

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

## General Comments

Candidates found **Questions 28** and **39** to be very easy, only **Question 37** more challenging. Guessing was shown by candidates in a number of questions. If a candidate finds a question challenging, one approach might be to use knowledge and judgement to eliminate distractors presenting a clearly incorrect answer leaving a choice between three or two options, giving the candidate a better chance of selecting the right answer.

## Comments on Specific Questions

### **Question 1**

This question proved to be relatively easy with most candidates correctly identifying the three cell structures.

### **Question 2**

Candidates found this question more challenging, with option B proving to be a strong distractor particularly for the weaker candidates.

### Question 3

Candidates also found this question difficult, with a quarter of them incorrectly suggesting that the enzymes in a germinating seed are to increase the rate of photosynthesis.

### Question 4

This question discriminated well between candidates. A significant number of weaker candidates incorrectly thought that carbon dioxide enters a plant via the chloroplast.

### Question 5

This question also discriminated very well between candidates. B was a very strong distractor for the weaker candidates suggesting some gaps in understanding about the process of peristalsis.

### Question 6

Candidates found this question difficult. Option A was the most popular incorrect answer. This suggests that candidates understand that, during wilting, water vapour is lost from the plant but they struggled to link this to the stomata being open.

### Question 7

This question, which asked candidates to link lifestyle factors to deaths from coronary heart disease, proved to be easy for the majority of candidates.

### Question 8

Candidates also found this question easy with over three quarters of the candidates selecting C as the correct answer.

### Question 9

This question worked well although a significant number of weaker candidates incorrectly selected option B. This suggests some confusion about the roles of the liver and the kidney.

### Question 10

This question discriminated well between candidates. Option A proved to be a strong distractor suggesting that some candidates may have confused enzymes and hormones.

### Question 11

This question worked well, although a significant percentage of candidates incorrectly thought that alcohol abuse does not lead to increased reaction times.

### Question 12

This question discriminated well between candidates.

### Question 13

This question worked well. Option A proved to be a strong distractor and suggests that a significant number of candidates incorrectly think that blood group affects the menstrual cycle.

### Question 14

Many of the candidates, including the better candidates, misinterpreted the question and chose option B, the piece of apparatus used to measure the  $25.0 \text{ cm}^3$  of the alkali.

### Question 15

The definition of an isotope is well understood by the majority candidates.

**Question 16**

The formation of ionic bonds in magnesium chloride is well understood by the candidates.

**Question 17**

Many of the candidates, particularly the better ones, were able to correctly identify the dot and cross diagram for the covalent compound formed between X and Y.

**Question 18**

There was evidence of guesswork even among the better candidates. Candidates are expected to be able to construct the formula of a compound from the charge on the ions and therefore the position of the elements in the Periodic Table.

**Question 19**

The reactions of acids and bases are not well understood by many of the candidates.

**Question 20**

The trends in state and colour of Group VII elements are not well known by the candidates. Less than 40% of the candidates knew that the elements change from gas to solid as the group is descended.

**Question 21**

A majority of the candidates identified P and Q as iron and sodium but a significant proportion of these candidates thought that zinc does not react with hydrochloric acid and chose option D.

**Question 22**

A majority of the candidates knew that zinc is used to galvanise steel.

**Question 23**

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

**Question 24**

There was evidence of guesswork amongst the weaker candidates.

**Question 25**

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

**Question 26**

The vast majority of the candidates recognised the structure A as an alkane.

**Question 27**

A large majority of the candidates identified X and Y as ethanol and ethanoic acid but almost half of these candidates thought that W was ethane rather than ethene and chose option A.

**Question 28**

Most of the candidates correctly chose option C but a small number of the better ones thought that acceleration, option A, would not be affected.

**Question 29**

This question showed good discrimination but found some better candidates choosing option C rather than the key, option B.

**Question 30**

This was well answered with option B the most popular of the distractors.

**Question 31**

This was also well answered with distractors B and D attracting a response from some better candidates.

**Question 32**

This question had twice as many candidates choosing option A than did the key, option D. Candidates needed to recognise that the context referred to the cooling of cans, and so there is a net emission of radiation from the surface of the can. Although dull black surfaces are better absorbers than white surfaces, that fact is irrelevant to this context.

**Question 33**

This was not well answered. Many candidates favoured option D believing that the amplitude of a wave is the distance from trough to crest.

