



O-Level Chemistry

CHEMICAL BONDING

MCQ

2026 EDITION

Q1

5070/12/M/J/25/Q21

Acid Definition - Hard

21 Which row shows the equations for the dissociation of methanoic acid and of nitric acid?

	methanoic acid	nitric acid
A	$\text{HCOOH(aq)} \rightarrow \text{H}^{\text{+}}\text{(aq)} + \text{HCOO}^{\text{-}}\text{(aq)}$	$\text{HNO}_3\text{(aq)} \rightarrow \text{H}^{\text{+}}\text{(aq)} + \text{NO}_3^{\text{-}}\text{(aq)}$
B	$\text{HCOOH(aq)} \rightarrow \text{H}^{\text{+}}\text{(aq)} + \text{HCOO}^{\text{-}}\text{(aq)}$	$\text{HNO}_3\text{(aq)} \rightleftharpoons \text{H}^{\text{+}}\text{(aq)} + \text{NO}_3^{\text{-}}\text{(aq)}$
C	$\text{HCOOH(aq)} \rightleftharpoons \text{H}^{\text{+}}\text{(aq)} + \text{HCOO}^{\text{-}}\text{(aq)}$	$\text{HNO}_3\text{(aq)} \rightleftharpoons \text{H}^{\text{+}}\text{(aq)} + \text{NO}_3^{\text{-}}\text{(aq)}$
D	$\text{HCOOH(aq)} \rightleftharpoons \text{H}^{\text{+}}\text{(aq)} + \text{HCOO}^{\text{-}}\text{(aq)}$	$\text{HNO}_3\text{(aq)} \rightarrow \text{H}^{\text{+}}\text{(aq)} + \text{NO}_3^{\text{-}}\text{(aq)}$

Q2

5070/11/M/J/23/Q19

Strong Acid - Easy

19 Samples of $\text{HCl}(\text{aq})$ and $\text{HNO}_3(\text{aq})$ are tested using universal indicator paper.

The sample of $\text{HCl}(\text{aq})$ has a pH of 4 and the sample of $\text{HNO}_3(\text{aq})$ has a pH of 2.

Which statement is correct?

- A** $\text{HCl}(\text{aq})$ is a weak acid and $\text{HNO}_3(\text{aq})$ is a strong acid.
- B** $\text{HNO}_3(\text{aq})$ has a lower formula mass than $\text{HCl}(\text{aq})$.
- C** The $\text{HNO}_3(\text{aq})$ is more concentrated than the $\text{HCl}(\text{aq})$.
- D** The $\text{HCl}(\text{aq})$ has dissociated more than the $\text{HNO}_3(\text{aq})$.

Q3

5070/11/M/J/17

Strong Acid - Hard

- 22 Which row shows the order of increasing pH (lowest to highest) for strong acids, strong bases, weak acids and weak bases at the same concentration?

	pH $\longrightarrow$			
A	strong acids	weak acids	weak bases	strong bases
B	strong bases	weak bases	weak acids	strong acids
C	weak acids	strong acids	weak bases	strong bases
D	weak bases	strong bases	strong acids	weak acids

Q4

5070/11/M/J/22/Q25

Strong Acid - Hard

- 25 Which statement about acids and bases is correct?

- A All strong acids react with carbonates but all weak acids do not.
- B The oxides of Group I metals are amphoteric.
- C The pH of 1.0 mol/dm^3 ethanoic acid, CH_3COOH , is higher than the pH of 1.0 mol/dm^3 sulfuric acid, H_2SO_4 .
- D The pH of 1.0 mol/dm^3 nitric acid, HNO_3 , is lower than the pH of 1.0 mol/dm^3 hydrochloric acid, HCl .

Q5

5070/11/O/N/25/Q17

Strong Acid - Hard

17 Which statement is correct?

- A Ethanoic acid is a weak acid because when it is added to excess alkali not all of the ethanoic acid reacts.
- B Ethanoic acid is a weaker acid than sulfuric acid because a smaller proportion of its molecules dissociate in aqueous solution.
- C Hydrochloric acid is a stronger acid than ethanoic acid because hydrochloric acid always has a higher pH than ethanoic acid.
- D Sulfuric acid is a strong acid because it produces two hydrogen ions for every molecule that dissociates.

Q6

5070/12/O/N/21/Q22

Weak Acid - Easy

22 Which statement about acids and bases is correct?

- A A 0.1 mol/dm^3 solution of ethanoic acid has a higher pH than a 0.1 mol/dm^3 solution of hydrochloric acid.
- B All bases dissolve in water to produce OH^- ions.
- C Bases react with nitrates to produce ammonia.
- D Oxides of metals are always acidic in character.

Q7

5070/12/M/J/24/Q22

Weak Acid - Easy

22 Which statement about weak acids is correct?

- A Some molecules are **not** dissociated.
- B Weak acids do **not** react with carbonates.
- C Weak acids always form more dilute solutions than strong acids.
- D Weak acids always have lower pH values than strong acids.

Q8

5070/11/M/J/25/Q20

Weak Acid - Hard

- 20 The pH of dilute ethanoic acid is measured. The equation for the partial dissociation of ethanoic acid is shown.



Aqueous sodium ethanoate, CH_3COONa , is added to the dilute ethanoic acid and the pH is measured again.

What is the initial pH of the dilute ethanoic acid and how does it change after the addition of the aqueous sodium ethanoate?

