National 5 Chemistry

Identified Past Paper Questions from SQA Credit and Intermediate 2 papers

Unit 1: Chemical Changes and Structure

March 2014

Transforming lives through learning

Chemistry N5 Past Paper Questions

These questions have been taken from the 2013, 2012 and 2011 Standard Grade and Intermediate 2 Past Papers.

The questions are divided into 3 sections.

1. Unit 1 - Chemical Changes and Structure

2. Unit 2 - Nature's Chemistry

3. Unit 3 - Chemistry in Society

Although a lot of the questions are integrated across the units, questions have been separated into sub-sections defined by key area. The stem of the question has been retained to give the context of the question. If practitioners require the full integrated question, they can refer to the original past paper on the SQA website.

Unit 1 - Chemical Changes and Structure

Mandatory Course key areas:

Rates of reaction

Atomic structure and bonding related to properties of materials

Formulae and reaction quantities

Acids and bases

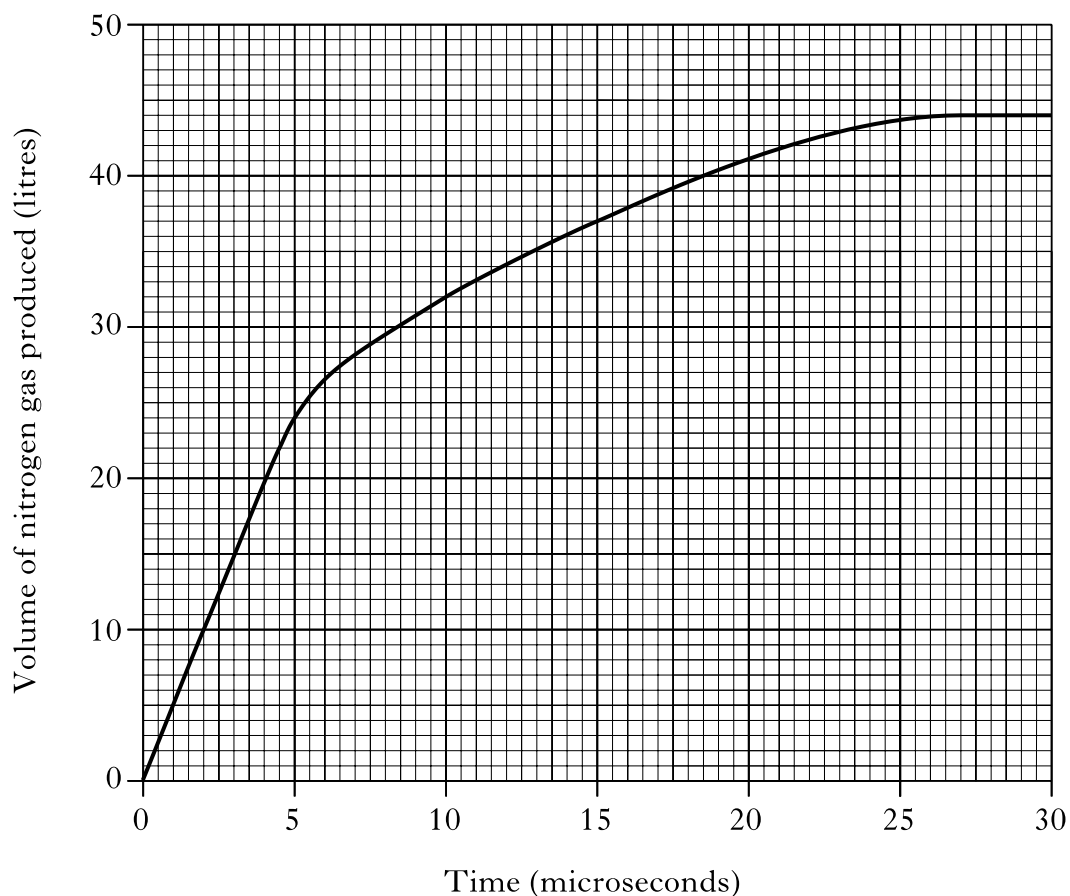## Rates of Reaction

Chemical changes and structure
Rates of reaction

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.   1

_____ litres per microsecond

Answer $\dfrac{32 - 10}{8}$

= 2.75 (2.8, 3 must have working)

or 2.75 on its own

Int 2   Marks
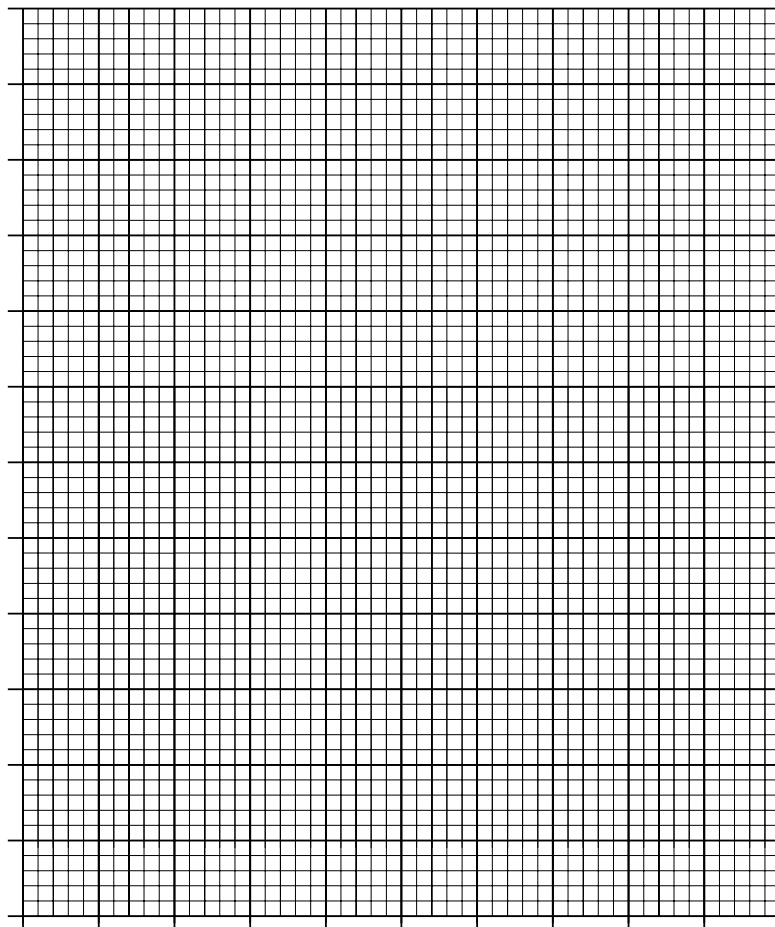2012
11   Egg shells are made up mainly of calcium carbonate. A pupil carried out an experiment
            to react egg shells with dilute hydrochloric acid. A gas was produced.
   (c)   The volume of gas produced during the reaction was measured.   2

Time (min)	Volume of gas (cm^3)
0	0
2	47
4	92
6	114
8	118
10	118

Plot these results as a line graph.

