



O-Level Chemistry

ACIDS, BASES & SALTS

THEORY

2026 EDITION

Q1

5070/21/O/N/21/Q8(c)

Acid Definition - Easy

(c) Angelic acid is a weak acid.

(i) Define the term *acid*.

..... [1]

(ii) Explain the meaning of the term *weak* as applied to acids.

.....
..... [1]

Q2

5070/22/M/J/21/Q6(d)(ii)

Strong and Weak Acids - Hard

(ii) Nitric acid is a strong acid.

Nitrous acid is a weak acid.

Describe the difference between a weak acid and a strong acid.

.....
.....
..... [2]

Q3

5070/21/M/J/25/Q6(d)(ii)

Strong and Weak Acids - Hard

(ii) HCl(aq) is a strong acid and HOCl(aq) is a weak acid.

Describe the difference between a strong acid and a weak acid.

.....
.....
..... [2]

Q4

5070/21/O/N/22/Q6 C

Strong Acid and pH - Easy

(c) Nitric acid, HNO_3 , is a strong acid.

(i) State the meaning of the term *strong* in strong acid.

.....
..... [1]

(ii) Suggest a pH value for a concentrated solution of a strong acid.

..... [1]

(iii) Complete the ionic equation for the reaction of an acid with an alkali.



Q5

5070/21/M/J/24/Q3(d)

pH Meter - Easy

(d) One way to measure the pH of aqueous ammonium nitrite is to use a pH meter.

Describe one **other** way to measure the pH of aqueous ammonium nitrite.

.....

.....

..... [2]

Total: 2

Q6

5070/22/M/J/24/Q3(d)

pH Scale and pH Meter - Easy

(d) A sample of aqueous hydrogen peroxide has a pH of 5.5.

(i) State which ion is responsible for this pH value.

..... [1]

(ii) A pH meter is used to measure the pH of an aqueous solution.

Describe one **other** way to measure the pH of an aqueous solution.

.....
.....
..... [2]

Q7

5070/22/M/J/22/Q2(e)(ii)

Indicator Colour Change - Easy

(ii) A small sample of selenium(IV) oxide is dissolved in water.

Two drops of universal indicator are added to this aqueous solution.

Predict the colour of the universal indicator in this solution.

Explain your answer.

colour

explanation

.....

r41

Q8

5070/22/O/N/23/Q7

Indicators, Alkalies and Strong Acids - Hard

(b) (i) State the colour of methyl orange in alkaline solution.

..... [1]

(ii) Write the formula of the ion present in aqueous solutions of alkalis.

..... [1]

Q8 (continued)

5070/22/O/N/23/Q7

Indicators, Alkalies and Strong Acids - Hard

(d) Hydrochloric acid is a strong acid.

Define the term strong in the phrase strong acid.

..... [1]

Q9

5070/22/O/N/21/Q1(d)-(e)

Base, Alkali and pH - Easy

- 1 Choose from the following chlorides to answer the questions.

aluminium chloride
ammonium chloride
cobalt(II) chloride
hydrogen chloride
iron(III) chloride
potassium chloride
silver chloride
sodium chloride

Each chloride may be used once, more than once or not at all.

State which chloride:

- (d) reacts with sodium hydroxide when warmed to produce a gas which turns damp red litmus paper blue

..... [1]

- (e) when added to water can form an aqueous solution with a pH of 1.

..... [1]

[Total: 5]

Q10

5070/21/O/N/25/Q5(d)(i)

Acid + Metal - Easy

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

(d) Nickel reacts slowly with dilute hydrochloric acid to form aqueous nickel(II) ions and hydrogen.

(i) Construct the ionic equation for this reaction.

Include state symbols in your answer.

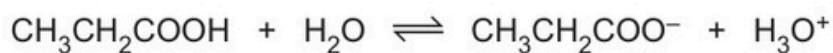
..... [2]

Q11

5070/21/O/N/24/Q7(a)(ii)-(iii)

Acid Definition, Weak Acid and Metal - Hard

(ii) Propanoic acid is a weak acid.



Explain how this equation shows that:

- $\text{CH}_3\text{CH}_2\text{COOH}$ is an acid by referring to proton transfer

.....