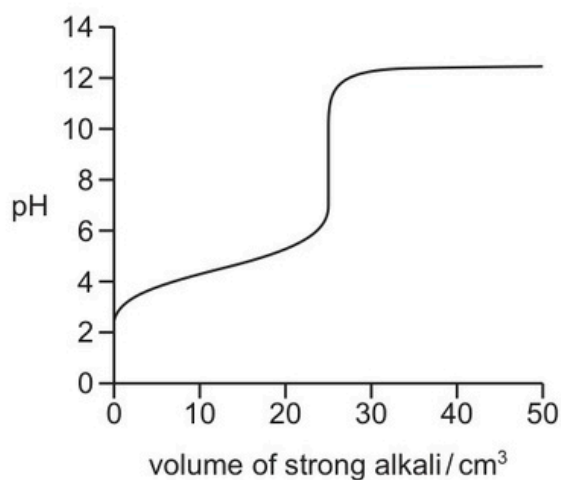
	initial pH	change in pH after adding aqueous sodium ethanoate
A	3–4	increases
B	3–4	decreases
C	8–9	increases
D	8–9	decreases

Q9

5070/12/M/J/25/Q20

Weak Acid - Hard

20 The diagram shows the change in pH as a strong alkali is added to a weak acid.



40 cm³ of a strong alkali is added to a weak acid and a sample of the solution is tested separately with methyl orange and thymolphthalein.

Which row is correct?

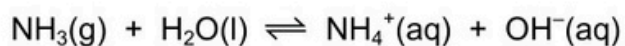
	methyl orange test	thymolphthalein test
A	red	colourless
B	yellow	colourless
C	red	blue
D	yellow	blue

Q10

5070/12/M/J/22/Q25

Base Definition - Easy

25 When ammonia gas is dissolved in water a reversible reaction takes place.



Which statements are correct?

- 1 Ammonia is an alkali because it produces hydroxide ions in solution.
- 2 The pH of this solution is 7.
- 3 Adding hydroxide ions to the mixture at equilibrium produces more ammonia.

A 1, 2 and 3 **B** 1 and 3 only **C** 1 only **D** 2 and 3 only

Q11

5070/11/M/J/24/Q23

Base Definition - Easy

23 Which row describes both the pH and the ion with the greatest concentration in an aqueous alkali?

	pH	H ⁺ or OH ⁻ ion with greatest concentration
A	greater than 7	H ⁺
B	greater than 7	OH ⁻
C	less than 7	H ⁺
D	less than 7	OH ⁻

Q12

5070/12/O/N/23/Q19

Base Definition - Hard

19 Which statement is correct?

- A A base will react with an ammonium salt to produce a gas that turns damp blue litmus paper red.
- B Adding a base to an acidic solution will increase the pH of the solution.
- C Aqueous sodium hydroxide is an alkali but **not** a base.
- D In a neutralisation reaction, a base donates a proton to an acid.

Q13

5070/11/M/J/21/Q22

pH Scale - Easy

- 22 Which row shows the pH values for 0.1 mol/dm^3 solutions of ammonia, hydrochloric acid, sodium chloride and sodium hydroxide?

	pH values			
	NH_3	HCl	NaCl	NaOH
A	1	7	13	11
B	7	1	11	13
C	11	1	7	13
D	13	11	7	1

Q14

5070/12/M/J/21/Q22

pH Scale - Easy

- 22 Which row shows the pH values for 0.1 mol/dm^3 solutions of ammonia, hydrochloric acid, sodium chloride and sodium hydroxide?

	pH values			
	NH_3	HCl	NaCl	NaOH
A	1	7	13	11
B	7	1	11	13
C	11	1	7	13
D	13	11	7	1

Q15

5070/12/O/N/22/Q27

pH Scale - Easy

27 The table shows the pH values of some substances that can be consumed by humans.

substance	pH value
P	6.6
Q	3.1
R	10.4
S	7.8

Which statement about these substances is correct?

- A P is alkaline.
- B Q has the lowest concentration of hydrogen ions.
- C R can neutralise excess stomach acid.
- D S has a pH value closest to neutral.

Q16

5070/12/O/N/24/Q22

pH Scale - Easy

22 Which 1 mol/dm^3 aqueous solution has the highest pH?

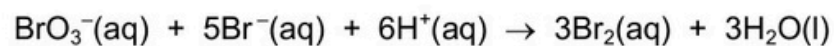
- A hydrochloric acid
- B sodium chloride
- C sodium hydroxide
- D sulfuric acid

Q17

5070/12/M/J/22/Q20

pH Meter - Hard

20 Bromate, bromide and hydrogen ions react according to the equation shown.



Some apparatus for measuring how the rate of this reaction varies over time is suggested.

- 1 gas syringe
- 2 balance
- 3 pH meter

Which apparatus is suitable to measure the rate of this reaction?

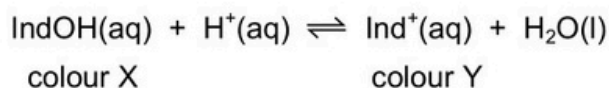
- A** 1 and 2 **B** 1 only **C** 2 and 3 **D** 3 only

Q18

5070/11/M/J/23/Q16

Indicator Colour Change - Hard

- 16 Universal indicator contains several dyes. The reversible reaction of one dye, IndOH, is shown.



A few drops of universal indicator solution are added to 50 cm³ of water.

A few drops of dilute hydrochloric acid are added to the solution.

Which row describes what happens when the acid is added?

	pH	colour of solution shifts towards
A	decreases	colour X
B	decreases	colour Y
C	increases	colour X
D	increases	colour Y

Q19

5070/12/M/J/23/Q38

Indicator Colour Change - Hard

- 38 25.0 cm³ of 1.0 mol/dm³ sodium hydroxide is titrated with dilute sulfuric acid, using a suitable indicator.

25.0 cm³ of the sulfuric acid is required to reach the end-point.

What is the concentration of the sulfuric acid and which indicator is used?