Answer

Correct labels and units   ½
Scale on X and Y axis   ½
Correct plotting of points   ½
Joining of points (by ruler allowed)   ½

- ½ if not used at least half the graph paper
- ½ if line not through origin

Max of 1 mark if bar graph or spike graph (labels, units and scale) or if both scales taken from table

Allow ½ box tolerance on plotting of points
Allow 1 plotting error

Axes can be reversed
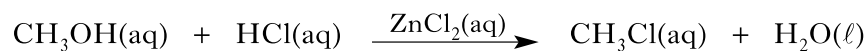0,0 does not need to be marked on scale but line must go through the origin

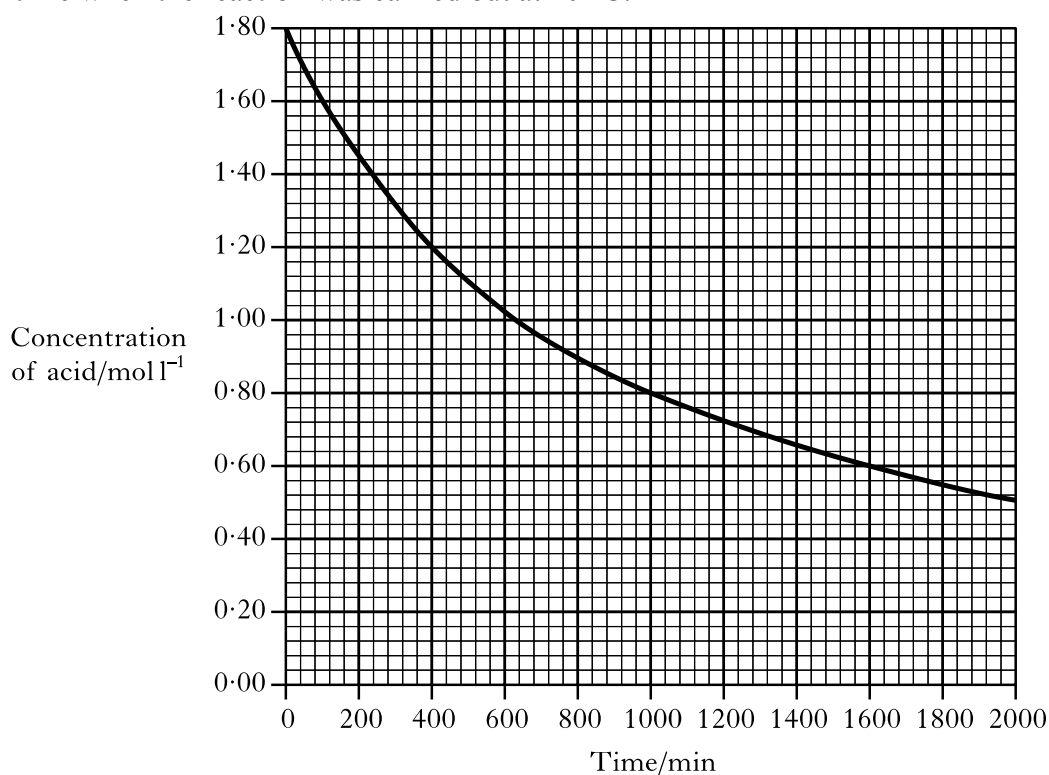Higher   Marks
2011
1   Chloromethane, CH3Cl, can be produced by reacting methanol solution with dilute
           hydrochloric acid using a solution of zinc chloride as a catalyst.

$$CH_3OH(aq) \ + \ HCl(aq) \ \xrightarrow{\quad ZnCl_2(aq) \quad} \ CH_3Cl(aq) \ + \ H_2O(\ell)$$

(b)   (i)   The graph shows how the concentration of the hydrochloric acid changed over a period   1
             of time when the reaction was carried out at 20 °C.

Concentration of acid/mol l^{-1}

Time/min

           Calculate the average rate, in mol l–1 min–1, in the first 400 minutes.

Answer   **(b)   (i)**   Answer 0·0015   **1**

                   Units not required. (Incorrect units -½)

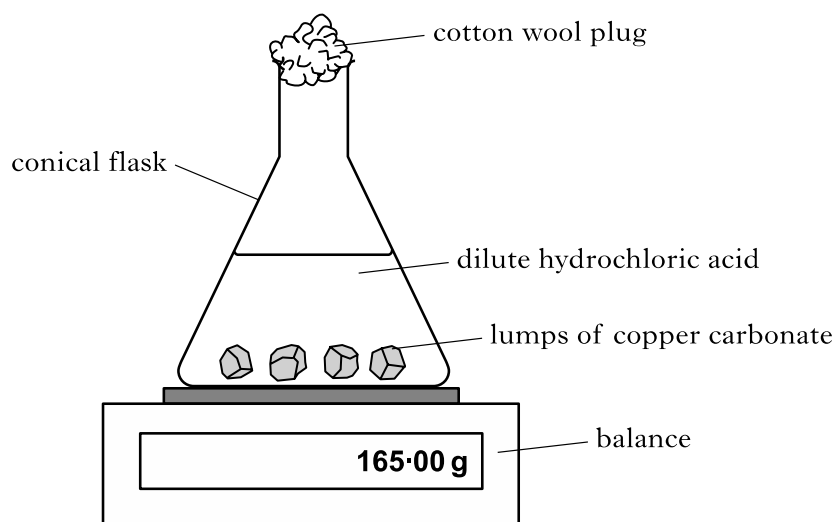Higher   Marks
2012
2   Copper(II) carbonate reacts with dilute hydrochloric acid as shown.

