GCSE EXAMINERS' REPORTS

CHEMISTRY
GCSE

SUMMER 2018

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CHEMISTRY COMPONENT 1 FOUNDATION

On the whole candidates coped well with the paper. Mathematical questions were generally well done. However, many marks were lost by candidates demonstrating weak writing skills. Those candidates who had experience of laboratory work were at a distinct advantage. Candidates demonstrated a serious lack of knowledge and understanding of the following areas of the specification:-

- writing chemical formulae
- writing symbol equations
- recall of chemical terminology
- drawing conclusion(s) from given evidence - methods of rust prevention
- chemical tests for gases and aqueous ions - bonding
- chemistry of Group 1 metals

Q.1 Generally well answered apart from part [c].

(a) Oxygen and nitrogen well answered, but carbon dioxide and argon often mixed up.

(b) Well answered.

(c) Poorly answered. Most candidates did not use the information in the stem. i.e. 'coal contains sulfur'…..'power stations are a major source of acid rain'. Most common incorrect response:

Step 1: 'Carbon burns forming carbon dioxide'.
Step 2: 'acid rain is formed'.

Most candidates gained the 'problem' mark.

(d) Well answered.

Q.2 Those candidates who had experience of methods for salt preparations and chromatography experiments were at an advantage when answering this question.

(a) (i) I. Weaker candidates often only gained one of the possible marks for the order of steps A-C. Only more able foundation candidates gained marks for the purpose of each step.

II. Most candidates gave vague generic responses or simply copied information given in the boxes. e.g.

Step B: 'excess zinc carbonate is added to dilute hydrochloric acid'. Step C: Generic answers, e.g. ' removing a solid from a solution'. Step A: ' colourless solution is left in evaporation basin'.

(ii) Poorly answered. The most common incorrect answers were, 'Zn_2Cl' and '$ZnCl$'.

(iii) Poorly answered. Most candidates did not understand the question. Some candidates changed the acid, e.g. gave 'sulphuric acid', others changed the salt, e.g. 'sodium sulfate'.

(b) Only weak foundation candidates struggled with this question. Common incorrect responses included:

(i) '2' instead of 3.

(ii) Giving either 'red' or 'blue' but not both.

(iii) Choosing the red or the yellow dye instead of the blue dye.

(iv) A few candidates missed this question altogether.

Q.3 (a) (i) Well answered.

(ii) Weaker candidates gave 'B'….the least amount of iron.

(iii) Many candidates lost a mark by not giving their answer to two significant figures.

(b) Poorly answered. Most candidates gained only one of the possible two marks. Poor grammar or simply copying information directly from the table were the two main problems. Most candidates did not demonstrate understanding of the term 'conclusion'.

(c) Very poorly answered. Candidates demonstrated poor knowledge of both methods. Common responses which gained no credit included:

Painting: 'painting forms a barrier'; 'a barrier is formed which stops the sea getting to the ship'. Sacrificial protection: 'zinc forms zinc oxide, which forms a barrier'; 'zinc rusts instead of iron'.

(d) Poorly answered. Incorrect formulae included: FeO; Fe_3O_2; $2Fe_3O$.

Q.4 (a) Most candidates were able to identify the correct apparatus but were unable to give an acceptable reason.

The term 'graduated' or 'has a scale' was not known. Weaker candidates simply stated 'so the hydrogen can be collected', which gained no credit.

(b) (i) Most candidates gained the maximum marks for the graph.

(ii) Most candidates were able to read values from the graph.

(c) This question was simply recall, unfortunately many candidates only gained the 'rate increases' mark.

Poor answers included:
'powdered magnesium has smaller pieces'; smaller surface area'; 'more collisions'; faster collisions'. The collision mark required 'a greater *chance* of collisions'.

(d) Poorly answered. Most candidates chose ' <94.60g'…….giving the reason 'hydrogen has no mass'; 'the magnesium has disappeared'; 'hydrogen leaves the flask' or '>94.60g' ……the hydrogen expands the balloon'; 'hydrogen is formed'.

Q.5 Only weaker candidates struggled with this question.

(a) Generally well answered.

(b) Generally well answered.

(c) Not well known by most candidates. All the compounds were chosen for answers.

(d) This question was simple recall but many candidates only achieved one of the three marks.

Naming the compound, 'ethene', was the most common reason for gaining one mark. Many candidates missed out 'the double bond opens', but did gain the 'joining' mark.