**Question 34**

Candidates needed to recognise that a light wave entering a glass block at a right angle, along the normal, will continue into the glass unbent.

**Question 35**

This was well answered and showed good discrimination with option A the most popular distractor.

**Question 36**

This was also well answered with the majority of candidates choosing option A, the key, and most of the remainder option D.

**Question 37**

This question showed good discrimination. Candidates needed to change the hours into seconds before multiplying the power, calculated from voltage and current, by the time.

**Question 38**

This was well answered.

**Question 40**

This showed very good discrimination with most of the weaker candidates divided between options B and C.

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

## General Comments

Candidates found no question to be very easy and found **Questions 37** and **40** very challenging. There was evidence of guessing from the candidates in a number of questions. If a candidate finds a question challenging, one approach might be to use knowledge and judgement to eliminate distractors presenting a clearly incorrect answer leaving a choice between three or two options, giving the candidate a better chance of selecting the right answer.

## Comments on Specific Questions

### **Question 1**

This question proved to be relatively easy with most candidates correctly identifying the three cell structures.

### **Question 2**

Candidates found this question much more challenging, with option B proving to be a strong distractor particularly for the weaker candidates.

### Question 3

Candidates also found this question difficult, with a quarter of them incorrectly suggesting that the enzymes in a germinating seed are used to make starch.

### Question 4

This question discriminated well between candidates. Over a quarter of the weaker candidates incorrectly thought that carbon dioxide enters a plant via the chloroplast.

### Question 5

This question also discriminated very well between candidates. B was a very strong distractor for the weaker candidates suggesting some gaps in understanding about the process of peristalsis.

### Question 6

Candidates found this question difficult. Option A was the most popular incorrect answer. This suggests that candidates understand that, during wilting, water vapour is lost from the plant but they struggled to link this to the stomata being open.

### Question 7

This question, which asked candidates to link lifestyle factors to deaths from coronary heart disease, proved to be relatively easy.

### Question 8

Candidates also found this question fairly easy with many candidates selecting C as the correct answer.

### Question 9

This question worked well although a significant number of weaker candidates incorrectly selected option B. This suggests some confusion about the roles of the liver and the kidney.

### Question 10

This question discriminated well between candidates.

### Question 11

This question worked well, although a quarter of the weaker candidates were unaware that alcohol abuse can lead to severe withdrawal symptoms.

### Question 12

This question proved difficult, particularly for the weaker candidates. Many thought that the producer was at the top of the food web. The direction of the arrows should have helped candidates here.

### Question 13

This question worked well. Option A proved to be a strong distractor and suggests that a significant number of candidates incorrectly think that blood group affects the menstrual cycle.

### Question 14

A majority of the candidates misinterpreted the question and chose option B, the piece of apparatus used to measure the  $25.0\text{ cm}^3$  of the alkali. Only the better candidates recognised that a burette is used to measure the volume of acid in a titration.

**Question 15**

The definition of an isotope is well understood by many of the candidates.

**Question 16**

Over 60% of the candidates knew how the ionic bonds are formed in magnesium chloride.

**Question 17**

Many of the better candidates were able to correctly identify the dot and cross diagram for the covalent compound formed between X and Y.

**Question 18**

There was evidence of widespread guesswork even amongst the better candidates. Candidates are expected to be able to construct the formula of a compound from the charge on the ions and therefore the position of the elements in the Periodic Table.

**Question 19**

The reactions of acids and bases are not well understood by many of the candidates.

**Question 20**

The trends in state and colour of Group VII elements are not well known by the candidates. Less than 40% of the candidates knew that the elements change from gas to solid as the group is descended.

**Question 21**

A significant number of the candidates thought that copper reacts with dilute hydrochloric acid and chose either option A or option B. The majority of the candidates who identified metal P as iron invariably identified the other three metals correctly.

**Question 22**

A majority of the candidates knew that zinc is used to galvanise steel.

**Question 23**

This was an easy question for the better candidates; however, a significant proportion of the candidates thought that oxygen is the most abundant gas in the air and chose option D.

**Question 24**

There was evidence of widespread guesswork even amongst the better candidates.

**Question 25**

The fact that members of a homologous series have the same chemical properties is known by a large majority of the candidates; however, a significant proportion of the candidates did not recognise that a homologous series can be represented by the same general formula.

**Question 26**

The vast majority of the candidates recognised the structure A as an alkane.