- $\text{CH}_3\text{CH}_2\text{COOH}$ is a **weak** acid.

.....

[2]

(iii) Propanoic acid reacts with magnesium.

Name the two products of this reaction.

1

2

[2]

Q12

5070/22/M/J/23/Q1(c)-(d)

Acid + Metal Oxide - Easy

1 Choose from the following oxides to answer the questions.

CO
CO₂
CaO
CuO
Fe₂O₃
H₂O
SO₂
SiO₂
ZnO

Each oxide may be used once, more than once or not at all.

State which oxide:

(c) reacts with warm dilute hydrochloric acid to give a blue coloured solution

..... [1]

(d) is amphoteric

Q13

5070/22/M/J/25/Q4(e)(iii)-(iv)

Acid + Carbonate and Hydroxide - Easy

(iii) Solid sodium carbonate is added to dilute propanoic acid.

Predict an observation for this reaction.

.....

..... [1]

(iv) Aqueous sodium hydroxide is added to dilute butanoic acid.

State the names of the products of this reaction.

..... [1]

[Total: 13]

Q14

5070/22/M/J/18/Q8 d-i

Acid + Metal Carbonate - Hard

(d) Calcium carbonate reacts with dilute nitric acid to form three compounds, **X**, **Y** and **Z**.

- **X** is a salt.
- **Y** is a colourless gas.
- **Z** is a colourless liquid.

(i) Name **Y** and describe a test for this gas.

name

test

observation

[2]

(ii) Name **Z** and describe a chemical test for this liquid.

name

chemical test

observation

[2]

(iii) Construct the equation for the reaction between calcium carbonate and nitric acid.

.....[1]

Q15

5070/21/O/N/23/Q6(c)

Acid + Ammonia and Titration - Easy

- (c) Aqueous ammonia is an alkali.
Aqueous ammonia reacts with dilute nitric acid to form a salt.

(i) Name this salt.

..... [1]

- (ii) Name the experimental technique used to make a solution of this salt from dilute nitric acid and aqueous ammonia.

..... [1]

[Total: 71]

Q16

5070/21/O/N/24/Q5(e)

Acid + Ammonia - Hard

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

- (e) Describe how to prepare crystals of ammonium chloride by reacting aqueous ammonia with dilute hydrochloric acid.

.....

.....

.....

.....

..... [3]

[Total: 14]

Q17

5070/21/M/J/22/Q9(b)(i)

Acid + Ammonia - Easy

(b) Ammonia is used to make the soluble salt ammonium nitrate, NH_4NO_3 .

(i) Name the acid that reacts with ammonia to make ammonium nitrate.

..... [1]

Q18

5070/21/M/J/21/Q8(d)

Preparation of Soluble Salts - Easy

(d) Silver nitrate is a white crystalline soluble salt.

Name a suitable combination of an acid and an insoluble base which is used to prepare silver nitrate.

acid

base

[1]

Q19

5070/22/M/J/21/Q4(d)(i)

Precipitation Method - Easy

(d) Zinc carbonate is insoluble in water.

- (i) Zinc carbonate can be prepared by reacting aqueous zinc bromide with $\text{CO}_3^{2-}(\text{aq})$ ions in a precipitation reaction.

Name a suitable aqueous solution that can provide $\text{CO}_3^{2-}(\text{aq})$ ions.

..... [1]

Q20

5070/22/M/J/21/Q8(d)-(e)

Soluble and Insoluble Salts - Hard

(d) Lead(II) ethanoate is a white crystalline soluble salt.

Name a suitable combination of an acid and an insoluble base which is used to prepare lead(II) ethanoate.

acid

base

[1]

(e) Aqueous lead(II) ethanoate reacts with aqueous sodium iodide.

A yellow precipitate of lead(II) iodide, PbI_2 , is formed.

Construct the ionic equation, with state symbols, for this reaction.

..... [2]

Q21

5070/21/M/J/23/Q3

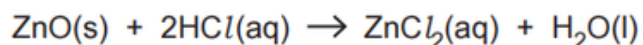
Preparation of Salts: All Methods - Hard

3 This question is about the preparation of salts.

(a) Zinc chloride is a soluble salt.

