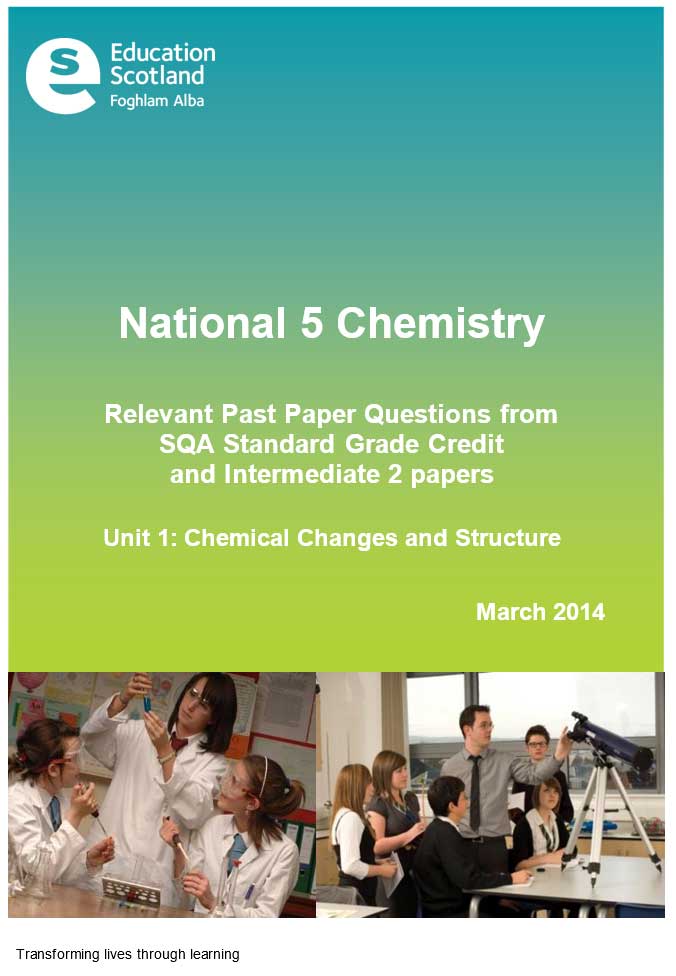
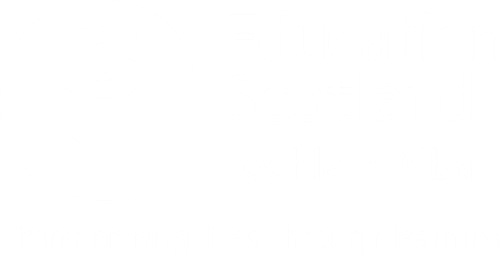
**N5 Chemistry Past Paper Questions**

**March 2014**



This resource has been produced in response to the requests from practitioners who attended the National Qualifications Sciences events at Hampden Stadium in December 2013 which Education Scotland organised in partnership with the SQA.

The questions in this resource relate to the Chemical Changes and Structure Unit for National 5 Chemistry and have been taken from the 2011, 2012 and 2013 Standard Grade and Intermediate 2 Past Papers.

For Chemical Changes and Structure (Unit 1), the mandatory course key areas are as follows:

* Rates of reaction
* Atomic structure and bonding related to properties of materials
* Formulae and reaction quantities
* Acids and bases

In cases where the questions relate to more than one of the National 5 Units, the constituent parts of the question have been separated into their respective key areas. The stem of the question has been retained to give the context of the question. If practitioners require the full integrated question, they should refer to the original past paper on the [SQA website](http://www.sqa.org.uk/pastpapers/findpastpaper.htm?subject=Chemistry&level=).

Past paper questions for the other two National 5 Units, Nature's Chemistry and Chemistry in Society, are also available from Education Scotland’s National Qualifications Glow portal: <http://www.educationscotland.gov.uk/nqcoursematerials/> (cut and paste link into your browser).

Education Scotland would like to acknowledge the support of the SQA in helping us produce this resource. We hope it proves helpful to practitioners across Scotland and assists with the implementation of the national qualifications.