$$CuCO_3(s) + 2HCl(aq) \rightarrow CuCl_2(aq) + H_2O(\ell) + CO_2(g)$$
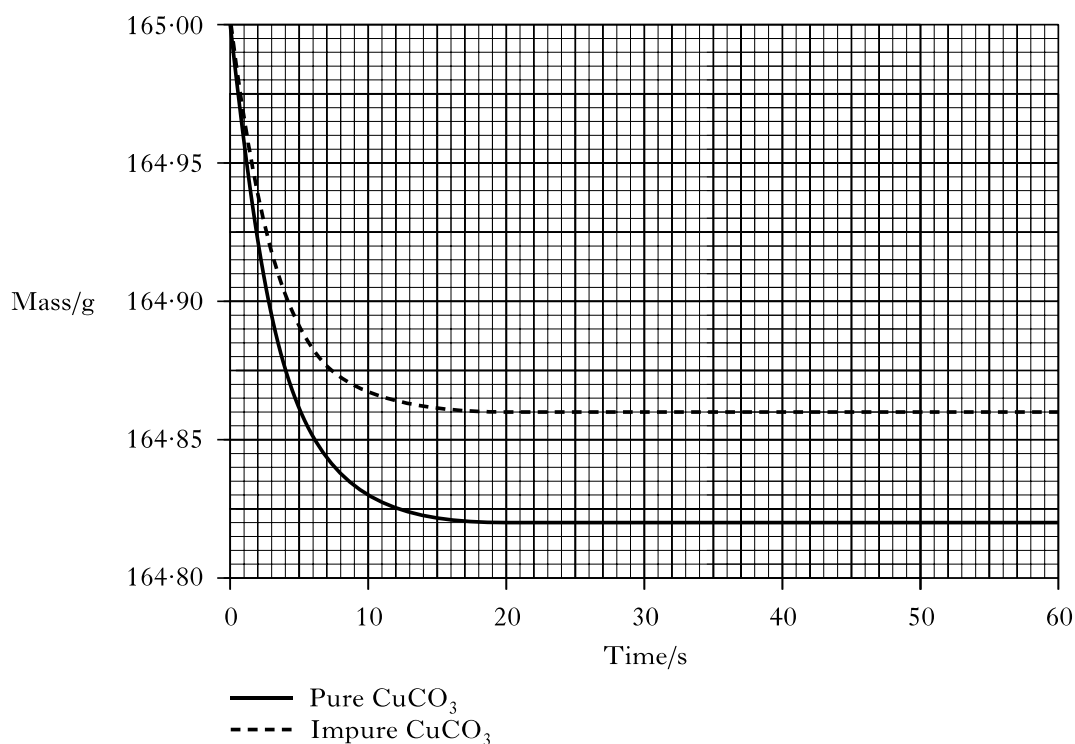
A student used the apparatus shown below to follow the progress of the reaction.

(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.

Answers **(i)** 0.017   1 mark
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
1

Marks

The properties of a substance depend on its type of bonding and structure.

There are four types of bonding and structure.

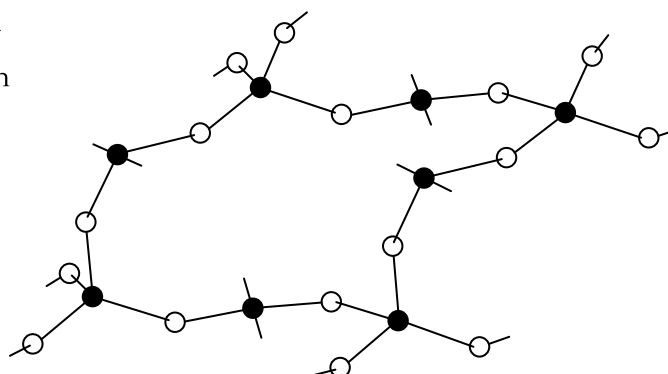| Discrete covalent molecular	Covalent network	Ionic lattice	Metallic lattice

(a) Complete the table to match up each type of bonding and structure with its properties.   2

Bonding and structure type	Properties
	do not conduct electricity and have high melting points
	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

(b) A section of a covalent network compound is shown below.   1

● = silicon

○ = oxygen

Write the formula for this covalent network compound.

_____

Answers

(a) 1st – covalent network (accept covalent lattice)

2nd – ionic lattice

3rd – metallic lattice

4th – discrete covalent/covalent molecular

½ mark each
accept abbreviations if obvious

(b) SiO_2
O_2Si
Simplest ratio

Int 2

Marks

2011

2   Information on some two-element molecules is shown in the table.

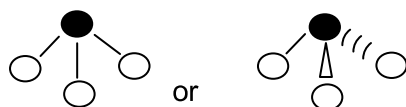| Name	Formula	Shape of molecule
hydrogen fluoride	HF	
water	H_2O	
ammonia	NH_3	

(a)   Complete the table to show the shape of a molecule of ammonia.   1

(b)   The hydrogen fluoride molecule can be represented as: 1
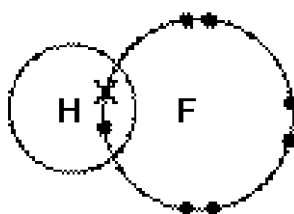
Showing all outer electrons, draw a similar diagram to represent a molecule of water, H_2O.