It is prepared by the reaction of an insoluble base with a dilute acid.

The equation for this reaction is shown.



(ii) State why it is important to use an excess of zinc oxide in this preparation.

.....
..... [1]

(iii) Suggest how the excess zinc oxide is removed from the reaction mixture to leave only aqueous zinc chloride.

..... [1]

(b) Barium sulfate is an insoluble salt.

It is prepared using a precipitation reaction.

Name **two** aqueous solutions that react together to give a barium sulfate precipitate.

..... and [1]

Q21 (continued)

5070/21/M/J/23/Q3

Preparation of Salts: All Methods - Hard

(c) Sodium nitrate is a soluble salt.

It is prepared by the reaction of an acid and an alkali.

(i) Name the acid and the alkali used.

acid

alkali

[1]

(ii) Name the experimental technique used to make neutral aqueous sodium nitrate.

..... [1]

Q22

5070/22/M/J/23/Q3

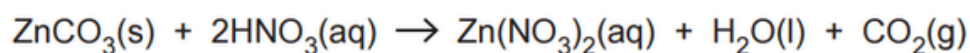
Preparation of Salts: All Methods - Hard

3 This question is about the preparation of salts.

(a) Zinc nitrate is a soluble salt.

It is prepared by the reaction of an insoluble carbonate with a dilute acid.

The equation for this reaction is shown.



(ii) Once the reaction has finished the mixture is filtered.

State why the mixture is filtered.

.....
..... [1]

(iii) Describe how to make pure, dry zinc nitrate crystals from an aqueous solution of zinc nitrate.

.....
.....
.....
.....
..... [3]

(b) Lead chloride is an insoluble salt.

It is prepared using a precipitation reaction.

Name **two** aqueous solutions that react together to give a precipitate of lead chloride.

..... and [1]

Q22 (continued)

5070/22/M/J/23/Q3

Preparation of Salts: All Methods - Hard

(c) Ammonium sulfate is a soluble salt.

It is prepared by the reaction of an alkali and an acid.

Name the alkali and the acid used.

alkali

acid

[1]

Q23

5070/22/M/J/22/Q10(b)

Titration Method - Hard

(b) Nitric acid is used to make the soluble salt potassium nitrate, KNO_3 .

(i) Name the alkali that reacts with dilute nitric acid to make potassium nitrate.

..... [1]

(ii) Describe the experimental procedure used to make colourless aqueous potassium nitrate from the alkali and dilute nitric acid.

.....
.....
.....
.....
..... [2]

Q24

5070/22/O/N/24/Q5(f)

Excess Method - Hard

- (f) Describe how to prepare pure, dry crystals of zinc chloride after reacting excess zinc with dilute hydrochloric acid.

.....

.....

.....

.....

..... [3]

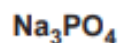
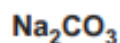
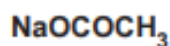
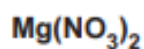
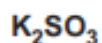
[Total: 17]

Q25

5070/21/M/J/22/Q1(a)-(d)

Salt Reactions and Precipitation - Hard

1 Choose from the following compounds to answer the questions.



Each compound may be used once, more than once or not at all.

State which compound:

(a) reacts with dilute nitric acid to form a gas that turns limewater milky

..... [1]

(b) reacts with warm aqueous sodium hydroxide to form a gas that turns damp red litmus paper blue

..... [1]

(c) reacts with dilute hydrochloric acid to give a gas that decolourises acidified potassium manganate(VII)

..... [1]

(d) is prepared using a precipitation reaction

..... [1]

Q26

5070/21/M/J/25/Q1(a)-(c)

Salt Solubility and Gas Identification - Hard

1 Choose from the following salts to answer the questions.

aluminium chloride

barium sulfate

calcium chloride

copper(II) sulfate

magnesium chloride

potassium iodide

potassium manganate(VII)

silver nitrate

sodium bromide

sodium sulfite

Each salt can be used once, more than once or not at all.