**Rates of reaction**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Rates of reaction |  |
| Int 2 2012 |  |  |  | Marks |
| 2 |  |  | Rapid inflation of airbags in cars is caused by the production of nitrogen gas.  The graph gives information on the volume of gas produced over 30 microseconds. |  |
|  | (a) | (i) | Calculate the average rate of reaction between 2 and 10 microseconds.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ litres per microsecond | 1 |
|  |  | Answer |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Rates of reaction |  |
| Int 2 2012 |  |  |  | Marks |
| 11 |  |  | Egg shells are made up mainly of calcium carbonate. A pupil carried out an experiment to react egg shells with dilute hydrochloric acid. A gas was produced. |  |
|  | (c) |  | The volume of gas produced during the reaction was measured.   |  |  | | --- | --- | | Time (min) | Volume of gas (cm3) | | 0 | 0 | | 2 | 47 | | 4 | 92 | | 6 | 114 | | 8 | 118 | | 10 | 118 |   Plot these results as a line graph. | 3 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | Answer | Correct labels and units 1  Scale on X and Y axis 1  Correct plotting and joining of points 1  -1 if not at least half the graph paper  -1 if line not through origin  Max of 2 marks if bar or spike graph (labels, units and scale) or if both scales taken from the table  Allow ½ box tolerance on plotting points  Allow one plotting error  Axes can be reversed  0,0 doesn’t need to be marked on scale but line must go through origin |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Rates of reaction |  |
| Higher 2011 |  |  |  | Marks |
| 1 |  |  | Chloromethane, CH3Cl, can be produced by reacting methanol solution with dilute hydrochloric acid using a solution of zinc chloride as a catalyst. |  |
|  | (b) | (i) | The graph shows how the concentration of the hydrochloric acid changed over a period of time when the reaction was carried out at 20 °C.    Calculate the average rate, in mol l–1 min–1, in the first 400 minutes. | 1 |
|  |  | Answer | 0.0015  Units not required. (Incorrect units – ½) |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Rates of reaction |  |
| Higher 2012 |  |  |  | Marks |
| 2 |  |  | Copper (II) carbonate reacts with dilute hydrochloric acid as shown.    A student used the apparatus shown below to follow the progress of the reaction. |  |
|  | (b) |  | The experiment was carried out using 0·50 g samples of both pure and impure copper (II) carbonate. The graph below shows the results obtained. |  |
|  |  | (i) | For the sample of pure copper(II) carbonate, calculate the average reaction rate, in g s-1, over the first 10 seconds. | 1 |
|  |  | Answers | 0.017  Units not required  Deduct ½ mark for incorrect units |  |

