01. 0620_m15_qp_62 Q: 5

Two metal salt solutions, **E** and **F**, were analysed.
E was a mixture of iron(II) sulfate and ammonium sulfate.
The tests on the solutions and some of the observations are in the following table.
Complete the observations in the table.

tests	observations
tests on solution **E** **(a)** Appearance of solution **E**.	..... [1]
The solution was divided into three equal portions in separate test-tubes. **(b)** Dilute nitric acid and aqueous barium nitrate were added to the first portion of the solution.	..... [1]
(c) **(i)** Excess aqueous sodium hydroxide was added to the second portion of the solution.	..... [2]
(ii) The mixture was filtered and the filtrate heated. The gas given off was tested with damp litmus paper.	.... [2]
(d) Dilute sulfuric acid and aqueous potassium manganate(VII), an oxidising agent, were added to the third portion of the solution. Aqueous sodium hydroxide was then added to the mixture.	..... [1]
tests on solution **F** **(e)** Appearance of solution **F**.	yellow liquid
(f) Zinc powder was added to solution **F**.	rapid effervescence
The solution was observed for five minutes.	turned blue, then green and finally light purple
The gas given off was tested with a splint.	lighted splint popped

(g) Identify the gas given off in test **(f)**.

..... [1]

(h) What conclusions can you draw about solution **F**?

.....

..... [2]

[Total: 10]

---

02. 0620_m16_qp_62 Q: 3

Two solids, **L** and **M**, were analysed. Solid **L** was copper(II) chloride and solid **M** was a different salt.
The tests on the solids, and some of the observations, are shown.

tests on solid L

(a) Describe the appearance of solid **L**.

observation ..... [1]

(b) Distilled water was added to solid **L** and shaken to dissolve.

The solution was divided into four equal portions in four test-tubes and the following tests carried out.

(i) Drops of aqueous ammonia were added to the first portion of the solution.

Excess ammonia solution was then added to the mixture and shaken.

observation .....

.....

.....

..... [4]

(ii) Excess aqueous sodium hydroxide was added to the second portion of the solution.

observation .....

..... [1]

(iii) Dilute nitric acid was added to the third portion of the solution followed by aqueous silver nitrate.

observation ..... [1]

(iv) Dilute nitric acid was added to the fourth portion of the solution followed by aqueous barium nitrate.

observation ..... [1]

tests on solid M

Tests are carried out and the following observations made.

tests on solid **M**	observations
Appearance of the solid.	white crystals
The solid was heated and the gas given off was tested with damp red litmus paper.	a sublimate formed on the sides of the test-tube litmus paper turned blue
Solid **M** was dissolved in water to form a solution. Aqueous sodium hydroxide was added to the solution and the mixture heated. The gas given off was tested.	pungent gas evolved pH paper showed pH 10
Dilute nitric acid was added to the solution followed by aqueous silver nitrate.	yellow precipitate

(c) Identify solid **M**.

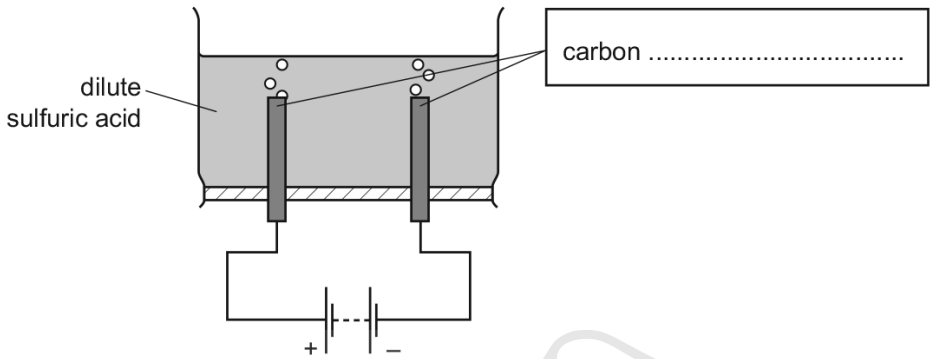
.....

..... [2]

[Total: 10]

03. 0620_m17_qp_62 Q: 1

A student investigated the gases formed during the electrolysis of dilute sulfuric acid using the apparatus shown.
Hydrogen and oxygen were produced.



(a) Complete the box to name the apparatus used. [1]

(b) On the diagram, sketch how a sample of **one** of the gases could be collected. [2]

(c) Give a test for oxygen.

test .....

result .....

[1]

(d) The gas collected at the positive side turned limewater milky.

(i) Based on this observation, what gas was present?

..... [1]

(ii) Suggest how this gas was formed.