**Question 27**

A large majority of the candidates identified X and Y as ethanol and ethanoic acid but almost half of these candidates thought that W was ethane rather than ethene and chose option A.

**Question 28**

Each distractor drew a significant response with a suggestion that some better candidates chose option D.

**Question 29**

The majority of candidates correctly chose option B, the key.

**Question 30**

This was answered well although some better candidates chose option B indicating confusion between the extension and the length of a spring.

**Question 31**

This was also answered well with weaker candidates divided between options A and D.

**Question 32**

This question showed good discrimination. Candidates needed to recognise that the context referred to the cooling of cans, and so there is a net emission of radiation from the surface of the can. Although dull black surfaces are better absorbers than white surfaces, that fact is irrelevant to this context.

**Question 33**

This also discriminated well. Weaker candidates favoured option D believing that the amplitude of a wave is the distance from trough to crest.

**Question 34**

Candidates needed to recognise that a light wave entering a glass block at a right angle, along the normal, will continue into the glass unbent.

**Question 35**

This was well answered and showed good discrimination with weaker candidates divided between options A and D.

**Question 36**

This was also well answered. The majority of candidates choosing option A, the key, and most of the remainder option D.

**Question 37**

This question discriminated well. Candidates needed to change the hours into seconds before multiplying the power, calculated from voltage and current, by the time.

**Question 38**

This was well answered with option A the most popular incorrect choice, indicating that some candidates think that all metals are magnetic.

**Question 39**

This was well known and showed good discrimination with weaker candidates choosing option D.

**Question 40**

This question was not well answered. Candidates need to know the ionising effect of the radiations.



# COMBINED SCIENCE

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Paper 5129/21

Theory

## Key Message

Candidates should be made aware that when doing a calculation they should write down the correct formula for the calculation using the correct symbols and then show how they reach their answer.

Candidates are expected to be able to use relative atomic masses and relative molecular masses and use these values in conjunction with chemical equations to calculate simple proportions of reacting masses.

## General Comments

It is pleasing to note that a number of the candidates are showing their working in Physics calculations. Those questions which required explanation of an observation or phenomenon were not well done by many of the candidates. All too often candidates repeated the question in their response or only gave part of the explanation. The responses to the Chemistry calculation were disappointing.

## Comments on Specific Questions

### Question 1

- (a) Many of the better candidates were able to identify the diagram that represents an element in the Periodic Table.
- (b) This question was well answered by a large number of candidates.
- (c) The diagram that represents an alloy was well known by many of the candidates.
- (d) The representation of a diatomic compound was not well understood by many of the candidates. A large proportion of the candidates confused this with the diagram of a mixture and gave their answer as diagram **P** rather than diagram **Q**.
- (e) The confusion about a diatomic compound and a mixture of two gases was again demonstrated by the candidates as many of the candidates gave their answer as diagram **Q** rather than diagram **P**.

### Question 2

This question was well answered by a large proportion of the candidates. A majority of the candidates were not aware that the type of digestion in the alimentary canal is extra-cellular.

### Question 3

- (a) (i) The vast majority of the candidates were able to calculate the volume of the cube.
  - (ii) The equation for calculating the density of a substance is well known. It was disappointing to note that although the calculation was well done a significant proportion did not give the correct units for the density.
- (b) The fact that iron is temporary magnet and steel is a permanent magnet is well known by many of the candidates.

Answers: (a)(i)  $40 \text{ cm}^3$  (ii)  $7.9 \text{ g/cm}^3$

#### Question 4

- (a) (i) The better candidates were able to deduce the formula of Y. Candidates should be aware that in any balanced chemical equation there are equal numbers of atoms on either side of the equation.
- (ii) The better candidates were able to identify Y as an alkane.
- (b) Most candidates knew that bromine water changes from brown to colourless in the presence of ethene. The rest of the question was poorly done by the majority of the candidates. Candidates were expected to know that ethene is an unsaturated hydrocarbon and that is called a monomer when it undergoes addition polymerisation.

#### Question 5

- (a) This proved to be an easy question particularly for the better candidates. There was evidence of guessing amongst the weaker candidates.
- (b) The products of photosynthesis are not well known by many of the candidates. A large number of the candidates identified oxygen as one of the products but many of these candidates gave the general name carbohydrate rather than the specific product, glucose.
- (c) A large number of the candidates knew that chlorophyll absorbs light energy during photosynthesis; the best candidates were able to go on to state that the light energy is converted to chemical energy during the process. Many of the candidates stated that the light energy is converted into food which is insufficient as an explanation.
- (d) This question was well answered by many of the candidates.

