eduresourceza.com

Downloaded from eduresourceza.com

CHEMISTRY

Paper 0620/11
Multiple Choice

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

General Comments

Candidates performed quite well on this paper.

Questions 1, 2, 14, 15, 16 and **39** proved particularly straightforward with the majority of candidates choosing the correct response.

Questions 8, 11, 12 and **27** proved to be difficult for candidates.

Comments on specific questions

The following responses were popular **wrong** answers to the questions listed.

Question 8 Response **B**. This was the most popular response, although incorrect. Roughly equal numbers of candidates chose responses **A** and **C**. Candidates clearly thought that only one of the methods should work, although both would.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

Question 11 Response **C**. This response was more popular than the correct one. Candidates may have remembered the experiments they had seen, rather than thinking about the actual results which would be obtained.

Question 12 In this question all of the responses were similarly popular, with response **C** being marginally the most popular.

Question 18 Response **B**. Candidates seemed reluctant to decide that neither was correct, although they knew that the litmus answer was wrong.

Question 19 Response **C**. Candidates knew that the oxides were covalent, but not of what type they were.

Question 27 Response **A**. This was by far the most popular response, although wrong. Candidates clearly thought that two 'no' answers meant least reactive, but not fully understanding the implications of the oxide reacting with carbon.

Question 34 Response **D**. Most candidates chose the correct alternative, but some were distracted by the mention of washing clothes in both the question and one of the responses.

Question 37 Response **B**. Candidates understood what the question was about but, perhaps, misread ethane for ethene.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

CHEMISTRY

Paper 0620/12
Multiple Choice

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

General comments

Candidates performed well on this paper.

Questions 1, 4, 6, 11, 14, 15, 16, 21, 24, 30, 37 and **38** proved particularly straightforward for the majority of candidates.

Questions 10, 17 and **29** proved to be difficult, with fewer candidates choosing the correct response.

Comments of specific questions

The following responses were popular **wrong** answers to the questions listed.

Question 3 Response **C**. Candidates understood the significance of the chromatogram, but did not realise the significance of the 'sharp' temperature at which substance Y solidified.

Question 9 Response **B**. Candidates knew that method 1 would work, but some were reluctant to believe that both would.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

Question 10 Response **C**. This response was more popular than the correct answer. Candidates seemed to think of experiments that they had experienced, rather than thinking of the outcomes of those shown.

Question 12 Response **B**. Some candidates knew that the reaction was exothermic and then selected the response which first mentioned the word without reading all of the alternatives.

Question 17 Response **B**. Some candidates knew that the litmus test was wrong, but were reluctant to decide that both tests were.

Question 18 Response **C**. Candidates knew that bonding between no metals is covalent, but chose the wrong alternative.

Question 22 Response **D**. Candidates were clear about the ductility of metals and there use in making alloys, but missed the fact that metal oxides react with acids.

Question 29 Response **A**. This was by far the most popular answer, although wrong. Candidates clearly thought that two 'no' answers meant least reactive, not fully understanding the implications of the oxide reacting with carbon.

Question 35 Response **C**. Most candidates chose the correct alternative.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

CHEMISTRY

Paper 0620/13
Multiple Choice

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

General comments

Candidates performed very well on this paper.

Questions 1, 2, 4, 7, 9, 10, 14, 15, 22, 23, 24, 27, 32, 38 and **39** proved particularly straightforward, with the majority of candidates choosing the correct response.

Question 8 proved to be the most difficult, with fewer candidates choosing the correct response.

Comments on specific questions

The following responses were popular **wrong** answers to the questions listed.

Question 3 Response **C**. Candidates understood the significance of the chromatogram, but did not realise the significance of the 'sharp' temperature at which substance Y solidified.

Question 16 Response **C**. Some candidates realised that the reaction was reversible, but not that it involved the loss and gain of water of crystallisation.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

Question 18 Response **B**. Some candidates knew that the litmus test was wrong, but were reluctant to decide that both tests were.

Question 19 Response **C**. Candidates knew that bonding between no metals is covalent, but chose the wrong alternative.

Question 25 Response **D**. Candidates giving this response did not understand the nature of alloys as mixtures rather than compounds.

Question 33 Response **B**. Some candidate did not realise the acidic nature of nitrogen and other non-metal oxides.

Question 34 Response **C**. Candidate knew about chlorination, but did not realise that water treatment does not remove substances dissolved in the water.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

CHEMISTRY

Paper 0620/21
Core Theory

Key Messages

- Many candidates showed a good ability in extracting and analysing data.
- More practice is needed in answering questions about structure and bonding, especially when comparing structures.
- Many candidates would benefit from learning definitions of chemical terms with greater accuracy.
- It is important that candidates read the question carefully in order to understand what is exactly being asked.
- Many candidates need more practice in learning organic chemistry, especially with respect to organic formulae and combustion of hydrocarbons.
- Some candidates would benefit from more revision in qualitative tests for ions and specific molecules.
- Some candidates need more practice in answering questions where comparisons are required, especially relating to changes of state.

General comments

Some candidates tackled this paper well, showing a good knowledge of core Chemistry. Good answers were seen to many parts of **Questions 1**, **2** and **5**. Nearly all candidates were entered at the appropriate level. The rubric was occasionally misinterpreted or not read properly. For example, in **Question 1(a)(iv)** many did not take any notice of 'single electron shell', whilst in **Question 4(a)** many wrote about properties and uses rather than structure. Some candidates disadvantaged themselves by writing conflicting statements. This was most obvious in **Question 6(a)**, where some candidates wrote conflicting statements about the properties of liquids and vapours. Fewer candidates tried to write symbol equations instead of word equations compared with previous sessions. A considerable number of candidates left blank spaces in **Questions 2(a)(i)** (electronic structure), **5(c)** (chromatography) and **6(b)(ii)** (naming ethanol from its formula) and **6(c)** (endothermic change). The extraction of information from tables of data was generally well done. Many candidates need to spend more time learning definitions of terms such as element and solvent. When writing these definitions, many candidates wrote vague or conflicting statements. Many candidates need more practice in answering questions about structure and bonding, especially when comparing structures such as diamond and graphite. Many candidates would also benefit from further revision of organic chemistry, especially organic structures and the products of combustion of organic compounds. The standard of English was generally good. As in previous sessions, chemical tests for specific substances e.g. for zinc ions in **Question 7(d)** and chlorine in **Question 7(f)** were not well known. A considerable proportion of the candidates did not know the test for carbon dioxide. Many candidates could do simple chemical calculations involving ratios of masses.

Comments on specific questions

Question 1

Most candidates gave correct responses for this question, especially in parts **(a)** and **(c)** involving basic inorganic chemistry. However, only a few candidates were able to give a sufficiently accurate definition of an element in part **(b)**. Candidates need to pay more attention to a proper understanding of terms in Chemistry when revising.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

(a) (i) Many candidates knew that nitrogen is present in fertilisers. The commonest errors were to suggest sodium or calcium.

(ii) Nearly all candidates realised that sulfur is in Group VI of the Periodic Table. A few suggested the answer 'iodine', through a mistake in interpreting Roman numerals. Candidates would be advised to refer to the Periodic Table provided whenever answering this type of question.

(iii) Most candidates identified iodine correctly. Some candidates confused Group number with Period number and gave the incorrect answer of nitrogen.

(iv) Many candidates recognised helium as having a single electron shell containing two electrons. The commonest incorrect answer was calcium. This error arose because candidates did not read the question carefully enough and did not take any notice of the phrase 'single electron shell'.

(v) Nearly all candidates realised that nickel is a transition element. The commonest incorrect answer was calcium.

(vi) This was the least well answered of the part **(a)** questions. Nickel, sodium or calcium were commonly seen as incorrect responses.

(b) Very few candidates gave a convincing definition of the term 'element'. Many answers were vague and referred to 'pure substances', 'solids, liquids and gases' or 'natural substances'. Few mentioned that elements were made up of the same type of atom.

(c) This question was well answered by most candidates, who gained credit for selecting suitable physical properties of metals.

Question 2

Parts **(b)** and **(c)** about pH values and word equations were generally done well. However, many candidates would benefit from more revision in writing electronic structures (part **(a)(i)**), understanding bonding (part **(a)(ii)**) and in understanding which factors to keep constant when repeating experiments (part **(d)(iii)**).

(a) (i) Few candidates gained full credit for the correct electronic structure of hydrogen chloride. Candidates who made errors, often made mistakes in the placement of the bonding pair of electrons. Common errors included giving too many electrons in the outer shell of chlorine, giving a single electron as a bonding electrons, placing a bonding electron just outside the overlap region on the diagram and adding extra electrons to the hydrogen shell. A considerable number of candidates did not respond to this question.

(ii) Many candidates realised that hydrogen chloride is covalent because of a shared electron pair. The commonest errors were to suggest 'ionic because it's a combination of a metal + a non-metal', to suggest covalent but give a wrong reason (commonly metal + non-metal), state 'has a single bond' or provide references to state.

(b) Most candidates gave the correct pH value. The commonest incorrect answer was pH 7.

(c) (i) Many candidates completed the equation correctly. Most gained at least partial credit. The commonest errors were to replace carbon dioxide or water with hydrogen or oxygen or to suggest hydrogen carbonate instead of carbon dioxide. A considerable number of candidates did not respond to this question.

(ii) Most candidates recognised magnesium chloride as the name of the salt. The main errors were 'magnesium chlorine' or giving made up names such as 'hydromagnesium oxide'. A small number of candidates did not respond to the request to balance the equation.

(d) (i) A majority of the candidates gave a correct answer within the range in the mark scheme. 225 cm^3 was the commonest correct answer. The commonest error was to give a value of 250 cm^3 or above. Fewer suggested values below the acceptable range of temperatures.

(ii) This was invariably correct.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

(iii) Many candidates chose two suitable factors which could be kept constant. Keeping the temperature constant was the correct answer most frequently seen. A large proportion of the candidates wrote about the apparatus or the volume of gas. Other common errors were keeping the time intervals the same or measure the same volume of hydrogen.

Question 3

Many candidates gained partial credit on this question. Most candidates selected 3 or 4 of the correct words in part **(a)** and gave a correct example of an area of everyday life where purity is important in part **(c)(iii)**. Few gained full credit. Parts **(b)** and **(c)** were least well done. Most candidates would benefit from revising organic structures.

(a) Most candidates partial credit for this question. The commonest errors were to suggest 'different' in the third space instead of 'similar' and 'elements' in the fourth space instead of 'functional'.

(b) (i) Few candidates could write the structure of ethanol correctly, showing all atoms and bonds. A significant proportion of the candidates who did know the structure, went on to omit the O–H bond. Common errors included adding C=O at the end, C–O without the H of the O–H or giving the structure of ethane.

(ii) Few candidates gained full credit for the products of complete combustion of ethanol. A wide range of incorrect answers was seen e.g. CO, H_2 or C. Many incorrect answers included atoms which were not present in the reactants e.g. HCl or N_2. A further subsection of incorrect answers included the reactants e.g. O_2 or ethanol (sometimes changed to methanol).

(c) (i) A minority of candidates identified the carboxylic acid group correctly. A wide variety of errors were seen. The commonest were to put a ring around the C=O group, the C–O–H group or the carbon atoms in the ring.

(ii) Nearly all the candidates counted the number of carbon atoms correctly. The commonest errors were to suggest 2, 3 or 6 carbons.

(iii) This was generally correct, most candidates suggesting drinking water. A few candidates suggested fertilisers or industrial chemicals or processes.

Question 4

This was the least well answered question on the Paper. Most candidates would benefit from revising structure and bonding in diamond and graphite. In part **(d)**, under half the candidates gave a convincing explanation as to why carbon monoxide is a reducing agent. In part **(e)** few recognised the raw materials required for the extraction of iron. The test for carbon dioxide (part **(b)**) was fairly well known, as was an adverse effect of carbon monoxide on health.

(a) Many candidates gained only partial credit, usually for the idea that both diamond and graphite contain carbon. Fewer candidates gained credit for the idea that both diamond and graphite are giant structures. Many candidates wrote vague statements, which did not answer the question and included comments about properties and uses.