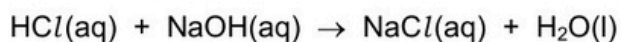
	concentration of sulfuric acid in mol/dm ³	indicator
A	0.5	methyl orange
B	0.5	universal indicator
C	2.0	methyl orange
D	2.0	universal indicator

Q20

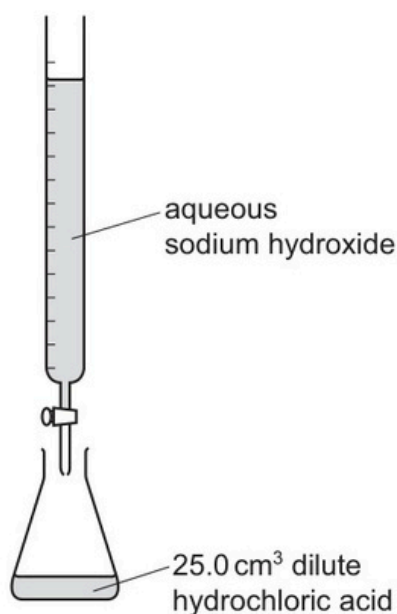
5070/12/M/J/24/Q39

Indicator Colour Change - Hard

- 39 Two titrations of dilute hydrochloric acid with aqueous sodium hydroxide are done using two different indicators, methyl orange and thymolphthalein. The equation for the reaction is shown.



Using a volumetric pipette, 25.0 cm^3 dilute hydrochloric acid is added to a conical flask with a few drops of indicator. Aqueous sodium hydroxide is added from a burette to the dilute hydrochloric acid until the end-point is reached.



The end-point of the titration with each indicator occurs when 23.6 cm^3 of aqueous sodium hydroxide is added.

Which statements about this experiment are correct?

- 1 The methyl orange changes colour from red to yellow.
- 2 The thymolphthalein changes colour from blue to colourless.
- 3 The dilute hydrochloric acid is less concentrated than the aqueous sodium hydroxide.

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

Q21

5070/11/M/J/22/Q9

Acid + Metal - Easy

- 9 A piece of magnesium reacts with dilute hydrochloric acid.

The resulting solution is then evaporated leaving a solid residue of magnesium chloride.

Which statement is correct?

- A A covalent solid is formed in this process.
- B Each chlorine atom gains one electron in this process.
- C Each magnesium atom loses only one electron in this process.
- D Molecules of an element are formed during the reaction.

Q22

5070/12/M/J/23/Q15

Acid + Metal - Easy

- 15 What is the best way of slowing down the reaction between magnesium and sulfuric acid?

- A adding a catalyst to the reactants
- B diluting the acid used in the reaction
- C stirring the reagents
- D using magnesium powder instead of a strip of magnesium

Q23

5070/12/O/N/25/Q25

Acid + Metal - Easy

- 25 When a piece of aluminium is placed in cold, dilute hydrochloric acid, no reaction is observed initially.

What is the reason for this?

- A Aluminium contains small amounts of a more reactive metal that reacts with the acid instead.
- B Aluminium is above hydrogen in the reactivity series.
- C Aluminium is amphoteric and will only react with bases.
- D Aluminium is coated with an oxide layer that prevents the acid getting to the metal.

Q24

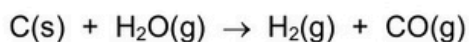
5070/11/M/J/24/Q10

Acid + Metal - Hard

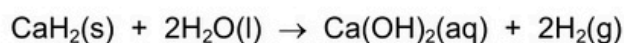
10 The reactions shown all produce hydrogen.

Which reaction produces the greatest volume of hydrogen, measured at room temperature and pressure?

A 1.4 g carbon reacts with excess steam.



B 2.4 g calcium hydride, CaH_2 , reacts with excess water.



C 4.0 g calcium reacts with excess dilute hydrochloric acid.



D 50 cm³ of 2.0 mol/dm³ sulfuric acid reacts with excess zinc.



Q25

5070/12/O/N/25/Q35

Acid + Metal Oxide - Easy

35 Copper(II) oxide reacts with dilute ethanoic acid.

Which equation for this reaction is correct?

- A** $\text{CuO} + \text{CH}_3\text{COOH} \rightarrow \text{CH}_3\text{COOCu} + \text{H}_2$
- B** $\text{CuO} + \text{CH}_3\text{COOH} \rightarrow \text{CH}_3\text{COOCu} + \text{H}_2\text{O}$
- C** $\text{CuO} + 2\text{CH}_3\text{COOH} \rightarrow (\text{CH}_3\text{COO})_2\text{Cu} + \text{H}_2$
- D** $\text{CuO} + 2\text{CH}_3\text{COOH} \rightarrow (\text{CH}_3\text{COO})_2\text{Cu} + \text{H}_2\text{O}$

Q26

5070/12/O/N/23/Q20

Acid + Metal Oxide - Hard

20 Information about three oxides, Q, R and T, is given.

Q reacts with dilute sulfuric acid to form a salt and water.

R reacts with both acids and bases to form a salt and water.

T reacts with aqueous sodium hydroxide to form a salt and water.

Using only this information, which row correctly classifies the three oxides?

	Q	R	T
A	acidic	amphoteric	basic
B	amphoteric	basic	acidic
C	basic	acidic	amphoteric
D	basic	amphoteric	acidic

Q27

5070/12/O/N/24/Q23

Acid + Metal Oxide - Hard

23 Oxide Q reacts with separate samples of dilute hydrochloric acid and aqueous potassium hydroxide.

Both reactions produce a salt and water.

Which statement is correct?

- A Q is an acidic oxide.
- B Q is an amphoteric oxide.
- C Q is a basic oxide.
- D Q is a non-metal oxide.