State which salt:

(a) is prepared using a precipitation reaction

..... [1]

(b) in aqueous solution, reacts with an excess of aqueous ammonia to give a dark blue solution

..... [1]

(c) reacts with warm aqueous sodium hydroxide and aluminium foil to give a gas that turns damp red litmus paper blue

..... [1]

Q27

5070/21/O/N/21/Q2(d)

Identification of Gases - Easy

(d) Describe the test for oxygen.

test

observation

[2]

Q28

5070/22/O/N/25/Q3(b)

Identification of Gases - Easy

(b) Describe a chemical test for hydrogen.

test

observation if hydrogen present

[1]

Q29

5070/21/M/J/23/Q2(c)

Flame Test - Easy

..... [1]

(c) A sample of sodium chloride is tested using a flame test.

State the colour of the flame seen in this test.

..... [1]

[Total: 2]

Q30

5070/22/M/J/25/Q1(a)-(b)

Flame Test and Precipitation - Easy

1 Choose from the following salts to answer the questions.

aluminium sulfate

barium chloride

copper(II) nitrate

copper(II) sulfate

magnesium chloride

potassium iodide

potassium manganate(VII)

silver chloride

sodium bromide

Each salt can be used once, more than once or not at all.

State which salt:

(a) is prepared using a precipitation reaction

..... [1]

(b) gives a yellow flame test colour

..... [1]

Q31

5070/21/O/N/24/Q1(a)(i)-(ii)

Flame Test - Hard

1 (a) Fig. 1.1 shows the electronic configurations of five atoms, D, E, F, G and H.

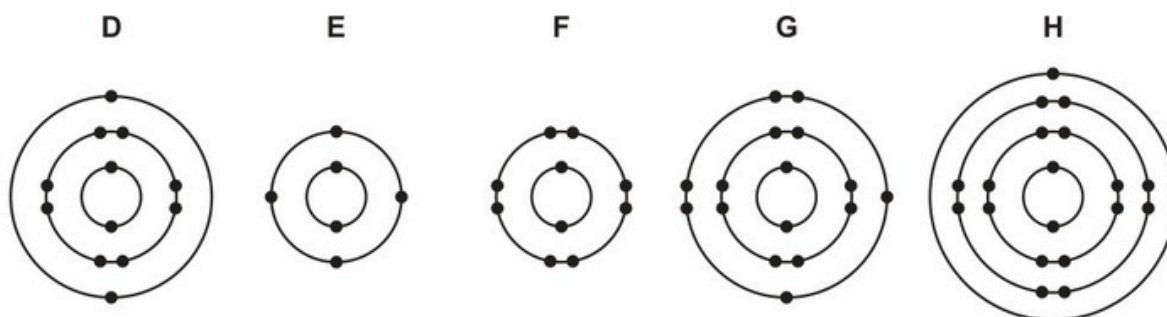


Fig. 1.1

Answer the questions about these electronic configurations.

Each electronic configuration may be used once, more than once or not at all.

State which electronic configuration, **D**, **E**, **F**, **G** or **H**, represents:

- (i) an atom of an element in Group VI of the Periodic Table

..... [1]

- (ii) an atom that forms an ion that gives a lilac colour in a flame test

..... [1]

Q32

5070/42/M/J/21/Q2

Identification of Cations and Anions (Paper 4) - Hard

- 2 (a) A solution contains two different cations and one anion.

Complete the table.

Name any gases formed and describe the tests used to identify these gases.

test	observations	conclusions
Add aqueous sodium hydroxide to the solution in a boiling tube.	a pale green precipitate forms	
(i) To the same boiling tube, continue adding aqueous sodium hydroxide until in excess. Keep the contents of the boiling tube for test (ii).	a green precipitate dissolves to form a green solution a white precipitate remains	cation 1 is cation 2 is
(ii)		 anion is NO_3^-

[2]

[4]

5070/42/M/J/21/Q2

Identification of Cations and Anions (Paper 4) - Hard

(b) Ammonium sulfite, $(\text{NH}_4)_2\text{SO}_3$, is a water-soluble compound.

Aqueous ammonium sulfite is slowly oxidised by oxygen in air.

This means aqueous ammonium sulfite will also contain some sulfate ions, SO_4^{2-} .

Describe a series of tests, and the observations, to show the presence of ammonium ions, sulfite ions and sulfate ions in this solution.