**Atomic structure and bonding related to properties of materials**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Atomic structure and bonding related to properties of materials |  |
| Int 2  2011 |  |  |  | Marks |
| 1 |  |  | The properties of a substance depend on its type of bonding and structure.  There are four types of bonding and structure.   |  |  |  |  | | --- | --- | --- | --- | | Discrete covalent | Covalent network | Ionic lattice | Metallic lattice | |  |
|  | (a) |  | Complete the table to match up each type of bonding and structure with its properties.   |  |  | | --- | --- | | **Bonding and structure type** | **Properties** | |  | do not conduct electricity and have high melting point | |  | have high melting points and conduct electricity when liquid but not when solid | |  | conduct electricity when solid and have a wide range of melting points | |  | do not conduct electricity and have low melting points | | 4 |
|  | (b) |  | A section of a covalent network compound is shown below.    Write the formula for this covalent network compound.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | 1 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | Answers |  |  |
|  |  | (a) | 1st – covalent network (accept covalent lattice)  2nd – ionic lattice  3rd – metallic lattice  4th – discrete covalent/covalent molecular  1 mark each  Accept abbreviations if obvious |  |
|  |  | (b) | Si02  O2Si  Simplest Ratio |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Atomic structure and bonding related to properties of materials |  |
| Int 2 2011 |  |  |  | Marks |
| 2 |  |  | Information on some two-element molecules is shown in the table.   |  |  |  | | --- | --- | --- | | **Name** | **Formula** | **Shape of molecule** | | hydrogen fluoride | HF |  | | water | H2O |  | | ammonia | NH3 |  | |  |
|  | (a) |  | Complete the table to show the shape of a molecule of ammonia. | 1 |
|  | (b) |  | The hydrogen fluoride molecule can be represented as:    Showing all outer electrons, draw a similar diagram to represent a molecule of water, H2O. | 1 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | Answers |  |  |
|  |  | (a) | Use professional judgement to establish pyramidal shape  Accept symbols, colours other way around |  |
|  |  | (b) | At least one of the symbols must be shown  Mixture of dots and crosses are acceptable  All dots or crosses acceptable  Accept Lewis dot diagram  Ignore inner electrons on oxygen  Allow for 1 slip for misplaced electron (professional judgement  Accepted electron pair on line of touching circles  Non shared electrons do not need to be in pairs |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Atomic structure and bonding related to properties of materials |  |
| Int 2 2011 |  |  |  | Marks |
| 4 |  |  | Research is being carried out into making chemicals that can be used to help relieve the side effects of chemotherapy.  Part of the process is shown. |  |
|  | (a) | (ii) | Write the formula for ruthenium (II) chloride. | 1 |
|  |  | Answer | If ionic formula used it must be fully correct |  |
|  |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Atomic structure and bonding related to properties of materials |  |
| Int 2 2011 |  |  |  | Marks |
| 15 |  |  | Fizzy drinks contain acids.  These acids can attack the compound calcium hydroxyapatite which is found in tooth enamel.  The equation for the reaction is: |  |
|  | (b) |  | Fluoride prevents tooth decay by replacing the hydroxide ions of calcium hydroxyapatite with fluoride ions to form hard wearing calcium fluoroapatite.    Write the formula for calcium fluoroapatite. | 1 |
|  |  | Answer | CA10(PO4)6F2  F can be in brackets (F)2  Accept any order of symbols  Ignore charges  Use professional judgement for size of numbers in formula |  |
|  |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Atomic structure and bonding related to properties of materials |  |
| Int 2 2013 |  |  |  | Marks |