#### Question 6

- (a) (i) Over half of the candidates correctly read the time for one complete rotation of the magnet from the graph.
- (ii) This was a very easy question for the vast majority of the candidates.
- (b) The effect of rotating the magnet more quickly was not well understood by many of the candidates.

Answers: (a)(i) 0.2 s (ii) 9.0 V

#### Question 7

- (a) The formula  $Q = It$  was well known only by the better candidates. A number of the candidates who knew the equation were unable to manipulate the equation to make the current the subject of the formula.
- (b) The responses to this question were disappointing. Many of the candidates tried to use the formula  $V = IR$  despite not being given a value of the resistance of the resistor. Candidates were expected to use the formula  $V = E/Q$  and were allowed error carried forward from their answer to (a).

Answers: (a) 2.5 A (b) 0.5 V

### Question 8

- (a) (i) Only a limited number of candidates were able to calculate the relative atomic mass of X from the relative molecular mass of the given formula,  $X_2O_3$ .
- (ii) This question was poorly answered by many of the candidates.
- (b) (i) The responses to this question were disappointing. Candidates need to understand the significance of the stoichiometry of the chemical equation and its relationship to the reacting masses involved in the reaction.
- (ii) Even allowing for error carried forward from (b)(i) the candidates' struggled to answer this question.
- (c) Candidates need to know that that *reduction* involves loss of oxygen from a substance.

Answers: (a)(i) 52 (b)(i) 72 (ii) 7.6

### Question 9

- (a) Candidates should know that acceleration is defined as the rate of change of velocity.
- (b) Due to the slight ambiguity in the question, candidates who stated the time taken for the pendulum to return to position **A** from position **B** and candidates who stated the time taken for the pendulum to return to position **A** from position **A** were given credit. Many of the candidates did not allow for the full swing of the pendulum and assumed that the pendulum returned to position **A** without swinging further than **B**.
- (c) A large proportion of the candidates drew an arrow indicating the movement of the pendulum bob rather than the direction in which the weight of the pendulum bob is acting. Candidates were expected to draw a vertical downward arrow from the pendulum bob.

Answer: (b) 1.2 or 1.6 s

### Question 10

- (a) The vast majority of the candidates knew a source of the sulfur dioxide, such as emissions from factories, but did not explain how the sulfur dioxide is produced by that source. Candidates should know that sulphur dioxide is produced when fossil fuels that contain sulfur compounds are burned.
- (b) (i) Only the best candidates were able to state that the hydrogen ion causes the sulfuric acid to be acidic.
- (ii) Over 50% of the candidates were able to balance the equation for the reaction between sulfuric acid and sodium hydroxide.
- (iii) Candidates should be aware that salts are produced when an acid reacts with a metal oxide or a metal carbonate and that to obtain a sodium salt the reactant must be a sodium compound. Candidates who stated that sodium is added to the sulfuric acid were not awarded credit due to the explosive nature of the reaction.

### Question 11

- (a) A significant proportion of the candidates simply stated the percentages of the gases in the air rather than the difference between expired and inspired air. The differences in carbon dioxide and oxygen were quite well known but the fact that there is no difference in the nitrogen content of expired and inspired air was less well known.
- (b)(i) This question was easy for the vast majority of the candidates.
- (ii) Candidates were expected to state that the runner's breathing would be faster and deeper after the race. Answers comparing the volume of air taken in after the race to before the race were given credit. A significant number of candidates answered the question in terms of heart beating rather than breathing.
- (iii) A large number of the candidates simply restated the question by stating that more air is required. Candidates were expected to explain that more oxygen is required by the runner in order to increase the amount of respiration and produce more energy.

Answer: (b)(i)  $14.7 \text{ dm}^3$

### Question 12

- (a) This question was done well by the better candidates. The formula for calculating a moment about a pivot was known by many of the candidates but a proportion of these candidates found it difficult to rearrange the formula in order to calculate the mass of the measuring cylinder.
- (b) The majority of the candidates were able to read the volume of liquid in the measuring cylinder correctly.
- (c) Only a small proportion of the candidates recognised that the measuring cylinder is heavier when it contains a liquid. This increased weight means that in order to make the clockwise moment equal to the anticlockwise the distance between the measuring cylinder and pivot has to be reduced.