(b) Many candidates gave the correct test for carbon dioxide. Common errors included lighted splint goes out and this is not a specific enough test, litmus paper, electrolysis and water, rather than limewater.

(c) Many candidates recognised the effect of carbon monoxide on the body in terms of toxicity or stopping respiration. A significant number of candidates did not gain credit because they wrote answers which were too vague e.g. 'affects breathing' or 'causes breathing problems'. Many candidates thought incorrectly that carbon monoxide damages the lung structure or causes cancer.

(d) Many candidates gave vague answers to this question e.g. 'not reducing', 'it reduces the amount of iron' or 'it's in the products as carbon dioxide'. The best responses referred to the removal of oxygen from the iron oxide or addition of oxygen to the carbon monoxide.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

(e) Few candidates appeared to know what is meant by a raw material and gave answers such as 'lime' or 'carbon monoxide'. Others suggested sand or water. Bauxite was a common incorrect response. A considerable number of candidates did not respond to this question.

Question 5

Some parts of this question were well done, especially parts **(c)**, **(d)**, **(d)(iii)** and **(f)(i)** and **(f)(ii)**. In part **(e)** few candidates were able to identify raw materials added to the blast furnace. In part **(f)(iii)**, few candidates used the information given in the equation to explain how green nickel(II) chloride can be obtained from white nickel(II) chloride.

(a) Many candidates gained partial credit but few were awarded full credit. Common errors were litmus paper instead of chromatography or filter paper and beaker instead of solvent. A few candidates incorrectly suggested that the solvent had pigment dissolved in it.

(b) Many candidates placed the '**X**' on the base line to mark the position of the spot at the start of the experiment. Others either placed the it below the line, often in the solvent. Fewer placed the '**X**' well above the line.

(c) Most candidates identified the process as chromatography. The commonest errors were to suggest pigmentation, chlorophyll or filtration.

(d) (i) The commonest error was to suggest aqueous copper(II) sulphate, but a considerable minority also chose solid nickel(II) sulfate incorrectly.

(ii) Most candidates correctly selected nickel. The commonest incorrect answers were chlorine and sulfur.

(iii) Most candidates remembered that the negative electrode is the cathode. A few candidates made up incorrect names ending in '–ode'. Others wrote down incorrect anode or cathode products.

(e) Partial credit was awarded to some candidates, who gave one correct reason for electroplating metals. Few candidates gave two correct reasons. Many responses were vague, such as 'to protect the metal' or 'to make them more resistant'. Others suggested a range of general physical properties of metals such as 'to make them conduct better' or 'to make them stronger'. Some candidates gave uses such as 'for jewellery', rather than focussing on the idea about making the surface more attractive.

(f) (i) Most candidates balanced the equation correctly. The commonest errors were to omit the 6 or to write $H_{12}O_6$.

(ii) Most candidates recognised the equilibrium sign in terms of a reversible reaction. The commonest errors were to suggest 'it is a cycle', 'it means equals' or 'it's the same'.

(iii) Very few candidates used the information given in the equation to explain how green nickel(II) chloride can be obtained from white nickel(II) chloride. Most incorrect answers referred to heating, boiling, cooling or adding other substances such as iron.

Question 6

Some parts of this question were well done, especially parts **(d)** and the calculation in part **(e)(ii)**. In part **(a)** some candidates gave good explanations of the change of state in terms of particle theory. Others wrote too vaguely. Vague or muddled writing was also responsible for some candidates not gaining credit for the definition of a solvent (part **(b)(i)**). Many candidates need more practice in the naming of organic compounds (part **(b)(ii)**) and writing inorganic formulae (part **(e)(i)**).

(a) Many candidates gained credit by making appropriate comparisons between the closeness and motion of the particles in liquid and vapour. A few candidates gave good explanations of the changes in state when a vapour changes to a liquid or vice versa. Most did not give a change and only referred to the gaseous state. Others disadvantaged themselves by suggesting that the particles are far apart in a liquid or move quickly.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

(b) (i) Many candidates gave a suitable definition of a solvent. Others wrote confusing or vague comments, often muddling the solvent and solute. The quality of the English often prevented candidates from expressing themselves adequately in this question, although elsewhere in the paper the quality was generally good. Common errors were 'what you mix with a solution' or 'a liquid used for tests'.

(ii) Few candidates recognised the formula of ethanol. Common incorrect answers included ethanoic acid, water and carbon hydroxide. The answer 'alcohol', given by a number of candidates was not accepted because it is a generic term. A considerable number of candidates did not respond to this question.

(c) A minority of the candidates recognised the change associated with a fall in temperature as being endothermic. The commonest errors were to suggest 'exothermic' or 'cooling'. A considerable number of candidates did not respond to this question.

(d) Most candidates gave the correct answer. The commonest error was to suggest that solid ammonium chloride could conduct electricity. A few also suggested ammonia.

(e) (i) Those candidates who correctly wrote the formula of lithium hydroxide, generally obtained credit for balancing the equation. Common incorrect formulae for lithium hydroxide included Li, LiO, $Li(OH)_2$ and LiH_2O.

(ii) Most candidates were successful in the calculation (answer = 20g).

Question 7

Many candidates performed well on this question, especially in part **(a)** where data extraction from the table was required. The test for zinc ions in part **(b)** was not well known and a majority of the candidates need more practice in the practical sequence of salt preparation (part **(c)**) and the test for chlorine (part **(f)**).

(a) (i) Nearly all the candidates correctly gave copper. A few candidates suggested poly(ethene).

(ii) Most candidates wrote about the better electrical conductivity compared with iron. Candidates who did not gain credit, often stated that 'copper is a good conductor' without any comparison being made. Others suggested malleable, expensive or 'its density'.

(iii) A majority of the candidates realised that insulators are poor conductors. Most suggested non-conductor, which was acceptable. Common errors included 'its conductivity' without qualification or 'it is a non-metal'.

(iv) This was the least well answered of the part **(a)** questions. Many candiates suggested steel, forgetting that steel is an alloy and therefore not a pure metal. A few candidates suggested poly(ethene), ignoring the fact that the question refers to a metal. The incorrect answer, aluminium, was not infrequently seen.

(v) Candidates who did not gain credit, often stated that 'steel is strong' without any comparison being made. Others suggested 'harder', which is not a property mentioned in the table.

(vi) This was almost invariably correct. Copper was the commonest incorrect answer.

(b) (i) Few candidates recognised the test for zinc ion. Common errors included calcium and copper.

(ii) Very few candidates could state that a hydroxide was formed. Credit was most often gained by those who selected zinc from part **(i)**. A few candidates gained an error carried forward mark from selecting the incorrect ion in part **(i)**. Many did not respond to the question. The commonest error was 'limewater'. Compounds other than hydroxides e.g. zinc chloride, ammonia, were not infrequently seen.

(c) A minority of the candidates wrote the correct order for the preparation of copper(II) chloride. Nearly all candidates started with step **C**. Thereafter, a wide range of errors were seen with no particular common sequence of steps.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

(d) The commonest error was to suggest CuC*l*. Many candidates wrote multiples of the simplest formula e.g. C_6Cl_{12}.

(e) Many candidates gained credit for the product at the negative electrode. Some went onto incorrectly suggest copper(II), which refers to an ion rather than an element. Fewer gave chlorine as the product at the positive electrode. The commonest errors were to suggest chloride or oxygen.

(f) Many candidates correctly identified chlorine. Those who did not, appeared to guess and a wide range of incorrect answers was seen, for example ammonia, hydrogen, nitrogen, oxygen, carbon dioxide.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

CHEMISTRY

Paper 0620/22
Core Theory

Key Messages

- Questions about electronic structure were generally done well, as were questions involving calculation of molecular mass and some aspects of particle theory, including diffusion.
- Some questions on practical procedures e.g. distillation were well understood. Others, such as describing the apparatus used to carry out the reaction involving the evolution of a gas need further revision.
- Some candidates need more practice in learning definitions.
- It is important that candidates read the question carefully in order to understand what is exactly being asked.
- Many candidates need more practice in learning the products of simple chemical reactions and qualitative analysis tests for specific compounds.

General comments

Many candidates tackled this paper well, showing a very good knowledge of core Chemistry. Good answers were seen to many parts of **Questions 3** and **5**. Nearly all Candidates were entered at the appropriate level. The rubric was occasionally misinterpreted. For example, in **Question 3(d)(i)**, many candidates did not follow the instructions and wrote either the full name of the salt instead of the negative ion only. Many candidates disadvantaged themselves by writing conflicting statements. This was most obvious in **Question 3(d)(i)**, where many candidates wrote calcium ion as well as chloride ion and in **Question 4(b)(i)** where hydrocarbons were called elements or atoms instead of compounds and also in **Question 1(b)**, where compounds were often described as mixtures of elements. Fewer candidates tried to write symbol equations instead of word equations compared with previous sessions. A considerable number of candidates left blank spaces in **Questions 4(d)(ii)** (equation for fermentation), **5(c)(ii)** (test for ammonia) and 7**(c)(ii)** (basic character of calcium oxide). The extraction of information from tables of data was generally well done. The exception to this was in **Question 7(b)**, where candidates tended to refer to the temperatures in the table, rather than the ease of decomposition. Many candidates need to spend more time learning definitions of terms such as compound, isotopes and hydrocarbons. When writing these definitions, many candidates wrote conflicting statements. In **Question 6(a)** many candidates wrote good answers by referring to particles or molecules. Others did not gain full credit because they did not apply the particulate theory, even though the question instructed them to do so. The standard of English was good and seemed more accurate than in previous November sessions. As in previous sessions, quantitative tests for specific molecules e.g. ammonia in **Question 5(c)(ii)**, were not well known. Many candidates could do simple calculations involving ratios and calculation of relative molecular masses.

Comments on specific questions

Question 1

In part **(a)**, most candidates gained partial credit. Candidates need to consider carefully what they write when defining a compound (part **(b)**). If the words, mixture or element appear in the incorrect context, there is a contradiction in their statements and credit cannot be awarded.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

(a) (i) Few candidates realised that ammonia is an alkaline gas. The commonest error was to suggest calcium oxide (which is a base but not a gas). Ethane was another common incorrect answer, presumably chosen because it is a gas.

(ii) Most candidates realised that methane is a greenhouse gas.

(iii) Many candidates gave an example of a metallic salt as an answer, copper(II) sulfate being the incorrect answer most frequently seen. Calcium carbonate and calcium oxide were also commonly seen as incorrect answers.

(iv) Some candidates recognised the test for water. A considerable proportion thought that ethane would turn blue cobalt chloride paper pink.

(v) A considerable proportion of the candidates realised that carbonates react with acids to release carbon dioxide. The commonest error was to suggest calcium oxide, even though it contains no carbon. Ethane was another common incorrect answer, presumably arising by candidates thinking about the combustion products rather than the product formed with hydrochloric acid.

(vi) A considerable number of candidates correctly identified copper(II) sulfate. Other candidates realised that a transition element ion was involved and so suggested iron(II) chloride. A considerable minority suggested calcium carbonate.

(b) Few candidates were able to give an adequate explanation of the term 'compound'. The main errors were starting with phrases such as 'A compound is an element….' or 'A compound is a mixture….', or not implying that the atoms are joined by bonds or are chemically combined.

(c) Some candidates realised that carbon dioxide is produced by the complete combustion of methane. Most candidates who did so, also gained credit for correctly balancing the equation. The commonest errors were putting CO on the right (through reading incomplete rather than complete combustion), giving combinations of carbon and hydrogen such as CH or CH_2 or C alone on the right (the candidates therefore suggesting that combustion involves removal of oxygen).

Question 2

Parts **(a)**, **(b)** and **(d)** were generally done well. Candidates need more practice in answering question requiring the arrangement of experimental apparatus related to rates of reaction (part **(e)(i)**). Most candidates were able to identify some factors that need to be increased in order to increase the rate of a reaction.

(a) Most candidates gave the correct order of reactivity of the metals and gained full credit. The commonest reason for loss of credit was to reverse the position of magnesium and calcium

(b) Many candidates completed the word equation correctly. The commonest errors were giving magnesium oxide or magnesium hydroxide instead of magnesium chloride, water instead of hydrogen, hydrogen chloride and some other substance or 'hybrid substances' such as magnesium chloride oxide'

(c) A majority of the candidates identified that ions are present in magnesium chloride. The commonest error was to suggest that the compound is covalent.