Answers

(a)

Use professional judgement to establish pyramidal shape

Accept symbols, colours other way around

(b)
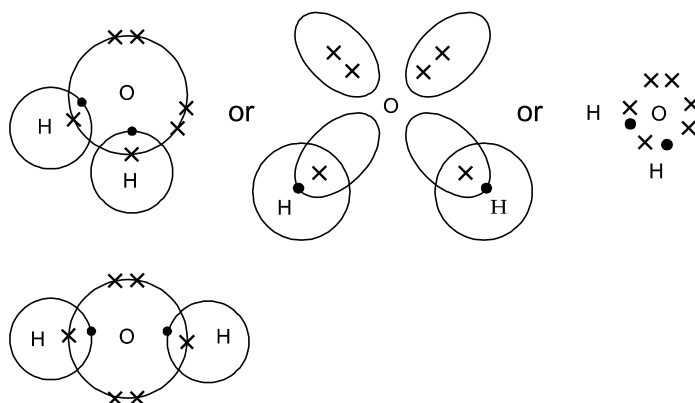
At least one of the symbols must be shown
Mixture of dots and crosses are acceptable
All dots or crosses acceptable
Accept Lewis dot diagram
Ignore inner electrons on oxygen
Allow for 1 slip for misplaced electron (professional judgement)
Accept electron pair on line of touching circles
Non shared electrons do not need to be in pairs

Int 2   Marks
2011
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.

             chemical **A** + hydrogen $\xrightarrow{\text{catalyst}}$ chemical **B**

(a)   (ii)   Write the formula for ruthenium(II) chloride.   1

      Answer $RuCl_2$ $Ru^{2+}(Cl^-)_2$ Cl_2Ru Ru_1Cl_2

             If ionic formula used it must be fully correct

Chemical changes and structure
Atomic structure and bonding related to properties of materials
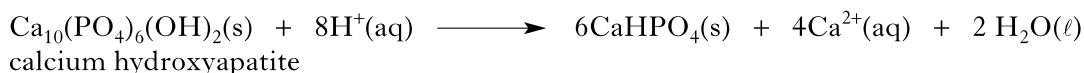
Marks

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:

$$Ca_{10}(PO_4)_6(OH)_2(s) \ + \ 8H^+(aq) \ \longrightarrow \ 6CaHPO_4(s) \ + \ 4Ca^{2+}(aq) \ + \ 2\,H_2O(\ell)$$
calcium hydroxyapatite

(b)   Fluoride prevents tooth decay by replacing the hydroxide ions of calcium hydroxyapatite with fluoride ions to form hard wearing calcium fluoroapatite.   1

calcium hydroxyapatite $\xrightarrow{\text{fluoride ions}}$ calcium fluoroapatite
$Ca_{10}(PO_4)_6(OH)_2$
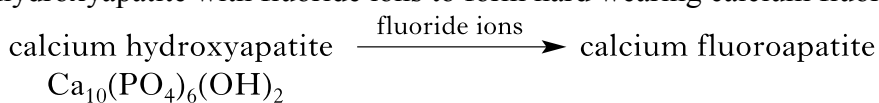
Write the formula for calcium fluoroapatite.

Answer $Ca_{10}(PO_4)_6F_2$
F can be in brackets(F)$_2$
Accept any order of symbols
Ignore charges
Use professional judgment for size of numbers in
formula

Chemical changes and structure
Atomic structure and bonding related to properties of materials

Marks

Tritium is a naturally occurring isotope of hydrogen. It can be represented as

$$^{3}_{1}H$$

(a)   Complete the table to show the number of particles in an atom of tritium.   1

Type of particle	Number of particles
proton	
neutron	
electron	

(b)   Hydrogen has three isotopes.   1

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?

_____

Answers   (a)   Proton = 1
Neutron = 2
Electron = 1

All 3 for 1 mark

(b)   Protium/
Top one/
1

Int 2   Marks
2013
6   Dishwasher tablets contain many different types of chemicals.

(c)   Phosphate ions, present in some types of dishwasher tablets, react with calcium ions in   1
                   water forming calcium phosphate.
                   Write the formula for calcium phosphate.
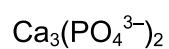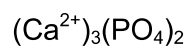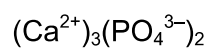
        Answer $Ca_3(PO_4)_2$

                   $(Ca^{2+})_3(PO_4^{3-})_2$

                   $(Ca^{2+})_3(PO_4)_2$

                   $Ca_3(PO_4^{3-})_2$

S Gr
2013
10

Marks

The nuclide notation for an isotope of hydrogen is $_1^1\text{H}$.

(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   1
mass number 63 and the other has mass number 65.

What is the relative atomic mass of this sample of copper?

_____

Answers   (a) i $_{29}^{63}\text{Cu}$

(a) ii   34

(b)   64

Chemical changes and structure
Atomic structure and bonding related to properties of materials

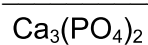11   The table shows information about some useful compounds.

Compound	Formula
Y	Na_3PO_4
ammonia	NH_3
ammonium nitrate	NH_4NO_3

(a)   (i)   Name compound Y.   1

_____

Answer   Sodium phosphate

S Gr   Marks
2013
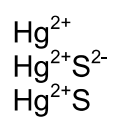16   Metals can be extracted from their ores by different methods.
    (b)   Mercury can be extracted from the ore cinnabar, HgS.
        (ii)   Write the formula for the mercury ion in cinnabar.   1

            Answer
                    Hg^{2+}
                    $Hg^{2+}S^{2-}$
                    $Hg^{2+}S$

                    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

Circle the correct words to complete the sentence.

A covalent bond forms when two $\begin{Bmatrix} \text{positive} \\ \text{negative} \\ \text{neutral} \end{Bmatrix}$ nuclei are held together by their common attraction for a shared pair of $\begin{Bmatrix} \text{protons} \\ \text{neutrons} \\ \text{electrons} \end{Bmatrix}$.

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)   (positive)   (electrons)

Chemical changes and structure
Atomic structure and bonding related to properties of materials

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, H_2.   1

        Answer   Any suitable diagram showing two hydrogen atoms
                  with two electrons in the overlapped area

                  H ˣₓ H   H °₀ H

S Gr
2012
15

Marks

Potassium hydroxide reacts with sulphuric acid to form potassium sulphate, which can be used as a fertiliser.

$$KOH(aq) \quad + \quad H_2SO_4(aq) \longrightarrow \quad K_2SO_4(aq) \quad + \quad H_2O(\ell)$$

(d)   Ammonium phosphate is also used as a fertiliser. Write the ionic formula for ammonium phosphate.

1

Answer $(NH_4^+)_3PO_4^{3-}$
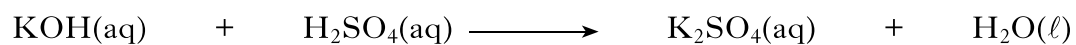
Chemical changes and structure
Atomic structure and bonding related to properties of materials

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   1
          solutions.

