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Examiners' Report
June 2019

GCSE Chemistry 1CH0 2F

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Introduction

This examination paper was the second paper of the 9-1 Chemistry specification, graded 9-1. This paper, like all the Separate Science examinations, consists of ten questions, giving a total of 100 marks. Six of these questions, 60 marks in total, also appear on the Combined Science Foundation tier paper.

This paper also has Combined Science Chemistry questions in common with Higher tier Combined Science and Higher tier Separate Chemistry paper, totalling 16 marks. These overlap items are the first five items of question 8 and the first three items of question 9. There are also 11 marks of Separate Chemistry questions in common with the Separate Chemistry Higher tier paper. These overlap items are the whole of question 10.

The paper made use of a variety of question types suitable for candidates at this level; multiple choice, calculations and short answer questions being the frequent types. The paper contained two extended open-response questions (6-marks). As with the other Chemistry papers, a minimum of 20% of the marks were for maths, a minimum of 15% for testing practical skills and a maximum of 15% on knowledge in isolation (recall) questions.

Question 1 (b) (i)

This question was very well answered on the whole with the vast majority of responses scoring the 1 mark available.

Most candidates were able to draw a bar between 20% and 22% on the given bar chart representing the percentage of oxygen in the atmosphere.

In the relatively few incorrect responses seen, common errors included: candidates having poorly drawn the line for the top of the bar at 22%, but with the bar going past into 23%; occasionally there was a bar that clearly wasn't being aimed at 21%, instead being almost 70%. .

Question 1 (b) (ii)

This was not answered well on the whole, with approximately half of responses scoring at least 1 of the 2 marks available.

While many responses scored both marks with the correctly calculated volume, 93 cm^3, many blank responses were seen by the examining team. Very few candidates scored on the first marking point, namely 21/100. Several responses were able to score 1 mark from the allowable responses for 300/4.8 = 62.5 or 21 x 300 (=6300) or 300/100 (=3).

Commonly seen errors included: 300/21 = 14.3; 21/300 = 0.07.

(ii) Calculate the volume of oxygen present in 300 cm^3 of air.

(volumes are measured under the same conditions of temperature and pressure)

(2)

300 × 21 = 6300

300 × 300 × 300 = 27000000

volume of oxygen = 6300 cm^3

ResultsPlus
Examiner Comments

A typical response which scored 1 mark only.

The percentage and volume from the question have been multiplied. However, this has not been divided by 100, so the final value is a factor of 100 greater than the correct answer.

Question 1 (c)

This question was generally well answered on the whole with two thirds of candidates gaining at least 1 of the 2 marks available.

Most candidates were able to link atomic number and mass number to their respective definitions.

In very few cases, candidates drew more than one line from each of the two substances, despite clear instructions in the question and this being a tried and established question style in this and in many of the previous examination series.

Question 2 (a) (i)

This question was not well answered with over half of responses not scoring the 1 mark available.

Many candidates were able to recall the 'halogens' as the name given to group 7 in the periodic table. However, many responses incorrectly referred to the names of other groups required in the specification, typically noble gases or alkali metals, or simply gave the incorrect term 'halides'.

Question 2 (a) (ii)

This question was not well answered with over half of responses not scoring the 1 mark available.

Many candidates were able to recall the 'noble gases' as the name given to group 0 in the periodic table. However, many responses incorrectly referred to the names of other groups required in the specification, typically halogens or alkali metals, or simply gave the incorrect and vague term 'gases'.

Question 2 (d)

This question was very well answered with most responses scoring the 1 mark available.

The majority of candidates were able to use the table of data to suggest a value for the density of krypton in the accepted range, greater than 1.4 and less than 3.5 g cm^{-3}.

Question 2 (e)

This question was poorly answered overall with approximately a quarter of responses scoring 1 or 2 of the 2 marks available.

Questions in relation to the uses of the noble gases linked to their inertness feature regularly in this and the previous specifications.

In the very few correct responses seen, candidates mainly scored by correctly linking the atomic structure of argon (or its position in periodic table) with its lack of reactivity rather than by the alternative route of discussing the reactivity of oxygen.

Overall there was significant confusion in candidates' responses in regard to the reason for the use of argon in filament light bulbs. Commonly seen errors included: argon is better at conducting heat so the bulb can get hotter; as argon glows more brightly than air; because argon is more dense; references to argon or oxygen reacting with heat rather than to the reaction with the metal filament.

A common misconception in a significant number of responses was that it was 'air' that was reactive and they were unable to identify 'oxygen' as the reactive component.

(e) For many years, argon was used to fill filament light bulbs.

A filament light bulb is shown in Figure 4.

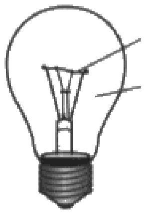


Figure 4

When the bulb is in use the metal filament becomes extremely hot.

Explain why argon, rather than air, was used to fill filament light bulbs.

(2)

Because it is an inert gas, therefore it is very unreactie and ensures that the metal filament does not burn out, whereas air is reactive and would cause the filament to burn.

ResultsPlus
Examiner Comments

This response scored both marks available.

There is a correct reference made to argon being inert and to the correct ideas of it being unreactive and not reacting with the metal filament.

Question 3 (a)

This question was very well answered on the whole with the vast majority of responses scoring at least 2 of the 3 marks available.

Most candidates correctly completed the table, drawing the repeating unit, drawing the monomer and naming the polymer, for each of the addition polymers in the table respectively.

The most commonly scored mark in the responses seen was invariably for drawing the correct monomer for poly(chloroethene).

It was noted that in many responses that did not score all the marks, candidates often left spaces blank.

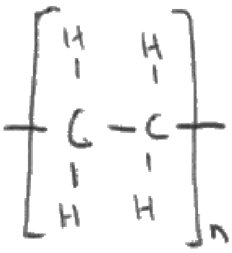
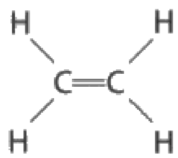
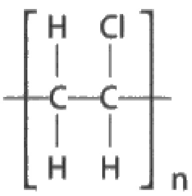
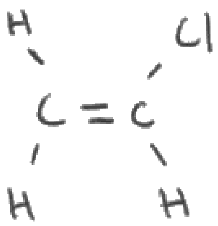
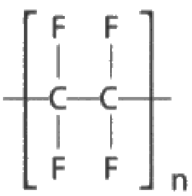
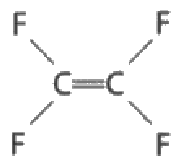
Commonly seen errors in many responses included: missing out the letter 'n' following the square brackets in the repeating unit for poly(ethene); missing out the word 'tetra' from the name of the polymer.

3 Polymer molecules can be made by joining together large numbers of small molecules called monomers.

(a) Figure 5 shows the names and structures of some polymers and the monomers used to make them.

Complete the table using the information given.

(3)

name of polymer	structure of polymer molecule	name of monomer	structure of monomer molecule
poly(ethene)		ethene	
poly(chloroethene)		chloroethene	
Poly(fluoroethene)		tetrafluoroethene	

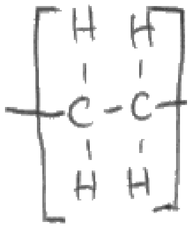
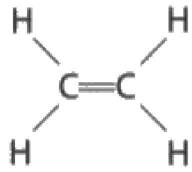
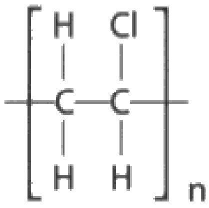
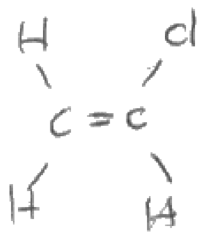
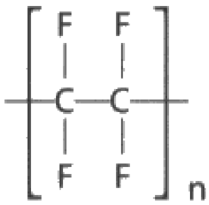
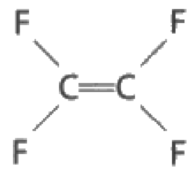
ResultsPlus
Examiner Comments

This response scored 2 marks for the correctly drawn structures of the poly(ethene) repeating unit and the chloroethene molecule.

Although very close to the correct name, the 'tetra' has been omitted from the name of the last polymer in the table, so this did not score the final mark.

ResultsPlus
Examiner Tip

Remember, when naming polymers, the convention is to write the word 'poly' with the name of the monomer in brackets immediately afterwards. Also, remember to look at the pattern for the other polymers named in the table.

name of polymer	structure of polymer molecule	name of monomer	structure of monomer molecule
poly(ethene)		ethene	
poly(chloroethene)		chloroethene	
poly(tetrafluoroethene)		tetrafluoroethene	

ResultsPlus
Examiner Comments

This response scored 2 marks for the correctly drawn structure of the chloroethene molecule and the correctly named polymer.