Q28

5070/11/O/N/25/Q18

Acid + Metal Oxide - Hard

18 Some properties of a solid oxide are listed.

- It reacts with dilute sulfuric acid giving a salt and water.
- It is insoluble in water.
- It reacts with aqueous sodium hydroxide.

Which oxide is being described?

- A** aluminium oxide
- B** magnesium oxide
- C** phosphorus(V) oxide
- D** sodium oxide

Q29

5070/11/M/J/22/Q13

Acid + Metal Hydroxide - Easy

- 13 Aqueous calcium hydroxide is an alkali. It is neutralised by dilute nitric acid to produce calcium nitrate and water.

What is the **ionic** equation for this reaction?

- A $\text{Ca}^+ + \text{OH}^- + \text{H}^+ + \text{NO}_3^- \rightarrow \text{CaNO}_3 + \text{H}_2\text{O}$
- B $\text{Ca}(\text{OH})_2 + 2\text{HNO}_3 \rightarrow \text{Ca}(\text{NO}_3)_2 + \text{H}_2\text{O}$
- C $\text{Ca}^{2+}(\text{OH}^-)_2 + 2\text{H}^+\text{NO}_3^- \rightarrow \text{Ca}^{2+}(\text{NO}_3^-)_2 + \text{H}_2\text{O}$
- D $\text{OH}^- + \text{H}^+ \rightarrow \text{H}_2\text{O}$

Q30

5070/12/M/J/23/Q23

Acid + Metal Hydroxide - Hard

- 23 The addition of calcium hydroxide to soil reduces its acidity but also reduces the efficiency of fertilisers.

Which two equations explain this?

- 1 $\text{Ca(OH)}_2(\text{s}) + \text{CO}_2(\text{g}) \rightarrow \text{CaCO}_3(\text{s}) + \text{H}_2\text{O}(\text{l})$
- 2 $\text{Ca(OH)}_2(\text{s}) + 2\text{H}^+(\text{aq}) \rightarrow \text{Ca}^{2+}(\text{aq}) + 2\text{H}_2\text{O}(\text{l})$
- 3 $\text{Ca(OH)}_2(\text{s}) + 2\text{NH}_4\text{NO}_3(\text{aq}) \rightarrow \text{Ca(NO}_3)_2(\text{aq}) + 2\text{NH}_3(\text{g}) + 2\text{H}_2\text{O}(\text{l})$
- 4 $\text{Ca(OH)}_2(\text{s}) + \text{Cu}^{2+}(\text{aq}) \rightarrow \text{Cu(OH)}_2(\text{s}) + \text{Ca}^{2+}(\text{aq})$

- A** 1 and 2 **B** 1 and 4 **C** 2 and 3 **D** 3 and 4

Q31

5070/11/M/J/21/Q23

Acid + Metal Carbonate - Easy

23 The water in a lake is acidic and the fish are dying. The water in the lake needs to be neutralised.

Which compound can be added in excess to neutralise the water in the lake?

- A calcium carbonate
- B phosphoric acid
- C potassium hydroxide
- D sodium nitrate

Q32

5070/12/M/J/23/Q7

Acid + Metal Carbonate - Easy

7 What is the equation for the reaction between sodium carbonate and dilute nitric acid?

- A $\text{NaCO}_3 + \text{H}_2\text{NO}_3 \rightarrow \text{NaNO}_3 + \text{H}_2\text{O} + \text{CO}_2$
- B $\text{NaCO}_3 + 2\text{HNO}_3 \rightarrow \text{NaNO}_3 + \text{H}_2\text{O} + \text{CO}_2$
- C $\text{Na}_2\text{CO}_3 + \text{H}_2\text{NO}_3 \rightarrow \text{Na}_2\text{NO}_3 + \text{H}_2\text{O} + \text{CO}_2$
- D $\text{Na}_2\text{CO}_3 + 2\text{HNO}_3 \rightarrow 2\text{NaNO}_3 + \text{H}_2\text{O} + \text{CO}_2$

Q33

5070/12/O/N/24/Q21

Acid + Metal Carbonate - Easy

21 Which solid reacts with dilute hydrochloric acid to produce a gas?

- A carbon
- B copper
- C magnesium oxide
- D sodium carbonate

Q34

5070/12/O/N/25/Q7

Acid + Metal Carbonate - Easy

- 7 Powdered calcium carbonate reacts with dilute hydrochloric acid to produce calcium chloride, water and carbon dioxide.

What is the correct ionic equation, including state symbols, for this reaction?

- A** $\text{CaCO}_3(\text{s}) + 2\text{HCl}(\text{aq}) \rightarrow \text{CaCl}_2(\text{aq}) + \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g})$
- B** $\text{CaCO}_3(\text{s}) + 2\text{H}^+(\text{aq}) \rightarrow \text{Ca}^{2+}(\text{aq}) + \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g})$
- C** $\text{Ca}^{2+}(\text{aq}) + \text{CO}_3^{2-}(\text{aq}) + 2\text{H}^+(\text{aq}) \rightarrow \text{Ca}^{2+}(\text{aq}) + \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g})$
- D** $\text{CO}_3^{2-}(\text{aq}) + 2\text{H}^+(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g})$

Q35

5070/12/M/J/23/Q22

Acid + Metal Carbonate - Hard

22 Which statement about hydrochloric acid is correct?

- A Hydrochloric acid reacts with magnesium carbonate to form three different products.
- B Hydrochloric acid reacts with magnesium to form magnesium chloride and water.
- C When hydrochloric acid is added to a colourless solution of thymolphthalein, it turns blue.
- D When hydrochloric acid is warmed with ammonium chloride, ammonia is formed.