(d) Nearly all the candidates were able to complete the electronic structure of the sodium atom correctly. The commonest error was to place two electrons in the outer shell.

(e) (i) Few candidates gained full credit. Some gained credit for the correct apparatus (syringe + suitable reaction vessel) but few connecting it up correctly. The commonest errors were in the reaction being carried out in beakers open to the atmosphere or to use burettes, drawing gas jars or test tubes without graduations instead of a measuring cylinder or mislabelling, especially of the measuring cylinder.

(ii) Most candidates could identify two things which could be done to increase the rate of the reaction. The commonest errors were to refer to temperature or surface area without qualification. Since the question asks how to increase the rate, the answer must also include the word 'increase' e.g.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

'increase the temperature'. Another common error was repeating the same point e.g. using small zinc pieces and using a larger surface area (of zinc).

Question 3

This was the best answered question on the paper. Most candidates had a good knowledge of changes of state and labelled apparatus correctly. Fewer extracted information correctly from the table in part **(d)**. More practice is needed in the careful reading of the questions so that the correct information is extracted.

(a) Many candidates identified the process shown in the diagram as distillation. A significant number just focused on the flask or condenser alone, rather than the process as a whole and so suggested the incorrect answers evaporation or condensation.

(b) Many candidates gained full credit for labelling the apparatus. The commonest errors were to label the condenser as a pipette or tube or to label the flask as a beaker.

(c) A majority of the candidates were awarded full credit for filling in the correct words. The first space (lower) was most likely to be incorrect, with many candidates thinking that water has a higher boiling point than salt. The second space (boils) was generally correct. A significant number of candidates suggested 'cools' rather than 'condenses' for the third space.

(d) (i) Some candidates did not follow the instructions to write the formula for a negative ion and wrote either the name of the salt (sodium chloride) or suggested calcium as well as chloride. Other common errors included Cl without a charge or sulfate.

(ii) This was the least well done of the part **(d)** questions. Few candidates chose potassium. Most chose calcium or a combination of potassium and calcium.

(iii) A majority of the candidates wrote the correct formulae for the ions. The commonest errors were to write singly charged ions or to write the formula i.e. $MgSO_4$. A minority of candidates wrote the sulfate with a positive charge.

Question 4

Many candidates gave good responses to parts **(a)** and **(b)(ii)**. The definition of a hydrocarbon was not always well known and only the best candidates obtained full credit for completing the equation for anaerobic respiration of glucose to form ethanol (part **(d)(ii)**). The definition of oxidation was not always well known. A proportion of these who muddled oxidation with reduction were also candidates who, in **Question 1(c)**, suggested that combustion involves removal of oxygen.

(a) Many candidates gained full credit, with commonest errors related to ethene and methane.

(b) (i) Some candidates gave a good definition of a hydrocarbon. Others did not write an exact enough explanation or gave conflicting information. The main errors were the omission of the word 'only' or 'contain no other elements than'. Contradictions such as 'hydrocarbons are elements…' were also common, as were suggestions that hydrocarbons contain oxygen or carbon dioxide.

(ii) Many candidates recognised that unsaturated hydrocarbons contain double bonds. Others wrote generally about relative numbers of carbon and hydrogen atoms or about addition of other substances (and not always addition of hydrogen). A significant number of candidates wrote about uses or properties of ethene or hydrocarbons in general.

(c) Fewer candidates realised that ethene was a monomer. Many misinterpreted the question because they referred back to poly(ethene) in the stem of the question, rather than the word 'ethene' in the question itself. Therefore, a significant number of candidates gave the incorrect answer 'polymer'.

(d) (i) About half the candidates gave a suitable definition of the term 'oxidation'. A significant minority thought that oxidation was the removal of oxygen. A proportion of these were also candidates who, in **Question 1(c)**, suggested that combustion involves removal of oxygen. Other errors included ethanoic acid gets oxidised, contradictions by writing about electron gain as well as addition of oxygen or vague statements about bubbling oxygen through liquids.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

(ii) Many candidates gained partial credit, usually for giving carbon dioxide as a product. Credit for stating glucose or sugar as a reactant was rarely given. Common errors were carbon dioxide or ethanol as a reactant, acids of various types as a product, carbon dioxide plus another substance as a product or water as a product or additional product.

Question 5

Many candidates gained partial credit for this question. Most were able to identify correct statements about iron (part **(b)(i)** and define a catalyst (part **(c)(i)**. In part **(a)** many candidates did not describe the structure of an alloy well enough. In part **(b)(ii)** many candidates gave too vague statements about the reasons for protecting the iron from rusting. Some candidates knew the test for ammonia. Others need more practice in memorising qualitative tests.

(a) Some candidates gave a standard definition of an alloy. Others did mention that alloys were mixtures. Many wrote that they are compounds of two metals. Candidates who gained partial credit usually got this for statements such as 'alloys are stronger than the pure metals'. Many of these candidates just gave a list of possible differences of alloys from the pure metals, including less likely properties such as increase electrical conductivity.

(b) (i) This was the best done part of **Question 5**. The commonest error was to suggest that iron has a giant covalent structure.

(ii) Most candidates were able to give a method of rust prevention. Few were able to give a convincing explanation of how the method prevented rusting. Common errors were to suggest covering or protecting the metal without any further qualification,) omission of either water or air in the explanation of how the method worked or writing vague statements e.g. suggesting that the method was simply 'to protect the iron underneath'.

(c) (i) A majority of the candidates were able to define a catalyst. The commonest errors were either to suggest that the catalyst 'affects the rate of the reaction' without mentioning how or to concentrate on the fact that catalysts are not used up.

(ii) The test for ammonia was not particularly well known. Many candidates suggested a 'smell test' or adding sodium hydroxide. The latter may be due to confusion in the candidates' mind about the test for ammonia and the preliminary part of the test for ammonium ions. A significant number of candidates either suggested testing with blue litmus or testing with limewater.

(iii) Few candidates gained full credit and generally wrote about increased plant growth. Common errors included to fertilise the soil, neutralise the soil, used as an insecticide or vague statements about helping plants grow. Very few candidates referred to nitrogen, phosphorus or potassium as essential elements for plant growth.

Question 6

Many candidates did well on the diffusion question (part **(a)**). Many were able to write to the point and organise their answers to this type of extended answer question. Fewer candidates were able to provide a suitable definition of the term isotope or to define nucleon number. In part **(b)** many candidates did not count the number of atoms correctly or make suitable comparisons of the number of atoms in compounds **A** and **B**.

(a) Many candidates gained partial credit, but a significant proportion were awarded full credit. Compared with previous sessions, more candidates were able to write to the point and organise their answers to this type of extended answer question. Where candidates did gain credit, it was often because they did not mention the word particles, molecules or atoms. Reference to gases or garlic moving or going from high to low concentration was not sufficient.

(b) (i) A minority of candidates gave the correct molecular formula. The commonest errors were to write incorrect formulae such as $4CH_2CH_2S$ or to count the carbon or hydrogen atoms incorrectly.

(ii) A minority of candidates gained partial credit. Some gave a comparison of the number of sulfur atoms, whilst others did not make a valid comparison. For example, the statement 'compound **A** has 2 S atoms' does not tell us anything about compound **B**. Most candidates who compared the number of carbon and hydrogen atoms, stated that there were more carbon and hydrogen atoms in compound **A**.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

(c) (i) A majority of the candidates gave the correct number of neutrons (18). The commonest errors were 16 or 17.

(ii) Few candidates gave a suitable definition of 'isotopes'. The commonest errors were to refer to molecules rather than atoms, to write about differences in relative atomic mass rather than mass number or to suggest that the number of protons differed. The definition of term 'nucleon number' was also not well known. Many candidates focus on either the number of protons or the number of neutrons, but not both. Others rephrased this as the mass number. This was not given credit because it is simply another term for the nucleon number and does not tell us exactly what is meant by a nucleon.

(iii) Most candidates gained partial credit and identified coal as the word place in the first gap. The word 'reduced' was often seen in the second gap, rather than 'oxidised'. The word 'monoxide' was not infrequently seen in the third gap, rather than 'oxidised'. The commonest error was in the fourth gap, where 'hydrogen' or 'nitrogen' was often seen in place of water.

(iv) Some candidates obtained credit for either the idea of acid rain reacting with limestone or the effect of the acid rain on the limestone. Common errors included omission of the idea of reaction of acid rain with calcium carbonate or limestone, vague writing about the effect using words such as 'destroys the building', 'causes the building to collapse' or the use of the word 'corrodes' rather than erodes.

Question 7

This question was the least well done by many candidates. Many could do simple chemical calculations involving ratios (part **(a)(iii)**), calculate relative molecular masses and extrapolate values using the pattern of data given in a table.

(a) (i) Few candidates gained full credit. The commonest errors were to suggest that the limestone is added at **D** and to suggest that the waste gases exit at the bottom at **C**.

(ii) A majority of the candidates balanced the equation by adding CO_2. The commonest incorrect answers were CO or O_2.

(iii) Some candidates calculated the minimum mass of calcium carbonate correctly (15 g). A considerable minority of candidates need more practice with this type of questions involving ratios.

(b) (i) Very few candidates could explain that the ease of decomposition decreased down the Group. Most just referred to the temperatures of decomposition or suggested that 'there is better decomposition down the group'. A significant number did not refer to the trend in the position in the Group.

(ii) Some candidates predicted a value for the decomposition temperature between 1000 and 2000°C. The commonest error was to suggest values between 2000 and 3000°C. A small number of candidates suggested values below 100°C or above 4000°C.

(c) (i) Few candidates suggested a correct use of lime. Some realised that it neutralised soils or lakes, but did not use the important word acid in their answers i.e. the answer accepted was 'neutralises acidic soils'. Errors were often due to vague statements. These included 'for buildings', for sterilisation' and 'for the soil'. A considerable proportion of candidates gave completely incorrect answers. A number of candidates suggested that lime was added to the blast furnace, rather than being formed from calcium carbonate within the furnace. A considerable minority muddled the chemical 'lime' with the fruit, so answers such as 'for cooking' were not uncommonly seen.

(ii) Few candidates realised that lime is basic or that oxides of reactive metals are basic. Common incorrect answers included 'neutral', 'mono', 'positive', 'simple' and 'metal'.

(iii) Some candidates calculated the formula mass of calcium oxide (56) correctly. The commonest errors were 76 by use of the formula CaO_2 or 28, by use of atomic numbers

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

(d) Few candidates realised that this question was about the reactivity of calcium. Many candidates tried to answer the question in terms of electrical conductivity. Others suggested, incorrectly, that it was to do with the reaction between calcium and carbon.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

CHEMISTRY

Paper 0620/23
Core Theory

Key Messages

- Questions about electronic structure and atomic structure were generally done well, as were questions involving calculation of molecular mass and diffusion.
- Some questions on practical procedures were generally well understood. Others, such as understanding how an unfamiliar filtration system works, require more careful study to consider how the process operates.
- Some candidates need more practice in learning definitions.
- It is important that candidates read the question carefully in order to understand what is exactly being asked.
- Many candidates need more practice in learning organic chemistry, especially with respect to hydration of ethene and properties of hydrocarbons.
- Most candidates need more revision on the topic of steelmaking and distinguishing it from the extraction of iron in the blast furnace.
- Many candidates need more practice in answering questions where comparisons are required, especially relating to changes of state.