..... [1]

(e) A solution of dilute sulfuric acid was electrolysed for 1 hour.

Suggest why the pH of the solution **decreased** during the electrolysis.

.....

..... [2]

[Total: 8]

04. 0620_m17_qp_62 Q: 3

Two solids, **Q** and **R**, which are both salts, were analysed. Solid **Q** was zinc bromide.
Tests were carried out on each solid.

tests on solid Q

Solid **Q** was dissolved in distilled water.
The solution was divided into three equal portions in three test-tubes, and the following tests were carried out.

Complete the expected observations.

(a) (i) Drops of aqueous sodium hydroxide were added to the first portion of the solution until a change was seen.

observations ..... [2]

(ii) Excess aqueous sodium hydroxide was then added to the mixture.

observations ..... [1]

(b) (i) Drops of aqueous ammonia were added to the second portion of the solution until a change was seen.

observations ..... [1]

(ii) Excess aqueous ammonia was then added to the mixture.

observations ..... [1]

(c) Dilute nitric acid and aqueous silver nitrate were added to the third portion of the solution.

observations ..... [2]

tests on solid R

Tests were carried out and the following observations made.

tests on solid **R**	observations
test 1 A flame test was carried out on solid **R**.	yellow colour
Solid **R** was dissolved in distilled water. The solution was divided into two equal portions in two test-tubes. **test 2** Dilute nitric acid and aqueous barium nitrate were added to the first portion of the solution.	no change
test 3 Dilute nitric acid and aqueous silver nitrate were added to the second portion of the solution.	yellow precipitate formed

(d) Identify solid **R**.

..... [2]

[Total: 9]

05. 0620_m17_qp_62 Q: 4

When solid barium hydroxide is added to solid ammonium chloride a reaction takes place.

(a) Describe an experiment to show that this reaction is endothermic.

.....

.....

.....

.....

.....

..... [4]

(b) How could you show whether or not the final mixture contains ammonium ions?

.....

.....

.....

..... [2]

[Total: 6]

06. 0620_m18_qp_62 Q: 3

Two substances, solution **M** and solid **N**, were analysed. Solution **M** was aqueous iron(III) chloride. Tests were done on the substances.

Complete the expected observations.

tests on solution M

(a) Describe the appearance of solution **M**.

..... [1]

Solution **M** was divided into three equal portions in three test-tubes.

(b) Dilute nitric acid and aqueous silver nitrate were added to the first portion of solution **M**.

observations ..... [2]

(c) Dilute nitric acid and aqueous barium nitrate were added to the second portion of solution **M**.

observations ..... [1]

(d) (i) Drops of aqueous sodium hydroxide were added to the third portion of solution **M** until a change was seen.

observations ..... [2]

(ii) An excess of aqueous sodium hydroxide was then added to the mixture.

observations ..... [1]

tests on solid N

Some of the tests and observations are shown.

tests on solid **N**	observations
The appearance of solid **N** was studied.	green powder
test 1 Solid **N** was heated. The gas produced was tested.	 solid turned black limewater turned milky
test 2 A flame test was done on solid **N**.	 blue-green colour

(e) Name the gas produced in **test 1**.

..... [1]

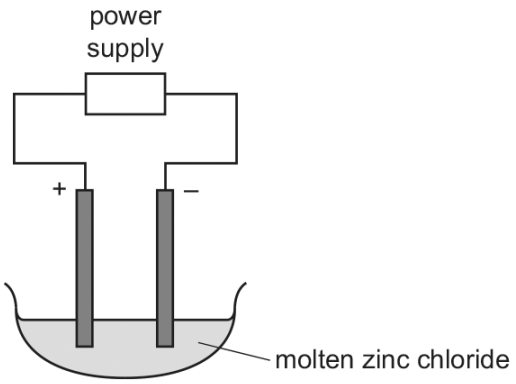
(f) Identify solid **N**.

..... [2]

[Total: 10]

07. 0620_m19_qp_62 Q: 1

A chemist heated solid zinc chloride until it became molten. The apparatus shown was then used to pass electricity through the molten zinc chloride using inert electrodes.



A silver-coloured solid was formed at the negative electrode (cathode).

(a) Name the process of breaking down a substance using electricity.

..... [1]

(b) A Bunsen burner was used to heat the zinc chloride.

Describe how a Bunsen burner is adjusted to give a very hot flame.

.....

..... [1]

(c) Suggest and explain the expected observation at the positive electrode (anode).

.....

..... [2]

(d) Suggest why iron electrodes **cannot** be used in this experiment.

..... [1]

(e) (i) What difference would the chemist observe at the negative electrode if aqueous zinc chloride were used, rather than molten zinc chloride?
Explain you answer.

difference .....

explanation .....