It must be clear in your answer which ion is identified by each test.

[6]

[6]

[Total: 12]

Q33

5070/42/M/J/22/Q2(a)

Identification of Cations and Anions (Paper 4) - Hard

- 2 (a) A solution contains one cation and two different anions.

The table shows the tests a student does on this solution.

Complete the table.

Name any gases formed.

test	observations	conclusions	
(i) To 1 cm depth of the solution in a test-tube, add a small volume of aqueous sodium hydroxide. Then add more aqueous sodium hydroxide until it is in excess.		The cation might be Al^{3+}. The cation could also be	[4]
(ii) To 1 cm depth of the solution in a boiling tube, add a small volume of aqueous ammonia. Then add more aqueous ammonia until it is in excess.		The cation is Al^{3+}.	[2]
(iii) To 1 cm depth of the solution in a test-tube add nitric acid and warm until no further change is seen.	A gas is evolved that decolourises acidified potassium manganate(VII) solution.	The gas is One of the anions is	[2]
(iv) To the solution from (iii) add aqueous silver nitrate.	A yellow precipitate forms.	The other anion is	[1]

Q34

5070/41/M/J/23/Q3(a)

Identification of Cations and Anions (Paper 4) - Hard

3 A student investigates solution **W** and copper(II) carbonate.

(a) The tests the student does on **W** are shown in Table 3.1.

Some of the observations for these tests are also shown.

Table 3.1

	tests on solution W	observations
1	Add aqueous sodium hydroxide to W .	solution remains colourless
2	Add dilute nitric acid, then add aqueous barium nitrate to W .	white precipitate
3	Add dilute hydrochloric acid, then add aqueous silver nitrate to W .	white precipitate
4	Flame test on W .	no colour is observed

(i) The student correctly concludes that ammonia is formed in test 1.

Describe what else the student must have done to reach this conclusion.

.....

 [3]

(ii) State why the student cannot identify the anion in **W** from the observation in test 3.

..... [1]

(iii) State how the tests and observations show that **W** does **not** contain sodium ions.

..... [1]

(iv) Identify the cation and anion in **W**.

cation anion [2]

Q35

5070/42/O/N/24/Q3

Identification of Cations and Anions (Paper 4) - Hard

3 A student investigates solution **P** and solution **Q**.

(a) Solution **P** is colourless and contains sodium ions.

(i) Describe how to do a flame test on solution **P** to confirm the identity of this cation.

.....

 [3]

(ii) Solution **P** contains an anion composed of nitrogen and oxygen.

Describe a test to identify the anion in solution **P**.

test

 observations

 identity of anion [6]

(b) The tests the student does on solution **Q** are shown in Table 3.1.

Some of the observations for these tests are also shown.

Table 3.1

	tests on solution Q	observations
1	Add drops of aqueous ammonia to solution Q until a change is seen. Then add excess aqueous ammonia.	green precipitate insoluble in excess
2	Add drops of aqueous sodium hydroxide to solution Q until a change is seen. Then add excess aqueous sodium hydroxide.	green precipitate soluble in excess, giving a green solution
3	Add aqueous silver nitrate to solution Q .	white precipitate
4	Add dilute nitric acid to solution Q . Then add aqueous barium nitrate.	

Q35 (continued)

5070/42/O/N/24/Q3

Identification of Cations and Anions (Paper 4) - Hard

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

- (i) Identify the cation in solution **Q** using the observations from tests 1 and 2.

..... [1]

- (ii) Test 3 is incomplete.

Describe what else must be done in test 3 to ensure that the white precipitate observed leads to a valid conclusion about the anion in solution **Q**.

..... [1]

- (iii) The student completes test 3 correctly. The observation remains the same.

Identify an anion in solution **Q**.

..... [1]

- (iv) The ion identified in (iii) is the only anion in solution **Q**.

Describe the expected observation from test 4.

..... [1]

- (v) Solution **Q** is acidic.

Describe the observation when solution **Q** is added to sodium carbonate.

..... [1]

[Total: 14]

Q36

5070/41/O/N/25/Q3

Identification of Cations and Anions (Paper 4) - Hard

3 A student does a series of tests using aqueous solution **Q** and aqueous solution **R**.

(a) Solution **Q** is acidic. Solution **Q** contains one cation and one anion.