Answers: (a) 24 g (b)  $14 \text{ cm}^3$

### Question 13

- (a) A large proportion of the candidates identified **Z** as the element with a proton number 17.
- (b) The better candidates identified **V** as the element which combines with three hydrogen atoms to form a covalent compound.
- (c) This question was well done by many of the candidates.
- (d) The fact that element **W** has a full outer shell and is therefore unreactive and does not form an oxide was recognised by a large number of the candidates.
- (e) A significant number of candidates attempted to answer the question in terms of aluminium and chlorine rather than use the letters from the table. Only the best candidates were able to deduce the formula, **YZ<sub>3</sub>**.

### Question 14

- (a) There is some confusion amongst a large proportion of the candidates regarding energy transfer. Candidates should be aware that when an object falls potential energy is converted into kinetic energy.
- (b) Many of the candidates knew the formula work done = force x distance, however marks were lost due to the candidates rearranging the formula incorrectly. Overall the question was well answered by many of the candidates.

Answer: (b) 6 N

### Question 15

This question was well answered by a large number of candidates.

### Question 16

This question was well answered by many of the candidates, particularly the better candidates. The least well known structure was the structure that controls the size of the candidate in the eye.

### Question 17

- (a) The reason for the apparent lack of reactivity of aluminium compared to iron is not well understood by many of the candidates.
- (b) A majority of the candidates were able to state a use of aluminium.

### Question 18

- (a) A majority of the candidates were able to draw the normal at  $90^\circ$  to the block where the ray is incident on the block.
- (b) Only the better candidates were able to label the angle of incidence correctly.
- (c) A large proportion of the candidates correctly drew the emergent ray parallel to the incident ray.

### Question 19

- (a) (i) Only a small proportion of the candidates knew that menstruation begins on day one of the cycle.  
(ii) There was some evidence of guesswork amongst the weaker candidates.
- (b) Methods of birth control are well known by many of the candidates.
- (c) (i) Many of the candidates confused the signs of syphilis with the signs of gonorrhoea.  
(ii) The treatment for syphilis was well known by many of the candidates.

### Question 20

The tests for the gases and the results for the tests are well known by many of the candidates. The weaker candidates often confused the tests for hydrogen and oxygen.

### Question 21

- (a) The vast majority of the candidates were able to calculate the number of protons in the atom of plutonium.
- (b) The candidates' responses to this question were very disappointing due to the fact that the vast majority of the candidates misread the question and calculated the number of protons and neutrons in the atom of plutonium rather than the number of protons and neutrons in alpha particle.
- (c) The concept of half-life is not well understood by the majority of the candidates. Candidates were expected to calculate that 352 years corresponds to four half-lives and use this to find the number of alpha-particles per second that the sample emits after 352 years.

Answer: (a) 144 (b) 2 protons 2 neutrons (c) 200 counts per second.

# COMBINED SCIENCE

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Paper 5129/22

Theory

## Key Message

Candidates should be made aware that when doing a calculation they should write down the correct formula for the calculation using the correct symbols and then show how they reach their answer.

Candidates are expected to be able to use relative atomic masses and relative molecular masses and use these values in conjunction with chemical equations to calculate simple proportions of reacting masses.

## General Comments

It is pleasing to note that a number of the candidates are showing their working in Physics calculations. Those questions which required explanation of an observation or phenomenon were not well done by many of the candidates. All too often candidates repeated the question in their response or only gave part of the explanation. The responses to the Chemistry calculation were disappointing.

## Comments on Specific Questions

### Question 1

- (a) Many of the better candidates were able to identify the diagram that represents an element in the Periodic Table.
- (b) This question was well answered by a large number of candidates.
- (c) The diagram that represents an alloy was well known by many of the candidates.
- (d) The representation of a diatomic compound was not well understood by many of the candidates. A large proportion of the candidates confused this with the diagram of a mixture and gave their answer as diagram **P** rather than diagram **Q**.
- (e) The confusion about a diatomic compound and a mixture of two gases was again demonstrated by the candidates as many of the candidates gave their answer as diagram **Q** rather than diagram **P**.

### Question 2

This question was well answered by a large proportion of the candidates. A majority of the candidates were not aware that the type of digestion in the alimentary canal is extra-cellular.