| 4 |  |  | Tritium is a naturally occurring isotope of hydrogen. It can be represented as |  |
|  | (a) |  | Complete the table to show the number of particles in an atom of tritium.   |  |  | | --- | --- | | **Type of particle** | **Number of particles** | | proton |  | | neutron |  | | electron |  | | 1 |
|  | (b) |  | Hydrogen has three isotopes.   |  |  | | --- | --- | | **Isotope of hydrogen** | **Mass number** | | protium | 1 | | deuterium | 2 | | tritium | 3 |   The relative atomic mass of hydrogen is 1.  Which isotope of hydrogen is the most abundant?  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | 1 |
|  | Answers | (a) | Proton = 1  Neutron = 2  Electron = 3  All 3 for 1 mark |  |
|  |  | (b) | Protium/  Tope one/  1 |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Atomic structure and bonding related to properties of materials |  |
| Int 2 2013 |  |  |  | Marks |
| 6 |  |  | Dishwasher tablets contain many different types of chemicals. |  |
|  | (c) |  | Phosphate ions, present in some types of dishwasher tablets, react with calcium ions in water forming calcium phosphate.  Write the formula for calcium phosphate.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | 1 |
|  |  | Answer | Ca3(PO4)2  (Ca2+)3(PO43–)2  (Ca2+)3(PO4)2  Ca3(PO43–)2 |  |
|  |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Atomic structure and bonding related to properties of materials |  |
| S Gr 2013 |  |  |  | Marks |
| 10 |  |  |  |  |
|  | (a) |  | An isotope of copper has atomic number 29 and mass number 63. |  |
|  |  | (i) | Write the nuclide notation for this isotope of copper. | 1 |
|  |  | (ii) | How many neutrons are present in this isotope of copper? | 1 |
|  | (b) |  | A sample of copper was found to contain equal amounts of two isotopes. One has mass number 63 and the other has mass number 65.  What is the relative atomic mass of this sample of copper?  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | 1 |
|  | Answers | (a) i |  |  |
|  |  | (a) ii | 34 |  |
|  |  | (b) | 64 |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Atomic structure and bonding related to properties of materials |  |
| S Gr 2013 |  |  |  | Marks |
| 11 |  |  | The table shows information about some useful compounds.   |  |  | | --- | --- | | **Compound** | **Formula** | | Y | Na3PO4 | | ammonia | NH3 | | ammonium nitrate | NH4NO3 | |  |
|  | (a) | (i) | Name compound Y.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | 1 |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  | Answer: | Sodium phosphate |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Atomic structure and bonding related to properties of materials |  |
| S Gr 2013 |  |  |  | Marks |
| 16 |  |  | Metals can be extracted from their ores by different methods. |  |
|  | (b) |  | Mercury can be extracted from the ore cinnabar, HgS. |  |
|  |  | (ii) | Write the formula for the mercury ion in cinnabar. | 1 |
|  |  | Answer | Hg2+  Hg2+S2–  Hg2+S  Ignore state symbols |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Atomic structure and bonding related to properties of materials |  |
| S Gr 2013 |  |  |  | Marks |
| 17 |  |  | Nitrogen trifluoride, NF3, is used in the manufacture of plasma screens. |  |
|  | (a) |  | Draw a diagram showing all outer electrons to represent a molecule of nitrogen trifluoride. | 1 |
|  | (b) |  | The atoms in nitrogen trifluoride are held together by covalent bonds. | 1 |
|  | Answer | (a) | Any suitable diagram showing symbols N, F and **all outer electrons** not just the shared pairs  Cross dot (with or without circles) or similar type of diagram, lobes or petals  2 non-bonding electrons need to be shown on N, but not in an overlap area  Non-bonding electrons needn’t be in pairs  N and F symbols can be missed |  |
|  |  | (b) |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Atomic structure and bonding related to properties of materials |  |
| S Gr 2012 |  |  |  | Marks |
| 13 |  |  | Hydrogen gas is made up of diatomic molecules. |  |
