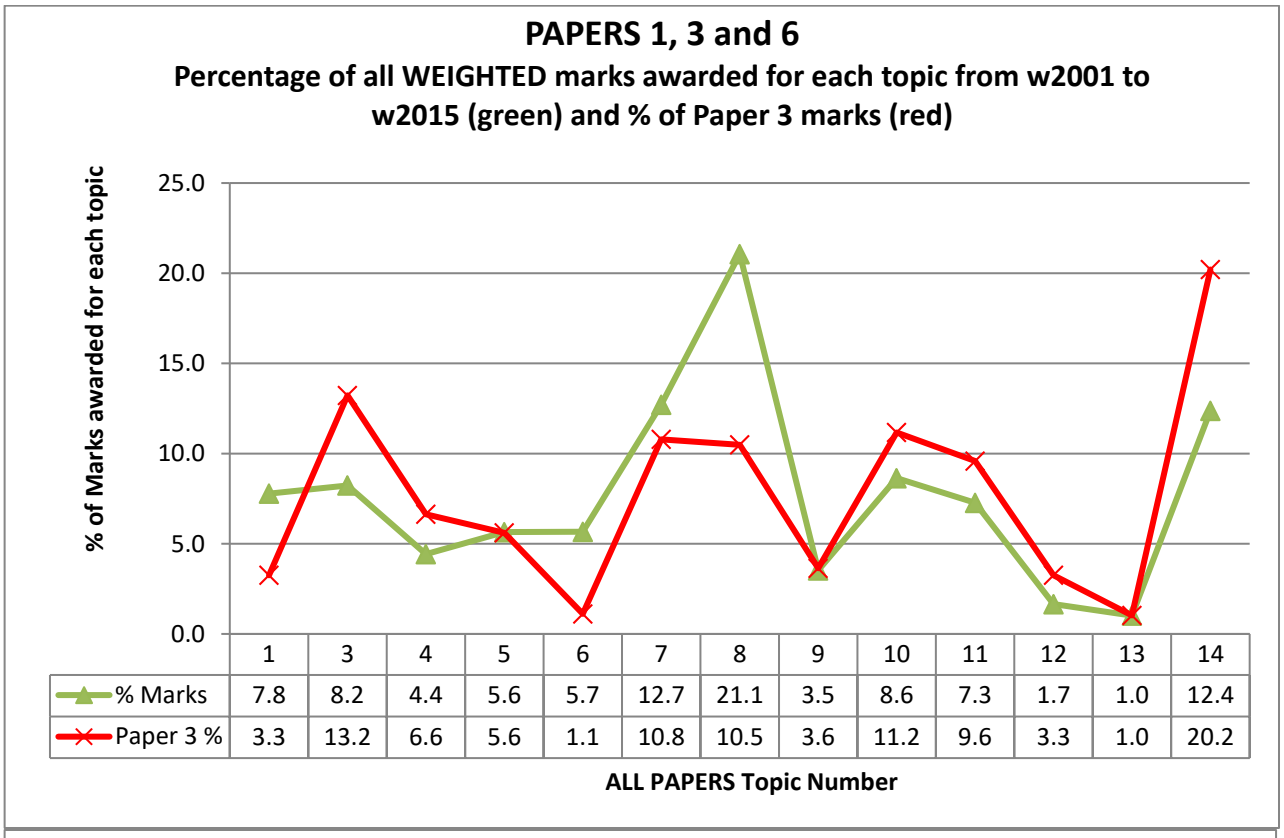
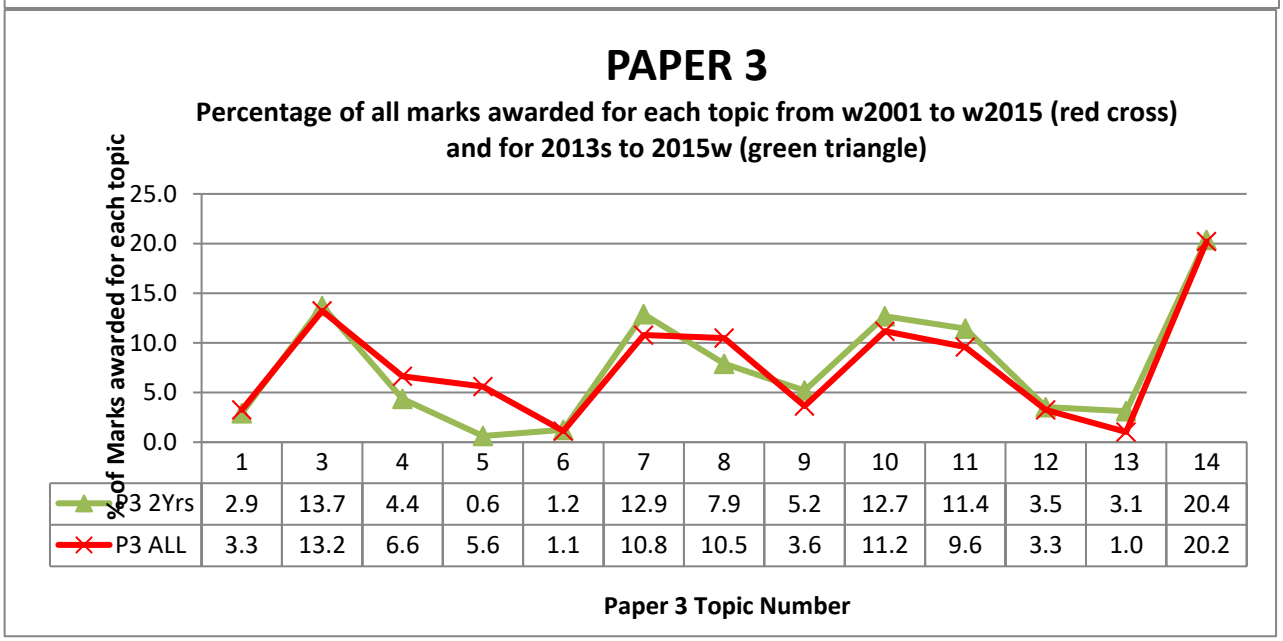
Name