Q.6 This question was mainly based on recall of practical work or interpreting experimental observations. Unfortunately neither were a strong point for most candidates.

(a) (i) Poorly known. Candidates could not recognise the tests for carbon dioxide , chlorine nor ammonia.

(ii) Most candidates only gave the metal ion present in each compound, therefore losing two marks.

Those candidates who attempted to name the negative ions usually got them wrong.

(b) Unfortunately most candidates were unable to work out the formula for barium sulfate, which resulted in them losing both marks.

(c) Many candidates failed to spot this question was a six marker. A simple list of the three metals in their correct order in the reactivity series was obviously insufficient as an answer. The main problem with candidates' responses was a lack of 'explanation' as to how the results can be used to arrive at the correct order. Most answers simply copied out the statements from the table.

Answers lacked:

- identification that the reactions involved 'displacement'
- a general description of how the position of a metal in the reactivity series determines if displacement occurs
- incorrect equations(word or symbol) or no equations at all
- no line of reasoning
- poor spelling
- poor hand writing

Q.7 Weak candidates failed to gain many of the six marks available for this structured bonding question.

(a) (i) Weaker candidates were not familiar with the terms ‘charge’ or ‘electronic structure’. Common incorrect answers included:

Charge mark: ‘2’ ; ‘-1’ ; ‘8’.
Electronic structure mark: ‘ +’ ; ‘2’ ; ‘2.8.6’ ; ‘8’ ; ‘6’.

(ii) Generally well answered. Weaker candidates were obviously guessing answers.

(iii) Very few correct formula seen. Incorrect answers included: Li_2SO_4; LiS_2; LiS. Candidates failed to use the information in the stem i.e. two lithium: one sulfur.

(b) All the letters were seen as answers. Weaker candidates failed to identify the bonding as covalent.

Q.8 (a) (i) Most candidates gain one of the two available marks for recognising an endothermic reaction. Only more able foundation candidates recognised that the more mass of ammonium nitrate added the bigger the temperature drop. This is a good example when weaker candidates failed to understand that a single statement will not gain two marks.

(ii) Most candidates gave ‘C’ as an answer relating the shape of the graph to the decrease in temperature from the table.

(iii) Surprisingly ‘electronic balance’ was not generally known.

(b) (i) Generally well answered. The most common errors were: ‘14+4+16’; ‘14+ +4+3 (14+16)’; ‘14+1+16’

(ii) Generally well answered. The most common error was to use only one nitrogen atom in the calculation, i.e. 14/80 x 100’.

(c) (i) Able foundation candidates gained both marks for this question. Weaker candidates calculated correctly the mass of reactants to be 119 but then used the total mass of products in the equation. e.g. 119/119 x 100 = 100%

These candidates obviously didn’t read the information in the given equation carefully enough.

(ii) Candidates were asked to tick two statements. A significant number of candidates only ticked one.

Q.9. (a) (i) Generally well answered.

(ii) Poorly answered. Candidates who had carried out this common experiment were at a distinct advantage.

The diagram hinted at a loss of the loss of magnesium oxide as white smoke but many candidates gave answers referencing to the students not reading the mass values ‘accurately enough’.

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CHEMISTRY COMPONENT 1 HIGHER

The majority of candidates were correctly entered for this higher tier paper. Candidates generally coped well with the mathematical demands of the paper. Weaker candidates often lost marks due to poor writing skills. Those candidates who had experience of laboratory work were at a distinct advantage. Candidates demonstrated a lack of knowledge and understanding of the following areas of the specification:-

- chemical reactions occurring in the blast furnace
- chemical tests
- ionic bonding
- benefits of N, P and K fertilisers

Q.1 Well answered. Most candidates demonstrated an excellent understanding of atomic structure.

(a) Well answered.

(b) Well answered.

(c) Generally well answered.

(i) The most common incorrect answer was 'E'.

(d) Well answered.

(e) (i) Well answered.

(ii) Surprisingly poorly answered. The most common errors included:
- 'they are found in the earth'
- 'they contain two elements'
- 'they couldn't be separated' or 'they are hard to separated'.

Q.2 (a) This question discriminated well between candidates but once again those candidates who had seen this common experiment were at an advantage.

(i) Weaker candidates chose graph A. To obtain the 'reason' mark a quantitative relationship was required. i.e. the ratio of H:O is 2:1.

(ii) Poor grammar and a lack of knowledge of the relevant terminology prevented many candidates gaining both the available marks. e.g. 'H^+ *attracted* to *negative cathode*' was needed for [1].