The tests the student does on **Q** are shown in Table 3.1.

Some of the observations for these tests are also shown.

Table 3.1

test number	test	observations
1	add five drops of universal indicator	colour change
2	add a piece of magnesium ribbon	magnesium ribbon disappears
3	add dilute nitric acid followed by aqueous silver nitrate	white precipitate

(i) Describe the expected colour change in test 1.

..... [1]

(ii) A gas is produced in test 2.

Predict **one** other observation made by the student in test 2.

..... [1]

(iii) Predict the identity of the gas produced in test 2.

..... [1]

(iv) Describe a test to confirm the identity of this gas.

Include the result of a positive test.

test

result [2]

(v) Identify the cation and the anion in **Q**.

cation anion [2]

Q36 (continued)

5070/41/O/N/25/Q3

Identification of Cations and Anions (Paper 4) - Hard

(b) The tests the student does on **R** are shown in Table 3.2.

Some of the observations for these tests are also shown.

Table 3.2

test number	test	observations
4	flame test	blue-green flame
5	add aqueous ammonia drop by drop until a change is seen add excess aqueous ammonia	light blue precipitate blue precipitate dissolves

(i) Describe how the student does a flame test.

.....

 [2]

(ii) Describe **one** additional observation expected in test 5 based on the observations in tests 4 and 5.

..... [1]

(iii) Describe **one** additional test to confirm the identity of the cation in **R**.

Include the result of a positive test.

test

 result [3]

(iv) Identify the cation in **R**.

cation [1]

[Total: 14]

Q1

5070/21/O/N/21/Q8(c)

Official MS

8(c)(i)	(solution which) contains hydrogen ions / hydrogen ion donor	1
8(c)(ii)	(acid which) is incompletely ionised / (acid which) is not completely dissociated	1

Q2

5070/22/M/J/21/Q6(d)(ii)

Official MS

6(d)(ii)	strong acid completely dissociates / completely ionises (1) weak acid incompletely dissociates / incompletely ionises / partially dissociates / partially ionises (1)	2
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Q3

5070/21/M/J/25/Q6(d)(ii)

Official MS

6(d)(ii)	strong acid completely dissociates to give hydrogen ions (1)	2
	weak acid only partially dissociates to give hydrogen ions (1)	

Q4

5070/21/O/N/22/Q6 C

Official MS

6(c)(i)	dissociates completely (in solution) / ionises completely (in solution)	1
6(c)(ii)	any value from 0 to 2 (inclusive of these values)	1
6(c)(iii)	OH^-	1

Q5

5070/21/M/J/24/Q3(d)

Official MS

3(d)	universal indicator (paper) (1) match colour with a pH colour chart (1)	2
------	--	----------

Q6

5070/22/M/J/24/Q3(d)

Official MS

3(d)(i)	H ⁺	1
3(d)(ii)	universal indicator (paper or solution) (1) match colour with pH colour chart (1)	2

Q7

5070/22/M/J/22/Q2(e)(ii)

Official MS

2(e)(ii)	red / orange / yellow / yellow-green because non-metal oxides (are acidic)	1
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Q8

5070/22/O/N/23/Q7(a)-(d)

Official MS

7(b)(i)	yellow	1
7(b)(ii)	OH^-	1
7(d)	(acid which is) completely dissociated / completely ionised (in aqueous solution)	1

Q9

5070/22/O/N/21/Q1(d)-(e)

Official MS

1(d)	ammonium chloride	1
1(e)	hydrogen chloride	1

Question	Answer	Marks
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Q10

5070/21/O/N/25/Q5(d)(i)

Official MS

5(d)(i)	$\text{Ni(s)} + 2\text{H}^+(\text{aq}) \rightarrow \text{Ni}^{2+}(\text{aq}) + \text{H}_2(\text{g})$ correct balancing (1) correct state symbols dependent on correct formulae (1)	2
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Q11

5070/21/O/N/24/Q7(a)(ii)-(iii)