|  | (a) |  | Draw a diagram to show how the electrons are arranged in a molecule of hydrogen, H2. | 1 |
|  |  |  |  |  |
|  |  | Answer | Any suitable diagram showing two hydrogen atoms with two electrons in the overlapped area |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Atomic structure and bonding related to properties of materials |  |
| S Gr 2012 |  |  |  | Marks |
| 15 |  |  | Potassium hydroxide reacts with sulphuric acid to form potassium sulphate, which can be used as a fertiliser. |  |
|  | (d) |  | Ammonium phosphate is also used as a fertiliser. Write the ionic formula for ammonium phosphate. | 1 |
|  |  |  |  |  |
|  |  | Answer | (NH4+)3PO43– |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Atomic structure and bonding related to properties of materials |  |
| S Gr 2012 |  |  |  | Marks |
| 18 |  |  | A student investigated how the concentration of sodium chloride in water affected the freezing point. |  |
|  | (a) |  | What type of bond is broken in sodium chloride when it dissolves in water?  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | 1 |
|  | b) |  | The table shows information about the freezing point of different sodium chloride solutions.   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | **Concentration of sodium chloride solution (mol/l)** | 1 | 0.09 | 0.18 | 0.27 | 0.37 | 0.46 | | **Freezing point (oC)** | 0 | –0.2 | –0.5 | –0.8 | –1.1 | –1.5 |   Describe the relationship between the concentration and freezing point. | 1 |
|  | (c) |  | Predict the freezing point of a 0·55 mol/l sodium chloride solution.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ oC | 1 |
|  | Answer | (a) | Ionic  Ionic lattice  Ionic network |  |
|  |  | (b) | As concentration increases/decreases freezing point decreases/increases  The freezing point decreases/increases as concentration increases/decreases  As concentration increases freezing point gets colder |  |
|  |  | (c) | –1.8 to –2.0 inclusive |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Atomic structure and bonding related to properties of materials |  |
| S Gr 2011 |  |  |  | Marks |
| 12 |  |  | Ethanol, for alcoholic drinks, can be made from glucose. |  |
|  | (b) |  | The table below shows the relationship between the percentage of ethanol and the density of alcoholic drinks.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Percentage of ethanol (%)** | 40 | 50 | 60 | 70 | 80 | | **Density of alcoholic drink (g/cm3)** | 0.928 | 0.907 | 0.886 | 0.865 | 0.844 | |  |
|  |  | (i) | Write a general statement describing how the percentage of ethanol affects the density of the alcoholic drink. | 1 |
|  |  | (ii) | The density of a particular brand of alcoholic drink is 0·970g/cm3.  Predict the percentage of ethanol in this alcoholic drink.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_% | 1 |
|  | Answer | (b) i | As the percentage increases…the density decreases  As the percentage decreases…the density increases  Density increases as percentage decreases  Density decreases as percentage increases    etc |  |
|  |  | (b) ii | 20 |  |
|  |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Atomic structure and bonding related to properties of materials |  |
| S Gr 2011 |  |  |  | Marks |
| 16 |  |  | Heptane can be cracked as shown. |  |
|  | (b) |  | Aluminium oxide is used as a catalyst to speed up the reaction. |  |
|  |  | (ii) | Write the formula for aluminium oxide. | 1 |
|  |  | Answer | AI2O3  If ion charges are shown all must be correct  (AI3+)2(O2–)3/AI23+O32– |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Atomic structure and bonding related to properties of materials |  |
| S Gr 2011 |  |  |  | Marks |
| 18 |  |  | A student set up the following experiment to electrolyse cobalt chloride solution. |  |
|  | (c) |  | The formula for cobalt chloride is CoCl2.  What is the charge on the cobalt ion in CoCl2? | 1 |
|  |  |  |  |  |
|  |  | Answer | Two positive, 2+, CO2+ |  |