Concentration of sodium chloride solution (mol/l)	0	0·09	0·18	0·27	0·37	0·46
Freezing point (°C)	0	−0·2	−0·5	−0·8	−1·1	−1·5

          Describe the relationship between the concentration and freezing point.

(c)   Predict the freezing point of a 0·55 mol/l sodium chloride solution.   1

                                              _____ °C

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

S Gr   Marks
2011
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/cm^3)	0·928	0·907	0·886	0·865	0·844

(i)   Write a general statement describing how the percentage of ethanol affects the density   1
        of the alcoholic drink.
(ii)   The density of a particular brand of alcoholic drink is 0·970g/cm^3.   1
        Predict the percentage of ethanol in this alcoholic drink.

                              _____%
Answer   (b) i   As the percentage increases…the density decreases

                  As the percentage decreases…the density increases

                  Density increases as percentage decreases

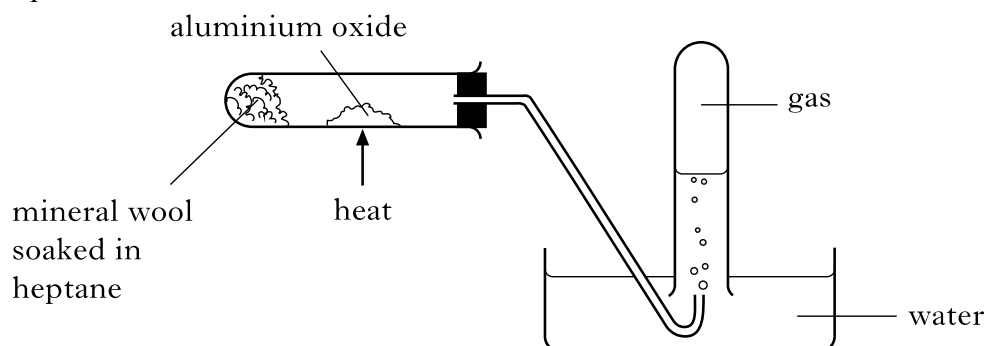   Density decreases as percentage increases

                  etc

(b) ii   20

S Gr
2011
16

Marks

Heptane can be cracked as shown.

One of the reactions which takes place is:

$$C_7H_{16} \longrightarrow C_4H_{10} + C_3H_6$$
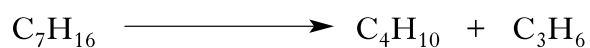
(b)   Aluminium oxide is used as a catalyst to speed up the reaction.

(ii)   Write the formula for aluminium oxide.   1

Answer Al_2O_3

If ion charges are shown all must be correct

$(Al^{3+})_2 (O^{2-})_3$ / $Al_2^{3+} O_3^{2-}$

S Gr   Marks
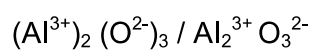2011
18   A student set up the following experiment to electrolyse cobalt chloride solution.

power supply

electrodes   +   –

cobalt chloride
solution
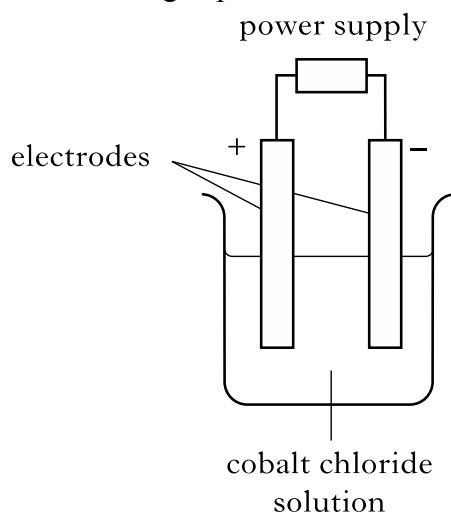
(c)   The formula for cobalt chloride is $CoCl_2$.   1

What is the charge on the cobalt ion in $CoCl_2$?

Answer   Two positive, 2+, Co^{2+}

Formulae and reaction quantities

Chemical changes and structure
Formulae and reaction quantities

Marks

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.

Time (microseconds)
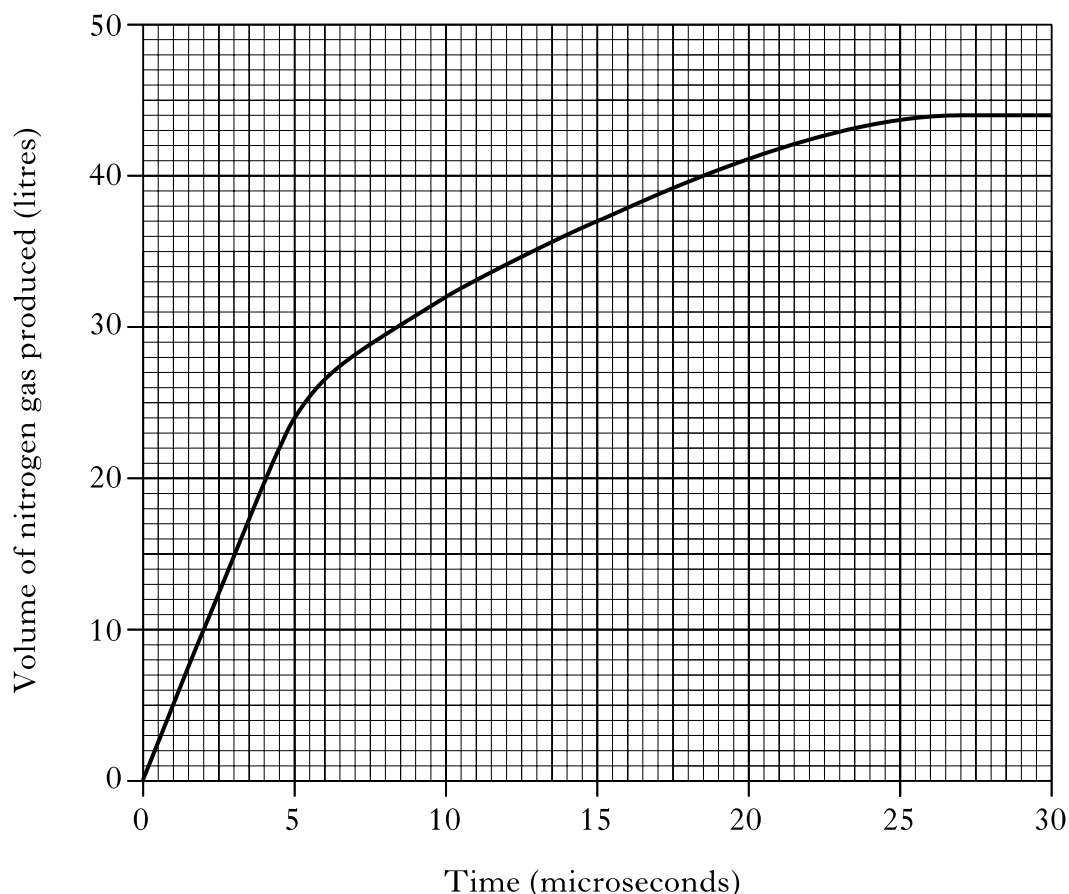
(b)   In some types of airbag, electrical energy causes sodium azide, NaN3, to   1
decompose producing sodium metal and nitrogen gas.