Although the poly(ethene) repeating unit is very close to the correct structure, the 'n' has been omitted, so this did not score the final mark.

ResultsPlus
Examiner Tip

When asked to draw the structure of a repeating unit for a particular addition polymer, make sure you include the 'n' outside the brackets.

Question 3 (b)

This question was generally well answered on the whole with the majority of candidates scoring at least 1 of the 2 marks available.

Most responses correctly referred to the fact that polymers are non-biodegradable, are harmful to wildlife or release toxic gases when disposed of by combustion.

The main issue from responses which did not score, noted by examiners, was the lack of detail or vagueness in the candidates' responses, mainly in failing to qualify examples. Commonly seen responses which did not score included: causes pollution; harms the environment; releases harmful chemicals/toxins or causes landfill.

Again, this area of the specification has commonly been tested both in this series and many previous series.

(b) Plastics are polymers.

State **two** problems caused by the disposal of polymers.

(2)

1 Polymers damage the environment by releasing harmful substances into the atmosphere

2 There can be ~~us~~ recycled and since disposing polymers reduces the limited amount ~~already~~ already it is not good.

ResultsPlus
Examiner Comments

This response was not creditworthy.

The reference made to polymers damaging the environment is too vague. Although there is a reference to 'releasing harmful substances into the atmosphere', it has not been qualified by a link to combustion.

ResultsPlus
Examiner Tip

When giving problems associated with the disposal of polymers be specific, eg 'releases toxic gases when disposed of by combustion', rather than simply 'releases toxic gases' alone.

1 The take a very long time to break down, so remain on the land or in the sea.

2 Cause harm to animals, as they either try to eat it, or can get stuck in it.

ResultsPlus
Examiner Comments

This response scored both marks.

There are the correct ideas that problems with polymer disposal are that polymers take a long time to break down and also that they are harmful to wildlife.

Question 3 (d)

This question was not well answered on the whole, with only half of responses scoring typically 1 mark out of the 2 marks available.

Many candidates struggled to understand what was required for this calculation. It was clear that from most responses, candidates were unable to identify that the two values needed to be multiplied together.

In many responses, candidates simply divided the number of molecules by the relative formula mass, namely 24600/42 = 586, and scored 1 mark for the mathematical skill of rounding their (incorrect) answer to 3 significant figures.

Many candidates struggled with the need to round their answers to 3 significant figures possibly due to the large numbers involved in this calculation. Typically, in many responses the correct answer was calculated, namely 1033200, which was then incorrectly rounded to 103.

(d) Calculate the relative formula mass of the poly(propene) molecule made from joining together 24 600 molecules of propene, C_3H_6.
(relative formula mass: C_3H_6 = 42.0)

Give your answer to three significant figures.

(2)

42 x 24,600 = 1,033,200

relative formula mass = 1033200

ResultsPlus
Examiner Comments

This response scored 1 mark only.

Although the calculation is correct, the final answer has not been rounded to 3 significant figures.

ResultsPlus
Examiner Tip

With calculation questions, read the question carefully to check whether the answer needs to be rounded to a specific number of significant figures or decimal places.

$\frac{24600}{42.0} = 586$

relative formula mass = 586

ResultsPlus
Examiner Comments

A typical example of a response where 1 mark was scored for the mathematical skill of rounding to 3 significant figures, as required by the question.

The candidate has (incorrectly) divided the two numbers from the question. However, the answer, 586, has been correctly rounded to three significant figures.

Question 4 (a)

This question was well answered with most candidates gaining the 1 mark available.

The majority of responses correctly referred to 'balance' or 'scales' as the correct piece of apparatus needed to measure the mass of the solid. The inclusion of the term 'scale' alone in the mark scheme allowed many candidates to score.

Commonly seen errors in incorrect responses included the use of a: measuring cylinder; burette; pipette.

Question 4 (b)

This question was not answered well on the whole, with only half of responses scoring typically 1 out of the 2 marks available.

Most responses scored 1 mark for recognising that there is a rise in temperature or equivalent. Fewer candidates were able to score on the second marking point for recognising this an exothermic process.

It was noted by examiners that candidates used the terms endothermic and exothermic but often confused these processes. In some responses, candidates thought that stirring was the cause of the temperature rise.

The main misconception was that many candidates thought that energy was being taken in to result in a temperature rise and said this was exothermic. Some candidates clearly had not read the question since they decided that the temperature had decreased.

(b) The student's results were

temperature of water at start	= 21 °C
temperature of mixture after stirring	= 32 °C

Explain, using these results, the type of heat energy change that occurs when calcium chloride dissolves in water.

(2)

when adding calcium chloride the temperature increases. Creating an exothermic reaction.

ResultsPlus
Examiner Comments

This response scored on both marking points.

There are correct references made to both 'temperature increases' and 'exothermic'.

when calcium Chloride dissolves in water when stirring it rises in temperature.

ResultsPlus
Examiner Comments

This response scored 1 mark only.

While the rise in temperature has been stated, there is no reference made to this being an exothermic process.

Question 4 (c) (ii)

This question was very well answered with a significant majority of responses scoring the 1 mark available.

Most correct responses referred to the use of goggles or gloves. In many responses where glasses were referred to, candidates specified 'safety' glasses to score the mark. Reference to 'glasses' alone did not score.

Commonly seen incorrect answers included: wear an apron, tie long hair back, washing hands, use a blast shield, being careful or wearing a mask.

(ii) Give a safety precaution that the student should take during the experiment.

(1)

wear glasses. ~~and~~

ResultsPlus
Examiner Comments

This response was typically seen and not creditworthy.

The use of glasses alone in insufficient and to score would need to be qualified, ie safety glasses.

Question 4 (d)

This was well answered on the whole with most candidates gaining the 1 mark available.

A wide range of correct responses for reducing heat loss was seen by the examiners. The most commonly seen correct responses gave the use of 'a lid'. Various forms of 'insulation' were suggested in responses, such as the use of a polystyrene cup, with some materials more conductive than others. A few candidates suggested the use ‘thermal’ cups or beakers but these were not credited, since these responses do not demonstrate a knowledge of the insulative properties of the cups.

Commonly seen errors included: heating the reaction up; doing it in water; changing the size of equipment; using less calcium chloride.

Question 4 (e)

This question was very poorly answered on the whole, with only a fifth of responses scoring typically 2 out of the 3 marks available.

Many responses scored 2 marks only, for 0.75, since many failed to convert dm^3 into cm^3 - many simply not recognising that there are 1000 cm^3 in 1 dm^3.

Many responses were left blank or in many cases candidates failed to score since they simply combined all sorts of number combinations, eg multiplying the numbers given in the question, namely 9.0 x 12.0 (= 108) was a very commonly seen response.

(e) The concentration of a calcium chloride solution is 12 g dm^{-3}.

Calculate the volume of this solution, in cm^3, that contains 9.0 g of calcium chloride.

You must show your working.

(3)

12 x 1000 = 12000 cm^3

volume = $\frac{mass}{concentration}$ $\frac{9}{12000}$ = 0.00075

= 0.00075 cm^3

volume of solution = 0.00075 cm^3

ResultsPlus
Examiner Comments

This response was awarded 2 marks.

The correct formula for calculating the volume has been given. In the first stage, the concentration has been incorrectly multiplied by 1000 (rather than divided by 1000). However, by error carried forward, the mass has been divided by this concentration and evaluated.

$\frac{12000}{9} = 1333$

volume of solution = 1333 cm^3

ResultsPlus
Examiner Comments

This response was awarded 1 mark.

The fraction is incorrectly inverted. However, the mark was given for the 'conversion' of the units, ie effectively multiplying the (incorrect) fraction by 1000.

Question 5 (a) (i)

This question was very well answered on the whole with most candidtes scoring the 2 marks available.

The majority of candidates clearly subtracted the numbers of carbon atoms and hydrogen atoms in butene from those in decane, to arrive at the correct answers, 6 and 14 respectively.

Question 5 (a) (ii)

This question was very poorly answered on the whole, with only a fifth of responses scoring the 1 mark available.

The majority of responses were often left blank.

It is evident that extremely few candidates understood how the law of conservation of mass applies to a chemical reaction.

Question 5 (b) (i)

This question was very poorly answered on the whole, with a significant majority of responses not scoring the 1 mark available.