(iii) This was one the worst answered questions on the paper. Most candidates simply gave four separate hydrogen atoms and two separate oxygen atoms. These candidates did obviously not know both hydrogen and oxygen are diatomic.

(b) Generally well answered.
The most common errors included:
- not reading '*molten*' for lead(II) iodide,
- giving Pb^{+} for lead(II) ions,
- giving 'oxygen' instead of 'chlorine' as the gas formed at the anode - gave 'chloride' instead of 'chlorine'.

Q.3 This question discriminated well between foundation and higher tier candidates.

(a) (i) I. Well answered.

II. Well answered.

III. Surprisingly not known by many candidates. Common incorrect answers included:

- stored in a sealed container,
- stored safely
- stored in a locked cupboard.

(ii) I. Common errors included:
Formula for lithium oxide: LiO_2; LiO
Formula for hydrogen: H
Incorrect products: $Li(OH)_2$.

(iii) Both marks lost due to candidates not being able to write the correct formula for lithium chloride. The most common incorrect formula included: $LiCl_2$; Li_2Cl.

(b) Disappointingly answered. Common incorrect answers included: $LiCO_3$; $Li(CO_3)_2$.

Q.4 This was one of the worst answered questions on the paper. Apart from part (a)(i) the question relied on recall of explicit statements in the Component 1 specification.

(a) (i) Well answered.

(ii) Many candidates simply defined the term *reduction* – this was not the question asked. Candidates needed to refer to the equation in part (a)(i) to define reduction i.e. '*iron oxide* loses oxygen'.

(b) Poorly answered. Candidates simply had to identify CaO as a base/alkali and SiO_2 as acidic for one mark. Neutralisation gained the second mark.

(c) Most candidates did not know that it is limestone that breaks down on heating to form calcium oxide.

(d) Only *some* of the waste gasses are used to heat up the in-going air. Even more able candidates struggled with this question .Vague answers suggesting that *all* the gases are *recycled* back into the furnace were often given.

Q.5 Generally well attempted.

(a) (i) Only weak candidates failed to gain both marks on this question. Weaker candidates often gave the repeating unit:
- of polythene
- still containing the C=C bond

(ii) I. Generally well answered. Some candidates failed to include the water molecule.

II. This question was straight recall from the specification. Only able candidates gained at least three of the marks available. Very few candidates stated that each monomer has *different* functional groups at *both* ends. Most candidates gained marks for stating the monomers *joined* together when the functional groups react and that a *small molecule* is also formed. Only able candidates include the fact that the repeating unit contains both monomers.

(b) Well answered.

Q.6 (a) Surprisingly very poorly answered. Many candidates did not recognise the chemical test for the ammonium ion. Only more able candidates stated C to be copper(II) bromide, no mark was given for copper bromide.

(b) Generally well answered.

Q.7 (a) Poorly answered. Experience of practical work was an advantage to answer this question. It is expected that candidates should be able to evaluate methods and suggest amendments.

(i) Many candidates gained the first marking point, i.e. 'the copper was not completely dried' but failed to gain the second marking point, i.e. heat copper until constant mass.

(ii) Candidates gained the first marking point, i.e.' copper remained on the flask' but failed to give a sensible method to overcome this problem, i.e. swirl out the flask with water.

(b) Generally well answered.

(c) Those candidates who had experience of carrying out displacement reactions would appreciate 'reactions' can sometimes be difficult to see. The 'voltmeter method' would always give a value no-matter how small. Only able candidates could express themselves clearly to gain this mark.

(d) Generally well answered.

Q.8 Surprisingly poorly answered. This is a traditional topic straight from the specification.

(a) (i) Only the most able candidates gained all three marks. Common errors included:

..O This answer lost the 'transfer' marking point.

O This answer lost the 'octet' marking point.

Weaker candidates gave a 'covalent' molecule for calcium oxide.

(ii) Well answered.

(iii) Candidates lost marks on this question by not knowing or confusing chemical terminology.

Most candidates gained the marking for '*strong ionic bonds'* in calcium oxide but failed to gain the second marking point, i.e. '*weak intramolecular forces'* in oxygen.

Common errors included :-
- calcium oxide contain strong bonds
- oxygen contains weak bonds.

(b) Generally well answered.

Q.9 (a) Able candidates coped well with this bond energy unstructured calculation. Weaker candidates were not able to cope with the size of the numbers and /or the actual number of calculations needed to reach the final answer.