Q36

5070/12/M/J/21/Q24

Acid + Ammonia - Easy

24 Aqueous ammonia reacts with a compound to form a salt, ammonium phosphate.

What type of reaction will ammonia undergo to form ammonium phosphate?

- A** combustion
- B** neutralisation
- C** oxidation
- D** precipitation

Q37

5070/11/O/N/21/Q23

Salt Solubility - Easy

23 Which compound can be formed by precipitation?

A NaCl

B K₂SO₄

C Ca(NO₃)₂

D PbSO₄

Q38

5070/12/O/N/21/Q23

Salt Solubility - Easy

23 Which compound can be formed by precipitation?

A NaCl

B K₂SO₄

C Ca(NO₃)₂

D PbSO₄

Q39

5070/11/O/N/23/Q22

Salt Solubility - Easy

22 A solution of sodium carbonate is added to tap water.

A white precipitate forms.

Which ion present in the tap water causes the precipitate to form?

A chloride

B magnesium

C potassium

D sulfate

Q40

5070/12/M/J/23/Q24

Salt Solubility - Easy

24 Which anions are contained in salts that are always soluble in water?

- A** carbonates
- B** chlorides
- C** nitrates
- D** sulfates

Q41

5070/12/M/J/24/Q23

Salt Solubility - Easy

23 Which compound is the least soluble in water?

- A** calcium chloride
- B** lead nitrate
- C** magnesium carbonate
- D** potassium sulfate

Q42

5070/12/O/N/25/Q20

Salt Solubility - Easy

20 Which pair of substances are both insoluble in water?

- A** ammonium chloride and ammonium carbonate
- B** copper carbonate and copper hydroxide
- C** lead nitrate and lead chloride
- D** zinc sulfate and zinc hydroxide

Q43

5070/12/M/J/22/Q28

Salt Solubility - Hard

28 A white compound is insoluble in water.

Which cations and anions could be present in the compound?

	sodium	calcium	carbonate	nitrate
A	✓	✓	x	✓
B	✓	x	✓	x
C	x	✓	✓	x
D	x	✓	✓	✓

key

✓ = present

x = absent

Q44

5070/12/O/N/23/Q22

Preparation of Salts - Hard

22 A student has five reagents.

- dilute hydrochloric acid
- dilute sulfuric acid
- dilute nitric acid
- solid calcium carbonate
- solid copper(II) carbonate

How many soluble salts can be prepared from these five reagents?

A 3**B** 4**C** 5**D** 6

Q45

5070/11/O/N/24/Q21

Preparation of Salts - Hard

21 A student is provided with suitable apparatus, distilled water and the following reagents.

solid magnesium hydroxide solid lead carbonate

dilute nitric acid aqueous sodium chloride aqueous sodium sulfate

Which salts can the student prepare as a pure dry sample?

- A** lead nitrate, magnesium nitrate, lead chloride, lead sulfate and magnesium sulfate
- B** lead nitrate, magnesium nitrate, lead chloride and lead sulfate only
- C** lead nitrate, magnesium nitrate and lead chloride only
- D** lead nitrate and magnesium nitrate only

Q46

5070/12/O/N/24/Q24

Preparation of Salts - Hard

24 The table shows four methods used to prepare pure salts.

Which row shows a method of making a pure sample of each named salt?

	acid + carbonate	acid + metal	precipitation	titration
A	copper(II) sulfate	magnesium sulfate	silver chloride	sodium chloride
B	sodium sulfate	copper(II) sulfate	sodium chloride	silver chloride
C	potassium chloride	sodium chloride	copper(II) sulfate	magnesium sulfate
D	potassium sulfate	sodium chloride	silver chloride	copper(II) sulfate

Q47

5070/11/O/N/21/Q1

Excess Method - Easy

- 1 A student makes aqueous copper(II) sulfate. The student adds an excess of copper(II) oxide powder to warm sulfuric acid and stirs the mixture.

Which apparatus should be used to separate aqueous copper(II) sulfate from the excess copper(II) oxide?

- A burette
- B distillation apparatus
- C filter funnel and paper
- D measuring cylinder

Q48

5070/12/O/N/22/Q30

Excess Method - Easy

- 30 A pure sample of a salt is obtained by filtration followed by evaporation of the filtrate.

Which pair of reagents would produce the salt?

- A copper and hydrochloric acid
- B excess copper(II) carbonate and hydrochloric acid
- C aqueous silver nitrate and hydrochloric acid
- D aqueous sodium hydroxide and hydrochloric acid

Q49

5070/12/M/J/25/Q38

Excess Method - Easy

- 38 A student is making a sample of aqueous copper(II) sulfate. The student adds an excess of copper(II) oxide powder to warm sulfuric acid and stirs the mixture.

Which apparatus is used to separate aqueous copper(II) sulfate from the excess copper(II) oxide?

- A burette
- B distillation apparatus
- C filter funnel and paper
- D measuring cylinder

Q50

5070/12/O/N/21/Q1

Titration Method - Easy

- 1 In a titration, 25.0 cm^3 of aqueous sodium hydroxide is transferred into a conical flask. A few drops of indicator are added. Dilute hydrochloric acid is then added to the flask until the end-point is reached.

Which pieces of apparatus are used to measure volume in this experiment?

	to measure dilute hydrochloric acid	to measure aqueous sodium hydroxide
A	burette	beaker
B	burette	pipette
C	pipette	pipette
D	pipette	beaker

Q51

5070/11/O/N/24/Q38

Titration Method - Easy

- 38 A student titrates aqueous sodium hydroxide with 0.1 mol/dm^3 hydrochloric acid. The titration results are used to calculate the concentration of the aqueous sodium hydroxide.