iG Chem 8 EQ P3 15w to 01s 4Teachers NEW 245marks





	Total	Chem 1	Chem 3	Chem 4	Chem 5	Chem 6	Chem 7	Chem 8	Chem 9	Chem 10	Chem 11	Chem 12	Chem 13	Chem 14
Total Marks	2320	74	312	155	81	26	256	246	85	296	231	76	24	474
% of Marks	2336	3.2	13.4	6.6	3.5	1.1	11.0	10.5	3.6	12.7	9.9	3.3	1.0	20.3
# of Questions		19	59	39	18	6	47	54	19	58	48	14	5	80
Average marks per Q		**3.9**	**5.3**	**4.0**	**4.5**	**4.3**	**5.4**	**4.6**	**4.5**	**5.1**	**4.8**	**5.4**	**4.8**	**5.9**

	1st Paper	1st P rank	Last Paper	Last P rank	Total # Papers	Marks/ paper	Theor. All Papers	Actual All Marks	Difference	Weight per paper	Weight per mark
Paper 1	**2002s**	**5**	**2012w**	**26**	**22**	**40**	**880**	**869**	**-11**	**30**	**0.75**
Paper 3	**2001w**	**4**	**2015w**	**32**	**29**	**80**	**2320**	**2336**	**16**	**50**	**0.625**
Paper 6	**2001w**	**4**	**2015w**	**32**	**29**	**60**	**1740**	**1890**	**150**	**20**	**0.625**

Topic	**14**	**3**	**10**	**7**	**8**	**11**	**4**	**5**	**9**	**1**	**12**	**6**	**13**
Rank ALL Papers	2	4	5	3	1	6	9	8	11	7	12	10	13
Rank P3: A* Focus	1	2	3	4	5	6	7	8	9	10	10	12	13
All Syllabus Word Count RANK	1	2	5	3	6	4	9	7	10	8	12	11	13

CIE iGCSE Chemistry Syllabus Details

(syllabus code 0620)

The core material is examined in all three exam papers (papers 1,3 and 6) and is intended to assess understanding up to a grade C level. From 2016, the Supplement material is **examined in all three papers**, however, before 2016 papers 1 and 6 did not contain any Supplement material. If the number of marks that can be awarded above a C grade will remain the same, in practice this means that:

1. Paper 3 will contain fewer Supplement marks, so more core marks so will be easier (if you can answer the Paper 3 questions from before 2016 then you will be fine)
2. Papers 1 and 3 will contain Supplement marks, unlike in all papers before 2016, so will assess material they have not done before, so will be harder because of the questions and as there are no previous questions to practice on, will be harder because of the newness.