Write a formula equation for this reaction.

Answer $NaN_3 \longrightarrow Na + N_2$

Ignore state symbols and attempts

to balance.

Allow electricity over the arrow.

Chemical changes and structure
Formulae and reaction quantities

Marks

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.

$$Fe_2O_3 \;+\; 2H_3PO_4 \longrightarrow 2FePO_4 \;+\; 3H_2O$$
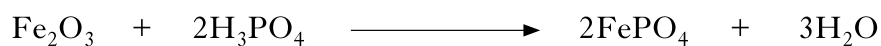
(a) The rust remover contains 250 cm^3 of 2 mol l^{-1} phosphoric acid.

(i) Calculate the number of moles of phosphoric acid in the rust remover.   1

_____mol

(ii) Using your answer in part (i), calculate the mass of iron(III) oxide that will be removed by 250 cm^3 of 2 mol l^{-1} phosphoric acid.   2

_____ grams

Answer (i)   2 x 0.25   ½
              = 0.5   ½

         0.5 no working   1

(ii)   GFM Fe_2O_3 = 160   ½

Moles of Fe_2O_3 = $\frac{0.5}{2}$ = 0.25

or mole ratio stated   ½
Fe_2O_3 : H_3PO_4
   1 : 2

Mass of Fe_2O_3 = 0.25 X 160   ½
          = 40   ½

Or 40 on its own (2)

Allow follow through using number of moles from
part (i) if show working
If atomic number is used instead of mass – max 1
mark

If use ratio 1:1 80g 1 ½ if show working

Chemical changes and structure
Formulae and reaction quantities

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:

$$H_2O_2(aq) \longrightarrow O_2(g) + H_2O(\ell)$$

(a)   Balance this equation.   1

(d)   When 34g of hydrogen peroxide decomposes, 12 litres of oxygen is produced.   1

Calculate the volume of oxygen produced when 1·7g of hydrogen peroxide decomposes.

_____litres

Answer   (a) $2H_2O_2(aq) \rightarrow O_2(g) + 2H_2O(\ell)$

or any multiple
ignore state symbols in transcription

(d)   34 g → 12 l
1·7 g → 1·7/34 × 12   ½ mark

        = 0·6   ½ mark

0·6 on own – 1 mark

OR

No moles   = 1·7/34 = 0·05
     Vol   = 0·05 x 12   ½ mark
          = 0·6   ½ mark

OR

34/1·7   = 20, then 12/20   ½ mark
       = 0·6   ½ mark

S Gr   Marks
2011
17   Urea reacts with water, breaking down to form carbon dioxide and ammonia.

$$H_2NCONH_2 \quad + \quad H_2O \longrightarrow CO_2 \quad + \quad 2NH_3$$
urea
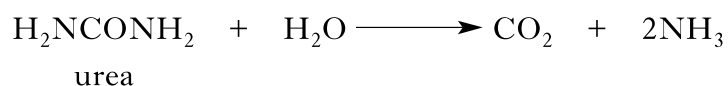
(b)   Calculate the mass of ammonia produced, in grams, when 90 g of urea breaks down.   2

_____ grams

Answers   1 mol   2 mol (½ mark)

              60   34 (½ mark)

              90          $\dfrac{90 \times 34}{60}$ =   51 (1 mark)

51 on its own = 2 marks

$\dfrac{90}{60}$ = 1·5 mol   (½ mark)

1 mol ⟶ 2 mol   (½ mark)
1·5 mol⟶ 3 mol   (½ mark)

Mass   = 3 × 17 = 51   (½ mark)

Use of atomic numbers max 1 mark – Must have
working

Deduct (½) mark for arithmetic error

Also accept 50·4, 50·9, 51·3 on its own = 2 marks

Chemical changes and structure
Formulae and reaction quantities

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:

$$Pb(NO_3)_2(aq) \; + \; NaI(aq) \longrightarrow \; PbI_2(s) \; + \; NaNO_3(aq)$$

(i)   Balance the above equation.   1

(c)   Potassium sulphate can be produced by titrating potassium hydroxide solution with dilute sulphuric acid.

burette containing
0·1 mol/l sulphuric acid

conical flask

10 cm³ potassium hydroxide
solution
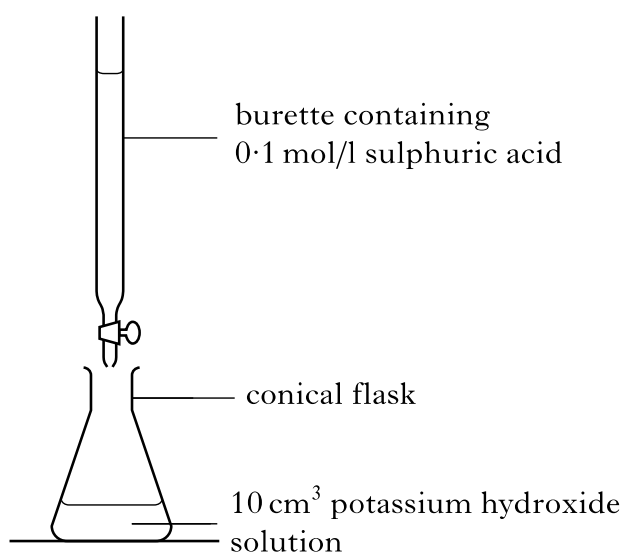
(ii)   The average volume of sulphuric acid used in the titration is 20 cm³.   1

Calculate the number of moles of sulphuric acid used.