Very few responses correctly drew in four electrons between the two carbon atoms in the diagram presented.

The majority of responses were often left blank. The vast majority of candidates drew a double bond as two lines and did not add in electrons. It would appear that candidates were unfamiliar with dot and cross diagrams where there were no rings shown to represent the electrons shells, as demonstrated by a number of responses where candidates added them in, often incorrectly.

(b) The structure of a molecule of ethene is shown in Figure 8.

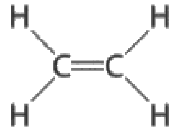


Figure 8

(i) Figure 9 shows the incomplete dot and cross diagram for a molecule of ethene.

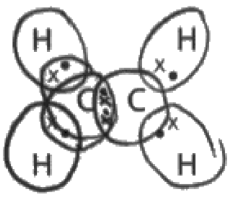


Figure 9

Complete Figure 9 to show the electrons of the C=C double bond.

ResultsPlus
Examiner Comments

An example of a fully correct response.

The candidate has correctly drawn in the four electrons representing the double bond between the carbon atoms. It is also worthwhile noting that shells have been added by the candidate to help clarify the bonding.

(i) Figure 9 shows the incomplete dot and cross diagram for a molecule of ethene.

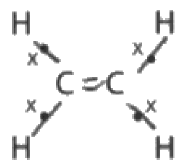


Figure 9

Complete Figure 9 to show the electrons of the C=C double bond.

(1)

ResultsPlus
Examiner Comments

A typical example of the many incorrect responses seen that did not score.

The candidate has simply drawn in a double bond between the carbon atoms and not followed the instructions in the question which is to show the electrons.

Question 5 (b) (ii)

This question was poorly answered on the whole, with only a fifth of responses scoring the 1 mark available.

Few candidates were able to recall the correct products, besides water, of the incomplete combustion of ethene.

The most commonly seen incorrect response was 'carbon dioxide'.

Question 5 (c)

This question was not well answered, with approximately half of the responses scoring 1 of the 2 marks available.

This part of the specification is frequently tested. However, few candidates were able to recall the term hydrocarbon correctly.

The vast majority of responses focused on why the molecule was unsaturated by correctly stating the presence of the double bond, scoring 1 mark only.

A common error was to confuse atoms and molecules, ie hydrocarbon containing hydrogen molecules and carbon molecules.

(c) Substance X is an unsaturated hydrocarbon.
The structure of a molecule of substance X is shown in Figure 10.

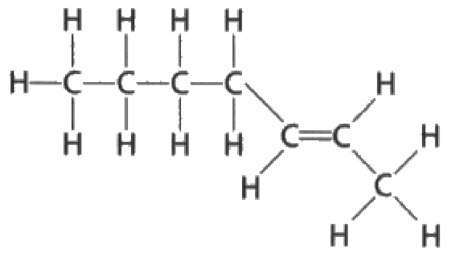


Figure 10

Explain how the structure of substance X shows that it is an **unsaturated hydrocarbon**.

(2)

Has a carbon carbon double bond and only contains hydrogen and carbon atoms.

ResultsPlus
Examiner Comments

An example of a fully correct response.

The candidate clearly states that an unsaturated hydrocarbon contains a carbon carbon double bond and only contains hydrogen and carbon atoms.

ResultsPlus
Examiner Tip

Note that when defining the term hydrocarbon the word 'only' is essential in relation to hydrogen and carbon atoms.

Explain how the structure of substance X shows that it is an **unsaturated hydrocarbon**.

(2)

The structure of substance X is an unsaturated hydrocarbon because of its double carbon bond which shows its an alkene.

ResultsPlus
Examiner Comments

This response is typical of one that scored only 1 mark.

The term unsaturation has been correctly defined. However, the term hydrocarbon has not been defined.

Question 5 (d)

This question was poorly answered with approximately a third of the responses scoring 1 or 2 of the 2 marks available.

It was clear that many candidates were unfamiliar with the bromine test for unsaturation, with many simply repeating the colour changes as stated in the question, offering no explanation.

The terms saturation and unsaturation were rarely used by candidates. Likewise explanations in terms of reactivity were rarely seen.

The most commonly seen correct responses often scored 1 mark for stating that A is alkene or B is an alkane. However, many responses got the identification of the alkanes and alkanes the wrong way round.

A common misconception seen by examiners was that alkanes are more reactive than alkenes so the alkane must be the one that goes colourless.

(d) Two liquid hydrocarbons, **A** and **B**, were tested with bromine water.
One hydrocarbon was known to be an alkane.
The other hydrocarbon was known to be an alkene.

Each hydrocarbon was shaken with a few drops of bromine water.

The results of the tests were
hydrocarbon A + bromine water: the mixture turned from orange to colourless.
hydrocarbon B + bromine water: the orange colour remained.

Explain these results.

(2)

hydrocarbon A is unsaturated but B is saturated

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Examiner Comments

A good example of a fully correct, response which scored 2 marks.

Both the hydrocarbons have been correctly identified.

The Hydrocarbon B shows that it is an alkane as it stayed the same, A was an alkene as the colour changed.

(Total for Question 5 = 9 marks)

ResultsPlus
Examiner Comments

This is typical example of a response which scored 1 mark.

The hydrocarbon A has been identified as an alkene and hydrocarbon B has been identified as an alkane.

Question 6 (a)

This response was well answered on the whole with most responses scoring the 1 mark available.

The majority of responses correctly referred either to 'measuring cylinder' or ocasionally a 'burette' or 'pipette' as the correct piece of apparatus needed to measure the dilute hydrochloric acid.

Commonly seen errors in incorrect responses included the use of a: measuring tube; measuring jug; beaker.

Question 6 (b)

This question was poorly answered with only a third of responses scoring 1 or 2 of the 2 marks available.

Few candidates were able to explain mass loss in terms of a gas being formed and escaping from the flask via the loose plug to gain full credit.

Most responses scored by reference to a gas escaping. However, many did not specify that the gas had been formed or incorrectly discussed air escaping or incorrectly discussed the solution evaporating.

Common misconceptions included: dissolving magnesium means loss of mass; cotton wool soaks up the acid; energy being lost which means mass is lost; or in some cases, that gaseous magnesium escaped.

(b) Explain why there is a loss in mass of the flask and contents.

(2)

Hydrochloric acid reacts with magnesium to form a gas - (hydrogen) Therefore there will be a loss in mass.

ResultsPlus
Examiner Comments

This response scored 1 mark only.

The formation of a gas, namely hydrogen, has been correctly mentioned. However, there is no mention of the gas escaping from the flask causing the mass loss.

ResultsPlus
Examiner Tip

Always check the number of marks available for a question since this will indicate the number of points needed in your answer.

Because hydrogen was a product, so the gas could've escaped through the cotton wool through diffusion.

ResultsPlus
Examiner Comments

This response scored the 2 marks available.

The fact that hydrogen is a product and also that this escapes are both credited.

Question 6 (c)

This question was poorly answered, with only around a third of the responses scoring any of 3 marks available.

In the responses that scored, mostly for 1 mark only, candidates correctly identified that there was less magnesium or reactant as the reaction takes place. Very few responses scored all three marking points.

Examiners noted that very few candidates actually referred specifically to 'particles' in their responses and rarely referred to the 'frequency of particle collisions'.

In many incorrect responses, candidates misinterpreted what was required and simply listed factors affecting the rate of a reaction.

(c) The graph shows that the rate of reaction slows as the reaction takes place.

Explain, in terms of particles, why the rate of reaction between magnesium ribbon and dilute hydrochloric acid slows as the reaction takes place.

(3)

Because the particles are loosing energy so they slow down making the collisions between them decrease.

ResultsPlus
Examiner Comments

This response scored 1 mark.

Although the first part of response is incorrect and was ignored, the correct idea of fewer collisions was creditworthy.

Because at first there are a lot of particles meaning that there are frequent collisions, however, as the reaction goes on more particles have already reacted so there are less particles in the same given volume so there are less frequent collisions, meaning slower rate of reaction.

ResultsPlus
Examiner Comments

This is a very good example of a fully correct response.

The correct ideas of fewer reaction particles and less frequent collisions scored all the available marks.

ResultsPlus
Examiner Tip

Remember when explaining the rate of a chemical reaction, always refer to **collision frequency** of particles.

Question 6 (d)

This question was not well answered, with approximately a half of the responses scoring the 1 mark available.

Those responses that scored correctly referred to the greater mass loss.

The most commonly seen error in responses was to discuss rate of reaction rather than mass loss.

(d) The experiment was repeated using the acid at a higher temperature.
All other conditions were kept the same.