Material that is new or changed in 2016 is highlighted with BLACK LINES next to it.

8. Acids, bases and salts	
8.1 The characteristic properties of acids and bases **Core** • Describe the characteristic properties of acids as reactions with metals, bases, carbonates and effect on litmus and methyl orange • Describe the characteristic properties of bases as reactions with acids and with ammonium salts and effect on litmus and methyl orange • Describe neutrality and relative acidity and alkalinity in terms of pH measured using Universal Indicator paper (whole numbers only) • Describe and explain the importance of controlling acidity in soil	**Supplement** • Define *acids* and *bases* in terms of proton transfer, limited to aqueous solutions • Describe the meaning of weak and strong acids and bases
8.2 Types of oxides **Core** • Classify oxides as either acidic or basic, related to metallic and non-metallic character	**Supplement** • Further classify other oxides as neutral or amphoteric
8.3 Preparation of salts **Core** • Demonstrate knowledge and understanding of preparation, separation and purification of salts as examples of some of the techniques specified in section 2.2.2 and the reactions specified in section 8.1	**Supplement** • Demonstrating knowledge and understanding of the preparation of insoluble salts by precipitation • Suggest a method of making a given salt from a suitable starting material, given appropriate information

8.4 Identification of ions and gases **Core** • Describe the following tests to identify: *aqueous cations:* aluminium, ammonium, calcium, chromium(III), copper(II), iron(II), iron(III) and zinc (using aqueous sodium hydroxide and aqueous ammonia as appropriate) (Formulae of complex ions are **not** required.) *cations:* use of the flame test to identify lithium, sodium, potassium and copper(II) *anions:* carbonate (by reaction with dilute acid and then limewater), chloride, bromide and iodide (by reaction under acidic conditions with aqueous silver nitrate), nitrate (by reduction with aluminium), sulfate (by reaction under acidic conditions with aqueous barium ions) and sulfite (by reaction with dilute acids and then aqueous potassium manganate(VII)) *gases:* ammonia (using damp red litmus paper), carbon dioxide (using limewater), chlorine (using damp litmus paper), hydrogen (using lighted splint), oxygen (using a glowing splint), and sulfur dioxide (using aqueous potassium manganate(VII))	

Tests for ions (Topic 8)

Tests for anions

anion	test	test result
carbonate (CO_3^{2-})	add dilute acid	effervescence, carbon dioxide produced
chloride (Cl^-) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white ppt.
bromide (Br^-) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	cream ppt.
iodide (I^-) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	yellow ppt.
nitrate (NO_3^-) [in solution]	add aqueous sodium hydroxide, then aluminium foil; warm carefully	ammonia produced
sulfate (SO_4^{2-}) [in solution]	acidify, then add aqueous barium nitrate	white ppt.
sulfite (SO_3^{2-})	add dilute hydrochloric acid, warm gently and test for the presence of sulfur dioxide	sulfur dioxide produced will turn acidified aqueous potassium manganate(VII) from purple to colourless

Tests for aqueous cations

cation	effect of aqueous sodium hydroxide	effect of aqueous ammonia
aluminium (Al^{3+})	white ppt., soluble in excess giving a colourless solution	white ppt., insoluble in excess
ammonium (NH_4^+)	ammonia produced on warming	–
calcium (Ca^{2+})	white ppt., insoluble in excess	no ppt. or very slight white ppt.
chromium(III) (Cr^{3+})	green ppt., soluble in excess	grey-green ppt., insoluble in excess
copper (Cu^{2+})	light blue ppt., insoluble in excess	light blue ppt., soluble in excess, giving a dark blue solution
iron(II) (Fe^{2+})	green ppt., insoluble in excess	green ppt., insoluble in excess
iron(III) (Fe^{3+})	red-brown ppt., insoluble in excess	red-brown ppt., insoluble in excess
zinc (Zn^{2+})	white ppt., soluble in excess, giving a colourless solution	white ppt., soluble in excess, giving a colourless solution

Tests for gases

gas	test and test result
ammonia (NH_3)	turns damp, red litmus paper blue
carbon dioxide (CO_2)	turns limewater milky
chlorine (Cl_2)	bleaches damp litmus paper
hydrogen (H_2)	'pops' with a lighted splint
oxygen (O_2)	relights a glowing splint
sulfur dioxide (SO_2)	turns acidified aqueous potassium manganate(VII) from purple to colourless

Flame tests for metal ions

metal ion	flame colour
lithium (Li^+)	red
sodium (Na^+)	yellow
potassium (K^+)	lilac
copper(II) (Cu^{2+})	blue-green

iGCSE Chemistry/2013/s/Paper 31/

6 Ammonia is a compound which only contains the elements nitrogen and hydrogen. It is a weak base.

(a) (i) Define the term *base*.