_____ mol

Answers

(a) i $Pb(NO_3)_2(aq) + 2NaI(aq) \longrightarrow PbI_2(s) + 2NaNO_3(aq)$

Or correct multiples

(c) ii   Moles n = c × v   (½ mark)

= 0·1 × 0·02 moles (if 20 used max ½ mark)

= 0·002 moles   (½ mark)

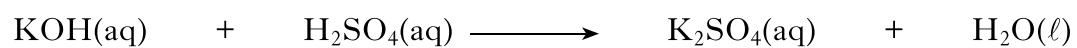0·002 on its own   1 mark

S Gr   Marks
2012
15   Potassium hydroxide reacts with sulphuric acid to form potassium sulphate, which can
            be used as a fertiliser.

            $KOH(aq)$ + $H_2SO_4(aq)$ $\longrightarrow$ $K_2SO_4(aq)$ + $H_2O(\ell)$

    (a)   Balance the above equation.   1

        Answers
        (a) $2KOH + H_2SO_4 \longrightarrow K_2SO_4 + 2H_2O$

            Or correct multiples

Chemical changes and structure
Formulae and reaction quantities

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 50cm^3 of   1
             0·1 mol/l hydrochloric acid solution.

Answer $n = c \times v$

             $n = 0.1 \times 0.05$ (½)

             $n = 0.005$ moles   (½)

             0.005 on its own 1 mark

             Deduct ½ if 50cm^3 not in litres (0.05)

Chemical changes and structure
Formulae and reaction quantities

S Gr   Marks
2012
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.   1
        Show your working clearly.

        _____ g

(ii)   Using your answer to (c)(i), calculate the number of moles of   1
        aluminium in the magnet.

        Show your working clearly.

        _____ mol

Answer (i)   25g
        (ii)   (allow follow through from (c)(i))

                (25/27 =) ½ 0.926 / 0.93 ½

                0.926, 0.93 or 0.9 on its own (1 mark)
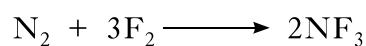
                if atomic numbers used (1.9) maximum ½ mark

S Gr
Marks
2013
17   Nitrogen trifluoride, NF3, is used in the manufacture of plasma screens.
(c)   The equation for the formation of nitrogen trifluoride, NF3 , is: 2

$$N_2 \ + \ 3F_2 \longrightarrow \ 2NF_3$$

Calculate the mass of nitrogen trifluoride produced from 7 g of nitrogen.

Show your working clearly.

_____ g

Answers   (c)

1 mole N_2 = 28 g

7/28 = 0·25 moles (½)

0·25 to 0·5 (1 mole to 2 moles) (½)

1 mole NF_3 = 71 g (½ for **both** formula masses)

71   x 0·5 = <u>35·5</u> (½)

35·5 on its own 2 marks

1   :   2 (½)
28   :   142 (½)

1 $\longrightarrow$ 142/28   (½)

7 $\longrightarrow$ 142 x 7/28 = <u>35·5</u> (½)

or any other acceptable method

S Gr   Marks
2013
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.

                  0·05 mol/l sulphuric acid

                  25·0 cm^3 sodium carbonate solution
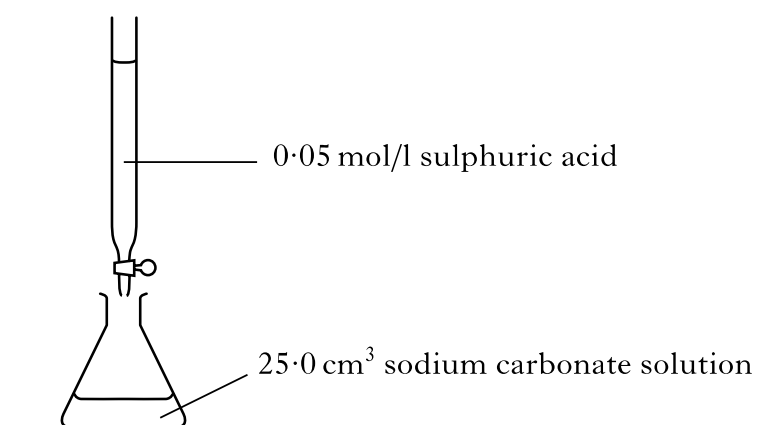
                  The results showed that 20cm^3 of sulphuric acid was required to neutralise the sodium
                  carbonate solution.
(i)   Calculate the number of moles of sulphuric acid in this volume.   1

                  _____ mol
Answer   (n = c x V)

                  n = 0·05 x 0·02 (½)

                  n = 0·001 (½)

                  If 20 cm^3 used in place of 0·02   (-½)
                  Using wrong substance i.e. 0·025 (-½)
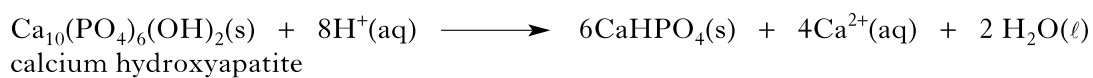
Acids and bases

Chemical changes and structure

Acids and bases

Marks

Fizzy drinks contain acids.

These acids can attack the compound calcium hydroxyapatite which is found in tooth enamel.