Official MS

7(a)(ii)	proton is transferred from the acid to water (1) the reaction does not go to completion / the acid is not fully dissociated / the acid is not fully ionised (1)	2
7(a)(iii)	magnesium <u>propanoate</u> (1) hydrogen (1)	2

Q12

5070/22/M/J/23/Q1(c)-(d)

Official MS

1(c)	CuO (1)	1
1(d)	ZnO (1)	1

Q13

5070/22/M/J/25/Q4(e)(iii)-(iv)

Official MS

4(e)(iii)	bubbles / fizzing / effervescence / forms a colourless solution	1
4(e)(iv)	sodium <u>butanoate</u> and water	1

Question	Answer	Marks
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Q14 5070/22/M/J/18/Q8 d-i

Official MS

Question	Answer	Marks
8(d)(i)	carbon dioxide (1) limewater turns milky (1)	2
8(d)(ii)	water (1) copper(II) sulfate goes from white to blue / cobalt chloride goes from blue to pink (1)	2
8(d)(iii)	$\text{CaCO}_3 + 2\text{HNO}_3 \rightarrow \text{Ca}(\text{NO}_3)_2 + \text{CO}_2 + \text{H}_2\text{O}$ (1)	1

Q15

5070/21/O/N/23/Q6(c)

Official MS

6(c)(i)	ammonium nitrate	1
6(c)(ii)	titration	1

Question	Answer	Marks
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Q16

5070/21/O/N/24/Q5(e)

Official MS

5(e)	Any three from: titrate (aqueous ammonia with hydrochloric acid) (1) repeat titration without indicator (1) evaporate filtrate to crystallisation point / heat until saturated solution formed (1) leave / cool and filter or leave / cool and dry (1)	3
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Question	Answer	Marks
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Q17

5070/21/M/J/22/Q9(b)(i)

Official MS

9(b)(i)	nitric acid	1
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Q18

5070/21/M/J/21/Q8(d)

Official MS

8(d)	silver oxide / silver hydroxide AND nitric acid	1
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Q19

5070/22/M/J/21/Q4(d)(i)

Official MS

4(d)(i)	sodium carbonate / potassium carbonate / ammonium carbonate	1
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Q20

5070/22/M/J/21/Q8(d)-(e)

Official MS

8(d)	ethanoic acid and lead(II) oxide or lead(II) hydroxide	1
8(e)	$\text{Pb}^{2+}(\text{aq}) + 2\text{I}^{-}(\text{aq}) \rightarrow \text{PbI}_2(\text{s})$ correct formulae for reactants and products and balanced (1) state symbols dependent on correct formulae (1)	2

Q21

5070/21/M/J/23/Q3

Official MS

3(a)(ii)	so all the acid is used up (1)	1
3(a)(iii)	filtration (1)	1
3(b)	barium nitrate or barium chloride AND any soluble sulfate (1)	1
3(c)(i)	nitric acid and sodium hydroxide (1)	1
3(c)(ii)	titration (1)	1

Q22

5070/22/M/J/23/Q3

Official MS

3(a)(ii)	to remove the excess zinc carbonate (1)	1
3(a)(iii)	heat to make a saturated solution / heat to crystallisation point (1) allow mixture to cool and filter (1) wash and dry crystals or solid with paper towel (1)	3
3(b)	lead nitrate AND any soluble chloride (1)	1
3(c)	(aqueous) ammonia and (dilute) sulfuric acid (1)	1

Question	Answer	Marks
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Q23

5070/22/M/J/22/Q10(b)

Official MS

10(b)(i)	potassium hydroxide	1
10(b)(ii)	idea of titrating acid and alkali together using an indicator to find the end-point (1) repeat the procedure using the same volumes but without the indicator (1)	2

Q24

5070/22/O/N/24/Q5(f)

Official MS

5(f)	M1 filter (off excess zinc from aqueous zinc chloride) (1)	3
	M2 evaporate (filtrate) to crystallisation point / heat until saturated solution formed (1)	
	M3 cool or leave (saturated solution), (filter) and dry (crystals) with filter paper (1)	

Question	Answer	Marks
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Q25

5070/21/M/J/22/Q1(a)-(d)

Official MS

1(a)	Na_2CO_3	1
1(b)	NH_4Cl	1
1(c)	K_2SO_3	1
1(d)	BaSO_4	1

Q26

5070/21/M/J/25/Q1(a)-(c)