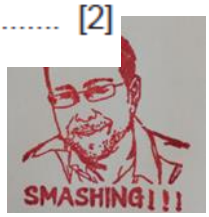
..... [1]

(ii) Given aqueous solutions of ammonia and sodium hydroxide, both having a concentration of 0.1 mol/dm^3, how could you show that ammonia is the weaker base?

.....

.....

..... [2]



2 An element, **M**, has the electron distribution 2 + 8 + 18 + 3.

(e) The hydroxide of **M** is a white powder which is insoluble in water.
Describe how you could show that this hydroxide is amphoteric.

.....

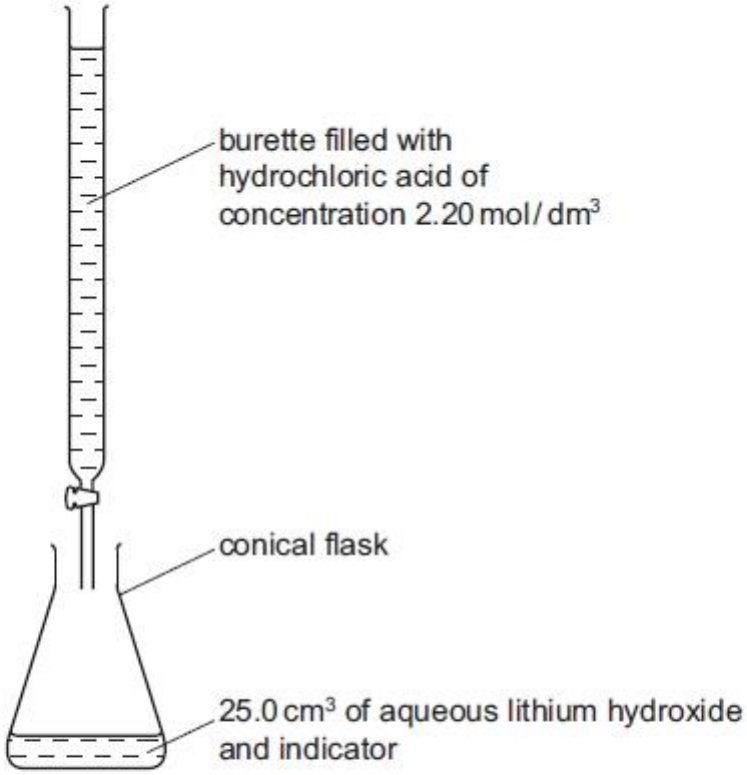
.....

..... [2]

iGCSE Chemistry/2013/s/Paper 31/

7 The hydroxides of the Group I metals are soluble in water. Most other metal hydroxides are insoluble in water.

(a) (i) Crystals of lithium chloride can be prepared from lithium hydroxide by titration.



25.0 cm^3 of aqueous lithium hydroxide is pipetted into the conical flask.
A few drops of an indicator are added. Dilute hydrochloric acid is added slowly to the alkali until the indicator just changes colour. The volume of acid needed to neutralise the lithium hydroxide is noted.

A neutral solution of lithium chloride, which still contains the indicator, is left. Describe how you could obtain a neutral solution of lithium chloride which does **not** contain an indicator.

.....

..... [2]

(ii) You cannot prepare a neutral solution of magnesium chloride by the same method. Describe how you could prepare a neutral solution of magnesium chloride.

.....

.....

..... [3]

(b) The concentration of the hydrochloric acid was 2.20 mol / dm^3. The volume of acid needed to neutralise the 25.0 cm^3 of lithium hydroxide was 20.0 cm^3. Calculate the concentration of the aqueous lithium hydroxide.

$$LiOH + HCl \rightarrow LiCl + H_2O$$

.....

.....

..... [2]

(c) Lithium chloride forms three hydrates. They are $LiCl.H_2O$, $LiCl.2H_2O$ and $LiCl.3H_2O$. Which **one** of these three hydrates contains 45.9 % of water?
Show how you arrived at your answer.