The equation for the reaction is:

$$Ca_{10}(PO_4)_6(OH)_2(s) + 8H^+(aq) \longrightarrow 6CaHPO_4(s) + 4Ca^{2+}(aq) + 2 H_2O(\ell)$$
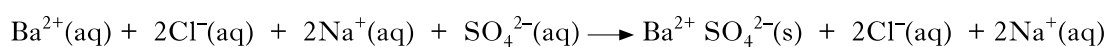calcium hydroxyapatite

(a)   What will happen to the pH as the tooth enamel is attacked by the acids?   1

Answers   (a)   (pH) will rise towards 7/
(pH) will rise/
(pH) becomes less acidic/
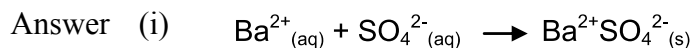increases/
becomes neutral

Marks

13   A student carried out the following experiment.

(b)   The equation for the reaction is

$Ba^{2+}(aq) + 2Cl^-(aq) + 2Na^+(aq) + SO_4{}^{2-}(aq) \longrightarrow Ba^{2+}SO_4{}^{2-}(s) + 2Cl^-(aq) + 2Na^+(aq)$
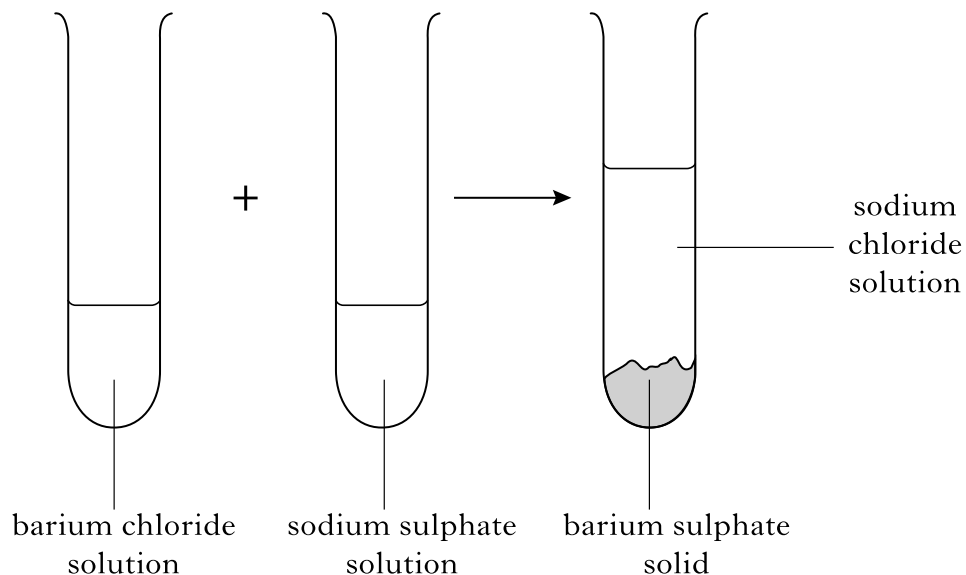
(i)   Rewrite the equation showing only the ions which react.   1
(ii)   What term is used to describe the ions which do not react?   1

Answer (i) $Ba^{2+}{}_{(aq)} + SO_4{}^{2-}{}_{(aq)} \longrightarrow Ba^{2+}SO_4{}^{2-}{}_{(s)}$

State symbols not required

(ii)   Spectator (ions)/spectate

S Gr   Marks
2011
14

(a)   When sulphur dioxide dissolves in water in the atmosphere "acid rain" is produced.

           Circle the correct phrase to complete the sentence.   1

           Compared with pure water, acid rain contains $\begin{cases} \text{a higher} \\ \text{a lower} \\ \text{the same} \end{cases}$ concentration of hydrogen ions.

           Answer   a higher

S Gr   Marks
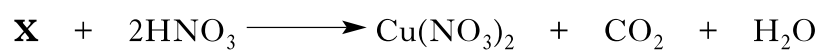2011
20   Metal salts can be produced by different methods.
　　(b)   The salt copper(II) nitrate can be produced as shown.

　　　　　　　　X + $2HNO_3$ ⟶ $Cu(NO_3)_2$ + CO_2 + H_2O 1

                            Name substance X.
　　Answer   Copper carbonate $CuCO_3$

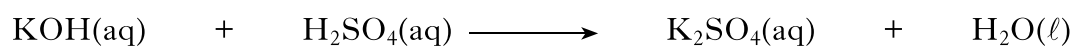S Gr   Marks
2012
15   Potassium hydroxide reacts with sulphuric acid to form potassium sulphate, which can
                      be used as a fertiliser.

    $KOH(aq)$ $+$ $H_2SO_4(aq)$ $\longrightarrow$ $K_2SO_4(aq)$ $+$ $H_2O(\ell)$

(b)   Name the type of chemical reaction taking place.   1

      Answer   neutralisation
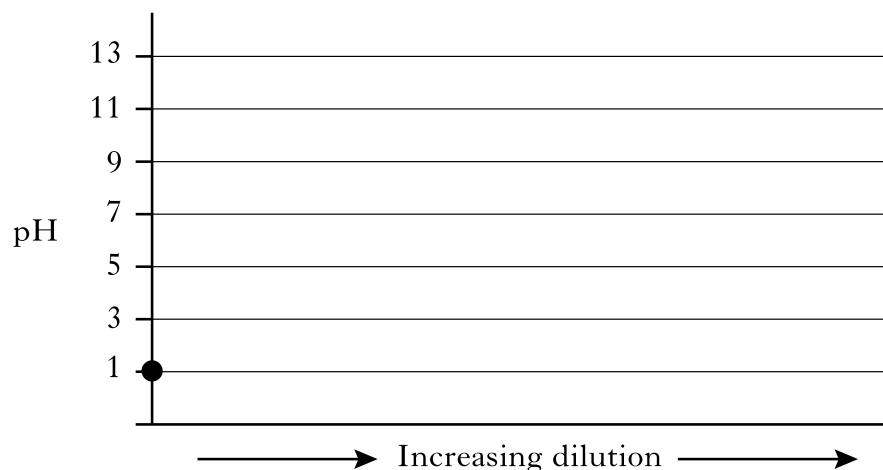
S Gr   Marks
2012
17   A solution of 0·1 mol/l hydrochloric acid has a pH of 1.

   (a)   (i)   What colour would universal indicator turn when added to a solution of hydrochloric   1
                     acid?
            (ii)   Starting at pH 1, draw a line to show how the pH of this acid changes when diluted   1
                     with water.

                                            Increasing dilution

   Answer (i)   Red, pink, orange, yellow
            (ii)   Line must be increasing
                     Line stops at pH7 or below   }   or 0