State the effect of the higher temperature on the mass loss after two minutes.

(1)

The rate of reaction would increase as the hot ~~heat~~ acid contains more energy.

ResultsPlus
Examiner Comments

This response was typical of many that did not score.

The candidate has misinterpreted the question and discussed the effect of increasing temperature on rate, as opposed to mass loss.

Question 6 (e)

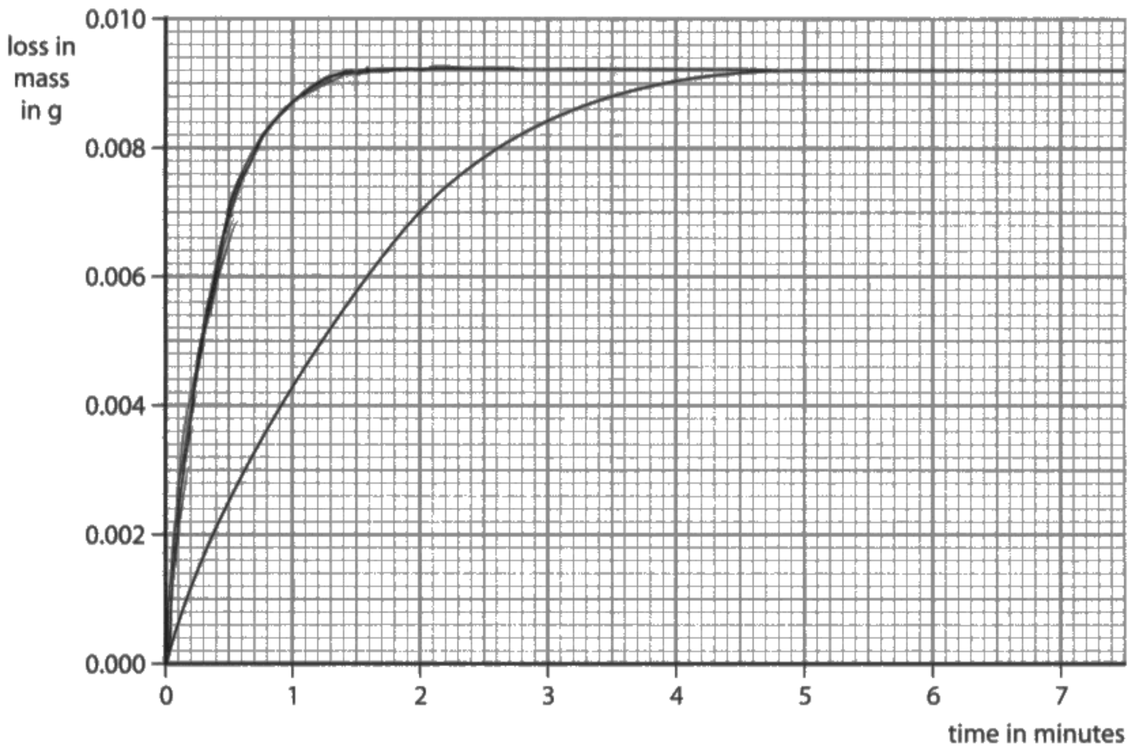
This question was not well answered, with approximately only half of the responses scoring a least 1 of the 2 marks available.

In those responses that scored 1 mark only, candidates correctly showed a steeper curve to left of the existing curve on the graph, scoring on the first marking point. However, many of these graphs failed to score on the second marking point since either they did not level out at the same place or simply did not level out or levelled out at higher mass loss than original existing curve.

Examiners noted that there were many blank responses to this question and that often curves were very poorly drawn.

(e) The original experiment was repeated using the same mass of magnesium powder instead of the magnesium ribbon.
All other conditions were kept the same.

Sketch, on the graph in Figure 12, the line you would expect for this experiment.



ResultsPlus
Examiner Comments

An example of a fully correct response, scoring both marks.

The curve has been drawn to the left and steeper than the original curve and also correctly levels off at the same height as the existing line.

Question 6 (f) (i)

This question was very well answered on the whole with most candidates scoring the 1 mark available.

In the majority of responses, candidates could recall the effect of a catalyst on a reaction. The most commonly seen correct responses referred to increases rate, with fewer references made to lowering activation energy.

(f) Some reactions are affected by the presence of a catalyst.

(i) State the effect of a catalyst on a reaction.

(1)

Speeds up the reaction time

ResultsPlus
Examiner Comments

This response did not score.

The reference to 'speeds up the reaction time' is incorrect. This is not equivalent to the speeds up the reaction.

ResultsPlus
Examiner Tip

Be careful when phrasing responses in relation to the effect on rate of reaction of using a catalyst (or changing other factors) - 'speeds up reaction time' is incorrect and it should be 'increases the speed (or rate)'.

Question 6 (f) (ii)

This question was poorly answered, with approximately only a third of the responses scoring any marks, mainly scoring 2 out of the 3 marks available.

The majority of responses scored 2 marks only, since extremely few candidates referred specifically the need to filter, wash or dry the catalyst, as part of the second stage of their method.

In responses that did not score there was a failure to link the method specifically to the mass of the catalyst.

It was clear to the examiners that the main misconception in responses resulted from candidates possibly attempting to describe an experiment they may have previously seen, ie how to test the rate of reaction with and then without the catalyst.

It is worthwhile noting that the requirement to describe experiments or devise a method is a required skill of this specification.

(ii) Devise a simple experiment to find out what happens to the mass of a solid catalyst during a reaction.

(3)

Measure the mass of the catalyst before it is used. Then use it in a reaction, after the reaction is complete take out the catalyst and clean it with pure water and dry it. Then remeasure the mass. then you can work out the difference in mass before and after.

ResultsPlus
Examiner Comments

A very good example, where the candidate has scored on all three marking points.

All three stages necessary have been discussed: measuring the mass of the catalyst before reaction; removing, washing and drying; measuring the mass of the catalyst after the reaction and calculating the difference in masses.

measure the mass of the catalyst before the reaction and once the catalyst has been added and the reaction is finished, remove the solid catalyst and measure the mass of it again. Note any changes in the mass compared to what it was initially.

ResultsPlus
Examiner Comments

This is typical of a response which scored 2 out of the 3 marks.

The measuring of the mass of the catalyst before and after the reaction has been discussed. However, there is no description of the need to wash and dry the catalyst prior to re-determining the mass.

Question 7 (a) (i)

This question was very poorly answered on the whole, with a significant majority of responses not scoring any of the 2 marks available.

A significant number of candidates were unable to interpret what was required in terms of explaining why the test for a given ion must be unique to that ion.

Most candidates simply repeated the stem of the question.

In those responses which did gain credit, candidates rarely mentioned that the test only detects one ion, but did often refer to the correct idea of avoiding confusion with other ions, to gain 1 mark only.

Question 7 (a) (ii)

This question was not well answered, with approximately half of the responses scoring the 1 mark available.

Although the test for carbonate ions was described in the stem of the question and many candidates were able to correctly recall the gas produced, namely carbon dioxide, many candidates clearly did not recognise this test and simply stated the names of other gases mentioned in the specification such as hydrogen, oxygen or chlorine.

Question 7 (a) (iii)

This question was generally well answered on the whole with two thirds of candidates gaining at least 1 of the 3 marks available.

Most candidates were able to link at least one of the descriptions of tests for three anions to a correct observation. The test which most commonly appeared to be answered correctly across the range of responses was that for the chloride ion.

In very few cases, candidates drew more than one line from each of the three descriptions, despite clear instructions in the question and this being a tried and established question style in this and in many of the previous examination series.

Question 7 (b)

This extended open-response question was very poorly answered with the majority of responses not scoring. Of those responses which scored, invariably they scored only a Level 1 answer.

Clearly, this area of the specification, 'qualitative tests for cations', is one which caused great difficultly for candidates, despite this being a Core practical and questions having been set regularly in this and the previous specifications.

Many candidates were unable recall the tests for metal ions let alone the results of the tests. The majority of responses which scored, did so by naming the flame test and a correct result of this test for a particular metal ion. Very few candidates mentioned or described the use of the precipitation test with sodium hydroxide solution.

Examiners noted that when the flame test was used, this was often poorly described.

The main misconceptions arose from candidates: simply describing the tests and results for anions in the specification, not relevant to the question or describing the reactions and observations for the reactions of the alkali metals with water, again not relevant to the question.

*(b) A white solid is known to be a chloride in which the metal ion is sodium, potassium, calcium or aluminium.

A chemist was told to carry out a test for each metal ion that could be present in this white solid.

