded for quoting the correct formula using the correct symbols in calculations.

## General Comments

The Biology questions were answered better than in previous years. Questions which required factual knowledge were particularly well done, but those requiring an explanation often lacked the detail required for credit to be awarded.

## Comments on Specific Questions

### Question 1

This question was answered particularly well by the vast majority of the candidates.

### Question 2

- (a) (i) A large number of the candidates correctly calculated the relative molecular mass. Those candidates who obtained the incorrect answer did not realise the significance of the numbers in the formula of aluminium oxide.
- (ii) The calculation was less well done because many of the candidates ignored the stoichiometry given in the equation, however, candidates who were unable to calculate the amount of chromium produced by 152 g of chromium oxide were often able to use the equation to calculate the correct mass of chromium produced from 38 g of chromium oxide using their incorrect answer.
- (b) Many of the candidates correctly identified the type of reaction as reduction.
- (c) A large number of the candidates knew that there is a protective layer on the surface of the aluminium, but a significant proportion of these candidates did not identify the layer as aluminium oxide.

Answer: (a)(i) 102 (ii) 104 g 26 g

### Question 3

- (a) (i) Many were able to quote the correct formula ( $V = IR$ ) for calculating the combined resistance of **P** and **Q**, but some of these candidates were unable to manipulate the equation correctly in order to calculate the resistance.
- (ii) The majority of the candidates realised that the resistance of **Q** could be found by subtracting the resistance of **P** from their answer to (a)(i).
- (b) The formula  $Q = It$  was not well known by many of the candidates. Once again a number of candidates who were able to quote the formula were unable to manipulate the equation correctly.

- (c) Only the more able candidates were able to draw the correct symbol for a variable resistor.

Answer: (a)(i)  $6\ \Omega$  (ii)  $4\ \Omega$  (b) 50 s

#### Question 4

- (a) This question was well answered by a large proportion of the candidates.
- (b) The vast majority of the candidates identified the condom as the most effective form of birth control that helps to prevent the spread of HIV. The explanation as to why a condom prevents the spread of HIV was answered less well. Candidates were expected to state that the condom provides a barrier between the partners that prevents the exchange of sperm and/or body fluids.

#### Question 5

- (a) The majority of candidates identified **E** as the element with proton number 12.
- (b) Many candidates identified **C** as the element with nucleon number 32.
- (c) The more able candidates recognised that elements in the same group of the Periodic Table have the same number of electrons in the outer shell, and selected elements **A** and **D**.
- (d) This question was answered less well. Candidates should know that basic oxides are formed by metallic elements which are situated on the left of the Periodic Table and therefore have a low number of electrons in their outer shell.

#### Question 6

- (a) Many candidates were able to calculate the weight of the moon buggy, but the unit of weight was less well known.
- (b) Many candidates were unaware of the difference between the mass and the weight of an object. The mass of an object is independent of the gravitational field strength but the weight is dependent on the gravitational field strength. Consequently, even some of the better candidates stated that the mass of the buggy is greater on the Earth than on the Moon.
- (c) The formula  $F = ma$  was extremely well known by the candidates. However, quite a number of candidates had difficulty quoting the correct unit for acceleration.

Answer: (a) 320 N (c)  $2.75\text{ m/s}^2$

#### Question 7

- (a) (i) This was an easy question for the vast majority of candidates.
- (ii) This question was answered well by a large number of candidates.
- (b) Again, this was answered correctly by the majority of candidates.

Answer: (a)(i) 32 (ii)  $1.1\text{ g/cm}^3$  (b) 14

#### Question 8

- (a) Almost all of the candidates were aware of the function of the heart.
- (b) A significant proportion of the candidates had difficulty naming the parts of the heart. The aorta was the most well known of the parts, however, the semi-lunar valve was frequently identified as the bicuspid valve even by the better candidates. The right atrium was the least well known part of the heart.
- (c) (i) Candidates had difficulty giving a full explanation of why the lack of blood causes heart tissue to die. Many candidates recognised that the lack of blood means that the heart tissue does not

receive sufficient oxygen, but only the best candidates went on to say that the cells in the tissue respire less and receive less glucose.

- (ii) The causes of coronary heart disease were well known and understood by a large number of candidates.