.....
[2]

(ii) When electricity is used to break down concentrated aqueous zinc chloride, chlorine is produced at the positive electrode.

Describe a test for chlorine.

test .....

observations .....
[2]

(f) The bottle of zinc chloride is labelled *corrosive*.

State **one** safety precaution that should be taken when using zinc chloride.

..... [1]

[Total: 10]

08. 0620_m19_qp_62 Q: 2

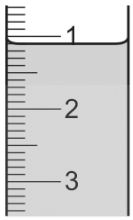
A student investigated the reaction between two different solutions, **A** and **B**, of aqueous potassium manganate(VII) and solution **C**.

Three experiments were done.

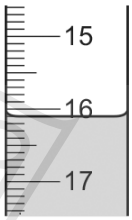
Experiment 1

- A burette was filled with solution **A**. The initial burette reading was recorded.
- A measuring cylinder was used to pour 25 cm^3 of solution **C** into a conical flask.
- Solution **A** was added to the conical flask until the mixture just turned pink. The final burette reading was recorded.
- About 2 cm^3 of the contents of the conical flask was poured into a test-tube to use in Experiment 3.
- The rest of the contents of the conical flask was poured away. The conical flask was rinsed with distilled water.

(a) Use the burette diagrams to record the burette readings in the table and complete the table.



initial burette reading



final burette reading

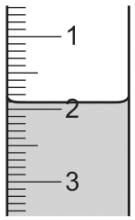
	Experiment 1
final burette reading / cm^3	
initial burette reading / cm^3	
volume used / cm^3	.

[2]

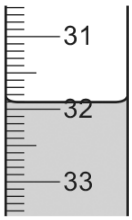
Experiment 2

- The contents of the burette used in Experiment 1 were poured away and the burette was rinsed with distilled water.
- The burette was then rinsed with solution **B**.
- Experiment 1 was repeated using solution **B** instead of solution **A**.

(b) Use the burette diagrams to record the burette readings in the table and complete the table.



initial burette reading



final burette reading

	Experiment 2
final burette reading / cm^3	
initial burette reading / cm^3	
volume used / cm^3	

[2]

(c) (i) Which solution of potassium manganate(VII), solution **A** or solution **B**, is the more concentrated?
Explain your answer.

.....

..... [2]

(ii) How many times more concentrated is this solution of potassium manganate(VII)?

..... [1]

(d) (i) Predict the volume of solution **B** that would be used if Experiment 2 were repeated using 50 cm^3 of solution **C**.
Explain your answer.

.....

..... [2]

(ii) Suggest a practical problem that using 50 cm^3 of solution **C** could cause. How could this problem be solved?

.....

..... [2]

(e) Give **one** advantage and **one** disadvantage of using a measuring cylinder rather than a pipette for solution **C**.

advantage of using a measuring cylinder .....

.....

disadvantage of using a measuring cylinder .....

.....
[2]

Experiment 3

The results from Experiment 3 are shown in the table.

tests	observations
Aqueous sodium hydroxide was added to about 2 cm^3 of solution **C**.	green precipitate formed
Aqueous sodium hydroxide was added to the reaction mixture saved from Experiment 1.	red-brown precipitate formed

(f) What conclusions can be drawn about solution **C** from Experiment 3?

.....

..... [2]

[Total: 15]

09. 0620_m19_qp_62 Q: 3

Two substances, solution **D** and solid **E**, were analysed. Solution **D** was dilute sulfuric acid. Tests were done on the substances.

tests on solution D

Complete the expected observations.

Solution **D** was divided into four equal portions in four test-tubes.

(a) The pH of the first portion of solution **D** was tested.

pH = ... [1]

(b) A strip of magnesium ribbon was added to the second portion of solution **D**. The gas produced was tested.

observations .....

.....

..... [3]

(c) Dilute nitric acid and aqueous silver nitrate were added to the third portion of solution **D**.

observations ..... [1]

(d) Dilute nitric acid and aqueous barium nitrate were added to the fourth portion of solution **D**.

observations ..... [1]

tests on solid E

Some of the tests and observations are shown.

tests on solid **E**	observations
The appearance of solid **E** was studied.	white solid
test 1 Solid **E** was heated gently and then more strongly. Distilled water was added to the residue and the pH of the mixture was tested.	white solid residue pH = 10
test 2 Dilute hydrochloric acid was added to solid **E**. The gas produced was tested. Distilled water was added to the solution and the mixture was shaken. An excess of aqueous sodium hydroxide was added to the mixture.	rapid effervescence limewater turned milky white precipitate formed which was insoluble in excess

(e) Identify the gas produced in **test 2**.