Describe tests to show the presence of each of these metal ions.

(6)

To carry out a flame test, first the wire loop should be sterelized in dilute hydrochloric acid and rinsed in distilled water for accurate results and to ensure no previous substance will be detected. Then dip a loop in the metal sample and hold in the blue flame of a bunsen burner. If the white solid is held in the flame and it goes yellow, Sodium is present. If the flame goes lilac potassium is present. If the flame turns orange-red, the solid is calcium chloride.

Likewise, the chemist could add a drop of sodium hydroxide to the metal ion to form a coloured precipitate. If the precipitate goes white then colourless, it is aluminium but if the precipitate stays white then it is calcium. For mixtures of ions in a compound, flame photometry could also be used

To make sure the solid is a chloride, dilute nitric acid should be added to silver nitrate to form a white precipitate.

ResultsPlus
Examiner Comments

This response was awarded Level 3 - 5 marks.

Both tests have been described with results of each test which put this in to Level 3.

The flame test is described in detail and with correct results for flame colours. The precipitation test is described in some detail with correct results but the need to dissolve the solids has not been mentioned.

ResultsPlus
Examiner Tip

When describing the precipitation test for metals ions in unknown solids using sodium hydroxide solution, remember to include a step in which the solids are dissolved in water before testing.

To find presence of sodium we can use the flame test and we will see a yellow colour.

To find presence of potassium we can use the flame test and we will see a green colour

To find the presence of calcium we can use the flame test and we will see an orange red colour.

To find aluminium we can use the flame test and we will see a brown ~~colour~~ blue colour.

ResultsPlus
Examiner Comments

This response was awarded Level 1 - 2 marks.

The response correctly states the use of a flame test to identify the metal ion in the solids. Two of the flame colours are correct, namely yellow for sodium and orange-red for calcium.

Since the flame test has not been described this limited the response to Level 1.

ResultsPlus
Examiner Tip

Learn the steps needed to carry out the flame test on a solid or solution.

In order to fully understand the contents of the solid when looking for ions you do the ion flame test.
Using a bunsen burner, you'd use a bunsen burner on a blue flame (easier for colour identification) and using a sanitised wire loop (first santatise in flame then in HCl.). Place a bit of the solid onto the wire loop. Place in flame. You'll be able to identify which of these ions are present in this solid if there are any.

Sodium → If positive, this ion will burn to ~~order~~ a yellow flame (this is why we have blue bunsen flame).

Potassium → If positive you'll see lilac flame.

Calcium → Orange - Red if positive.

If theres nothing it is Aluminium this is because Aluminium will not show a colour if burnt. instead use a solution to test for it.

For aluminium you must use nitric acid and silver nitrate.

ResultsPlus
Examiner Comments

This response was awarded Level 2 - 4 marks.

The flame test has been described in some detail and there is at least one correct result of the flame test.

flame test:

- take the metal loop and dip it in hydrochloric acid to clean it.
- dip the loop into ~~*~~ one of the metal ions
- ~~put~~ make sure the bunsen burner is on the blue flame.
- ~~dip~~ put loop into the bunsen burner and observe the colour
- record the result and put the loop Back into the acid so its clean for the next metal ion.
- repeat steps.

ResultsPlus
Examiner Comments

This response was awarded Level 2 - 3 marks.

The procedure for carrying out the flame test has been carried out in some detail. However, there are no results given in the response, so this limited the overall score to 3 marks.

ResultsPlus
Examiner Tip

Make sure you are able to recall the flame colours for the metal ions in the specification.

Question 8 (b) (i)

This question was generally very well answered on the whole with most responses gaining the 2 marks available.

Most candidates were able recall a correct the use of kerosene, usually for aircraft, a few suggested for cooking and lamps. The use of diesel oil for cars was most often mentioned, although lorries, trucks, trains and large vehicles were also seen frequently.

Some candidates confused kerosene with bitumen while others just wrote about it being used 'to start fires' or the very general ‘for machines’.

The most commonly seen error occurred when candidates described diesel oil as ‘petrol for cars’.

Question 8 (b) (ii)

This question was poorly answered on the whole with most responses not scoring the 1 mark available.

It was evident from the majority of responses that candidates simply did not understand what they were being asked to do. Many simply did not understand what is meant by the word property. Few candidates used the two lines of the question as intended, often repeating the ideas, eg many wrote '(property) it is flammable' followed by '(comparison) kerosene is more flammable'.

Where properties were discussed, the most common were boiling point and viscosity, the latter usually being in terms of thickness or runniness. Many, unfortunately, thought that the higher up the fractionating tower, the higher the boiling point. Surprisingly, many seemed to think that this was a repeat of the previous item and answered in terms of uses of the kerosene and diesel oil.

(ii) Figure 13 shows where the fractions kerosene and diesel oil are produced in the fractionating column.

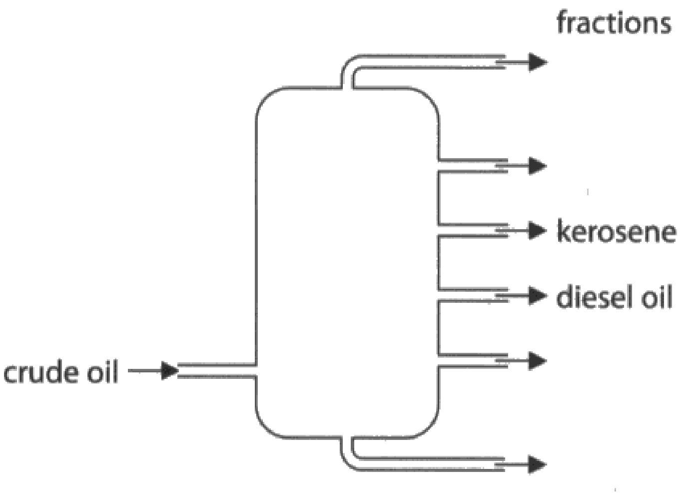


Figure 13

Kerosene is obtained higher up the column than diesel oil.
Kerosene and diesel oil fractions have slightly different properties.

Choose a property.
State how this property for kerosene compares with the property for diesel oil.

(1)

property viscosity

comparison kerosene is less viscous than diesel

ResultsPlus
Examiner Comments

A typical example of a commonly seen correct response, scoring 1 mark.

A correct property has been stated (which alone did not score a mark). There is a correct comparison, namely that kerosene is less viscous than diesel.

Question 8 (c) (i)

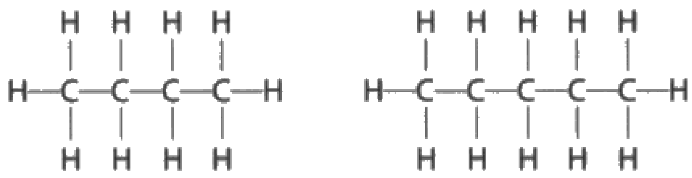
This question was poorly answered with only a third of responses scoring, generally just 1 mark of the 2 marks available.

In many responses, it was evident to examiners that candidates were unclear of what is meant by the term 'homologous series'. Candidates simply repeated information from the stem of the question, especially quoting the molecular formulae of the two alkanes, or simply stating the respective numbers of carbon and hydrogen atoms.

Most responses gaining 1 mark only scored by mentioning stating that pentane has one more carbon or that they differed by one carbon and two hydrogens.

Although the correct general formula was often seen, the term general formula was often confused with the term molecular formula. Many candidates simply gave a definition of a hydrocarbon.

(c) Figure 14 shows the formulae of a molecule of butane and of a molecule of pentane. Butane and pentane are neighbouring members of the same homologous series.



butane pentane

Figure 14

(i) Explain, using these formulae, why butane and pentane are neighbouring members of the same homologous series.

(2)

They are both alkanes and they are hydrocarbons because they include only hydrogen and carbon.

ResultsPlus
Examiner Comments

This response scored 1 mark only.

The correct reference to both the compounds being alkanes scored the mark. The definition of a hydrocarbon is also given but is not relevant.

Question 8 (c) (ii)

This question was very poorly answered with the majority of responses not scoring any of the 3 marks available.

Most candidates struggled with what was required in this calculation and where to start. In those responses that scored 1 mark only, this was often for writing 4 x 12 = 48, with no further creditworthy material seen afterwards. Very few responses correctly rounded their answers to 3 significant figures.

(ii) Butane has the formula C_4H_{10}.

Calculate the mass of carbon in 100 g of butane.

Give your answer to three significant figures.

(relative atomic masses: H = 1.00, C = 12.0;
relative formula mass: C_4H_{10} = 58.0)

You must show your working.