General Comments

Many candidates tackled this paper well, showing a very good knowledge of core Chemistry. Good answers were seen to many parts of **Questions 3, 4** and **8**. Nearly all candidates were entered at the appropriate level and few candidates scored less than one fifth of the marks available. The rubric was occasionally misinterpreted. For example, in **Question 1(a)(ii)** many muddled Groups with Periods. In **Question 1(b)** most candidates gave physical properties of iron rather than chemical properties. In **Question 8(c)(ii)** many candidates did not follow the instructions and wrote the full name of the salt instead of the negative ion only. Many candidates disadvantaged themselves by writing conflicting statements. This was most obvious in **Question 8(a)**, where many candidates suggested that compounds are mixtures if the elements are combined. In **Question 4(f)(ii)** hydrocarbons were called elements or atoms instead of compounds. Fewer candidates tried to write symbol equations instead of word equations compared with previous sessions. A considerable number of candidates left blank spaces in **Questions 3(c)(ii)** (sketch graph), **3(e)(ii)** (use of calcium oxide) and **5(e)** (hydration of ethene). The extraction of information from tables of data was generally well done. Many candidates need to spend more time learning definitions of terms such as hydrocarbon and diatomic. When writing these definitions, many candidates wrote conflicting statements. In **Question 7(c)** many candidates wrote good answers by referring to particles or molecules. Others did not apply the particulate theory, even though the question instructed them to do so. Revision of particular topics such as steelmaking and the hydration of ethene would be beneficial to the majority of the candidates. The standard of English was good and seemed more accurate than in previous November sessions. As in previous sessions, chemical tests for specific substances e.g. for halides in **Question 1(a)(iv)** and for an unsaturated compound in **Question 4(e)(i)**, were not well known. Many candidates could calculate relative molecular masses and had a good grasp of atomic (including electronic) structure.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

Comments on Specific Questions

Question 1

In part **(b)** most candidates described the physical properties of iron, rather than the chemical properties. Very few candidates understood the process of steelmaking (part **(c)**). Most referred to the blast furnace, rather than the converter.

(a) (i) A majority of the candidates realised that aluminium has three electrons in its outer shell. The commonest errors were to suggest iron or silver.

(ii) The commonest error was in misreading the question. Many candidates selected the two elements in the same Group (calcium and barium) rather than from the same Period.

(iii) Many candidates suggested the correct answer, lithium. The commonest error was to choose aluminium, presumably because it is in Group III and candidates were thinking that the Group number corresponded to the number of protons. Iron was also frequently seen as an incorrect answer.

(iv) Many candidates realised that silver nitrate is used to test for halide ions. The commonest incorrect answer was barium.

(v) This was generally well answered. The commonest incorrect response was to suggest silver, presumably because it is low in the reactivity series. Iron was also often seen as an incorrect answer.

(b) Few candidates gained both credit. Errors generally arose because candidates thought that the question was about the physical properties of transition elements. Incorrect responses, such as coloured compound, hard and high melting point were seen. Those candidates who did write about a chemical property generally gained credit for suggesting catalytic activity or reacts with an acid.

(c) Only a minority of candidates were awarded credit for this question. Most candidates were thinking about the blast furnace when writing their answers, rather than the conversion of iron into steel. The idea of adding air (or oxygen) was more frequently given (even though it was often in the context of the blast furnace). Very few candidates mentioned the addition of calcium oxide to form a slag. The majority who mentioned calcium compounds wrote about calcium carbonate in terms of the blast furnace. Other common errors included the addition of more carbon (instead of the idea of removal of carbon), the removal of slag (without the addition of substances to form a slag in the first place) and heating alone to form the steel or make the slag.

Question 2

Many candidates gained partial credit for the extended response question about atomic structure (part **(a)**) and most gave a correct use of helium **(b)**. Many could calculate the relative molecular mass of XeF_4O correctly. Fewer were able to give a suitable definition of the term diatomic.

(a) Some candidates gave excellent answers, focussing on the number of protons, neutrons and electrons, as well as their position in the atom. Many candidates gave the correct numbers of each of the subatomic particles. Fewer wrote about their position in the atom. Many candidates ignored the third bullet point in the question and did not give any information about the charges on the protons, neutrons and electrons. The commonest error here was to suggest that the helium atom was positively (or negatively) charged as a whole. Few candidates wrote about the position of the electrons outside the nucleus.

(b) Most candidates identified a correct use of helium. The commonest answer referred to balloons. A significant minority gave the conflicting statement that the balloons were 'hot air balloons'. A few candidates gave correct answers relating to the use of helium in diving. Again, conflicting statements such as 'used as the oxygen in diving' prevented some candidates from obtaining full credit.

(c) Many candidates calculated the relative molecular mass of XeF_4O correctly (223). The commonest errors were 166 (not multiplying F by 4), 239 (thinking that the double bond to the oxygen meant that you have to multiply O by 2) and mistaking F for Fe.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

(d) (i) Many candidates gave the correct physical state of fluorine at room temperature and at -200°C. The commonest error was to suggest that fluorine was a solid at -200°C.

(ii) The term diatomic was explained well by a minority of candidates. Others had a vague idea of the meaning, but did not express it well enough. Common errors were elements containing two molecules, elements containing two or more atoms, compounds containing two elements and a sort of element like chlorine (not specific enough). Some candidates focused on the idea that the atoms had to be the same in diatomic molecules and did not mention the phrase 'two atoms'.

Question 3

Many candidates gained partial credit on this question. Most candidates could draw the electronic structure of calcium, deduce information from a graph and describe a test for carbon dioxide. The meaning of the term decomposition was not well known. Many did not know a specific use of calcium oxide.

(a) Most candidates drew the electronic structure of calcium correctly. The main errors were to draw extra shells of electrons outside the rings already drawn, to draw too many electrons in the outer shell (sometimes up to 12) and to draw two or four electrons in the second shell.

(b) Nearly all the candidates named calcium chloride correctly. The main errors were stating calcium chlorine or calcium chloric.

(c) (i) Nearly all candidates read the graph correctly, to give a value of 27 cm^3.

(ii) Many candidates drew the graph correctly. The commonest error was to draw the volume of gas levelling off lower than the volume using smaller pieces of calcium carbonate.

(iii) Most candidates realised that the rate increases with increase in temperature and decreases with decrease in concentration of acid. The commonest errors were to suggest an increase in reaction rate with decrease in concentration of acid or no effect.

(d) (i) A minority of candidates correctly identified the conversion of calcium carbonate to calcium oxide as a decomposition reaction. The commonest error was to suggest combustion. A few candidates circled reduction.

(ii) Many candidates knew the test for carbon dioxide. The commonest errors were addition of litmus or use of a burning splint (muddling with the test for hydrogen).

(e) (i) Most candidates gained credit for the correct identification of calcium nitrate. The commonest error was to suggest substances other than water were formed. Oxygen and hydrogen were the commonest errors and carbon dioxide was not infrequently seen. Some candidates put the name of three products.

(ii) Few candidates suggested a correct use of calcium. Some realised that it neutralised soils or lakes but did not use the important word acid in their answers i.e. the answer accepted was 'neutralises acidic soils'. Errors were often due to vague statements. These included 'for buildings', for sterilisation' and 'for the soil'. A considerable proportion of candidates gave completely incorrect answers. A number of candidates suggested that calcium oxide was added to the blast furnace, rather than being formed from calcium carbonate within the furnace.

(iii) Most candidates could identify that a reaction giving off heat is exothermic. The commonest errors were to suggest 'endothermic' or 'combustion', the latter being an example of an exothermic reaction rather than the generic name of the type of reaction.

Question 4

Many candidates gave good answers to parts **(a)**, **(b)** **(c)** and **(d)**. Fewer could describe the result of the bromine water test or understood the term 'hydrocarbon'.

(a) Most candidates realised that a source of heating was required. The commonest errors were measuring cylinder (perhaps to measure the amount of gas produced), burette or thermometer.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

(b) Many candidates placed the **X** correctly in the test tube. Some placed it by the side of the test tube or at the bottom. A few placed **X** in the delivery tube. A minority of candidates did not respond to this part.

(c) Most candidates knew the purpose of the catalyst.

(d) Most candidates wrote the correct formula, usually for butene. Some incorrecty gave H_2 or O_2, indicating that they need more practice in the principles of balancing equations.

(e) (i) The majority of candidates knew the test for an alkene. Significantly fewer gave the correct result. Common errors included incorrect colour change (mainly bromine water turning orange), bubbles forming or vague statements such as 'there is a colour change'.

(ii) Many candidates realised that **B** is one of the possible structures formed when bromine water reacts with ethene. The commonest error was to choose compound **A**, which has a double bond. A minority suggested structure **D** in which hydrogen is substituted as well.

(iii) Nearly all the candidates selected the two correct statements about polymerisation. The commonest incorrect response was oxidation.

(f) (i) Most candidates wrote the correct formula for the hydrocarbon. The commonest incorrect answer was to write out a formula similar to a simplified structural formula e.g. $CH_3C_5H_{10}CH_3$.

(ii) Some candidates gave a good definition of a hydrocarbon. Others did not write an exact enough explanation or gave conflicting information. The main errors were omission of the word 'only' or 'contain no other elements than', contradictions such as 'hydrocarbons are elements…' or suggestions that hydrocarbons contain oxygen or carbon dioxide.

(g) Most candidates identified carbon dioxide as a product of the complete combustion of hydrocarbons. Few identified water as the other product. Common errors were hydrogen or carbon monoxide.

Question 5

This was the least well answered question on the paper. Some candidates gave good answers to the questions about fermentation and the structure of ethanol. Others did not know the functional group present in ethanol or suggested that ethene or methane were required for fermentation. A majority of the candidates need more practice in answering questions about the hydration of ethene and distinguishing between hydration and cracking and a comparison of the conditions required.

(a) Many candidates gained partial credit, usually for 'sugar'. The commonest error was to suggest that ethene is present in the reaction mixture.

(b) Many candidates suggested that distillation is necessary to separate ethanol from the rest of the fermentation mixture. Common errors included 'filtration' and 'crystallisation'.

(c) Many candidates gave the correct structure of ethanol. A significant number did not realise that alcohols contain the –OH group and so either just joined the carbon atom with an –H or added an O or a combination of C, H and O to the end. A few candidates realised that ethanol has an –OH group but joined the hydrogen to the carbon. Most candidates realised that 'eth–' is a suffix relating to two carbon atoms, so did not add extra carbon atoms.

(d) Most candidates recognised that octanol is in the same homologous series as ethanol. The commonest incorrect answer was ethanoic acid.

(e) Very few candidates gave answers relating to the hydration of ethene. Some referred incorrectly to the use of ethane. Many suggested using ethanol as a reactant, despite the fact that it was the required product. Most candidates referred to cracking. Many responses correctly included an idea that a high temperature is required. A large number of candidates did not respond to this question.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

Question 6

Many candidates were able to explain the sign for a reversible reaction and aspects of the production of copper (part **(b)**). Fewer candidates were able to use the equation for the conversion of anhydrous copper(II) sulfate to hydrated copper(II) sulfate to explain the test for water.

(a) (i) Most candidates gave a good explanation of the double arrow in terms of reversibility. The commonest error was to suggest that 'the reaction goes backwards' rather than 'backwards as well as forwards' or 'backwards as well'.

(ii) A few candidates gave good answers, referring to addition of water to the anhydrous copper sulfate. A majority of the candidates gave answers which were far too vague to award credit. Many referred to the hydrated copper sulfate and answered the question in terms of heating this to see if water is formed. Others ignored the copper sulfate altogether and answered in term of other chemicals, such a cobalt chloride or even litmus.

(iii) Many candidates realised that either dissolving the salt in water or melting it would result in the salt becoming conductive. Other candidates suggested adding metals or other substances which conduct electricity. A significant number of candidates suggested heating the salt. This was not credited, since the heat must be sufficient to melt the salt. A few suggested 'adding charges'.

(b) (i) Nearly all candidates gave a suitable reason for how the diagram shows that the slag is less dense than the rest of the reaction mixture.

(ii) Many candidates were able to explain how oxidation is related to the addition of oxygen to the sulfur atom. Others wrote statements which were too vague or only wrote about the copper and sulfur, leaving out any mention of oxygen.

(iii) Most candidates correctly identified the cathode and the electrolyte. Common errors were to suggest **A** (cell) or **B** (anode) as being the cathode or to suggest that the cell was the electrolyte.

Question 7

Many candidates performed well on this question, especially in parts **(a)** and **(c)**. In part **(c),** more candidates were able to write to the point and organise their answers to the question on diffusion than in previous sessions. In part **(b),** many candidates wrote vague or incorrect statements about the arrangement and motion of particles in solids and liquids.