Which row is correct?

	apparatus to measure the volume of dilute hydrochloric acid	apparatus to measure the volume of aqueous sodium hydroxide
A	burette	measuring cylinder
B	burette	volumetric pipette
C	measuring cylinder	burette
D	volumetric pipette	volumetric pipette

Q52

5070/11/M/J/25/Q38

Titration Method - Easy

38 A titration is completed.

25.0 cm³ of aqueous sodium hydroxide is added to a conical flask.

A few drops of methyl orange indicator are added.

Dilute hydrochloric acid is added slowly to the mixture until the colour changes.

Which row is correct?

	apparatus used to add alkali	apparatus used to add acid	colour change of indicator
A	volumetric pipette	burette	red to orange
B	measuring cylinder	burette	red to orange
C	volumetric pipette	burette	yellow to orange
D	volumetric pipette	measuring cylinder	yellow to orange

Q53

5070/12/O/N/25/Q37

Titration Method - Easy

37 Which piece of apparatus is used to measure the volume of acid required to neutralise 25.0 cm³ of alkali in a titration?

- A beaker
- B burette
- C measuring cylinder
- D volumetric pipette

Q54

5070/12/M/J/22/Q27

Titration Method - Hard

27 The steps for the preparation of a pure sample of sodium nitrate are listed.

- 1 Titrate with dilute nitric acid until the end-point is seen.
- 2 Evaporate to concentrate the solution.
- 3 Rinse out the conical flask.
- 4 Add indicator.
- 5 Pipette a known volume of aqueous sodium hydroxide into a conical flask.
- 6 Cool and filter to remove crystals.
- 7 Repeat using the same volumes of aqueous sodium hydroxide and dilute nitric acid but no indicator.

Which order of steps is correct?

- A** 1 → 7 → 5 → 4 → 2 → 6 → 3
- B** 3 → 5 → 7 → 1 → 2 → 4 → 6
- C** 4 → 1 → 3 → 5 → 2 → 6 → 7
- D** 5 → 4 → 1 → 3 → 7 → 2 → 6

Q55

5070/11/M/J/21/Q24

Precipitation Method - Easy

24 Two incomplete statements about the preparation of an insoluble salt are given.

.....1..... can be used to prepare insoluble salts, such as 2..... .

The salt is collected by 3..... and it is then 4..... .

Which words correctly complete gaps 1–4?

	1	2	3	4
A	precipitation	barium nitrate	filtration	evaporated
B	precipitation	lead sulfate	evaporation	washed and dried
C	precipitation	lead sulfate	filtration	washed and dried
D	titration	barium nitrate	evaporation	washed and dried

Q56

5070/11/O/N/22/Q29

Precipitation Method - Easy

29 Which substance reacts with dilute sulfuric acid in the preparation of a pure sample of lead(II) sulfate?

- A aqueous lead(II) nitrate
- B lead foil
- C powdered lead(II) carbonate
- D powdered lead(II) oxide

Q57

5070/11/M/J/24/Q25

Precipitation Method - Easy

25 Which pair of reagents is used in a school laboratory to prepare a sample of pure barium sulfate?

- A barium carbonate and dilute sulfuric acid
- B barium carbonate and sodium sulfate
- C barium chloride and sodium sulfate
- D barium hydroxide and concentrated sulfuric acid

Q58

5070/11/M/J/22/Q28

Precipitation Method - Hard

- 28 A pure sample of lead sulfate is made by reacting aqueous solutions of two salts. The lead sulfate formed is then separated from the mixture.

Which solutions and method of separation are used?

	salt solution 1	salt solution 2	method of separation
A	lead chloride	sodium sulfate	crystallisation
B	lead chloride	sodium sulfate	filtration
C	lead nitrate	potassium sulfate	crystallisation
D	lead nitrate	potassium sulfate	filtration

Q59

5070/12/M/J/25/Q39

Precipitation Method - Hard

- 39 How can a pure sample of barium sulfate be obtained from barium carbonate?
- A Dissolve it in dilute hydrochloric acid, add dilute sulfuric acid, filter and crystallise.
 - B Dissolve it in dilute hydrochloric acid, add dilute sulfuric acid, filter and wash.
 - C Dissolve it in water, add dilute sulfuric acid, filter and crystallise.
 - D Dissolve it in water, add dilute sulfuric acid, filter and wash.

Q60

5070/11/M/J/21/Q5

Identification of Gases - Easy

5 Gas X has the following properties.

- 1 colourless
- 2 no effect on either damp red or blue litmus papers
- 3 no effect on limewater
- 4 flammable

What is gas X?

- A ammonia
- B chlorine
- C hydrogen
- D oxygen

Q61

5070/12/M/J/21/Q5

Identification of Gases - Easy

5 Gas X has the following properties.

- 1 colourless
- 2 no effect on either damp red or blue litmus papers
- 3 no effect on limewater
- 4 flammable

What is gas X?

- A** ammonia
- B** chlorine
- C** hydrogen
- D** oxygen

Q62

5070/11/O/N/21/Q5

Identification of Gases - Hard

- 5 A compound X, when heated with an aqueous solution of compound Y, produces a gas that turns red litmus blue.

- 1 Y could be potassium hydroxide.
- 2 X is an acid.
- 3 X could be an ammonium salt.
- 4 X could be sodium nitrate.

Which statements are correct?