(3)

4 x 12 = 48.

$\frac{48}{58}$ x 100 = 82.75862%

mass of carbon = 83 g

ResultsPlus
Examiner Comments

This response scored 2 marks.

The calculation is correctly set out. However unfortunately the final answer has been incorrectly rounded to 2 significant figures, rather than 3 significant figures as required by the question.

Question 8 (c) (iii)

This question was well answered on the whole, with most responses scoring at least 1 of the 2 marks available.

Most candidates were abe to construct a word equation with the correct products on the right hand side, especially having been given those products in the stem of the question.

The most commonly seen errors included: writing 'butane + air' rather than 'butane + oxygen'; mixing and matching words and formulae, giving CO_2 or H_2O as one of the products. In some responses, candidates attempted to give a formula equation, some getting the correct formulae, and occasionally some candidates managed to balance it correctly.

(iii) Butane burns completely in air to form carbon dioxide and water.

Write the word equation for this reaction.

(2)

Butane + air → carbon dioxide + water

ResultsPlus
Examiner Comments

This response scored 1 mark only.

The response highlights a commonly seen error. The left hand side of the equation does not score since 'air' as opposed to 'oxygen' has been included.

ResultsPlus
Examiner Tip

Remember in combustion reactions, 'air' is not a reactant and it is 'oxygen' that should be included. Air is not a compound - it is a mixture of gases.

Butane → Carbon Dioxide + Water

ResultsPlus
Examiner Comments

This response was awarded 1 mark.

One of the reactants in this combustion reaction, namely oxygen, has been omitted, most probably because it the only one of the species not given in the stem of the question.

ResultsPlus
Examiner Tip

Remember - oxygen is always included as a reactant in combustion reactions.

Question 9 (b)

This question was very poorly answered with just over a quarter of responses scoring any of the 3 marks available.

Most candidates found this calculation question very challenging. In those responses that scored, it was most usually for 40 (relative formula mass of MgO) or 80 (2 x relative formula mass of MgO). A few candidates were able to develop this further. A few tried combining the 40 or 80 with 1.35 and came up with 54 or 108, which scored the second mark. Many fewer candidates scored the third mark.

Examiners noted that the setting out of many of the canadidates' calculations was invariably poor and was often difficult to follow.

(b) Magnesium burns in excess oxygen to form magnesium oxide.
The balanced equation for this reaction is

$$2Mg + O_2 \rightarrow 2MgO$$

Starting with 1.35 g of magnesium, calculate the maximum mass of magnesium oxide that could be formed in this reaction.
(relative atomic masses: O = 16.0, Mg = 24.0)

You must show your working.

(3)

$\frac{1,35}{24} = 0,05625$ $\quad$ $0,05625 \times (24+16) = 2,25$

mass of magnesium oxide = 2,25 g

ResultsPlus
Examiner Comments

This response scored 3 marks.

This candidate has recognised that the ratio of the magnesium to magnesium oxide from the equation is 1:1. The candidate has very concisely and correctly calculated the number of moles of magnesium. In turn this has been used to calculate the mass of magnesium oxide giving the correct final answer, 2.25 g.

Question 9 (c)

This question was not well answered with just over half of the responses scoring, mainly 1 mark out of the 3 marks available.

Of those candidates who attempted this equation, the most commonly scoring attempts showed HCl (or ClH) as the product. It was evident from the majority of responses that very few candidates knew that both chlorine and hydrogen were diatomic, with most responses showing both reactants as monatomic. Generally, in a very few responses seen, if the formulae of both the reactants and products were correct, the balancing was also correct.

(c) Chlorine reacts with hydrogen to form hydrogen chloride.

Write the balanced equation for this reaction.

(3)

$Cl_2 + H_2 \rightarrow 2HCl$

ResultsPlus
Examiner Comments

A good example of a fully corrrect response.

The formulae of all the correct species have been given and are all correctly balanced.

$2Cl + H_2 \rightarrow 2HCl$

ResultsPlus
Examiner Comments

This response scored 1 mark only.

The formula for the product, namely HCl, is correct. However, the formula for chlorine is incorrectly shown, ie the candidate has not recognised that chlorine exists as a diatomic molecule.

Question 9 (d)

This extended open-response question was poorly answered with just under half of responses scoring. Of those responses which scored, invariably they scored a Level 1 or Level 2 answer.

Pleasingly, it was noted by examiners that for those candidates who had attempted the question their responses were clearly structured. It was clear that some candidates have seen the description of the formation of sodium and chloride ions from sodium and chlorine atoms using electron configurations. Many conveyed ion formation using clearly drawn diagrams.

A common misconception noted by examiners was that many candidates confused ionic bonding with covalent bonding and frequently (and incorrectly) showed dot and cross diagrams of sodium covalently bonded to chlorine. Some responses had repetition of the exam question, showing the electronic configurations of sodium and chlorine which scored no marks.

Very few candidates attempted a description of the arrangement of ions in sodium chloride. When candidates did describe the structure it was usually very basic, ie they did not did not use terms such as lattice, or identify that the positive and negative ions alternate. Very occasionally, there were a few good diagrams showing this.

*(d) Sodium chloride is an ionic compound, containing sodium ions, Na^+, and chloride ions, Cl^-.

Figure 15 shows the electronic configuration of sodium and chlorine.

	electron configuration
sodium	2.8.1
chlorine	2.8.7

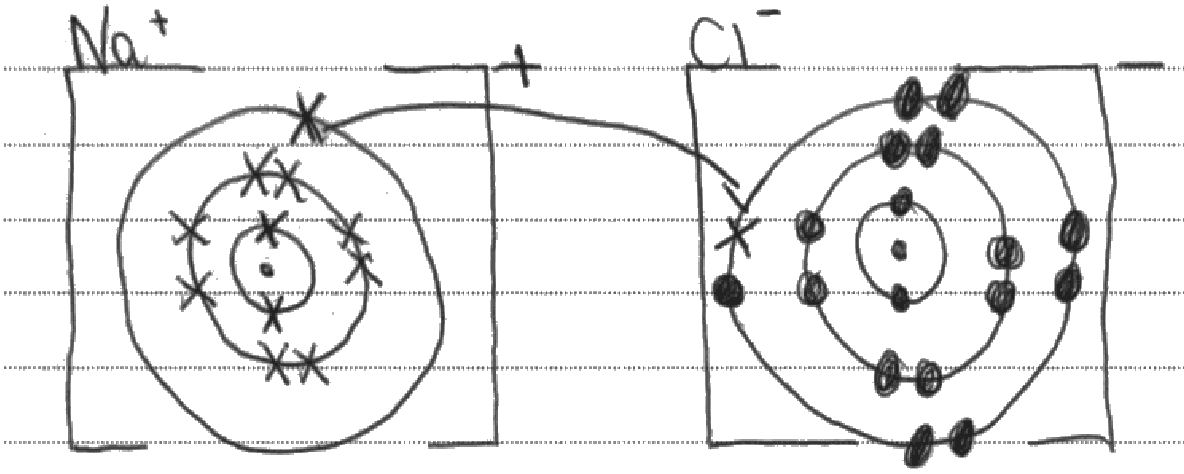
Figure 15

Explain how sodium and chlorine atoms form the ions in sodium chloride and how the ions are arranged in the solid sodium chloride.

You may wish to use diagrams in your answer.

(6)

Sodium is ~~1st group~~ will easily become an ion because it can easily get rid of an electron to become positive. ~~This~~ Chlorine will easily become an ion because it can ~~get rid~~ gain an electrone to become negative. This means they will easily react with each other because Sodium can give its electron to Chlorine so they both get to where they want



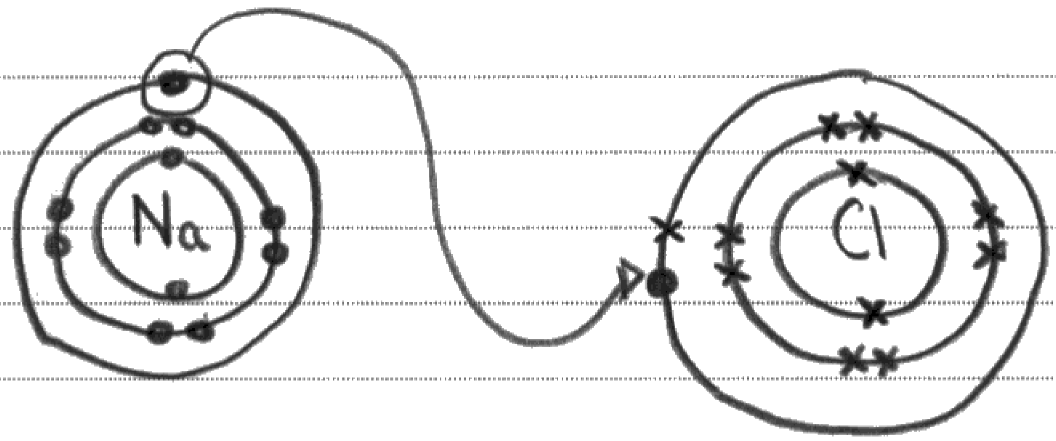
They both now have full outer shells, meaning they can become an ionic compound.