#### Question 9

- (a) Many candidates were able to identify gas **A** and liquid **B** but the identity of green solid **C** was less well known.
- (b) (i) The responses to this question were often incorrect. Candidates should know that dilute hydrochloric acid turns Universal Indicator red.
- (ii) Many candidates knew that the hydrogen ion is the ion which causes acidity.
- (c) The test for carbon dioxide was well known by the candidates.

#### Question 10

- (a) (i) The formula used to calculate the clockwise moment was known by many of the candidates.
- (ii) The responses to this question were poor. Only the better candidates recognised that the force is equal to the moment divided by the distance.
- (iii) This question also proved difficult for the majority of candidates. Only a minority realised that the anti-clockwise moment produced by the weight of the iron cube was the sum of the two moments, 0.24 plus the answer to (a)(i).
- (b) Only the better candidates were able to explain that the lead and iron cubes must have different weights because the lead cube is not attracted to the magnet.

Answer: (a)(i) 0.36 Nm (ii) 0.8 N (iii) 0.6 Nm

#### Question 11

- (a) Many candidates correctly identified **A** as the epidermis, however **B** and **C** were only identified correctly by the more able candidates. Candidates were expected to state the full name of the types of leaf cell rather than part of the name.
- (b) (i) The word equation for photosynthesis was well known by many of the candidates but a significant number lost credit for the right hand side of the equation because they gave either starch or carbohydrate as one of the products rather than glucose.
- (ii) The vast majority of the candidates knew that the function of chlorophyll during photosynthesis is to absorb light energy, but only a small number then went on to state that the light energy is converted into chemical energy.

#### Question 12

- (a) The candidates responses to this question were poor; bitumen was the only fraction which was well known.
- (b) Many of the candidates were aware of the general characteristics of a homologous series. However, there was some confusion amongst many between the meaning of general formula and structural or molecular formula.
- (c) (i) This question was extremely well answered.
- (ii) A large number of candidates stated that it is incomplete combustion of the propane that produces carbon monoxide, but only a few gave a limited supply of oxygen as the condition.

#### Question 13

- (a) (i) The vast majority of candidates knew that the volume of liquid in the thermometer increases when the thermometer is placed in hot water.
- (ii) The better candidates knew that the mass of the liquid in the thermometer did not change.
- (b) The majority of candidates answered this correctly.
- (c) The purpose of the constriction in a clinical thermometer was understood by a large number of the candidates.

**Question 14**

- (a) Many candidates were able to describe that a covalent bond is formed by the sharing of electrons between two different atoms.
- (b) The differences in the properties of covalent and ionic compounds were less well known. A number of candidates lost credit because they stated a correct property of a covalent compound but then gave as their second difference the same property of an ionic compound.
- (c) This question proved difficult for many of the candidates. The expected answer was that the oxides of metals are basic and the oxides of non-metals are acidic.

**Question 15**

- (a) This question was well answered by the vast majority of candidates.
- (b) The responses to this question were poor. Many did not refer to the energy being lost between the second and third trophic level, but answered the question in terms of the lion rather than the impala.

**Question 16**

- (a) (i) The definition of the *frequency* of a wave was not well known by many of the candidates. Answers often referred to the distance the wave travels or the time the wave takes to travel, rather than the number of waves per unit time.
- (ii) This question was poorly answered. Many of the candidates had great difficulty with the scientific notation used in the data given. Some candidates did gain credit for stating the correct formula for calculating the wavelength ( $v = f\lambda$ ).
- (b) (i) Many candidates knew that the frequency of infra-red radiation is higher than the frequency of microwave radiation.
- (ii) The fact that the speed of infra-red radiation and the speed of microwave radiation in a vacuum are the same was less well known.

Answer: (a)(ii) 0.12 m

**Question 17**

- (a) The metal extracted from haematite was well known by many of the candidates.
- (b) The amphoteric nature of aluminium oxide was well understood by many candidates.
- (c) The use of iron as the catalyst in the manufacture of ammonia was less well known.
- (d) The composition of brass was well known by the majority of candidates.
- (e) The position of potassium relative to sodium in the reactivity series was well known.

**Question 18**

- (a) A large proportion of the candidates were able to explain the meaning of the word *isotope*.
- (b) Only a minority of candidates were able to correctly deduce the number of protons and neutrons in an atom of the isotope of helium.

*Answer:* 2 protons  
1 neutron

# COMBINED SCIENCE

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Paper 5129/22

Theory

## Key Messages

Candidates should be encouraged to show all the working in their calculations, particularly in the Physics section of the paper. They should also be encouraged to use the correct symbols for the quantities in the formulae they use in the calculations rather than just random letters. Credit is awarded for quoting the correct formula using the correct symbols in calculations.