### Question 3

- (a) (i) The vast majority of the candidates were able to calculate the volume of the cube.
  - (ii) The equation for calculating the density of a substance is well known. It was disappointing to note that although the calculation was well done a significant proportion did not give the correct units for the density.
- (b) The fact that iron is temporary magnet and steel is a permanent magnet is well known by many of the candidates.

Answers: (a)(i)  $40 \text{ cm}^3$  (ii)  $7.9 \text{ g/cm}^3$

#### Question 4

- (a) (i) The better candidates were able to deduce the formula of Y. Candidates should be aware that in any balanced chemical equation there are equal numbers of atoms on either side of the equation.
- (ii) The better candidates were able to identify Y as an alkane.
- (b) Most candidates knew that bromine water changes from brown to colourless in the presence of ethene. The rest of the question was poorly done by the majority of the candidates. Candidates were expected to know that ethene is an unsaturated hydrocarbon and that is called a monomer when it undergoes addition polymerisation.

#### Question 5

- (a) This proved to be an easy question particularly for the better candidates. There was evidence of guessing amongst the weaker candidates.
- (b) The products of photosynthesis are not well known by many of the candidates. A large number of the candidates identified oxygen as one of the products but many of these candidates gave the general name carbohydrate rather than the specific product, glucose.
- (c) A large number of the candidates knew that chlorophyll absorbs light energy during photosynthesis; the best candidates were able to go on to state that the light energy is converted to chemical energy during the process. Many of the candidates stated that the light energy is converted into food which is insufficient as an explanation.
- (d) This question was well answered by many of the candidates.

#### Question 6

- (a) (i) Over half of the candidates correctly read the time for one complete rotation of the magnet from the graph.
- (ii) This was a very easy question for the vast majority of the candidates.
- (b) The effect of rotating the magnet more quickly was not well understood by many of the candidates.

Answers: (a)(i) 0.2 s (ii) 9.0 V

#### Question 7

- (a) The formula  $Q = It$  was well known only by the better candidates. A number of the candidates who knew the equation were unable to manipulate the equation to make the current the subject of the formula.
- (b) The responses to this question were disappointing. Many of the candidates tried to use the formula  $V = IR$  despite not being given a value of the resistance of the resistor. Candidates were expected to use the formula  $V = E/Q$  and were allowed error carried forward from their answer to (a).

Answers: (a) 2.5 A (b) 0.5 V

### Question 8

- (a) (i) Only a limited number of candidates were able to calculate the relative atomic mass of X from the relative molecular mass of the given formula,  $X_2O_3$ .
- (ii) This question was poorly answered by many of the candidates.
- (b) (i) The responses to this question were disappointing. Candidates need to understand the significance of the stoichiometry of the chemical equation and its relationship to the reacting masses involved in the reaction.
- (ii) Even allowing for error carried forward from (b)(i) the candidates' struggled to answer this question.
- (c) Candidates need to know that that *reduction* involves loss of oxygen from a substance.

Answers: (a)(i) 52 (b)(i) 72 (ii) 7.6

### Question 9

- (a) Candidates should know that acceleration is defined as the rate of change of velocity.
- (b) Due to the slight ambiguity in the question, candidates who stated the time taken for the pendulum to return to position **A** from position **B** and candidates who stated the time taken for the pendulum to return to position **A** from position **A** were given credit. Many of the candidates did not allow for the full swing of the pendulum and assumed that the pendulum returned to position **A** without swinging further than **B**.
- (c) A large proportion of the candidates drew an arrow indicating the movement of the pendulum bob rather than the direction in which the weight of the pendulum bob is acting. Candidates were expected to draw a vertical downward arrow from the pendulum bob.

Answer: (b) 1.2 or 1.6 s

### Question 10

- (a) The vast majority of the candidates knew a source of the sulfur dioxide, such as emissions from factories, but did not explain how the sulfur dioxide is produced by that source. Candidates should know that sulphur dioxide is produced when fossil fuels that contain sulfur compounds are burned.
- (b) (i) Only the best candidates were able to state that the hydrogen ion causes the sulfuric acid to be acidic.
- (ii) Over 50% of the candidates were able to balance the equation for the reaction between sulfuric acid and sodium hydroxide.
- (iii) Candidates should be aware that salts are produced when an acid reacts with a metal oxide or a metal carbonate and that to obtain a sodium salt the reactant must be a sodium compound. Candidates who stated that sodium is added to the sulfuric acid were not awarded credit due to the explosive nature of the reaction.