**Formulae and reaction quantities**



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Formulae and reaction quantities |  |
| Int 2 2012 |  |  |  | Marks |
| 2 |  |  | Rapid inflation of airbags in cars is caused by the production of nitrogen gas.  The graph gives information on the volume of gas produced over 30 microseconds. |  |
|  | (b) |  | In some types of airbag, electrical energy causes sodium azide, NaN3, to  decompose producing sodium metal and nitrogen gas.  Write a formula equation for this reaction. | 1 |
|  |  | Answer |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Formulae and reaction quantities |  |
| Int 2 2012 |  |  |  | Marks |
| 15 |  |  | Rust, iron (III) oxide, that forms on cars can be treated using rust remover which contains phosphoric acid.    When painted on, rust remover changes iron (III) oxide into iron (III) phosphate. |  |
|  | (a) |  | The rust remover contains 250 cm3 of 2 mol l-1 phosphoric acid. |  |
|  |  | (i) | Calculate the number of moles of phosphoric acid in the rust  remover.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_mol | 2 |
|  |  | (ii) | Using your answer in part (i), calculate the mass of iron (III) oxide  that will be removed by 250 cm3 of 2 mol l-1 phosphoric acid.  \_\_\_\_\_\_\_\_\_\_\_\_ grams | 2 |
|  | Answer | (i) | 2 x 0.25 1  = 0.5 1  0.5 no working 2 |  |
|  |  | (ii) | GFM Fe203 =160 1  Moles of Fe203 = 0.5/2 = 0.25  Or mole ratio stated 1  Fe203 :H3PO4  1: 2  Mass of Fe203 = 0.25 x 160 1  = 40 1  Or 40 on its own (4)  Allow follow through using number of moles from part (i) if show working  If atomic number used instead of mass- max 2 marks  If use ratio 1:1 80g 3 marks if show working |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Formulae and reaction quantities |  |
| Int 2 2011 |  |  |  | Marks |
| 3 |  |  | Hydrogen peroxide is a useful bleaching agent and is contained in many hair dyes. Over time, the hair dye becomes less effective as the hydrogen peroxide decomposes forming water and oxygen.  The equation for the decomposition of hydrogen peroxide is: |  |
|  | (a) |  | Balance this equation. | 1 |
|  | (d) |  | When 34g of hydrogen peroxide decomposes, 12 litres of oxygen is produced.  Calculate the volume of oxygen produced when 1·7g of hydrogen peroxide decomposes.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_litres | 1 |
|  | Answer | (a) |  |  |
|  |  | (d) | 34 g → 12 l  1∙7 g → 1.7/34 x 12 1 mark  = 0.6 1 mark  0.6 on its own – 2 marks  OR  No moles = 1.7/34 = 0.05  Vol = 0.05 x 12 1 mark  = 0.6 1 mark  OR  34/ 1.7 = 20, then 12 /20 1 mark  = 0.6 1 mark |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Formulae and reaction quantities |  |
| S Gr 2011 |  |  |  | Marks |
| 17 |  |  | Urea reacts with water, breaking down to form carbon dioxide and ammonia. |  |
|  | (b) |  | Calculate the mass of ammonia produced, in grams, when 90 g of urea breaks down.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_ grams | 2 |
|  |  |  |  |  |
|  |  | Answers |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Formulae and reaction quantities |  |
| S Gr  2011 |  |  |  | Marks |
| 20 |  |  | Metal salts can be produced by different methods. |  |
|  | (a) |  | Lead (II) iodide can be produced by reacting lead(II) nitrate solution with sodium iodide solution.  The equation for this reaction is: |  |
|  |  | (i) | Balance the above equation. | 1 |
|  | (c) |  | Potassium sulphate can be produced by titrating potassium hydroxide solution with dilute sulphuric acid. |  |
|  |  | (ii) | The average volume of sulphuric acid used in the titration is 20 cm3.  Calculate the number of moles of sulphuric acid used.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mol | 1 |
|  |  | Answers |  |  |
|  |  | (a) i |  |  |
|  |  | (c) ii |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Formulae and reaction quantities |  |
| S Gr 2012 |  |  |  | Marks |
| 15 |  |  | Potassium hydroxide reacts with sulphuric acid to form potassium sulphate, which can be used as a fertiliser. |  |
|  | (a) |  | Balance the above equation. | 1 |
|  |  |  |  |  |
|  |  | Answers |  |  |
|  |  | (a) |  |  |
|  |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Formulae and reaction quantities |  |
| S Gr 2012 |  |  |  | Marks |
| 17 |  |  | A solution of 0·1 mol/l hydrochloric acid has a pH of 1. |  |
|  | (b) |  | Calculate the number of moles of hydrochloric acid in 50cm3 of  0·1 mol/l hydrochloric acid solution. | 1 |
|  |  | Answer | n= c x v  n = 0.1 x 0.05 (1 mark)  n = 0.005 moles (1 mark)  0.005 on its own 1 mark  Deduct 1 if 50 cm3 is not in litres |  |
|  |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Formulae and reaction quantities |  |
| S Gr 2012 |  |  |  | Marks |
| 21 |  |  | Aluminium is extracted from the ore bauxite. |  |
|  | (c) |  | The composition of a 250 g magnet is shown.   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | **Metal** | Aluminium | Nickel | Cobalt | Copper | Titanium | Iron | | **% by mass** | 10 | 25 | 20 | 4 | 1 | 40 | |  |
|  |  | (i) | Calculate the mass, in grams, of aluminium in the magnet.  ­­­­­Show your working clearly.  \_\_\_\_\_\_\_\_\_\_\_ g | 1 |
|  |  | (ii) | Using your answer to (c)(i), calculate the number of moles of  aluminium in the magnet.  Show your working clearly.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_mol | 2 |
|  | Answer | (i) | 25g |  |
|  |  | (ii) |  |  |