(a) Many candidates deduced the correct melting point of **P** and the state of **P** at 160° C. The commonest errors for the melting point were to suggest 110°C or 116°C. The commonest error regarding the state was to give two states e.g. 'solid turning into liquid' or 'liquid turning into gas'.

(b) A few candidates gave good explanations of the changes in state when a solid changes to a liquid. Most did not give a change and only referred to the gaseous state. Others disadvantaged themselves by suggesting that the particles are far apart in a liquid or move quickly.

(c) A significant proportion of candidates gained full credit. Compared with previous sessions, more candidates were able to write to the point and organise their answers to this type of extended answer question. Where candidates were not awarded credit, it was often because there was no mention the word particles, molecules or atoms. Reference to crystals moving or going from high to low concentration was not sufficient to gain credit.

Question 8

In part **(a),** few candidates could explain the difference between a mixture and compound. Many wrote contradictory statements. In part **(b),** some candidates either thought that the salt was insoluble and should be separated from the water or that the holes in the clay bowl acted as a filter paper (rather than the holes in the banana leaves). A majority of the candidates answered parts **(c)** and **(d)** well.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

(a) Few candidates could explain the difference between a mixture and a compound. Many realised that the components of compounds cannot be separated by physical means but mixtures can be separated. Few candidates expressed these ideas accurately and wrote about 'compounds are mixtures which cannot be easily separated' and other such contradictory statement. Hardly any candidates mentioned constancy of composition for compounds and variable composition for mixtures.

(b) Many candidates gained credit for the idea of filtration. Fewer related the idea of the banana leaves with holes as being equivalent to the filter paper and incorrectly suggested that the filtration occurred through the holes in the pot. Others regarded the salts as being insoluble and suggested that the salt was separated from the water by the banana leaf filter and only the water filtered through into the clay pot.

(c) (i) This was almost invariably correct.

(ii) Many candidates did not read the question carefully enough and sodium chloride as an answer rather than giving the negative ion. Other common errors included carbonate ions, carbon dioxide or sodium carbonate.

(iii) Most candidates wrote the correct formula for the potassium and sulfate ions. Common errors were S^-, SO_4 (no charge) and K (no charge).

(d) This was almost invariably correct.

(e) Most candidates realised that the chlorine atoms gain electrons to form chloride ions. The commonest errors were charge, anion and protons.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

CHEMISTRY

Paper 0620/31

Extended Theory

Key Message

There were instances of candidates not awarded full credit for some parts because they had not responded to the requirements of the question. There was some evidence that candidates were not checking the paper after the required number of questions had been completed. On many scripts, contradictory comments which negated a correct response were found.

Candidates would benefit from further preparation for the organic component of this examination.

Candidates are also encouraged to practise their examination technique, with the completion of past papers.

General Comments

Candidates are reminded to write with clear legible hand writing and appropriate use of the available space.

Comments on Specific Questions

Question 1

(a) The was generally answered correctly.

(b) Most candidates answered this correctly.

(c) A common incorrect response was carbon, which is not a metal. Inert electrodes are made from platinum, gold, titanium and mercury.

(d) This was answered correctly by many candidates.

(e) The most common correct response was argon but any isoelectronic cation or anion was accepted.

(f) Most candidates correctly named an element that has the same electronic distribution as Ca^{2+}.

(g) Polonium was more popular than the correct response, tellurium. Candidates often did not count hydrogen and helium as Period 1.

Question 2

(a) A comparison of the physical properties of iron and potassium was needed. Credit was not given if chemical properties were included or there was no element of comparison.

(b) Typical errors were potassium oxide not hydroxide, zinc hydroxide not oxide and copper reacted with water.

Question 3

(a) (i) and (ii)

The majority of candidates were aware of the industrial methods of obtaining both nitrogen and hydrogen but failed to give sufficient detail. Those who could not recall the methods used, often resorted to fractional distillation as a general method. Cracking as a method of making hydrogen only gained partial credit.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

(b) (i) **C** was correctly identified by some candidates.

(ii) This extended prose question required planning to avoid contradictions, ambiguities and omissions. Candidates needed to introduce an element of structure to ensure coherence to the response.

(iii) Most candidates commented that catalysts increase the reaction rate. A good number of responses commented that the presence of a catalyst made it possible to reduce the operating temperature with a consequent increase in yield and yet have a viable rate. The idea of a decrease in activation energy was allowed on this paper, but would not be accepted on any post 16 paper.

Question 4

(a) (i) Many of the answers were too imprecise to gain credit.

(ii) The labelling F, S and O was usually correct.

(iii) The explanation had to relate to the shape of the graph, this was not always the case.

(b) The graph had to start at the origin, have an initial smaller gradient and finish with the same final mass. These sketched graphs would have benefited from being drawn with greater care.

(c) (i) Larger lumps would have smaller surface area so the collision rate would decrease as would the reaction rate.

(ii) Most candidates seemed to have a good understanding of the theory of reaction rate.

(d) The method was frequently not apparent, but a creditworthy answer which was often obtained.

Question 5

(a) (i) Candidates should rely on the definition, 'same molecular formula but different structural formula or structure' and not attempt to explain in terms of atoms. The term c*hemical formula* is meaningless and must be avoided.

(ii) Pent-2-ene was usually not given and the more demanding methylbutene was selected.

(b) (i), (ii) and (iii)
The majority of candidates could not recall the addition reactions of the alkenes and this would suggest that candidates would benefit from further preparation for the organic component of this examination.

(c) (i) Some candidates recognised the pattern given in the question.

(ii) The colour change purple/pink was quite well known.

(d) The ability to draw the structural formula of this type of polymer has improved since last November.

Question 6

(a) (i) The most common error was to state negative ions not electrons.

(ii) Some candidates could explain why lead is malleable.

(b (i) Only a minority realised that the anhydrous salt was hydrated and this is the cause of the colour change.

(ii) Only a few candidates realised that this is acid-base chemistry.

(iii) Naming these last two substances proved to be challenging.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

(c) Many candidates identified x and y, but did not go onto arrive at the correct formula.

Question 7

(a) (i) Some candidates were able to explain the phrase.

(ii) The majority were aware of the pivotal need for light in this type of reaction.

(b) This question was correctly answered by most of the candidates.

(c) A large proportion of the candidates gained credit for this question.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

CHEMISTRY

Paper 0620/32
Extended Theory

Key Message

There were instances of candidates not awarded full credit for some parts because they had not responded to the requirements of the question. There was some evidence that candidates were not checking the paper after the required number of questions had been completed. On many scripts, contradictory comments which negated a correct response were found.

Candidates would benefit from further preparation for the organic component of this examination.

Candidates are also encouraged to practise their examination technique, with the completion of past papers.

General Comments

Candidates are reminded to write with clear legible hand writing and appropriate use of the available space.

The majority of candidates had sufficient time to complete the paper, with only the weaker ones leaving the last few questions or parts of questions blank.

Candidates should be encouraged to learn the names of chemical processes and to learn definitions of terms such as 'saturated',' 'carbohydrate' etc.

Comments on Specific Questions

Question 1

Many candidates gained full credit for question 1.

Question 2

(a) (i) Many candidates found this question challenging. The commonest error was stating that two atoms must be of the same element and giving several examples. e.g. Cl_2.

(ii) and (iii)
Some responses talked about neutrons and many were vague.

(iv) The colours and states of the halogens were not well known and incorrect colours were frequently given.

(b) There were many good structures for the arsenic trifluoride molecule, with only a few ionic structures or ones with only 2 atoms. A common error, which lead to the loss of credit, was for incorrect symbols such as Ar instead of As and F*l* instead of F. On a few occasions, the fluorine atom was replaced by chlorine.

(c) Some excellent answers were seen but also some which simply repeated the stem of the question. Errors included confusion of the change in the silver atom. Many candidates said in bright light it was oxidised from AgC*l* to Ag and vice versa with lack of light.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

Question 3

Parts of **Question 3** involved understanding equilibrium and many candidates found this a difficult area.

(a) (i) Many candidates were unaware that the reference to temperature indicated that it should be used in their answers.

(ii) Many responses indicated that there were more/less moles on one side of equilibrium **2** when the equation showed the numbers were the same, so the yield is independent of pressure.

(iii) Some candidates were able to deduce why equilibrium **2** was carried out at lower temperatures.

(iv) Most candidates added water to the equation but not many were able to balancing it correctly. The huge amounts of energy needed for the electric arc process for electricity and high temperatures were stated in the question and yet were rarely used in answers. Candidates should be encouraged to read the questions more carefully.

(v) Some candidates were able to suggest a correct reason.

(b) (i) Few candidates were aware that there is a larger percentage of nitrogen in ammonium nitrate than in the sulfate and most answers stated that nitrates were needed for plant growth or were insoluble so would not dissolve in rain water.

(ii) Many candidates showed a good knowledge of photosynthesis, although several said it converted glucose to carbon dioxide and water.

Question 4

(a) Many candidates had a clear understanding of the chemistry involved in extraction of iron in the blast furnace. However, common incorrect responses were the conversion of CO_2 to CO by addition of oxygen, the reduction of iron oxides to Fe_2 and the formation of slag from silicon and calcium oxide

Some candidates wrote lengthy accounts of the process which were inaccurate and therefore gained no credit.

(b) (i) A majority were able to link increasing percentages of CO_2 to the greenhouse effect and global warming but they also included comments about acid rain and ozone layers.

(ii) Very few candidates were able to link the fact that charcoal comes from trees, which absorbed carbon dioxide for photosynthesis while they were growing and released it again when they were burnt. The most common incorrect answers were that charcoal has less carbon so forms less carbon dioxide or that it forms carbon monoxide.

(iii) This question proved to be challenging to many candidates. There was much confusion generated by the presence of the lithium carbonate and Li and C and CO etc. were all stated to be products. Most responses were in terms of Fe^{2+}, not Fe^{3+}, at the cathode and whilst the anode reaction often formed oxygen, the number of electrons were rarely correct or too many moles of oxygen were formed.

Question 5

(a) Few candidates knew what a transition element is.

(b) (i), (ii) and (iii)
This demonstrated some uncertainty of why certain practical techniques were used. Candidates were unsure about the terms residue/ filtrate and often said the precipitate was put in an oven to allow it to cool.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

(c) (i), (ii) and (iii)

The correct answer, given in terms of the mole ratio, was very rarely seen a few times. Most candidates reported that silver is less reactive, so you need more of it. The calculations were generally correctly completed and there has been a real improvement in the standard of calculations since last November.

Question 6

Candidates did not always answer with respect to the context of the question; nevertheless many were able to gain partial credit.

(a) (i) Many correct equations were seen, although a minority formed wrong products including hydrogen.

(ii) Few were aware that the compounds of the most reactive metals were the most stable and did not select rubidium as having a thermally stable hydroxide.

(b) (i) Some candidates gave a correct definition of oxidation in terms of electron transfer.

(ii) Most candidates were able to correctly define an oxidising agent but had more difficulty in their explanations as to why positive ions were oxidising agents.

(c) (i) Many candidates gave only one metal.

(ii) Some candidates were able to describe a correct experiment.

(d) (i) This was a reasonably answered question.

(ii) The majority of candidates gained credit for knowing that the solution goes colourless, even if they gave an incorrect answer in **(i)**.

Question 7

(a) (i) This question illustrated the importance of precision in formulating the explanation of terms, such as carbohydrate e.g. compounds which contain carbon, hydrogen and oxygen only. Many candidates missed the ''only'' or gave the H:O ratio the wrong way round.

(ii) While some candidates were able to give the reaction type, many gained only partial credit as both condensation and polymerisation were needed. A common incorrect response was photosynthesis.

(b) (i) A majority gained full credit.

(ii) The species in the equation were usually correct but not the balancing of this equation.

(iii) It was generally well known that a carboxylic acid rather than ethanol was produced. Equally acceptable was to avoid aerobic respiration or to ensure that the yeast respired anaerobically.

(c) The structural formula of methyl butanoate was generally well drawn, although sometimes an OH group was added at the end or the ester group was joined to the methyl group via a H atom.

(d) (i) It was not uncommon for the salt or the NaOH to be circled.

(ii) The term saturated was not well known and many of the responses were not sufficiently precise.