ResultsPlus
Examiner Comments

This response was awarded Level 3 - 5 marks

The response correctly explains how both the chlorine and the sodium atoms become ions by the transfer of an electron. This is correctly illustrated by a diagram which clearly shows the origin of the outer shell electron transferred to chlorine from the sodium.

While not perfect, this is sufficient for Level 3 - ideally we would wish to see references to chloride ions and the structure of sodium chloride.



sodium loses/gives one electron to chlorine, giving sodium a +1 ~~charge~~ ion and chlorine a −1 ion. This is because sodium now has more protons than electrons and chlorine now has more electrons than protons.

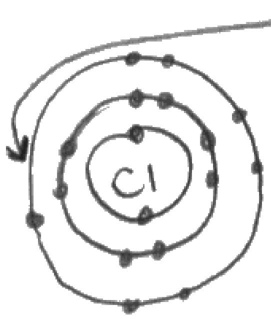
ResultsPlus
Examiner Comments

This response was awarded Level 2 - 4 marks

The correct idea of electron transfer has been conveyed to show the loss of an electron from the sodium to the chlorine atom. Ideally we would like to see the charges on the diagram to show the ions and the use of chloride ion in the description.

*(d) Sodium chloride is an ionic compound, containing sodium ions, Na^+, and chloride ions, Cl^-.

Figure 15 shows the electronic configuration of sodium and chlorine.



	electron configuration
sodium	2.8.1
chlorine	2.8.7

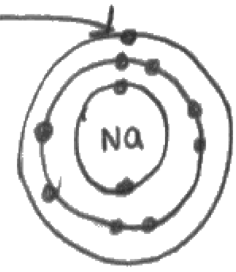


Figure 15

Explain how sodium and chlorine atoms form the ions in sodium chloride and how the ions are arranged in the solid sodium chloride.

You may wish to use diagrams in your answer.

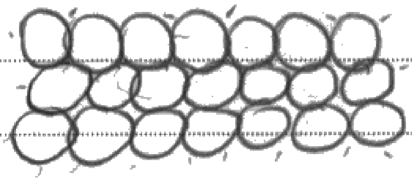
(6)

Sodium has one electron on it's outer shell, this means it's in group one of the periodic table. It has 11 protons and electrons, and 7 neutrons.

Chlorine has 7 electrons on it's outer shell, this means it's in group 7 of the periodic table.

Chlorine needs to gain one more electron to have a full outer shell, this means that Sodium will lose it's outer shell electron to give to Chlorine.
This rearanges how the ions are placed and sodium chloride is formed.

As a solid sodium chloride ions will be arranged in neat, close together lines that will subtly vibrate against each other, all ions will be touching.



ResultsPlus Examiner Comments

This response was awarded Level 3 - 5 marks

The response correctly explains how both the chlorine and the sodium atoms become ions by the transfer of an electron. This is correctly illustrated by a diagram which clearly shows the origin of the electron transferred to chlorine from the sodium. There is also a brief description of the structure of the sodium chloride.

While not perfect, this is sufficient for Level 3 - ideally we would wish to see references to chloride ions and the ions drawn.

Question 10 (a)

This question was poorly answered on the whole with only about a quarter of responses scoring any of the 2 marks available.

Few candidates were able to correctly link the idea of enzymes and yeast and to discuss enzymes denaturing. Most responses identified that enzymes are denatured at 80 °C, but not that yeast provided these enzymes.

In responses that did not score many candidates simply stated vaguely 'too hot' or confused the 'carbohydrates with the yeast'.

10 (a) Ethanol is made by fermentation of a carbohydrate dissolved in water, in the presence of yeast.

The reaction is carried out at 30 °C.

Explain why the reaction is carried out at a temperature of 30 °C rather than at a temperature of 80 °C.

(2)

The enzymes would be denatured at 80°c so wouldn't react properly.

ResultsPlus
Examiner Comments

This response scored 1 mark only.

There is a correct reference made in the response to the enzymes being denatured. However, the source of the enzymes, namely yeast, has not been identified.

Because the enzyme in the yeast can denature if the temperature is too high and the active site changes shape.

ResultsPlus
Examiner Comments

This first part of the response scores both marks, coupled with the fact that the second part actually gives a good description (although not required in this particular question) of what is meant by denaturing.

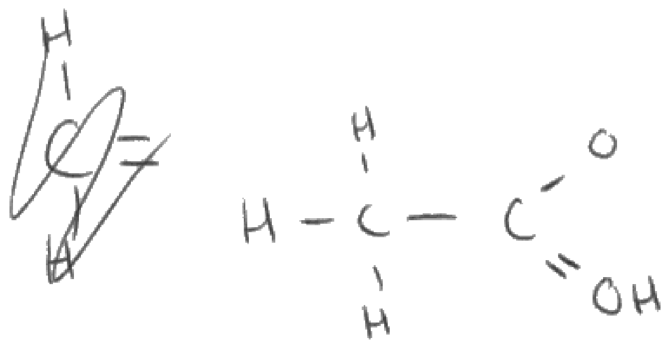
Question 10 (b) (ii)

This question was poorly answered on the whole with just over a third of responses scoring, mainly 1 mark out of the 2 marks available.

Very few candidates were able to draw the carboxylic acid group correctly. When 1 mark only was scored in a response this was often for a correct representation of a methyl group in a two carbon structure.

(ii) **Draw the structure of a molecule of ethanoic acid, CH_3COOH, showing all covalent bonds.**

(2)



ResultsPlus
Examiner Comments

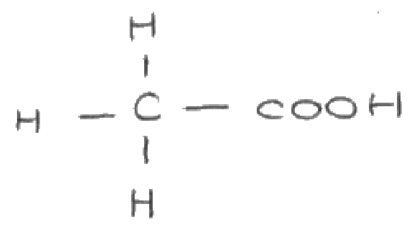
This response scored 1 mark only for the correctly drawn methyl group in the ethanoic acid molecule. However, although nearly correct, the carboxylic acid functional group has been incorrectly drawn with a double bond between the carbon and hydroxyl group, as opposed to between the carbon the oxygen atom.

ResultsPlus
Examiner Tip

Make sure you can draw all the covalent bonds in a carboxylic acid functional group.

(ii) Draw the structure of a molecule of ethanoic acid, CH_3COOH, showing all covalent bonds.

(2)



ResultsPlus
Examiner Comments

This response scored 1 mark only.

The methyl group within the ethanoic molecule is correct. However, the bonding in the carboxylic acid functional group has not been shown.

ResultsPlus
Examiner Tip

When drawing the structure of the carboxylic acid make sure include all the covalent bonds.

Question 10 (c) (i)

This question was not well answered on the whole, with approximately half the candidates scoring any of the 3 marks available.

Considering that this is based around a Core practical, most candidates struggled to score marks.

Some responses clearly described the remaining steps of the method needed to determine the mass of ethanol to raise the temperature of the water by 30°C. However, it was evident that many candidates had failed to read the question properly since many answered by stating 'stop heating the water once it had reached 30°C', as opposed to a temperature **increase** of 30°C. Many candidates confused the mass of the burner with the mass of ethanol.

(c) (i) The apparatus in Figure 16 can be used to investigate the temperature rise produced in a known mass of water when a sample of ethanol is burned.

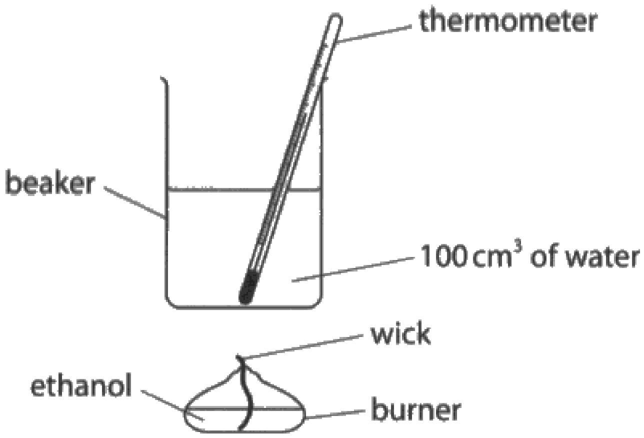


Figure 16

The first steps of the method are

1. put 100 cm^3 of water into a beaker
2. determine the mass of the burner containing ethanol
3. measure the initial temperature of the water
4. place the burner under the beaker of water
5. light the wick

Describe the remaining steps of the method that are needed to determine the mass of ethanol required to raise the temperature of the water by 30 °C.