..... [1]

(f) What conclusions can you draw about solid **E**?

..... [2]

[Total: 9]

10. 0620_m20_qp_62 Q: 3

Solution **J** and solid **K** were analysed.

tests on solution J

tests	observations
Solution **J** was colourless. Solution **J** was divided into three portions in three test-tubes. **test 1** Universal indicator paper was dipped into the first portion of solution **J**.	the universal indicator paper turned red
test 2 A spatula measure of sodium carbonate was added to the second portion of solution **J**. The gas given off was tested.	effervescence was seen, the gas produced turned limewater milky
test 3 1 cm^3 of dilute nitric acid and a few drops of aqueous silver nitrate were added to the third portion of solution **J**.	a white precipitate formed

(a) Use the observation from **test 1** to suggest the pH of solution **J**.

pH = ... [1]

(b) Name the gas given off in **test 2**.

..... [1]

(c) Identify solution **J**.

.....

..... [2]

tests on solid K

Solid **K** was ammonium nitrate.

Complete the expected observations.

Solid **K** was dissolved in water to produce solution **K**. Solution **K** was divided into two equal portions.

(d) About 1 cm^3 of dilute nitric acid and a few drops of aqueous barium nitrate were added to the first portion of solution **K**.

observations ..... [1]

(e) 2 cm^3 of aqueous sodium hydroxide was added to the second portion of solution **K**. The mixture was warmed and the gas given off was tested.

observations .....

.....

..... [2]

[Total: 7]

11. 0620_m21_qp_62 Q: 3

Two solids, solid **C** and solid **D**, were analysed.
Tests were done on each solid.

tests on solid C

Tests were carried out and the following observations were made.

tests	observations
test 1 A flame test was carried out on solid **C**.	a red flame was seen
Solid **C** was dissolved in distilled water to produce solution **C**. **test 2** About 5 cm^3 of aqueous sodium hydroxide was added to solution **C**.	no change
test 3 A piece of aluminium foil was added to the mixture formed in **test 2**.The mixture was warmed gently and any gas produced was tested.	effervescence was seen; damp red litmus paper turned blue

(a) Name the gas that turned the damp red litmus paper blue in **test 3**.

..... [1]

(b) Identify solid **C**.

.....

..... [2]

tests on solid D

Solid **D** was aluminium sulfate.

Complete the expected observations.

Solid **D** was dissolved in water to form solution **D**. Solution **D** was divided into four approximately equal portions in four test-tubes.

(c) Aqueous sodium hydroxide was added dropwise and then in excess to the first portion of solution **D**.

observations .....

..... [2]

(d) Aqueous ammonia was added dropwise and then in excess to the second portion of solution **D**.

observations .....

..... [2]

(e) About 1 cm^3 of dilute nitric acid and a few drops of aqueous silver nitrate were added to the third portion of solution **D**.

observations ..... [1]

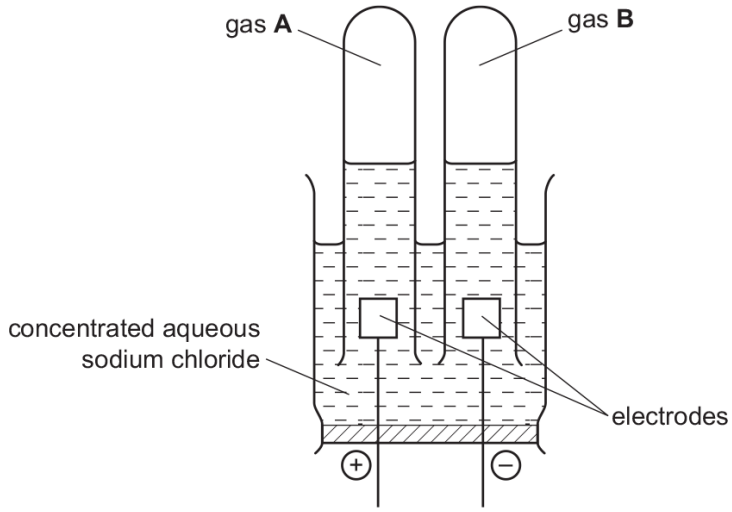
(f) About 1 cm^3 of dilute nitric acid and a few drops of aqueous barium nitrate were added to the fourth portion of solution **D**.

observations ..... [1]

[Total: 9]

12. 0620_p20_qp_60 Q: 3

Concentrated aqueous sodium chloride was broken down by electricity using the apparatus shown.



(a) Suggest a suitable material from which to make the electrodes.