(allow follow through from (c)(i))

(25/27 =) 1 mark 0.926/0.93 1 mark

0.926, 0.93 or 0.9 on its own (1 mark)

If atomic numbers used (1.9) maximum 1 mark

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Formulae and reaction quantities |  |
| S Gr 2013 |  |  |  | Marks |
| 17 |  |  | Nitrogen trifluoride, NF3, is used in the manufacture of plasma screens. |  |
|  | (c) |  | The equation for the formation of nitrogen trifluoride, NF3 , is:    Calculate the mass of nitrogen trifluoride produced from 7 g of nitrogen.  **Show your working clearly.**  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ g | 2 |
|  |  |  |  |  |
|  | Answers | (c) |  |  |
|  |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Formulae and reaction quantities |  |
| S Gr 2013 |  |  |  | Marks |
| 18 |  |  | A student investigated the reaction between dilute sulphuric acid and sodium carbonate. |  |
|  | (b) |  | Another experiment involved determining the concentration of sodium carbonate solution by titration.    The results showed that 20cm3 of sulphuric acid was required to neutralise the sodium carbonate solution. |  |
|  |  | (i) | Calculate the number of moles of sulphuric acid in this volume.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mol | 1 |
|  |  | Answer |  |  |
|  |  |  | (n = c x V)  n = 0∙05 x 0∙02 (1)  n = 0∙001 (1) |  |

If 20 cm3 used in place of 0∙02 (-1)

Using wrong substance i.e. 0∙025 (-1)

**Acids and bases**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Acids and bases |  |
| Int 2 2011 |  |  |  | Marks |
| 15 |  |  | Fizzy drinks contain acids.  These acids can attack the compound calcium hydroxyapatite which is found in tooth enamel.  The equation for the reaction is: |  |
|  | (a) |  | What will happen to the pH as the tooth enamel is attacked by the acids? | 1 |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Answers | (a) |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Acids and bases |  |
| Int 2 2012 |  |  |  | Marks |
| 13 |  |  | A student carried out the following experiment. |  |
|  | (b) |  | The equation for the reaction is |  |
|  |  | (i) | Rewrite the equation showing only the ions which react. | 1 |
|  |  | (ii) | What term is used to describe the ions which do not react? | 1 |
|  | Answer | (i) |  |  |
|  |  | (ii) | Spectator (ions)/spectate |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Acids and bases |  |
| S Gr 2011 |  |  |  | Marks |
| 14 |  |  |  |  |
|  | (a) |  | When sulphur dioxide dissolves in water in the atmosphere “acid rain” is produced. |  |
|  |  |  |  | 1 |
|  |  | Answer: | a higher |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Acids and bases |  |
| S Gr 2011 |  |  |  | Marks |
| 20 |  |  | Metal salts can be produced by different methods. |  |
|  | (b) |  | The salt copper (II) nitrate can be produced as shown. |  |
|  |  |  | Name substance X. | 1 |
|  | Answer |  | Copper carbonate CuCO3 |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Acids and bases |  |
| S Gr 2012 |  |  |  | Marks |
| 15 |  |  | Potassium hydroxide reacts with sulphuric acid to form potassium sulphate, which can be used as a fertiliser. |  |
|  | (b) |  | Name the type of chemical reaction taking place. | 1 |
|  |  |  |  |  |
|  |  | Answer: | neutralisation |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Chemical changes and structure |  |
|  |  |  | Acids and bases |  |
| S Gr 2012 |  |  |  | Marks |
| 17 |  |  | A solution of 0·1 mol/l hydrochloric acid has a pH of 1. |  |
|  | (a) | (i) | What colour would universal indicator turn when added to a solution of hydrochloric acid? | 1 |
|  |  | (ii) | Starting at pH 1, draw a line to show how the pH of this acid changes when diluted with water. | 1 |
|  | Answer | (i) | Red, pink, orange, yellow |  |
|  |  | (ii) |  |  |