(b) Generally well answered.

(c) Most candidates gained a mark for a qualitative relationship. Only the more able were to identify and explain the quantitative relationship.

Q.10 Candidates who had carried out and investigated this experiment were at a distinct advantage with this question.

(a) Many candidates failed to achieve this mark because of poor writing skills. They were unable to express themselves clearly. Vague answers, e.g.' heat is lost to the surroundings' gained no credit. Answers required a reference to '*cooling between heating and adding the acid'* i.e. recognising the *time delay* in adding the acid.

(b) Most candidates coped well with the graph. A few candidates plotted 'target' and not 'actual' temperature losing two of the four marks.

(c) (i) Marks were lost with this question as a result of candidates not reading the question carefully. The question clearly states:

- *use your graph* ……and not the table of results,
- show the relationship for *every 10°C*

Those candidates who followed these instructions usually gained both marks.

(ii) Candidates needed to use their graph to find the rate at 50°C, 60°C most probably not plotted, and calculate what the rate would be at 70°C. Candidates then had to use the equation for rate (1/t) and the correct unit for rate, e.g. 132 x 10^{-3}, to find the time. Only more able candidates gained full marks for this question.

(iii) 'Human error' was insufficient to gain this mark. A reference to human error is a large proportion of 5 seconds was required to gain this mark.

Q.11 (a) (i) Marks for this question required candidates to:

- recognise the *equilibrium* sign in the given reaction
- *greater number of molecules* on the right hand side
- decreasing pressure / low pressure causes the reaction to *shift to the right*

Many candidates gained two of the three marks.

(ii) Reasons for achieving only one, or no marks, for this question include:
- an error in calculating the total masses of the reactants,
- not multiplying the relative molecular mass of hydrogen by 3,
- not multiplying the ratio of calculated masses by 100,
- not giving their answers to three significant figures,
- not knowing how to give their answer to three significant figures.

(iii) Generally well answered. The most common error was missing out the 1:3 ratio of CH_4: H_2 in the three part calculation.

(b) Surprisingly poorly answered. Most candidates could identify the three elements, nitrogen, phosphorus and potassium. Most could give the benefit of nitrogen but only more able candidates could give a benefit for phosphorus and potassium.

(c) This question discriminated well. More able candidates used correct chemical terminology in concise and well organised answers. They handled the demanding symbol equation well. Weaker candidates failed to cope with the many steps within the method and were unable even to attempt a symbol equation.

Q.12. As expected only the most able candidates achieved credit for this question.

(a) (i) I. Weak candidates failed to cope with the three stage calculation.

Many candidates failed to incorporate the factor of '1000' in the first and third steps. e.g. number of moles = 1.5 x 0.1 = 0.15, instead of '1.5 x 0.1/1000= 0.0015' Many candidates missed out the second step i.e. the ratio of acid : alkali, 1:3.

(ii) Only able candidates recognised the other acid in the fruit drink.

(b) (i) Most candidates attempted to name 'sodium ethanoate', with only the most able being able to spell it correctly.

(ii) Most candidates gained one mark for the correct formulae of the reactants (*CH_3COOH given in stem of question*), however, only the most able candidates gave the correct formula for sodium ethanoate.

(c) The most able candidates coped well with this difficult concept and gained at least two of the possible three marks. Weaker candidates did obtain one of the marks by identifying ethanoic acid as a weak acid.

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CHEMISTRY COMPONENT 2 FOUNDATION

Q.1 (a) The majority of candidates gained credit here.

(b) Most candidates gained 2 from 3 for this question, the water from salt solution was most frequently answered incorrectly.

Q.2 (a) This question was well answered.

(b) (i) Answers were very vague in the table. Most could state “limewater” for carbon dioxide but a variety of incorrect answers were seen as the observations for ammonia.

(ii) Most candidates could recognise carbon dioxide but ammonia was less frequently identified.

Q.3 (a) (i) The majority of candidates could identify the experiments required but many did not read the question carefully and then stated why they had chosen the experiments rather than a description of the results.

(ii) This question was poorly answered with many candidates stating factors that did not relate to the calcium carbonate.

(iii) Over half of candidates chose the correct graph here.

(b) Most candidates gained at least one mark here.

(c) (i) Few candidates achieved both marks here. Many candidates gave confused statements about the weight of liquids and gases, or the cotton wool trapping the gas in the flask.

(ii) Many vague answers were seen here relating to accuracy.