.....[1]

(b) Gas **A** is chlorine. Give a test for chlorine.

test .....

result .....[2]

(c) Gas **B** pops when tested with a lighted splint. What is gas **B**?

.....[1]

[Total: 4]

13. 0620_p20_qp_60 Q: 4

Solid **E** was analysed. **E** was an aluminium salt. Some of the observations are shown below.

tests on solid E	observations
Appearance of solid **E**.	white crystalline solid
test 1 A little of solid **E** was heated in a test-tube.	colourless drops of liquid formed at the top of the tube

(a) A little of solid **E** was dissolved in distilled water.

The solution was divided into four test-tubes and the following tests were carried out.

Complete the observations for **tests 2** and **3**.

(i) **test 2**

Drops of aqueous sodium hydroxide were added to the first test-tube.

observations ..... [1]

(ii) Excess sodium hydroxide was then added.

observations ..... [1]

(iii) **test 3**

Drops of aqueous ammonia solution were added to the second test-tube. Excess ammonia solution was then added.

observations .....

..... [2]

Two further tests are carried out and the following observations made.

tests on solution of E	observations
test 4 To the third test-tube of solution, dilute hydrochloric acid was added, followed by barium nitrate solution.	no reaction
test 5 To the fourth test-tube of solution, aqueous sodium hydroxide and aluminium foil were added. The mixture was warmed carefully.	effervescence pungent gas given off gas turned damp litmus paper blue

(b) What does **test 1** tell you about solid **E**?

.....

..... [1]

(c) Identify the gas given off in **test 5**.

..... [1]

(d) What conclusions can you draw about solid **E**?

.....

..... [2]

(e) **Test 5** states that the mixture should be warmed carefully.

In terms of safety, explain why it is necessary to warm carefully.

.....

.....

.....

..... [2]

[Total: 10]

14. 0620_p20_qp_60 Q: 5

E-numbers identify chemicals which are added to foods.

(a) E210 is benzoic acid. How could you show that a solution of benzoic acid is a weak acid?

test .....

result ..... [2]

(b) E110 is Sunset Yellow.
Outline a method you could use to show the presence of E110 in a food colouring.
You may draw a diagram to help answer the question.

.....

.....

.....

.....

..... [4]

[Total: 6]

15. 0620_s12_qp_61 Q: 5

Solid **W** was analysed. **W** was a carbonate salt.
The tests on solid **W**, and some of the observations, are in the following table. Complete the observations in the table.
Do not write any conclusions in the table.

tests	observations
tests on solid **W** **(a)** Appearance of solid **W**.	white solid
(b) Solid **W** was heated.	gas evolved formed a white solid at the top of the test-tube
The gas given off was tested with damp red litmus paper.	litmus paper turned blue
(c) Dilute hydrochloric acid was added to solid **W**. The gas given off was tested.	.... [3]
(d) Dilute sodium hydroxide was added to solid **W** and the mixture heated. The gas given off was tested with damp pH indicator paper.	pungent gas given off pH of gas = 10

(e) Identify the gas given off in test **(d)**.

..... [1]

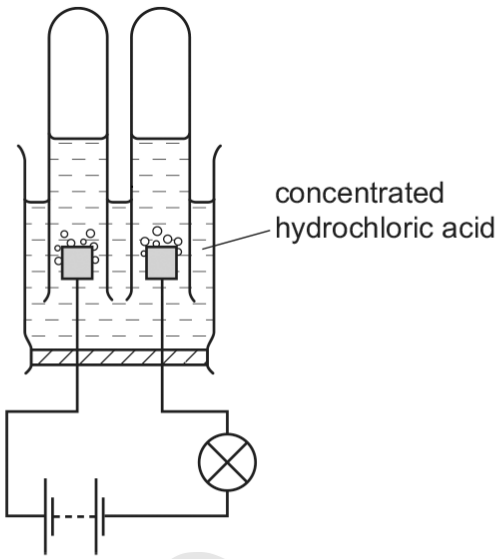
(f) What conclusions can you draw about solid **W**?

..... [2]

[Total: 6]

16. 0620_s12_qp_62 Q: 3

Electricity was passed through a solution of concentrated hydrochloric acid as shown below.



Bubbles were observed at both electrodes.

(a) Give **one** other expected observation.

..... [1]

(b) Label the electrodes. [1]

(c) **(i)** Name the gas given off at the cathode (negative electrode).

..... [1]

(ii) Give a test for this gas.

test .....

result ..... [2]

(d) Suggest why, at the beginning of the electrolysis, no gas was collected at the anode (positive electrode).

.....