## General Comments

In the Biology section of the paper, questions which required an explanation of a experimental phenomenon were less well answered than those questions which required recall of knowledge. In the Chemistry section, the structure of the atom and properties of gases were well understood by many of the candidates, but questions which involved application of knowledge were less well answered.

## Comments on Specific Questions

### Question 1

This question was answered well by many of the candidates. The products of aerobic respiration were less well known, particularly by the weaker candidates.

### Question 2

- (a) The vast majority of the candidates plotted the graph correctly.
- (b) (i) Most of the candidates read the correct value from the graph.  
(ii) This question was answered very well by the better candidates. However, many of the less able candidates did not recognise that the answer to the question is ten times the value obtained from the graph.
- (c) The responses to this question were poor. The test for carbon dioxide was not well known by many of the candidates.

Answer: (b)(i)  $240 \text{ cm}^3$  (ii)  $24\,000 \text{ cm}^3$

### Question 3

- (a) (i) Only the most able candidates were able to explain that the acceleration is not constant because the speed/time graph is not a straight line. Many answered in terms of speed rather than acceleration.  
(ii) Only a small proportion of the candidates recognised that because the speed/time graph is horizontal, the acceleration is zero.  
(iii) A significant proportion of the candidates knew the formula to use in the calculation, but only the more able candidates realised that the time to be used in the calculation was 0.4 s.
- (b) (i) The formula  $F = ma$  was very well known by many and this question was well answered, particularly by the better candidates.

- (ii) The formula to calculate the density was well known by many. However, the use of scientific notation in the given data caused some confusion, particularly amongst the weaker candidates.

Answer: (a)(iii) 0.8 m (b)(i) 0.24 N (ii) 3750 kg/m<sup>3</sup>

#### Question 4

- (a) The substances produced by the metabolism of amino acids and glucose in the liver were not well known.
- (b) Similarly, other substances broken down by the liver were only known by the better candidates.

#### Question 5

- (a) The general name given to the elements in Group VII was not well known.
- (b) The trend in colour and state as Group VII is descended was not understood by many of the candidates.
- (c) A significant number of candidates knew the relationship between the number of electrons in the outer shell and the group number in the Periodic Table.
- (d) The more able candidates recognised that bromine is used as a test for alkenes. A number of candidates gave the name of a specific alkene rather than the name of the homologous series.

#### Question 6

- (a) The vast majority of candidates were able to correctly state the length of the spring, but the extensions were invariably calculated incorrectly. Only the best candidates realised that the extensions could be calculated by subtracting the length of the spring with no load from the length of the spring with the load.
- (b) This proved to be a difficult question for all but the more able candidates. A number of candidates obtained the value of the load (0.3 N) from the table, but were unable to continue the calculation to find the weight of the wooden cube. Candidates needed to know that the clockwise moment is equal to the anti-clockwise moment, and substitute the numbers into the formula  $f_1 \times d_1 = f_2 \times d_2$ .

Answer: (a) 14.4, 1.2, 2.4, 3.6, 4.8 (b) weight = 0.96 N

#### Question 7

- (a) (i) The process of osmosis was not well understood. There was some confusion between osmosis and transpiration, particularly amongst the weaker candidates.
- (ii) A large number of candidates thought that the loss in weight of the yam was due to the fact that it was removed from the water and weighed. Candidates were expected to state that the yam loses water through the semi-permeable cell membrane during the experiment because the concentration of water in the yam is greater than the concentration of the water in the sugar solution.
- (iii) Very few candidates realised that no further osmosis occurs because the concentration of water is the same in both the yam and the sugar solution. Many candidates thought that all of the water had been lost from the piece of yam.
- (b) The calculation of the volume of the cube was well done by a large number of candidates.
- (c) (i) Despite the calculation showing that the volume of each piece of yam was the same, only the best candidates stated that they had the same volume. Many simply referred to the two pieces of yam having the same mass.
- (ii) The most able candidates recognised that the second piece of yam has a smaller surface area. Many candidates either repeated the stem of the question or made vague statements about the pieces of yam being a different shape.