.....

.....

..... [3]

iGCSE Chemistry/2012/w/Paper 31/ Q7

(b) Strontium chloride-6-water can be made from the insoluble compound, strontium carbonate, by the following reactions.

$$SrCO_3(s) + 2HCl(aq) \rightarrow SrCl_2(aq) + CO_2(g) + H_2O(l)$$

$$SrCl_2(aq) + 6H_2O(l) \rightarrow SrCl_2.6H_2O(s)$$

The following method was used to prepare the crystals.

1. Add excess strontium carbonate to hot hydrochloric acid.
2. Filter the resulting mixture.
3. Partially evaporate the filtrate and allow to cool.
4. Filter off the crystals of $SrCl_2.6H_2O$.
5. Dry the crystals between filter papers.

(i) How would you know when excess strontium carbonate had been added in step 1?

.....

..... [1]

(ii) Why is it necessary to filter the mixture in step 2?

..... [1]

(iii) In step 3, why partially evaporate the filtrate rather than evaporate to dryness?

..... [1]

iGCSE Chemistry/2012/w/Paper 31/

4 Silicon(IV) oxide, SiO_2, and zirconium(IV) oxide, ZrO_2, are both macromolecules. They have similar physical properties but silicon(IV) oxide is acidic and zirconium(IV) oxide is amphoteric.

(c) (i) Name a reagent that reacts with the oxides of both elements.

..... [1]

(ii) Name a reagent that reacts with only one of the oxides.

reagent .....

oxide which reacts ..... [2]

iGCSE Chemistry/2012/s/Paper 31/

2 Three ways of making salts are

- titration using a soluble base or carbonate
- neutralisation using an insoluble base or carbonate
- precipitation.

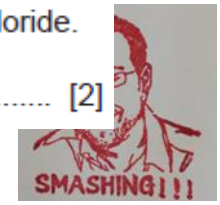
(a) Complete the following table of salt preparations.

method	reagent 1	reagent 2	salt
titration	....	....	sodium nitrate
neutralisation	nitric acid	....	copper(II) nitrate
precipitation	....	....	silver(I) chloride
neutralisation	sulfuric acid	zinc(II) carbonate	....

[6]

(b) (i) Write an ionic equation with state symbols for the preparation of silver(I) chloride.

..... [2]



(ii) Complete the following equation.

$$ZnCO_3 + H_2SO_4 \rightarrow \text{.....} + \text{.....} + \text{.....}$$

[2]

iGCSE Chemistry/2011/w/Paper 31/ Q5

(c) Describe how you could test the solution to find out which ion, Fe^{2+} or Fe^{3+}, is present.

.....

.....

..... [3]

iGCSE Chemistry/2011/w/Paper 31/

1 This question is concerned with the following oxides.

sulfur dioxide
carbon monoxide
lithium oxide
aluminium oxide
nitrogen dioxide
strontium oxide

(a) (i) Which of the above oxides will react with hydrochloric acid but not with aqueous sodium hydroxide?

..... [1]

(ii) Which of the above oxides will react with aqueous sodium hydroxide but not with hydrochloric acid?

..... [1]

(iii) Which of the above oxides will react with both hydrochloric acid and aqueous sodium hydroxide?

..... [1]

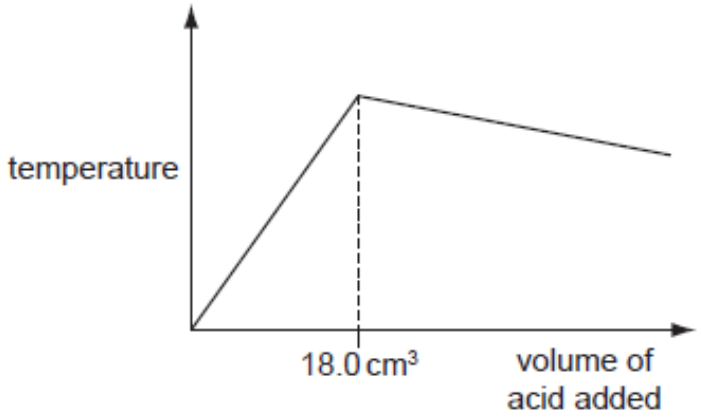
(iv) Which of the above oxides will not react with hydrochloric acid or with aqueous sodium hydroxide?