Official MS

1(a)	barium sulfate	1
1(b)	copper(II) sulfate	1
1(c)	silver nitrate	1

Q27

5070/21/O/N/21/Q2(d)

Official MS

2(d)	glowing splint (1) relights (1)	2
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Q28

5070/22/O/N/25/Q3(b)

Official MS

3(b)	'pops' with a lighted splint	1
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Q29

5070/21/M/J/23/Q2(c)

Official MS

2(c)	yellow / orange (1)	1
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Question	Answer	Marks
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Q30

5070/22/M/J/25/Q1(a)-(b)

Official MS

1(a)	silver chloride	1
1(b)	sodium bromide	1

Q31

5070/21/O/N/24/Q1(a)(i)-(ii)

Official MS

1(a)(i)	G	1
1(a)(ii)	H	1

Q32

5070/42/M/J/21/Q2

Official MS

2(a)(i)	Cr ³⁺ (1) Ca ²⁺ (1)	2
2(a)(ii)	M1 add aluminium (1) M2 warm (1) M3 ammonia (1) M4 gas turns damp red litmus blue (1)	4
2(b)	(sulfite) M1 add acid and warm (1) M2 sulfur dioxide turns acidified potassium manganate(VII) colourless (1) (sulfate) M3 add aqueous barium nitrate and dilute nitric acid (1) M4 White precipitate (1) (ammonium) M5 add aqueous sodium hydroxide and warm (1) M6 ammonia gas turns damp red litmus blue (1)	6

Question	Answer	Marks
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Q33

5070/42/M/J/22/Q2(a)

Official MS

2(a)(i)	M1 white precipitate (1) M2 dissolves/soluble (1) M3 colourless solution (1) M4 Zn^{2+} (1)	4
2(a)(ii)	M1 white precipitate (1) M2 insoluble (in excess) (1)	2
2(a)(iii)	M1 sulfur dioxide / SO_2 (1) M2 sulfite / SO_3^{2-} (1)	2
2(a)(iv)	iodide / I^-	1

Q34

5070/41/M/J/23/Q3(a)

Official MS

3(a)(i)	M1 warm M2 test gas with (damp red) litmus paper M3 paper turns blue	3
3(a)(ii)	hydrochloric acid contains chloride / Cl^- ions	1
3(a)(iii)	sodium ions would give a yellow flame	1
3(a)(iv)	M1 ammonium / NH_4^+	1
	M2 sulfate / SO_4^{2-}	1

Q35

5070/42/O/N/24/Q3

Official MS

3(a)(i)	M1 dip wire / splint into solution / P M2 put in blue / roaring / non-luminous flame (of Bunsen burner) M3 observe colour (of flame) produced / (flame turns) yellow	3
3(a)(ii)	M1 add (aqueous) sodium hydroxide M2 add aluminium M3 warm / heat M4 (gas turns damp red) litmus paper turns blue M5 ammonia M6 nitrate / NO_3^-	6
3(b)(i)	chromium(III) / Cr^{3+}	1
3(b)(ii)	add dilute nitric acid	1
3(b)(iii)	chloride / Cl^-	1
3(b)(iv)	no (observable) change / no precipitate	1
3(b)(v)	effervescence / fizzing / bubbling	1

Q36

5070/41/O/N/25/Q3

Official MS

3(a)(i)	(from green to) yellow/orange/red	1
3(a)(ii)	effervescence	1
3(a)(iii)	hydrogen / H ₂	1
3(a)(iv)	M1 lighted splint M2 pop sound	2
3(a)(v)	M1 hydrogen / H ⁺ M2 chloride / Cl ⁻	2
3(b)(i)	M1 dip a wire / splint into R / put R into spray bottle M2 put/spray in blue / roaring / non-luminous / open air-hole (Bunsen) flame	2
3(b)(ii)	dark(er) blue solution	1
3(b)(iii)	M1 add sodium hydroxide (solution) M2 (light) blue precipitate M3 insoluble in excess (sodium hydroxide solution)	3
3(b)(iv)	Copper(II) / Cu ²⁺	1