(iii) Many suggestions for the type of compound, included alkanes, carbohydrates, carboxylic acids and esters. The question required a type of compound rather than a specific compound.

(e) Overall, this part was quite well answered. However, a wide variety of structures were seen and many did not have an amide link.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

CHEMISTRY

Paper 0620/33
Extended Theory

Key Messages

Candidates are expected to know the meaning and to give examples of structural, empirical, displayed, molecular and general formulae. In addition, some candidates showed awareness of skeletal formulae. Candidates may have to describe what these phrases mean in words and also to recognise similarities and differences between them. The phrase chemical formula or the word formula (unqualified) is usually inadequate to make the required point concerning formulae, particularly in organic chemistry.

Many candidates incorrectly referred to the 'rusting' of aluminium, copper and zinc in various parts of the paper.

Candidates were often unsure of the lack of observations in reactions between acids and alkalis (unless an indicator is present) because the reactants and products are colourless liquids. There is no gas evolved, no colour change nor any formation of a precipitate. Thus, it is not appropriate to use neutralisation reactions to test for the presence of acidity. In addition, there was often confusion in understanding that there is no difference in the volume of a weak acid and a strong acid as far as the amount required to neutralise a given amount of a base.

If candidates use pronouns such as 'it', 'they' or 'them', this often leads to lack of clarity. For example, 'oxygen oxidises zinc as **it** is more reactive'. This does not make it clear whether the zinc or the oxygen is more reactive.

The instruction to 'write an equation' means that symbols/formulae are expected as opposed to words. Word equations need not be given in addition to symbol equations. If word equations are requested, the phrase 'word equation' will be used in the question.

Working out should be clearly shown in calculations. If the final answer is incorrect, candidates can achieve credit as long as they make it clear what they are doing. The final answer should always have units if appropriate, but units should also be shown in the working out rather than unqualified numbers.

General Comments

Candidates need to be reminded that handwriting should be legible. If candidates wish to change their answers, they should cross out all the parts that they do not want to be marked and rewrite the answer, rather than altering what they have already written which often leads to illegibility. If candidates write outside the lines or spaces provided, they should indicate within the spaces that they have done this.

Comments on Specific Questions

Question 1

(a) Large numbers of candidates answered this correctly.

(b) (i) The element was usually named (e.g. uranium) but the mass number was rarely given, therefore the isotope was unidentified. Some thought that they were restricted to choosing an isotope of zirconium, despite the phrase 'different element'. Many different elements were seen.

(ii) Most candidates gave two correct uses of radioactive isotopes.

(iii) Large numbers of candidates answered this correctly.

(iv) There were frequent suggestions that it was the formation of water that represented the danger.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

(c) The most common error was to think that neutral oxides react with both acids and alkalis, rather than with neither.

Question 2

(a) (i) Protons and electrons were often referred to instead of ions. There was no requirement to comment on bonding or forces of attraction.

(ii) Candidates found that it was a challenge to find the right words to explain their answers. Cations and anions do not always have the same numbers of positive charges and negative charges; therefore the ratio of ions in an ionic compound was not always 1:1.

(iii) Many candidates gained full credit. Malleability and ductility are more appropriate when describing the properties of metals, rather than ionic compounds.

(b) Large numbers of candidates answered this correctly. Some showed a covalent bond between the metallic element and the non-metallic element. Others showed charged atoms, rather than charged ions.

Question 3

(a) (i) Electrolysis was a very common answer. The need for both heat and air/oxygen was essential for a correct response.

(ii) Many correct equations, using many correct reducing agents, were seen.

(b) (i) This was often answered correctly. Hydrogen was sometimes seen as a product, as opposed to water.

(ii) Many candidates achieved full credit. The statement that zinc reduces (meaning that zinc acts as a reducing agent) is preferred to zinc oxidises, which could mean that zinc is oxidised (which is correct), or alternatively it could mean that zinc acts as an oxidising agent (which is incorrect). This also applies in **(d)(ii)**

(c) (i) $Zn^{2+} + 2e^- \rightarrow 2Zn$ was occasionally seen, as was $2H^+ + 2e^- \rightarrow H_2$.

Copper was occasionally seen as opposed to zinc.

(ii) This was often answered correctly, although the equation was sometimes unbalanced.

(iii) Zinc compounds were seen, as was zinc itself. The word electrolyte may have been occasionally confused with electrode.

(d) (i) It was more common for candidates to give one correct reason, rather than the required two. Strength and hardness were often mentioned, although resistance to corrosion and improved appearance were less common.

(ii) Many answers were seen that gained full credit. Movement of electrons was sometimes omitted, despite the requirements of the question.

Question 4

(a) (i) Many candidates gained full credit. There were occasional references to the involvement of alkanes in the production of sulfuric acid (this also applies to **(a)(ii)**). Vanadium oxide was often seen instead of vanadium pentoxide or vanadium(V) oxide as the catalyst. Candidates who referred to a temperature of 450°C and a catalyst of vanadium(V) oxide, did not always make it clear which of the three reactions the conditions referred to. The question states, 'Give equations' but some chose to ignore this request.

(ii) This was often answered correctly.

(b) This was often answered correctly. $C_6H_{13}(SO_3)_2Ba$ was seen occasionally.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

(c) (i) and (ii)

Sulfate and hexanesulfate (as well as the non-existent hexanesulfonic and sulfonic) were often seen in parts **(c)(i)** and **(c)(ii)**. Candidates were sometimes more inclined to give names and formulae that they were familiar with in all three parts to this question, rather than names and formulae they had to deduced from the information in the question stem.

(iii) The salt was often shown to contain the hydrogen atom that should have been replaced by a sodium atom.

(d) (i) 'Describe how you could show' means give a very brief outline of an experiment e.g. add magnesium **or** measure pH **or** add universal indicator, followed by a very brief description of the result, such as vigorous bubbling **or** pH 1 **or** turns red. Candidates often gave too much theory concerning strong acids rather than what is suggested.

(ii) Only a few candidates were aware that using different concentrations of the acids would lead to the hydrogen ion concentrations being equal because sulfuric acid is diprotic and hexanesulfonic acid is monoprotic.

(iii) Several comments were made concerning pH, reactivity, concentration and corrosiveness rather than degree of dissociation/ionisation. Strong acids are fully dissociated/ionised, as opposed to almost or nearly fully dissociated/ionised, in aqueous solution.

Question 5

(a) Large numbers of candidates answered this correctly.

(b) 'Boxes' drawn in the stem should be used in the answer (exactly as drawn in the question), rather than attempting to use symbols to represent the contents of the 'box'.

(c) (i) The majority of candidates discussed the phrase biological catalysts and gained full credit. It is preferable to describe enzymes/catalysts as being unchanged (chemically) at the end of a reaction, rather than as not taking part in a reaction.

(ii) Enzymes (especially protease) were mentioned, despite the question saying name another substance. It is advisable to give the name of a substance, rather than a formula or a generic term, if the question asks for a name. Hydrochloric acid is usually used for the hydrolysis of proteins. Those who recognised that hydrolysis suggested the involvement of water should also have known that water on its own would react too slowly.

(iii) The majority of candidates answered this correctly.

(iv) Large numbers of candidates answered this correctly. Reagents such as bromine water and biuret were sometimes seen.

(v) Many synthetic polymers were seen, including several addition polymers and polyesters as well as the word polyamide as opposed to the name of a specific synthetic polyamide.

(d) (i) Non-biodegradable is the only appropriate scientific term to answer this question.

(ii) Large numbers of candidates answered this correctly. Some were successful at drawing out the structure of C_6H_5–, although it was unnecessary to do this to achieve the mark. Some drew polymeric chains as opposed to small monomers.

Question 6

(a) (i) This was answered very well by the majority of candidates.

(ii) Candidates should have been aware that carbon dioxide and water were the products of combustion in excess oxygen of all substances containing carbon and hydrogen or carbon, hydrogen and oxygen. The equation can be balanced with or without use of a fraction. Many candidates used $8O_2$ in an attempt to balance the equation.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

(b) There was confusion between the different types of organic formulae in **(b)** and **(c)(i)**.

(c) (i) A statement that isomers have the same molecular formulae but different structural formulae is the preferred way to answer this question. Many candidates realised this. Those who tried to write complex sentences to explain what isomers were did not usually achieve credit.

(ii) When candidates draw an organic molecule which has a straight chain, they are advised to draw the carbon atoms in the straight chain horizontally. If they do otherwise, they often draw a straight chain molecule such as butan-1-ol or butan-2-ol in a manner which they think represents a branched chain isomer as opposed to the same molecule in the stem drawn differently. Many drew the primary alcohols in the stem as an answer to this question.

(d) (i) Large numbers of candidates achieved the correct answer and showed clear working out. Some candidates calculated the number of moles of glucose as 0.4, then multiplied by two to calculate the number of moles of ethanol correctly as 0.8, and then multiplied by 92 instead of 46. This meant that the factor of 2 had been used twice.

(ii) Very few candidates gave any conditions for either process. Fermentation was occasionally mentioned instead of hydration.

eduresourceza.com

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

CHEMISTRY

Paper 0620/04
Coursework

General Comments

The November entry for this component was, as usual, small.

The tasks chosen by Centres and the way in which the assessment criteria were applied was completely satisfactory.

A careful reading of the assessment criteria and the feedback given from the Moderator is recommended.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

CHEMISTRY

Paper 0620/51
Practical Test

Key messages

Burette readings should be recorded to one decimal place and it is not possible for the initial reading on the burette to be greater than the final reading.

In qualitative analysis exercises, candidates must follow the instructions given and record all observations. Candidates should be aware that the mark allocation reflects the number of valid points to be made for parts of questions.

General comments

The majority of candidates successfully attempted and completed both questions. However, a few candidates failed to follow the instructions as detailed in certain parts of the questions.

A few Centres did not submit any Supervisors' results with the candidates' scripts, while a significant minority only recorded results for Question 1 and none for Question 2. Centres are reminded that these results are used when marking to compare with the candidates' responses, particularly in Question 1.

Some Centres recorded unexpected volumes of acid in experiments 1 and 2 in **Question 1**. Centres should ensure that the Confidential Instructions are followed.

Comments on specific questions

Question 1

(a) and (b)

The tables of results were completed by all of the candidates. A minority of candidates recorded initial burette readings greater than the final burette readings. Some candidates recorded volumes to the nearest whole number only and lost credit. Burette readings should be recorded to one decimal place. There was often a wide variation in the results produced by different candidates from the same Centre. A significant number of candidates had burette readings under 10 cm^3 in experiment 2.

(c) The colour changes were usually correctly recorded, with full credit being given for colourless to pink. White, clear or transparent were common incorrect starting colours. Purple given as a final colour was ignored.

(d) Most candidates recognised that a neutralisation reaction had occurred.

(e) Partial credit was awarded for recognising that double the volume of sodium hydroxide would be required to react with 50 cm^3 of acid **K**. Full credit was given for candidates doubling their value from experiment 1 and giving the correct unit.

(f) (i) More able candidates clearly described the effect of the calcium carbonate reacting with the acid, thus reducing the volume of sodium hydroxide used. Many candidates answered in terms of what they observed, describing effervescence and the evolution of carbon dioxide.

(ii) Only the more able candidates were able to correctly calculate the difference in volume.

(iii) Many candidates answered this question incorrectly.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

(g) Only the more able candidates understood that the results would be unaffected as the concentrations and volumes of the reactants in the titrations were unchanged. Most responses answered in terms of the reaction rate increasing and consequently more or less sodium hydroxide would be used.

(h) (i) Having used a measuring cylinder in the experiments, almost all candidates were able to describe an advantage of using a pipette as being more accurate.

(ii) Only a minority of candidates were able to realise that using a polystyrene cup would have no advantages, as temperature measurement was not involved in the experiments. Most answers referred to the insulating effect of the cup which was irrelevant. A large number of responses mentioned the ease of disposal of the cups, the fact that glass containers break easily or that the contents of the polystyrene cup could not be seen.

Question 2

(a) Most candidates were able to state that the appearance of liquid **F** was colourless or yellow, although some thought it was white or clear. Incorrect references to precipitates were common.