..... [1]

iGCSE Chemistry/2011/s/Paper 31/ Q5

(d) 20.0 cm^3 of aqueous sodium hydroxide, 2.00 mol / dm^3, was placed in a beaker. The temperature of the alkali was measured and 1.0 cm^3 portions of hydriodic acid were added. After each addition, the temperature of the mixture was measured. Typical results are shown on the graph.

E2q



$$NaOH(aq) + HI(aq) \rightarrow NaI(aq) + H_2O(l)$$

(iii) In another experiment, it was shown that 15.0 cm^3 of the acid neutralised 20.0 cm^3 of aqueous sodium hydroxide, 1.00 mol/dm^3. Calculate the concentration of the acid.

.....

..... [2]

iGCSE Chemistry/2011/s/Paper 31/ Q2

(c) The selenide ion reacts with water.

$$Se^{2-} + H_2O \rightarrow HSe^- + OH^-$$

What type of reagent is the selenide ion in this reaction? Give a reason for your choice.

.....

..... [3]

iGCSE Chemistry/2011/s/Paper 31/ NOT w/ith Q5(a)

5 **(a)** **(i)** $2Li + 2HI \rightarrow 2LiI + H_2$

(ii) zinc carbonate + hydriodic acid → zinc iodide + carbon dioxide + water

(iii) $MgO + 2HI \rightarrow MgI_2 + H_2O$

(b) Two of the reactions in **(a)** are acid/base and one is redox. Which one is redox? Explain your choice.

.....

.....

..... [2]

iGCSE Chemistry/2011/s/Paper 31/

5 Hydriodic acid, HI(aq), is a strong acid. Its salts are iodides.

(a) It has the reactions of a typical strong acid. Complete the following equations.

(i) .....Li + ...HI → ..... + ... [1]

(ii) zinc carbonate + hydriodic acid → ..... + ... + ...

[1]

(iii) MgO + ...HI → ..... + ... [1]

iGCSE Chemistry/2010/w/Paper 31/ Q6

(b) Beryllium hydroxide, a white solid, is an amphoteric hydroxide.

(i) Name another metal which has an amphoteric hydroxide.

..... [1]

(ii) Suggest what you would observe when an excess of aqueous sodium hydroxide is added gradually to aqueous beryllium sulfate.

.....

..... [2]

iGCSE Chemistry/2010/w/Paper 31/

8 Soluble salts can be made using a base and an acid.

(a) Complete this method of preparing dry crystals of the soluble salt cobalt(II) chloride-6-water from the insoluble base cobalt(II) carbonate.

Step 1

Add an excess of cobalt(II) carbonate to hot dilute hydrochloric acid.

Step 2

.....

.....

Step 3

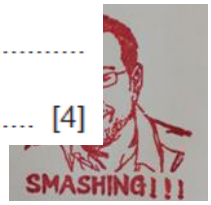
.....

.....

Step 4

.....

..... [4]



Mark Scheme

iGCSE Chemistry/2013/s/Paper 31/

6 (a) (i) proton or H^+ acceptor [1]

(ii) (measure) pH or (use) UI indicator [1]
note: can be implied need not be explicit
sodium hydroxide has higher pH / ammonia(aq) has lower pH [1]
(this sentence would score 2 marks)
or
appropriate colours with UI / appropriate numerical values [1]
ammonia is closer to green, blue-green, turquoise or lighter blue
sodium hydroxide is darker blue / purple / violet [1]
or
measure electrical conductivity [1]
can be implied need not be explicit
ammonia (aq) is the poorer conductor/ sodium hydroxide is the better conductor [1]

iGCSE Chemistry/2013/s/Paper 31/ Q2

(e) it would react with/dissolves in a named strong acid [1]
it would react with/dissolves in a named alkali [1]
it shows both basic and acid properties =1 [1]
it reacts with both acids and bases/alkalis =1 [1]
[max 2]

iGCSE Chemistry/2013/s/Paper 31/

7 (a) (i) add carbon / animal charcoal [1]
filter [1]

OR

repeat experiment without indicator [1]
using same quantity / volume of acid [1]

(ii) add magnesium metal / carbonate / oxide / hydroxide
to (hot) (hydrochloric) acid [1]

cond: until in excess **or** no more dissolves **or** reacts [1]

cond: filter (to remove unreacted solid) [1]