..... [2]

[Total: 7]

17. 0620_s12_qp_62 Q: 6

Two substances, **E** and **F**, were analysed. **E** was a solid compound and **F** was a solution of ethanoic acid.

The tests on **E** and **F**, and some of the observations, are in the table. Complete the observations in the table.

Do not write any conclusions in the table.

tests	observations
tests on solid **E** **(a)** Appearance of solid **E**.	green powder
(b) Solid **E** was heated in a test-tube. The gas given off was tested.	black solid formed limewater turned milky
(c) (i) Solid **E** was added to dilute sulfuric acid. The solution was divided into two equal portions in test-tubes. **(ii)** Excess aqueous sodium hydroxide was added to the first portion of the solution. **(iii)** Drops of aqueous ammonia were added to the second portion of the solution. Excess aqueous ammonia was then added to the mixture.	effervescence and blue solution formed pale blue precipitate formed pale blue precipitate formed precipitate dissolved to form a dark blue solution
tests on liquid **F** **(d)** Appearance and smell of liquid **F**. **(e)** pH indicator paper was used to measure the pH of liquid **F**.	appearance ..... smell ..... [2] pH ..... [1]

(f) Identify the gas given off in test **(c)(i)**.

..... [1]

(g) Identify solid **E**.

..... [2]

[Total: 6]

18. 0620_s12_qp_63 Q: 2

Three bottles of liquids have lost their labels.
The liquids are known to be:

pentene;

aqueous sodium iodide;

aqueous ammonia.

Outline chemical tests you would do to identify and distinguish the liquid in each bottle.

liquid	chemical test	result
pentene	....	....
aqueous sodium iodide	....	....
aqueous ammonia	....	....

[6]

[Total: 6]

19. 0620_s12_qp_63 Q: 5

A mixture of two solids, **G** and **H**, was analysed. **G** was water-soluble and **H** was copper carbonate.

The tests on the mixture and some of the observations are in the following table.

Complete the observations in the table.

tests	observations
The mixture was added to water in a boiling tube. The mixture was shaken and filtered. The filtrate and the residue were tested. <u>tests on the filtrate</u> **(a)** To the filtrate, dilute nitric acid was added followed by aqueous silver nitrate.	white precipitate
(b) To the filtrate, dilute sulfuric acid was added.	white precipitate
<u>tests on the residue</u> **(c)** A little of the residue was put into a test-tube and dilute nitric acid added. The gas was tested. The contents of the test-tube were kept for test **(d)**.	..... [1] ..... [2]
(d) The contents of the test-tube were divided into two portions. **(i)** To the first portion, an excess of aqueous sodium hydroxide was added. **(ii)** To the second portion, a few drops of aqueous ammonia were added. Excess aqueous ammonia was then added.	..... [2] ..... [1] .... [2]

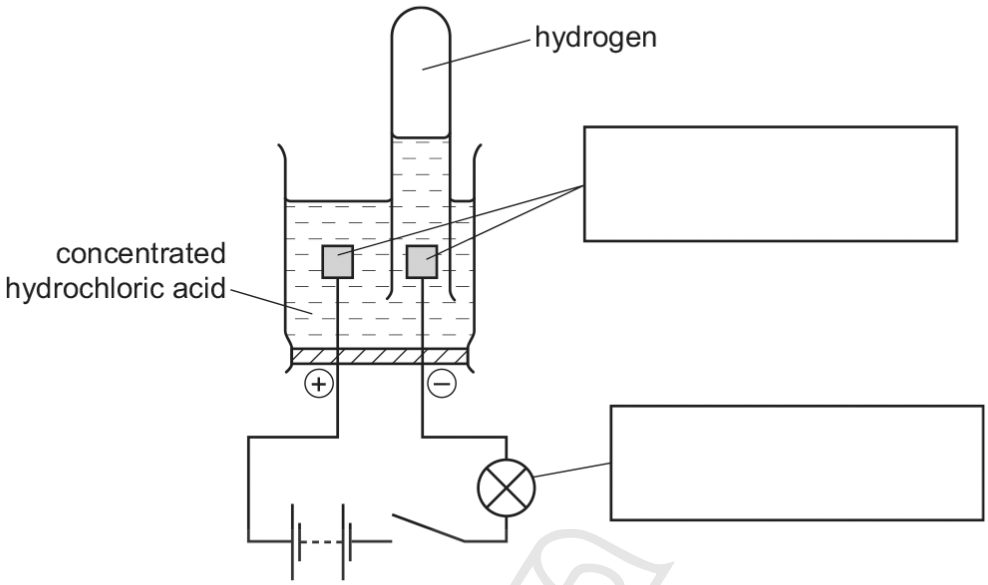
(e) What conclusions can you draw about solid **G**?