(b) The formation of a yellow/red/brown solution, followed by the formation of layers was expected. Many orange colourations were recorded and many candidates failed to record the presence of layers and the colours of these layers. The formation of precipitates did not gain credit.

(c) A significant number of candidates recorded the formation of a white precipitate, colour changes or effervescence.

(d) This question was generally well answered, with the recognition of a yellow precipitate. Some candidates incorrectly noted the colour of the precipitate as cream or white.

(e) The formation of a brown or white precipitate was often recognised.

(f) Only the more able candidates gained full credit. Reference to effervescence and the formation of a yellow solution was often missing.

The addition of starch solution should have produced a blue/black colouration showing the formation of iodine. However, some candidates did not record this observation. Other candidates recorded the formation of a black precipitate, which was incorrect.

(g) A significant number of candidates suggested the iodine was reacting or displacing bromine. Good responses referred to the iodine dissolving in liquid **L**.

(h) Most candidates gained partial credit for referring to the organic nature of liquid **M**. Many responses mentioned immiscibility or oils which received credit. Reference to transition metal ions was ignored.

(i) Credit was given for recognition of a positive test for iodide ions in **(d).** References to bromide, chloride and halide ions were ignored.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

CHEMISTRY

Paper 0620/52
Practical Test

Key messages

Burette readings should be recorded to one decimal place and it is not possible for the initial reading on the burette to be greater than the final reading.

In qualitative analysis exercises, candidates must follow the instructions given and record all observations. Candidates should be aware that the mark allocation reflects the number of valid points to be made for parts of questions.

General comments

The majority of candidates successfully attempted and completed both questions. However, a few candidates failed to follow the instructions as detailed in certain parts of the questions.

A few Centres did not submit any Supervisors' results with the candidates' scripts, while a significant minority only recorded results for Question 1 and none for Question 2. Centres are reminded that these results are used when marking to compare with the candidates' responses, particularly in Question 1.

Some Centres recorded unexpected volumes of acid in experiments 1 and 2 in **Question 1**. Centres should ensure that the Confidential Instructions are followed.

Comments on specific questions

Question 1

(a) and (b)
The tables of results were completed by all of the candidates. A minority of candidates recorded initial burette readings greater than the final burette readings. Some candidates recorded volumes to the nearest whole number only and lost credit. Burette readings should be recorded to one decimal place. There was often a wide variation in the results produced by different candidates from the same Centre. A significant number of candidates had burette readings under 10 cm^3 in experiment 2.

(c) The colour changes were usually correctly recorded, with full credit being given for colourless to pink. White, clear or transparent were common incorrect starting colours. Purple given as a final colour was ignored.

(d) Most candidates recognised that a neutralisation reaction had occurred.

(e) Partial credit was awarded for recognising that double the volume of sodium hydroxide would be required to react with 50 cm^3 of acid **K**. Full credit was given for candidates doubling their value from experiment 1 and giving the correct unit.

(f) (i) More able candidates clearly described the effect of the calcium carbonate reacting with the acid, thus reducing the volume of sodium hydroxide used. Many candidates answered in terms of what they observed, describing effervescence and the evolution of carbon dioxide.

(ii) Only the more able candidates were able to correctly calculate the difference in volume.

(iii) Many candidates answered this question incorrectly.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

(g) Only the more able candidates understood that the results would be unaffected as the concentrations and volumes of the reactants in the titrations were unchanged. Most responses answered in terms of the reaction rate increasing and consequently more or less sodium hydroxide would be used.

(h) (i) Having used a measuring cylinder in the experiments, almost all candidates were able to describe an advantage of using a pipette as being more accurate.

(ii) Only a minority of candidates were able to realise that using a polystyrene cup would have no advantages, as temperature measurement was not involved in the experiments. Most answers referred to the insulating effect of the cup which was irrelevant. A large number of responses mentioned the ease of disposal of the cups, the fact that glass containers break easily or that the contents of the polystyrene cup could not be seen.

Question 2

(a) Most candidates were able to state that the appearance of liquid **F** was colourless or yellow, although some thought it was white or clear. Incorrect references to precipitates were common.

(b) The formation of a yellow/red/brown solution, followed by the formation of layers was expected. Many orange colourations were recorded and many candidates failed to record the presence of layers and the colours of these layers. The formation of precipitates did not gain credit.

(c) A significant number of candidates recorded the formation of a white precipitate, colour changes or effervescence.

(d) This question was generally well answered, with the recognition of a yellow precipitate. Some candidates incorrectly noted the colour of the precipitate as cream or white.

(e) The formation of a brown or white precipitate was often recognised.

(f) Only the more able candidates gained full credit. Reference to effervescence and the formation of a yellow solution was often missing.

The addition of starch solution should have produced a blue/black colouration showing the formation of iodine. However, some candidates did not record this observation. Other candidates recorded the formation of a black precipitate, which was incorrect.

(g) A significant number of candidates suggested the iodine was reacting or displacing bromine. Good responses referred to the iodine dissolving in liquid **L**.

(h) Most candidates gained partial credit for referring to the organic nature of liquid **M**. Many responses mentioned immiscibility or oils which received credit. Reference to transition metal ions was ignored.

(i) Credit was given for recognition of a positive test for iodide ions in **(d).** References to bromide, chloride and halide ions were ignored.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

CHEMISTRY

Paper 0620/53
Practical Test

Key messages

Burette readings should be recorded to one decimal place and it is not possible for the initial reading on the burette to be greater than the final reading.

In qualitative exercises, candidates must follow the instructions given and note all observations.

General comments

The majority of candidates successfully attempted and completed both questions and there was no evidence that candidates were short of time.

Supervisors' results were submitted with all of the candidates' scripts. These results were used when marking to compare with the candidates' responses, particularly in **Question 1**.

Comments on specific questions

Question 1

(a) and (b)
The tables of results were completed by all of the candidates. A minority of candidates recorded initial burette readings greater than the final burette readings. Some candidates recorded volumes to the nearest whole number only and lost credit. Burette readings should be recorded to one decimal place.

(c) Some candidates did not follow the instructions to leave the mixture to stand for five minutes. Hence, any change in colour was missed and not recorded.

(d) (i) The colour changes were usually correctly recorded.

(ii) The idea of potassium manganate(VII) being self indicating was recognised by the more able candidates. Responses that described the likelihood of indicators reacting with the contents of the flask were incorrect.

(e) (i) The majority of candidates were able to use their results to determine which titration had required the greatest volume of potassium manganate(VII) solution.

(ii) This question was well answered, with the majority of candidates realising that twice as much potassium manganate(VII) solution was used in experiment 2.

(iii) A common misunderstanding followed that solution **D** was twice as concentrated as solution **E** instead of vice verse.

(f) Most candidates realised that using half of the volume of solution **E** in experiment 2 would require only half of the volume recorded in the table in **(b).**

(g) Having used a measuring cylinder in the experiments, almost all candidates were able to describe an advantage of use as easy to use or quick and convenient. However, some responses referred to accuracy as an advantage of using a measuring cylinder, instead of a disadvantage.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

(h) Only the more able candidates gained credit, with many responses simply repeating the observations given in **(c)**.

More able candidates were capable of describing the presence of iron(II) ions and their subsequent oxidation by air/oxygen to iron(III) ions.

Question 2

Liquid **F** was aqueous potassium chromate(VI). However, the observations stated by some candidates would not have been possible given the reagents provided.

(a) Most candidates were able to state that the appearance of liquid **F** was yellow, although some thought it was green.

When testing the pH of the liquid, colours were often given without pH numbers and thus credit was lost.

The addition of sulfuric acid to the liquid changed the yellow solution to orange. When excess sodium hydroxide solution was then added to the mixture a yellow solution was expected. These observations were recorded by many candidates. However, a significant number of candidates referred to the formation of precipitates and saw no colour changes.

(b) The formation of a blue solution, followed by a glowing splint relighting, or glowing brighter, was expected. Many green colourations were recorded and a number of candidates used a lighted splint to test the gas which they recorded as 'popping'.

(c) This question was generally well answered, with the recognition of a brown or red brown precipitate. Many candidates noted the dissolving of the precipitate in excess nitric acid, but did not describe the yellow solution formed.

(d) The formation of a yellow precipitate was often recognised, but the dissolving of the precipitate in excess nitric acid was often omitted.

(e) Some candidates gained both marks for the observation of effervescence and the formation of a green solution. Other candidates failed to give any meaningful observations and just noted 'no reaction'.

(f) A significant number of candidates realised that the type of reaction in **(a)** was reversible because of the colour changes observed. Confused responses referred to acid-base reactions.

(g) The gas was generally correctly identified as oxygen

(h) More able candidates gained credit by referring to the acid-base nature of liquid **F** from the pH recorded in **(a)** and reached the correct conclusion. Only a few candidates realised that the coloured nature of the solution indicated the presence of transition metal ions.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

CHEMISTRY

Paper 0620/61
Alternative to Practical

Key message

Questions requiring candidates to plan an experimental method should be answered with details of apparatus to be used, reactants and substances involved and practical procedures clearly specified and a conclusion. Preliminary notes are advisable before writing the plan.

General comments

The majority of candidates attempted all of the questions. A full range of marks was seen.

Candidates found **Questions 1**, **3**, **4** and **6** to be the most demanding.

The majority of candidates were able to complete the tables of results from readings on diagrams and plot points successfully on a grid, as in **Question 5**.

Comments on specific questions

Question 1

(a) Most candidates gained credit for identifying the funnel. There were many references to cones, flasks and tubes, which were ignored.

(b) Many candidates got the idea of the pump extracting the gaseous products of the combustion through the apparatus. References to moving oxygen and air and reducing the pressure were not credited.

(c) (i) Credit was given for identifying limewater as liquid F and being used to test for carbon dioxide gas. Water and ethanol were common incorrect answers.

(ii) Good responses mentioned the tube being below the surface of the liquid so that the gas would pass through the liquid and not be directly sucked out by the pump. Answers such as, 'to collect liquid' and 'count bubbles' were not credited.

(d) Reference to the formation of water by condensation was only realised by a minority of candidates. Many confused responses referred to observations such as vapour, gas, smoke and fog.

Those candidates who realised that incomplete combustion could occur and that a black deposit of carbon would form, gained credit.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

Question 2

(a) Credit was given for a straight line drawn with a ruler through all points, except the point at pH 5. Many best fit straight lines were seen that included the anomalous point; these gained partial credit. A significant number did not use a ruler and the lines were not straight.

(b) The idea of a fair test or comparison was commonly given for the mark. References to accuracy and reliability were ignored.

(c) Only some candidates gained credit for this question, with time, volume of solution and pH being common incorrect responses. Temperature was only realised by more able candidates.

(d) The majority of candidates gained credit, with correct references to the lower the pH the greater percentage of corrosion or the converse. Comments on the anomalous point were not accepted.

(e) Some candidates did not extrapolate the graph. Other candidates were unable to correctly read the scale on the *y*-axis and gave answers in the range 4-6%.

Question 3

(b) Very few candidates gave burette readings to one decimal place. The initial reading for Experiment 1 was often incorrectly recorded as 25 instead of 0.0.

(b) Most candidates gained full credit, as failure to specify the readings to one decimal place was not penalised again.

(c) Responses showed that good candidates could specify the colour change from colourless to pink.

(d) A majority of candidates realised that the reaction was a neutralisation and credit was given for exothermic. Displacement, endothermic and redox were common incorrect answers.

(e) Double or twice the value in Experiment 1 and the correct unit gained full credit.

(f) (i) Only the more able candidates realised that calcium carbonate reacted or neutralised the acid so that less sodium hydroxide was used in Experiment 2. Observations such as fizzing or colour changes were ignored.

(ii) Only a few candidates gave a value from the readings.

(iii) Many candidates did not attempt this part.

(g) The majority of responses were incorrect. Good candidates realised that there would be no effect on the results as the volumes or concentrations of the reactants had not changed.

(h) (i) This part was generally well answered, by noting that the procedure would be more accurate by using a pipette. However, many candidates failed to indicate that a measuring cylinder was not accurate.