(3)

Start a stop watch and measure and record the temperature at intervals. once the temperature has risen to 30 °C, determine the mass of the burner containing ethanol by weighing the burner. Then subtract the initial weight by the ending weight to get how much ethanol was used. This answer is how much ethanol is required to raise the temperature to 30°C.

ResultsPlus
Examiner Comments

This example is typical of a response scoring 2 out of the 3 marks available.

The candidate has scored 2 marks for mentioning that the burner containing the ethanol should be (re-)weighed and that the difference the in initial and final masses should be calculalated. A third marking point is not scored since the response incorrectly mentions a rise to 30°C as opposed to a **rise by** 30°C.

Question 10 (c) (ii)

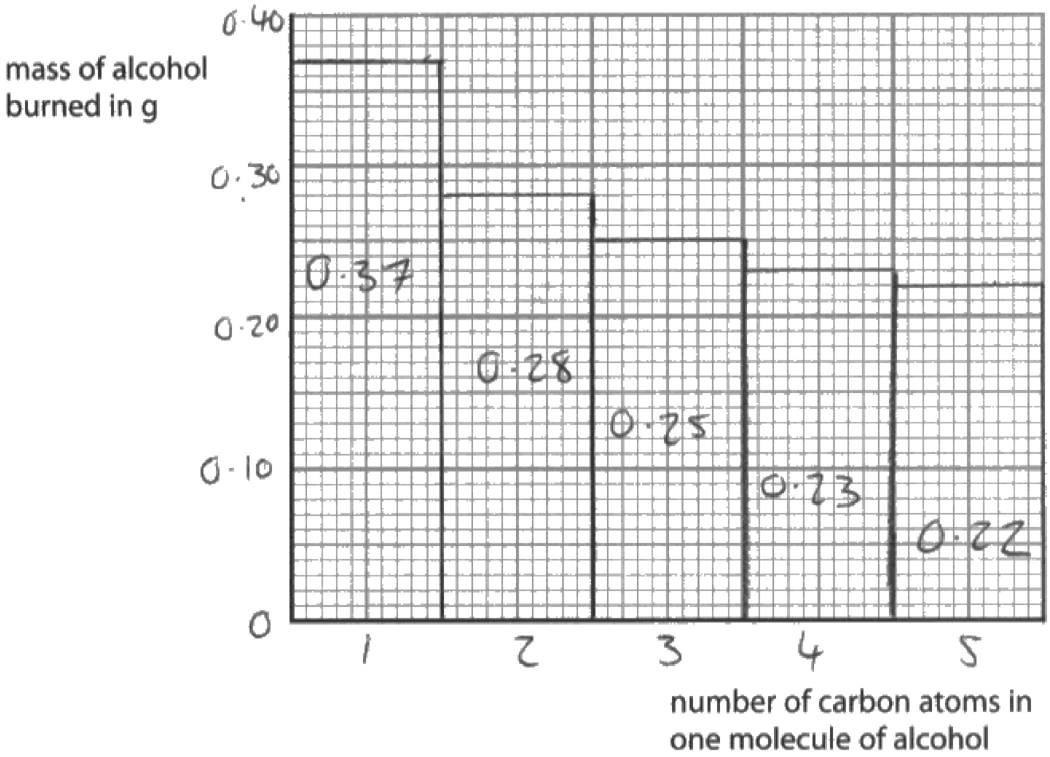
This question was generally well answered, with most responses gaining at least 2 out of the 3 marks available. A large number of responses included bar charts rather than line graphs and were able to score 2 marks. Commonly seen errors included: the y axis not covering enough of the graph paper and confusion in the scale, namely instead of 0.05, 0.1, 0.15 etc, many responses substituted 0.05 with 0.5; occasionally the points were plotted correctly but no attempt had been made to join them.

(ii) In a different experiment, separate samples of the alcohols methanol, ethanol, propanol, butanol and pentanol were burned to determine the mass of each alcohol that needs to be burned to raise the temperature of 100 cm^3 water by 10 °C.

alcohol	number of carbon atoms in one molecule of alcohol	mass of alcohol burned in g
methanol	1	0.37
ethanol	2	0.28
propanol	3	0.25
butanol	4	0.23
pentanol	5	0.22

Draw a graph of the mass of each alcohol required to raise the temperature of 100 cm^3 of water by 10 °C against the number of carbon atoms in one molecule of that alcohol.

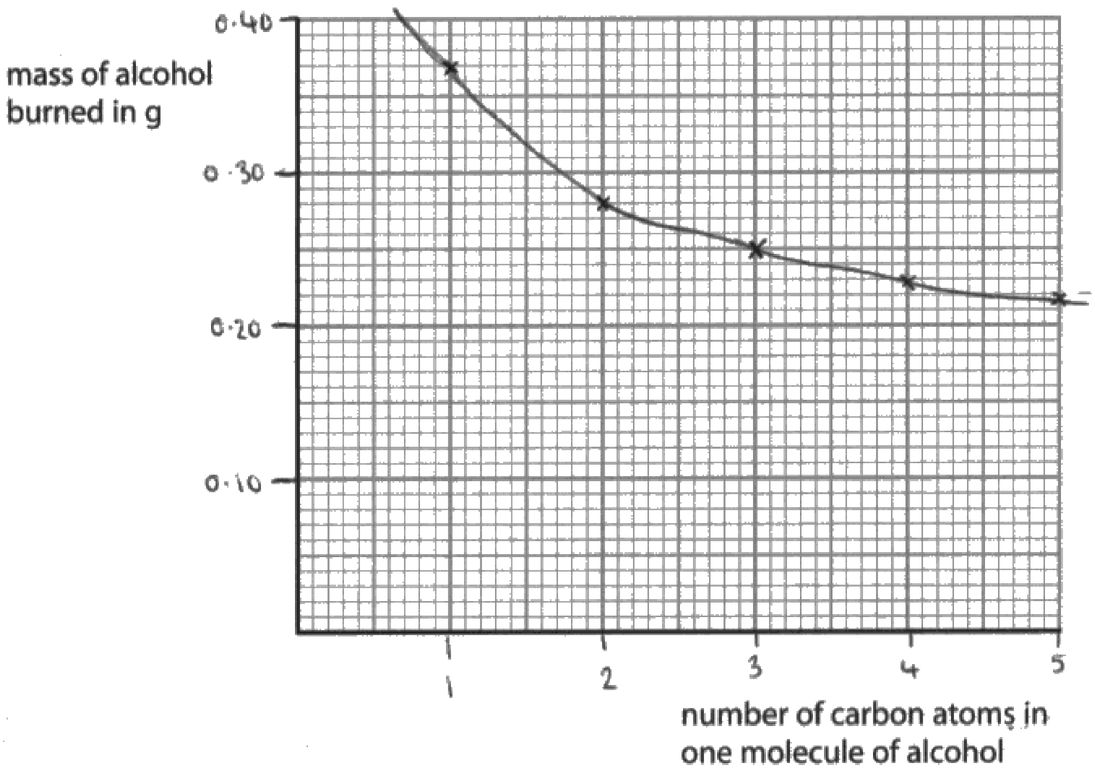
(3)



ResultsPlus
Examiner Comments

This response scored 2 marks.

The bar chart shown is sufficient to score 2 marks since the heights of the bars are correctly drawn and the scales are correct.



ResultsPlus
Examiner Comments

This response scored all 3 marks.

The scales, plotting of the points and the line of best fit are all creditworthy.

Paper Summary

Based on their performance on this paper, candidates are offered the following advice:

- practise a variety of calculations as described in the specification.
- learn definitions in the specification of terms such as isotopes, hydrocarbons and saturation.
- be able to be explain effects of rates of reaction in terms of particle collisions.
- learn the formulae of simple compounds as used in the specification.
- learn the qualiitative tests and results of these tests for anions and cations described in the specification.
- be able to describe the different types of bonding such as ionic bonding.
- practise answering extended open-response questions.

To help with the above, there are plenty of examples in examination papers of the previous specification which has similar coverage.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:

http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

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