- A** 1, 2 and 3 **B** 1 and 3 only **C** 3 only **D** 2 and 4

Q63

5070/11/O/N/23/Q40

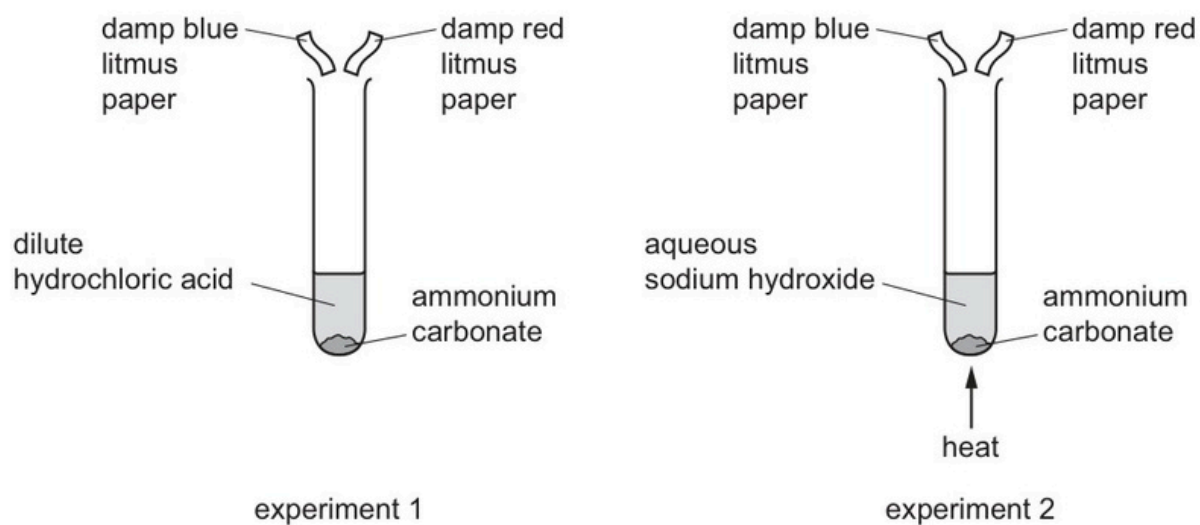
Identification of Gases - Hard

40 A student does two experiments.

In experiment 1, ammonium carbonate is reacted with dilute hydrochloric acid.

In experiment 2, ammonium carbonate is heated with aqueous sodium hydroxide.

In each experiment, the gas evolved is tested with damp blue litmus paper and damp red litmus paper.



Which row correctly shows the colour of both pieces of litmus paper at the end of each experiment?

	experiment 1	experiment 2
A	blue	blue
B	blue	red
C	red	blue
D	red	red

Q64

5070/12/O/N/25/Q40

Identification of Gases - Hard

40 Solid Q reacts with dilute hydrochloric acid, producing a gas that turns limewater milky.

Warming solid Q with aqueous sodium hydroxide produces a gas that turns damp red litmus paper blue.

What is solid Q?

- A** ammonium carbonate
- B** ammonium nitrate
- C** calcium carbonate
- D** calcium nitrate

Q65

5070/11/O/N/23/Q20

Flame Test - Easy

20 Limewater is aqueous calcium hydroxide.

Which statement about limewater is correct?

- A** It has a pH below 7.
- B** It gives a blue-green colour in the flame test.
- C** It reacts with ammonia to form an ammonium salt.
- D** It turns yellow when methyl orange is added.

Q66

5070/11/M/J/24/Q40

Flame Test - Hard

40 The table shows the results of a series of tests with two substances, X and Y.

test	result with X	result with Y
dilute nitric acid added	no reaction	no reaction
then aqueous silver nitrate added	white precipitate	no precipitate
aqueous sodium hydroxide added	white precipitate, insoluble in excess	no precipitate
then aluminium foil added; warmed gently	no gas produced	ammonia produced
flame test	orange-red flame	yellow flame

Which row shows the identities of the ions present in X and Y?

	X	Y
A	Ca^{2+} and Br^-	Na^+ and NO_3^-
B	Ca^{2+} and Cl^-	Na^+ and I^-
C	Ca^{2+} and Cl^-	Li^+ and NO_3^-
D	Ca^{2+} and Cl^-	Na^+ and NO_3^-

Q67

5070/11/M/J/25/Q40

Flame Test - Hard

40 Samples of two compounds, P and Q, are tested. The result of each test is shown.

test	P	Q
add dilute hydrochloric acid	gas given off that turns limewater milky	no observable change
acidify with dilute nitric acid then add aqueous barium nitrate	no precipitate forms	white precipitate
add aqueous sodium hydroxide	no observable change	green precipitate, soluble in excess
add aqueous ammonia	no observable change	green precipitate, insoluble in excess
flame test	lilac flame	not tested

Which row shows the identities of the ions present in P and Q?

	P	Q
A	K^+ and SO_4^{2-}	Cr^{3+} and CO_3^{2-}
B	K^+ and CO_3^{2-}	Fe^{2+} and SO_4^{2-}
C	K^+ and CO_3^{2-}	Cr^{3+} and SO_4^{2-}
D	Li^+ and CO_3^{2-}	Cr^{3+} and SO_4^{2-}

MARKING SCHEME - ACID DEFINITION - HARD

Q	Ans	Paper reference
Q1	D	5070/12/M/J/25/Q21

MARKING SCHEME - STRONG ACID - EASY

Q	Ans	Paper reference
Q2	C	5070/11/M/J/23/Q19

MARKING SCHEME - STRONG ACID - HARD

Q	Ans	Paper reference
Q3	A	5070/11/M/J/17
Q4	C	5070/11/M/J/22/Q25
Q5	B	5070/11/O/N/25/Q17