..... [2]

[Total: 10]

20. 0620_s13_qp_61 Q: 1

Electricity was passed through a solution of concentrated hydrochloric acid using the apparatus shown.



(a) Complete the boxes to identify the parts of the apparatus labelled. [2]

(b) Describe the test for hydrogen.

test .....

result ..... [2]

(c) Describe how a sample of the gas given off at the positive electrode could be collected and its volume measured.

.....

.....

..... [2]

(d) The experiment was repeated using a concentrated aqueous solution of sodium chloride instead of hydrochloric acid.

(i) State the name of the solution formed.

..... [1]

(ii) Give a test to show the presence of this product.

..... [1]

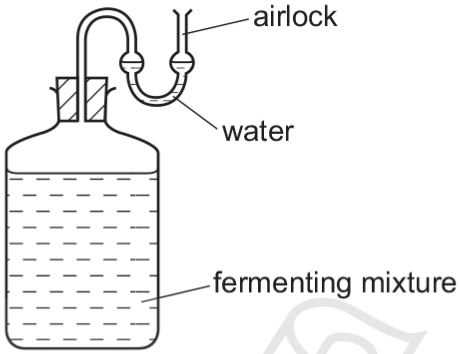
[Total: 8]

21. 0620_s13_qp_61 Q: 2

A student found a recipe for making elderberry wine by fermentation.

1 kg elderberries
0.5 kg sugar
10 g yeast granules
3 dm^3 water

The student decided to make some elderberry wine using the apparatus below.



The student carried out the following method.

Step 1 The elderberries were crushed.

Step 2 The crushed elderberries and sugar were added to the water and the mixture was boiled for ten minutes. The crushed elderberries were then separated from the mixture.

Step 3 Yeast was added to the liquid when it had cooled to room temperature.

(a) Suggest the purpose of the airlock in the apparatus.

..... [1]

(b) What apparatus could be used in Step 1?

..... [1]

(c) Draw a labelled diagram of the apparatus used to separate the crushed elderberries from the mixture in Step 2.

[2]

(d) Why was the yeast in Step 3 not added until the liquid was at room temperature?

..... [1]

(e) **(i)** State **one** observation during the fermentation.

..... [1]

(ii) Suggest how the rate of the fermentation reaction could be measured.

.....

..... [2]

(f) Name the method that could be used to separate ethanol from the fermented mixture.

..... [1]

[Total: 9]

---

22. 0620_s13_qp_62 Q: 4

A mixture of two solids, **R** and **S**, was analysed.
Solid **R** was the water-soluble salt aluminium sulfate, $Al_2(SO_4)_3$, and solid **S** was an insoluble salt.
The tests on the mixture and some of the observations are in the following table.
Complete the observations in the table.

tests	observations
Distilled water was added to the mixture in a boiling tube. The boiling tube was shaken and the contents of the boiling tube filtered, keeping the filtrate and residue for the following tests. The filtrate was divided into five test-tubes.	
<u>tests on the filtrate</u> **(a)** Appearance of the first portion of the filtrate.	..... [1]
(b) Drops of aqueous sodium hydroxide were added to the second portion of the solution and the test-tube shaken. Excess aqueous sodium hydroxide was then added to the test-tube.	.... [3]
(c) Aqueous ammonia was added to the third portion, dropwise and then in excess.	.... [2]
(d) Dilute nitric acid was added to the fourth portion of the solution followed by aqueous silver nitrate.	..... [1]
(e) Dilute nitric acid was added to the fifth portion of the solution and then aqueous barium nitrate.	..... [2]

tests	observations
<u>tests on the residue</u>	
(f) Dilute hydrochloric acid was added to the residue.	rapid effervescence
The gas given off was tested.	limewater turned milky
Excess aqueous sodium hydroxide was added to the mixture in the test-tube.	white precipitate, insoluble in excess

(g) Name the gas given off in test **(f)**.

..... [1]

(h) What conclusions can you draw about solid **S**?