(b) number of moles of $HCl = 0.020 \times 2.20 = 0.044$ [1]
number of moles of LiOH = 0.044
concentration of LiOH = $0.044/0.025 = 1.769\,(mol/dm^3)$ [1]
accept 1.75 to 1.77 need 2 dp
correct answer scores = 2

(c) (for $LiCl.2H_2O$)
mass of one mole = 78.5 [1]
percentage water = 36 / 78.5 x 100 [1]
45.9 so is $LiCl.2H_2O$ [1]
only award the marks if you can follow the reasoning and it gives 45.9% of water

note: if correct option given mark this and ignore the rest of the response

allow: max 2 for applying a correct method to another hydrate, [1] for the method and [1] for the correct value, working essential

iGCSE Chemistry/2012/w/Paper 31/ Q7

(b) (i) strontium carbonate does not dissolve / no effervescence; [1]
note: not just reaction is complete

(ii) to remove excess / unreacted / undissolved strontium carbonate; [1]

(iii) water of crystallisation needed / $6H_2O$ in crystals / would get anhydrous salt / would not get hydrated salt / crystals dehydrate; [1]
not: just to obtain crystals

iGCSE Chemistry/2012/w/Paper 31/ Q4

(c) (i) sodium hydroxide / any named alkali / reactive metal; [1]

(ii) named acid; [1]
zirconium oxide; [1]

iGCSE Chemistry/2012/s/Paper 31/

2 (a) nitric acid; [1]
sodium hydroxide / carbonate / hydrogen carbonate; [1]

copper(II) oxide / hydroxide / carbonate; [1]

any named soluble chloride; [1]
accept: *hydrochloric acid / hydrogen chloride*
silver(I) nitrate / ethanoate / sulfate; [1]
must be soluble silver salt **not** *silver oxide / carbonate*

zinc(II) sulfate [1]

(b) (i) $Ag^+(aq) + Cl^-(aq) \rightarrow AgCl(s)$ [2]
equation correct state symbols missing [1]

(ii) $ZnCO_3 + H_2SO_4 \rightarrow ZnSO_4 + CO_2 + H_2O$ [2]
correct formula for zinc sulfate = 1

iGCSE Chemistry/2011/w/Paper 31/ Q5

(c) add sodium hydroxide solution / ammonia(aq) [1]
Fe^{2+} green precipitate [1]
Fe^{3+} brown precipitate [1]

iGCSE Chemistry/2011/w/Paper 31/

1 (a) (i) lithium oxide / strontium oxide [1]

(ii) sulfur dioxide / nitrogen dioxide [1]

(iii) aluminium oxide [1]

(iv) carbon monoxide [1]
accept: correct formulae

iGCSE Chemistry/2011/s/Paper 31/ Q5(d)

(iii) 1.33 / 1.3 / 1.3333 (mol/dm^3) scores both marks [2]
not 1.34
for a correct method – $M_1 V_1$ / moles of NaOH = 0.02
with an incorrect answer **only** [1]

iGCSE Chemistry/2011/s/Paper 31/ Q2

(c) base [1]
not alkali
accepts a proton [2]
accepts hydrogen ion / H^+ **only** [1]
proton and H^+ [2]

iGCSE Chemistry/2011/s/Paper 31/ Q5

(b) reaction 1 is redox / Li/2HI reaction [1]
cond reason either oxidation number/state / electron transfer [1]

iGCSE Chemistry/2011/s/Paper 31/

5 **(a)** **(i)** $2Li + 2HI \rightarrow 2LiI + H_2$ [1]

(ii) zinc carbonate + hydriodic acid → zinc iodide + carbon dioxide + water [1]

(iii) $MgO + 2HI \rightarrow MgI_2 + H_2O$ [1]

iGCSE Chemistry/2010/w/Paper 31/ Q6

(b) **(i)** zinc / aluminium / lead / tin / chromium [1]

(ii) white precipitate [1]
precipitate dissolves / colourless solution forms / forms a clear solution / soluble in excess [1]

iGCSE Chemistry/2010/w/Paper 31/

8 **(a)** filter / centrifuge / decant [1]
(partially) evaporate / heat / boil [1]
allow to crystallise / cool / let crystals form [1]
dry crystals / dry between filter paper / leave in a warm place to dry [1]
"dry" on its own must be a verb
evaporate to dryness only marks 1 and 2
note if discuss residue only mark 1