### Question 11

- (a) A significant proportion of the candidates simply stated the percentages of the gases in the air rather than the difference between expired and inspired air. The differences in carbon dioxide and oxygen were quite well known but the fact that there is no difference in the nitrogen content of expired and inspired air was less well known.
- (b)(i) This question was easy for the vast majority of the candidates.
- (ii) Candidates were expected to state that the runner's breathing would be faster and deeper after the race. Answers comparing the volume of air taken in after the race to before the race were given credit. A significant number of candidates answered the question in terms of heart beating rather than breathing.
- (iii) A large number of the candidates simply restated the question by stating that more air is required. Candidates were expected to explain that more oxygen is required by the runner in order to increase the amount of respiration and produce more energy.

Answer: (b)(i)  $14.7 \text{ dm}^3$

### Question 12

- (a) This question was done well by the better candidates. The formula for calculating a moment about a pivot was known by many of the candidates but a proportion of these candidates found it difficult to rearrange the formula in order to calculate the mass of the measuring cylinder.
- (b) The majority of the candidates were able to read the volume of liquid in the measuring cylinder correctly.
- (c) Only a small proportion of the candidates recognised that the measuring cylinder is heavier when it contains a liquid. This increased weight means that in order to make the clockwise moment equal to the anticlockwise the distance between the measuring cylinder and pivot has to be reduced.

Answers: (a) 24 g (b)  $14 \text{ cm}^3$

### Question 13

- (a) A large proportion of the candidates identified **Z** as the element with a proton number 17.
- (b) The better candidates identified **V** as the element which combines with three hydrogen atoms to form a covalent compound.
- (c) This question was well done by many of the candidates.
- (d) The fact that element **W** has a full outer shell and is therefore unreactive and does not form an oxide was recognised by a large number of the candidates.
- (e) A significant number of candidates attempted to answer the question in terms of aluminium and chlorine rather than use the letters from the table. Only the best candidates were able to deduce the formula, **YZ<sub>3</sub>**.

### Question 14

- (a) There is some confusion amongst a large proportion of the candidates regarding energy transfer. Candidates should be aware that when an object falls potential energy is converted into kinetic energy.
- (b) Many of the candidates knew the formula work done = force x distance, however marks were lost due to the candidates rearranging the formula incorrectly. Overall the question was well answered by many of the candidates.

Answer: (b) 6 N

### Question 15

This question was well answered by a large number of candidates.

### Question 16

This question was well answered by many of the candidates, particularly the better candidates. The least well known structure was the structure that controls the size of the candidate in the eye.

### Question 17

- (a) The reason for the apparent lack of reactivity of aluminium compared to iron is not well understood by many of the candidates.
- (b) A majority of the candidates were able to state a use of aluminium.

### Question 18

- (a) A majority of the candidates were able to draw the normal at  $90^\circ$  to the block where the ray is incident on the block.
- (b) Only the better candidates were able to label the angle of incidence correctly.
- (c) A large proportion of the candidates correctly drew the emergent ray parallel to the incident ray.

### Question 19

- (a) (i) Only a small proportion of the candidates knew that menstruation begins on day one of the cycle.  
(ii) There was some evidence of guesswork amongst the weaker candidates.
- (b) Methods of birth control are well known by many of the candidates.
- (c) (i) Many of the candidates confused the signs of syphilis with the signs of gonorrhoea.  
(ii) The treatment for syphilis was well known by many of the candidates.

### Question 20

The tests for the gases and the results for the tests are well known by many of the candidates. The weaker candidates often confused the tests for hydrogen and oxygen.

### Question 21

- (a) The vast majority of the candidates were able to calculate the number of protons in the atom of plutonium.
- (b) The candidates' responses to this question were very disappointing due to the fact that the vast majority of the candidates misread the question and calculated the number of protons and neutrons in the atom of plutonium rather than the number of protons and neutrons in alpha particle.
- (c) The concept of half-life is not well understood by the majority of the candidates. Candidates were expected to calculate that 352 years corresponds to four half-lives and use this to find the number of alpha-particles per second that the sample emits after 352 years.

Answer: (a) 144 (b) 2 protons 2 neutrons (c) 200 counts per second.