(ii) Only the more able candidates surmised that measuring and recording temperature changes was not carried out in these experiments and consequently, using a polystyrene cup would have no advantages. Many comments incorrectly focused on the fact that a glass flask would break more easily and that the colour change of the reaction mixture could not be seen through polystyrene.

Question 4

Answers to this qualitative analysis question were Centre dependent. It was evident that many candidates had no knowledge of the tests required to complete the observations in table for **(a), (c)** and **(d).** Many blank spaces were seen.

(a) The appearance of aqueous potassium iodide was expected to be colourless or yellow. Clear, red or brown were common incorrect responses, as was the presence of a precipitate.

(c) Some candidates thought that a white precipitate would be formed.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

(d) Some candidates recognised that a yellow precipitate would be formed. White precipitates were common, as well as effervescence and other colour changes.

(e) Credit was awarded for understanding that iodine had dissolved in liquid **L**. Poor use of scientific language to explain this was common and references to the iodine reacting were penalised. Vague responses such as 'because iodine was present' were ignored.

(f) Very few candidates worked out that liquid **M** was an organic solvent and immiscible with liquid **L**. References to the presence of metal cations were abundant.

Question 5

For some candidates, this question was where the majority of their marks were awarded.

(a) The table of results was frequently completed correctly. All candidates were able to record the volumes of oxygen from the syringe diagrams.

(b) Most candidates plotted the points on the grid correctly. Many graphs were not drawn with smooth lines and the points, including the anomalous point, were joined with dot to dot straight lines using a ruler; this was penalised. Some candidates plotted the points, but did not attempt to draw smooth line graphs. Some graphs were not clearly labelled.

(c) Some candidates could not deduce which result was inaccurate.

(d) The more able candidates realised that catalyst **R** was a better catalyst, because of a faster reaction. Many thought that **S** was a better catalyst, because they did not recognise the anomalous result for **R**. Others thought that both catalysts performed the same, as the final volume of oxygen was the same in both experiments.

(e) Well answered by more able candidates, with a sketch to the left of the **R** graph and levelling off at the same height. Many candidates did not attempt this part of the question.

Question 6

The quality of answers spanned the entire spectrum. Most candidates gained partial credit for mentioning weighing a packet of silica gel crystals and heating them. It was often unclear whether candidates were starting with dry crystals or those that had absorbed water.

Incorrect responses discussed adding crystals to measured volumes of water and recording the difference in volume. Methods involving heating crystals and collecting and measuring the volume of water vapour in a gas syringe were also incorrect.

Well planned answers from more able candidates gave essential experimental detail, with a clear practical method and a means of removing and measuring the amount of water present in the crystals.

Many candidates did not attempt this question.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

CHEMISTRY

Paper 0620/62
Alternative to Practical

Key messages

Candidates should use a sharp pencil for plotting points and for drawing their lines of best fit on their graphs. This allows them to correct any errors. The question might require the line of best fit to be a curve or straight line as appropriate. Straight lines should be drawn with a ruler, but rulers should not be used to join the points on a curve. Lines of best fit should avoid anomalous points.

Questions requiring candidates to plan an investigation should be answered with details of apparatus to be used, reactants/substances involved and quantitative information clearly specified. Candidates who made notes of their approach before finalising their answer generally gained more credit.

General comments

The vast majority of candidates attempted all of the questions. The full range of marks was seen. The paper discriminated successfully between candidates of different abilities but was accessible to all.

Candidates found **Question 5** to be the most demanding. **Question 6** was answered better than in previous sessions.

The majority of candidates were able to complete the tables of results from readings on diagrams and plot points successfully on a grid as in **Questions 3** and **4**.

Comments on specific questions

Question 1

(a) Credit was given for scientifically accurate answers.

(b) The arrow was frequently missing or drawn in the wrong position.

(c) The was generally well answered, with candidates recognising the idea of holding the liquid alkane. Common incorrect answers included the speeding up of the reaction by the mineral wool as it is a catalyst.

(d) Candidates who thought that the broken tile was some sort of filtering device or was to allow the alkane/alkene to travel through the tube or not to let the alkane escape did not gain credit.

(e) The test using bromine was well known. However, bromide was penalised. Some candidates used pH indicators or litmus, others tried burning methods which scored no credit.

Question 2

(a) Most candidates correctly named the process as chromatography. A few candidates thought it was a distillation.

(b) Most responses had spots in a vertical line, but it was common to have no spot on the base line or all 4 spots above the base line.

(c) The idea of the ink being soluble and spreading and interfering with the results was well understood.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

(d) This was well answered, with most responses referring to the dyes washing off or dissolving in the propanone. Some inappropriate use of terms was noticed, with answers referring to the reaction of the propanone with dyes.

Question 3

(a) and (b) The vast majority of candidates were able to read and record the masses from the balance diagrams.

(c) Few candidates recognised that the lid was raised to allow the entry of air or oxygen.

(d) Few candidates gained full credit for the idea of checking for constant mass, thus confirming the reaction as being complete. The idea of repeating to take an average or for reliability was a common misconception. Other common responses referring to reducing errors or anomalies or accuracy were awarded partial credit.

(e) Very few incorrect answers were seen.

(f) Most candidates plotted the points on the grid correctly. Many straight line graphs were not drawn with a ruler. Some lines were drawn dot to dot with a ruler, while a few candidates bent their lines to include the first point. A minority included the anomalous point.

(g) This was usually correct, although a few candidates gave an additional wrong answer or two answers.

(h) A good range of marks was seen. Most candidates extrapolated their graphs. Some then read the mass of oxygen and wrote it on the grid, instead of in the answer space provided. Few candidates realised that a calculation was required to find the mass of the calcium oxide formed.

Question 4

(c) and (e) The tables of results were completed correctly by the vast majority of candidates.

(f) This was very well answered, with many candidates gaining maximum marks. Some responses did not include an appropriate scale on the *y*-axis. A few attempts at line graphs were seen and a very small minority tried to plot all of the temperatures. The most common error was having bars touching, with labels where the bars touched.

(g) (i) This was generally correct.

(ii) Most candidates gained credit. A common error was to simply refer to magnesium being used without reference to the higher reactivity of the metal.

(h) The majority of candidates realised that the gas evolved was hydrogen.

(i) Few candidates recognised that the red-brown solid formed was copper. Rust, iron and iron(III) sulfate were common incorrect answers.

(ii) Credit was awarded for exothermic, redox or displacement reaction. A common incorrect answer was 'endothermic' or 'enothermic'.

(j) This was generally well answered and well explained, though some responses incorrectly referred to a bigger surface area resulting in a slower reaction.

(k) Some candidates thought that potassium was not used in the experiments at it would not react or that it was not a metal.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

Question 5

Some responses indicated that candidates had no knowledge of the tests required to complete the observations in the table.

(a) Many candidates lost credit for not putting both a colour and smell in the first part. Descriptions of the smell of ethanoic acid as strong, sweet or antiseptic scored no credit. A significant number of candidates incorrectly thought the colour change would be to blue, purple or colourless. A significant number also had acid colours, with alkaline pHs and vice versa.

(b) A range of marks were awarded. Many candidates omitted the effervescence/fizzing point. Pops, with no references to splints or burning splints were common. Stating hydrogen was formed gained no credit, as this is not an observation. Some candidates thought the gas was oxygen and gave the wrong tests.

(c) It was common for candidates to miss the observation and state 'carbon dioxide' or 'gas formed' instead of effervescence. The formation of a white precipitate was a common incorrect answer.

(f) Meaningful conclusions about liquid **B** were rare. A common error was to link the flame colour in **(e)** to the presence of a sodium or copper/transition metal compound. The recognition of the presence of ethanol gained full credit.

Question 6

Many candidates gained two marks for adding the catalyst to both solutions of hydrogen peroxide. A significant number of candidates did not attempt the question and left the space blank.

The best responses were well planned and gave a clear route to the solution. However, some were in a random sequence, where half way through the candidate realised that something had been missed out earlier on.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

CHEMISTRY

Paper 0620/63
Alternative to Practical

Key Messages

Candidates should use a sharp pencil for plotting points and for drawing their lines of best fit on graphs. This allows them to correct any errors. The question might require the line of best fit to be a curve or a straight line, as appropriate. Straight lines should be drawn with a ruler, but rulers should not be used to join the points on a curve. Lines of best fit should avoid anomalous points.

Candidates should understand the difference between a chemical test for the presence of water and a physical property to show the purity of water.

When the question asks for a colour change, both the initial colour and the final colour are required.

Where planning an investigation is required, candidates who make notes before starting to write their plans generally gain more credit.

General comments

The vast majority of candidates successfully attempted all of the questions.

No question proved to be more demanding than the others, all discriminated equally well.

The majority of candidates were able to complete tables of results from readings on diagrams and plot points successfully on a grid as in **Questions 3** and **4**.

Comments on specific questions

Question 1

(a) Nearly all candidates identified the stirring rod and Bunsen burner correctly.

(b) Whilst most candidates could answer this question correctly, there was some confusion between the terms solvent, solute and solution. Other candidates gave specific examples.

(c) Many candidates answered this question correctly.

(d) Most candidates realised that the water had evaporated, although a few thought that it had been filtered out.

Question 2

(a) The most common incorrect response, often concentrated on the comparative lengths of the various tubes and the use of a tap funnel, sometimes mistaken for a burette, for the delivery of the hydrochloric acid.

(b) Some candidates knew that a fume cupboard (or a well-ventilated area) should be used, although many gave it different names. Other responses concentrated on general safely precautions, such as tying hair back or wearing goggles. The use of gas masks was not credited.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

Question 3

(a) The table of results was usually completed correctly.

(b) Most points were plotted correctly, although many curves were not smooth. There were several straight lines and curves that also went through the anomalous point.

(c) Most responses not only identified the anomalous point, but also explained how they knew that it was anomalous.

(d) The extrapolation of the curve was well attempted by nearly all candidates and most gave a correct reading for the temperature.

(e) The majority of candidates gave a chemical test for water. A large minority, however, gave a physical property as a test for pure water.

Question 4

(a) Taking readings from the burettes was well attempted by nearly all candidates. However, some responses give the initial volume as "0" rather than "0.0". A few candidates did not realise that the burette scale reads downwards.

(b) This question was well answered.

(c) Most candidates realised that iron(II) was present in Solution E and that it was then oxidised to iron(III). A few candidates incorrectly thought both were present in the original solution.

(d) (i) Some candidates gave only the final answer, rather than the colour change. The most common error was giving the colour change of the potassium manganate(VII) at the end-point (purple to pink) rather than the colour change in the conical flask (colourless to pink).

(ii) There were many good reasons stated for not using an indicator.

(e) Most candidates knew that Experiment 2 used the greatest volume and that it was twice as much as Experiment 1. Some responses did not explain why this occurred and confused the strength of the acid with that of the solution. Others found it difficult to say which solution was the most concentrated. The more able candidates realised that Solution E was twice as concentrated as Solution D.

(f) The majority of candidates gave the correct answer. A few candidates realised that the volume halved, but did not give an actual volume.

(g) The advantages and disadvantages of using measuring cylinders were well known.

Question 5

(c) Most candidates realised that there would be no reaction with barium nitrate solution.

(d) The formation of a white precipitate when a chloride reacts with silver nitrate solution was given by most candidates.

(e) Whilst most candidates realised that the solution was neutral, few went on to say that it was a transition element. Other acceptable answers were iron (III), a dichromate, a chromate, or methyl orange.

(f) Both reversible and neutralisation were accepted, but the explanation also needed to refer to the information given in the question, in this case the colour changes.

(g) Nearly all candidates correctly identified oxygen.

Downloaded from eduresourceza.com

© 2013

Downloaded from eduresourceza.com

Question 6

Most methods contained the idea of fair testing. Both tablets were tested, using constant masses or volumes, using both the tablets and the acid. Some candidates gave methods that would give meaningful results, such as to titrate (or add drop by drop) the hydrochloric acid into the dissolved indigestion tablets or vice versa, in the presence of an indicator. Other methods involved the rate of neutralisation and the measurement of the final pH. Responses that involved the rate of dissolving, the rate of evolution of gases or the temperature change were less likely to give meaningful results and therefore less likely to gain full credit.

Downloaded from eduresourceza.com

© 2013