Q.4 (a) (i) Fewer than half of candidates could correctly identify the copper(II) oxide here. Some answers were also seen relating to the removal of oxide.

(ii) The most frequent incorrect answer seen here was carbon and aluminium oxide, especially where candidates chose three answers.

(b) Candidates answered this question well.

Q.5 (a) (i) The majority of candidates could identify the anomalies.

(ii) Candidates had a good understanding of repeatability but some vague answers were seen about “similar” results.

(iii) Most candidates were able to draw the graph with a line of best fit.

(iv) I This was answered well.

II Where the graph was drawn correctly candidates could answer this correctly.

(b) (i) Very few correct answers were seen here.

(ii) The most frequent incorrect answer here related to the copper as an impurity.

(c) (i) Half of candidates could identify the variables here.

(ii) Most candidates stated a suitable control variable.

Q.6 Most candidates could state the way at least one of the tests could be used and their expected observations but many failed to discuss the effectiveness of the tests in distinguishing between the compounds. Very few answers were seen worthy of the top band.

Q.7 Resource Booklet

(a) Over half of candidates could identify the correct functional group.

(b) Many displayed formulae were seen for ethanol and butanol, rather than propanol. Most candidates could write a molecular formula for their structure.

(c) Most candidates identified that Brazil produced 27% of the worlds ethanol but many failed to find the correct data for ethanol production and instead tried to use the data from the graph for ethanol consumption.

(d) The majority of candidates identified heat loss as the reason for the smaller value but few candidates gained both marks here as vague answers relating to carrying out experiments in “enclosed areas” were common.

(e) The modal mark here was 1, though some candidates gained all three marks and many spotted that ethanol was anomalous.

(f) This question was well attempted, though many candidates gained two marks (usually for hydrogen having the highest energy content and not releasing CO_2 to contribute to global warming) and then stated the converse for ethanol so did not gain any extra credit. Some answers failed to relate the problems with hydrogen storage to its gaseous nature. Knowledge of hydrogen and ethanol production were generally good when mentioned.

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CHEMISTRY COMPONENT 2 HIGHER

Q.1 Resource Booklet

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Q.2 (a) (i) Most candidates answered correctly here, though some incorrectly referred to the movement of electrons.

(ii) The majority of candidates correctly drew the arrows here.

(iii) The equation was balanced correctly by most candidates.

(b) (i) Almost all candidates gained one mark here. Many did not give a quantitative answer for the second.

(ii) Most candidates had the idea of weighing the electrodes here.

Q.3 (a) Half of candidates could sketch the graph correctly. The majority had the idea of the energy of the particles changing but few were precise about the successful collision frequency changing or mentioned activation energy.

(b) This question was poorly answered with very few candidates able to calculate the mass of hydrogen gas and therefore unable to gain credit for a comment regarding the resolution.

Q.4 (a) The majority of candidates could describe the displacement reactions and subsequent reactivity series, some did not include the results or had the series the wrong way round.

(b) Over half of candidates could relate the reactivity to the number of shells but credit was given where this was linked to the ability to gain an electron. Few candidates stated that halogens had 7 outer electrons and required one more for a full shell.

Q.5 (a) This question was poorly answered with many candidates attempting displacement reactions with “a more reactive metal”. Few could state that a precipitate is formed. The ionic equation was rarely attempted and seldom correct.

(b) This question was poorly attempted. Where barium chloride was stated most candidates went on to gain the second mark. However, many then failed to gain the third mark as they just gave “iron chloride” rather than iron(III) chloride as the other product.

Q.6 (a) (i) Most candidates calculated the masses of sodium and oxygen for the first mark, but many did not continue beyond this point. Where the division by the A_rs was attempted some truncation of the answers was seen, this led to confusion for the final ratio.

(ii) Many candidates gave an answer here that related to repeatability rather than reproducibility.

(b) Few candidates gave two points worthy of credit here.

Q.7 (a) A full range of answers were seen for this question.

(b) (i) This question was poorly answered with many candidates not sure which information to use. Some candidates did not exclude the trial run when calculating the mean, so only achieved 3 marks.

(ii) Most candidates could calculate the M_r of ethanoic acid but few could complete the calculation to give evidence for their conclusion.

WJEC
245 Western Avenue
Cardiff CF5 2YX
Tel No 029 2026 5000
Fax 029 2057 5994
E-mail: exams@wjec.co.uk
website: www.wjec.co.uk