MARKING SCHEME - WEAK ACID - EASY

Q	Ans	Paper reference
Q6	A	5070/12/O/N/21/Q22
Q7	A	5070/12/M/J/24/Q22

MARKING SCHEME - WEAK ACID - HARD

Q	Ans	Paper reference
Q8	A	5070/11/M/J/25/Q20
Q9	D	5070/12/M/J/25/Q20

MARKING SCHEME - BASE DEFINITION - EASY

Q	Ans	Paper reference
Q10	B	5070/12/M/J/22/Q25
Q11	B	5070/11/M/J/24/Q23

MARKING SCHEME - BASE DEFINITION - HARD

Q	Ans	Paper reference
Q12	B	5070/12/O/N/23/Q19

MARKING SCHEME - PH SCALE - EASY

Q	Ans	Paper reference
Q13	C	5070/11/M/J/21/Q22
Q14	C	5070/12/M/J/21/Q22
Q15	C	5070/12/O/N/22/Q27
Q16	C	5070/12/O/N/24/Q22

MARKING SCHEME - PH METER - HARD

Q	Ans	Paper reference
Q17	D	5070/12/M/J/22/Q20

MARKING SCHEME - INDICATOR COLOUR CHANGE - HARD

Q	Ans	Paper reference
Q18	B	5070/11/M/J/23/Q16
Q19	A	5070/12/M/J/23/Q38
Q20	C	5070/12/M/J/24/Q39

MARKING SCHEME - ACID + METAL - EASY

Q	Ans	Paper reference
Q21	D	5070/11/M/J/22/Q9
Q22	B	5070/12/M/J/23/Q15
Q23	D	5070/12/O/N/25/Q25

MARKING SCHEME - ACID + METAL - HARD

Q	Ans	Paper reference
Q24	A	5070/11/M/J/24/Q10

MARKING SCHEME - ACID + METAL OXIDE - EASY

Q	Ans	Paper reference
Q25	D	5070/12/O/N/25/Q35

MARKING SCHEME - ACID + METAL OXIDE - HARD

Q	Ans	Paper reference
Q26	D	5070/12/O/N/23/Q20
Q27	B	5070/12/O/N/24/Q23
Q28	A	5070/11/O/N/25/Q18

MARKING SCHEME - ACID + METAL HYDROXIDE - EASY

Q	Ans	Paper reference
Q29	D	5070/11/M/J/22/Q13

MARKING SCHEME - ACID + METAL HYDROXIDE - HARD

Q	Ans	Paper reference
Q30	C	5070/12/M/J/23/Q23

MARKING SCHEME - ACID + METAL CARBONATE - EASY

Q	Ans	Paper reference
Q31	A	5070/11/M/J/21/Q23
Q32	D	5070/12/M/J/23/Q7
Q33	D	5070/12/O/N/24/Q21
Q34	B	5070/12/O/N/25/Q7

MARKING SCHEME - ACID + METAL CARBONATE - HARD

Q	Ans	Paper reference
Q35	A	5070/12/M/J/23/Q22

MARKING SCHEME - ACID + AMMONIA - EASY

Q	Ans	Paper reference
Q36	B	5070/12/M/J/21/Q24

MARKING SCHEME - SALT SOLUBILITY - EASY

Q	Ans	Paper reference
Q37	D	5070/11/O/N/21/Q23
Q38	D	5070/12/O/N/21/Q23
Q39	B	5070/11/O/N/23/Q22
Q40	C	5070/12/M/J/23/Q24
Q41	C	5070/12/M/J/24/Q23
Q42	B	5070/12/O/N/25/Q20

MARKING SCHEME - SALT SOLUBILITY - HARD

Q	Ans	Paper reference
Q43	C	5070/12/M/J/22/Q28

MARKING SCHEME - PREPARATION OF SALTS - HARD

Q	Ans	Paper reference
Q44	C	5070/12/O/N/23/Q22
Q45	B	5070/11/O/N/24/Q21
Q46	A	5070/12/O/N/24/Q24

MARKING SCHEME - EXCESS METHOD - EASY

Q	Ans	Paper reference
Q47	C	5070/11/O/N/21/Q1
Q48	B	5070/12/O/N/22/Q30
Q49	C	5070/12/M/J/25/Q38

MARKING SCHEME - TITRATION METHOD - EASY

Q	Ans	Paper reference
Q50	B	5070/12/O/N/21/Q1
Q51	B	5070/11/O/N/24/Q38
Q52	C	5070/11/M/J/25/Q38
Q53	B	5070/12/O/N/25/Q37

MARKING SCHEME - TITRATION METHOD - HARD

Q	Ans	Paper reference
Q54	D	5070/12/M/J/22/Q27

MARKING SCHEME - PRECIPITATION METHOD - EASY

Q	Ans	Paper reference
Q55	C	5070/11/M/J/21/Q24
Q56	A	5070/11/O/N/22/Q29
Q57	C	5070/11/M/J/24/Q25

MARKING SCHEME - PRECIPITATION METHOD - HARD

Q	Ans	Paper reference
Q58	D	5070/11/M/J/22/Q28
Q59	B	5070/12/M/J/25/Q39

MARKING SCHEME - IDENTIFICATION OF GASES - EASY

Q	Ans	Paper reference
Q60	C	5070/11/M/J/21/Q5
Q61	C	5070/12/M/J/21/Q5

MARKING SCHEME - IDENTIFICATION OF GASES - HARD

Q	Ans	Paper reference
Q62	B	5070/11/O/N/21/Q5
Q63	C	5070/11/O/N/23/Q40
Q64	A	5070/12/O/N/25/Q40

MARKING SCHEME - FLAME TEST - EASY

Q	Ans	Paper reference
Q65	D	5070/11/O/N/23/Q20

MARKING SCHEME - FLAME TEST - HARD

Q	Ans	Paper reference
Q66	D	5070/11/M/J/24/Q40
Q67	C	5070/11/M/J/25/Q40