### Question 8

- (a) This question was answered well by a large proportion of the candidates. The weaker candidates found the electronic structure of the sulfide ion difficult. Many thought that a sulfur atom loses electrons when it forms an ion, and gave the electronic structure as 2, 8, 6 rather than 2, 8, 8.
- (b) (i) Many candidates found this question difficult. Candidates should be able to construct the formula of an ionic substance when they are given the charges on the ions.
- (ii) The type of bonding in sodium sulfide was well known by many.

### Question 9

- (a) Colourless solution **X** was only rarely identified as potassium hydroxide solution. The identity of acid **Y** was known by many, but only the very best candidates realised that the gas produced when an ammonium salt reacts with a base is ammonia.
- (b) Candidates should know that the reaction between an acid and an alkali is a neutralisation reaction.
- (c) A large number of candidates did not know the industrial uses of hydrogen.

### Question 10

- (a) Many correctly identified the types of emission.
- (b) The concept of half-life was well understood by the most able candidates but weaker candidates found this question difficult.

Answer: (b) 24, 100

### Question 11

- (a) The idea of the normal being at 90° to the mirror at the point of reflection was not well known by a large number of candidates.
- (b) The laws of reflection were understood only by the best candidates. Candidates were expected to draw the ray reflected from mirror **A** so that the angle of reflection was equal to the angle of incidence. The ray reflected from mirror **B** should be parallel to the incident ray on mirror **A**. Candidates should be reminded that the rays should be drawn with a ruler and not freehand.

### Question 12

- (a) This question was poorly answered by the majority of candidates. Candidates were expected to define a *drug* as an externally administered substance that changes the chemical reactions of the body.
- (b) Many of the candidates answered this question in terms of general effects of any drug on the body rather than the specific effects of heroin.

### Question 13

- (a) (i) Only the better candidates knew that petroleum is separated by fractional distillation.
- (ii) The use of bitumen in road building was known by many of the candidates, but the use of paraffin/kerosene as a fuel for oil stoves was less well known.
- (b) (i) Many knew that hexane belongs to the alkane homologous series.
- (ii) Only the most able candidates were able to correctly balance the equation.

#### Question 14

- (a) The majority of candidates knew the symbol used for the voltmeter. However, it was less well known that it should be placed in parallel with the variable resistor.
- (b) Many of the candidates knew the formula,  $V = IR$ , but a number had difficulty rearranging the formula to make the current the subject of the formula.
- (c) The effect on the ammeter reading of changing the resistance of the variable resistor, the potential difference across resistor **R** and the potential difference across the variable resistor were not well understood by many of the candidates and there was evidence of guesswork amongst some.

Answer: (b) 0.3 A

#### Question 15

- (a) (i) The parts of the human heart were not well known. The aorta was identified more often than the pulmonary vein and the semi-lunar valve.
- (ii) Many of the candidates knew that the function of the tissue **D** is to pump blood around the body. However, only the best candidates were able to explain why tissue **D** is thicker than tissue **E**. Candidates were expected to state that blood in tissue **D** is at a higher pressure, or pumps with a greater force than tissue **E**.
- (b) (i) Many of the better candidates identified the platelets as the part of the blood responsible for clot formation.
- (ii) This question proved difficult even for the candidates who had correctly identified platelets in (b)(i). Many knew that a clot prevents a wound from bleeding but were unable to state the role of the platelets in the formation of a clot.
- (c) The responses to this question were poor. Many candidates simply stated the causes of coronary heart disease (which were well known) rather than the changes in lifestyle that would reduce the risk of developing coronary heart disease.

#### Question 16

- (a) Many candidates knew that oxygen relights a glowing splint.
- (b) Only a small number of candidates knew that nitrogen is the most abundant gas in the atmosphere.
- (c) Many candidates knew helium, as an unreactive gas, is used to fill balloons.
- (d) The use of carbon monoxide as the reducing agent in the extraction of iron from iron ore was not well known.
- (e) Many candidates recognised sulfur dioxide as a gas that dissolves in water to produce an acidic solution.

#### Question 17

- (a) Many understood that the ammeter reading is positive, but many of these candidates did not realise that the ammeter reading becomes **more** positive when the magnet is pushed more quickly into the coil.
- (b) Only the best candidates knew that the current in the ammeter is reversed when the polarity of the magnet is reversed or when the magnet is removed from the coil.

**Question 18**

- (a) Many candidates were able to suggest that the can is painted black because black is the best absorber of heat.
- (b) (i) Many candidates, particularly the more able ones, knew that the volume of the water increases when it is heated.
  - (ii) The effect on the density of the water of increasing the temperature was less well known.