..... [2]

[Total: 12]

23. 0620_s13_qp_63 Q: 4

Two solids, **H** and **I**, were analysed. **H** was the salt copper ethanoate, $(CH_3COO)_2Cu$.
The tests on the solids and some of the observations are in the following table.
Complete the observations in the table.

tests	observations
<u>tests on solid **H**</u> Solid **H** was added to distilled water in a test-tube and shaken to dissolve. The solution was divided into three equal portions in test-tubes, and the following tests carried out.	
(a) Appearance of the solution.	..... [1]
(b) Aqueous sodium hydroxide was added to the second portion of the solution.	..... [2]
(c) Drops of aqueous ammonia were added to the third portion of the solution.	..... [2]
Excess aqueous ammonia was then added to the mixture.	.... [2]
<u>tests on solid **I**</u>	
(d) (i) Solid **I** was heated in a dry test-tube. The gas given off was tested with a lighted splint.	solid turned black and charred the gas ignited
The test-tube was left to cool. Dilute hydrochloric acid was then added to the test-tube. The gas given off was tested.	effervescence limewater turned milky
(ii) Solid **I** was added to dilute nitric acid in a test-tube. The solution was warmed and the mixture smelled.	smell of vinegar

(e) What conclusions can you draw about solid **I**?

.....

..... [2]

[Total: 9]

24. 0620_s14_qp_61 Q: 5

A solid **U** was analysed. **U** was a soluble metal sulfate.
The tests on **U**, and some of the observations are in the following table.
Complete the observations.

tests	observations
tests on solid **U** **(a)** Appearance of solid **U**.	pink crystals
(b) Solid **U** was heated gently and then strongly in a test-tube.	condensation droplets formed on the sides of the test-tube
(c) Solid **U** was added to distilled water in a test-tube and shaken until dissolved. The solution was divided into three equal portions in separate test-tubes and the following tests carried out. Several drops of aqueous sodium hydroxide were added to the first portion of the solution and the test-tube shaken. Then hydrogen peroxide solution was added to the mixture and the gas given off tested.	pale brown precipitate effervescence glowing splint relit
(d) Dilute nitric acid was added to the second portion of the solution followed by barium nitrate solution.	..... [2]
(e) Dilute nitric acid was added to the third portion of the solution followed by silver nitrate solution.	..... [1]

(f) What does test **(e)** tell you about solid **U**?

..... [1]

(g) Name the gas given off in test **(c)**.

..... [1]

(h) What conclusions can you draw about solid **U**?

.....

..... [2]

[Total: 7]

---

25. 0620_s14_qp_62 Q: 5

A mixture **E** was analysed. **E** consisted of two solids, **F** and **G**. Solid **F** was ammonium chloride which is water-soluble and solid **G** was insoluble.
The tests on **E** and some of the observations are in the following table.
Complete the observations in the table.

tests	observations
<u>tests on mixture **E**</u> **(a)** Appearance of mixture **E**.	white solid
(b) Mixture **E** was heated gently then strongly. The gas was tested with damp pH indicator paper and the test-tube left to cool.	.... [1]
Mixture **E** was added to distilled water in a boiling tube and shaken. The contents of the boiling tube were filtered. <u>tests on the filtrate</u> **(c)** **(i)** Aqueous sodium hydroxide was added to the filtrate. The mixture was heated. The gas given off was tested with damp pH indicator paper. **(ii)** Silver nitrate solution was added to the filtrate followed by about 1 cm^3 of dilute nitric acid.	.... [2] ..... [2]

tests	observations
<u>tests on the residue</u> **(d)** The residue was transferred from the filter paper into a test-tube. Dilute hydrochloric acid was added to the residue.	rapid effervescence
The gas given off was tested.	limewater turned milky
The solution in the test-tube was divided into two portions. **(e) (i)** Several drops of aqueous sodium hydroxide were added to the first portion of the solution.	white precipitate
Excess aqueous sodium hydroxide was then added to the mixture.	precipitate dissolved
(ii) Several drops of aqueous ammonia were added to the second portion of the solution.	white precipitate
Excess aqueous ammonia was then added to the mixture.	precipitate dissolved

(f) What conclusions can you draw about solid **G**?

.....

..... [2]

[Total: 7]

26. 0620_s14_qp_63 Q: 4

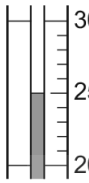
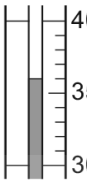
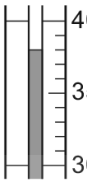
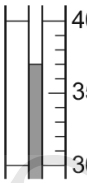
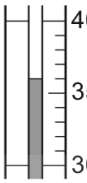
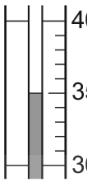
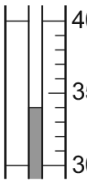
A student investigated what happened when two different solids, **M** and **N**, dissolved in water.

Three experiments were carried out.

(a) *Experiment 1*

Using a measuring cylinder, 25 cm^3 of distilled water were poured into a polystyrene cup. The temperature of the water was measured. Solid **M** was added to the water, the timer started and the mixture stirred with a thermometer. The temperature of the solution was measured every 30 seconds for three minutes.
Use the thermometer diagrams to record the results in the table.

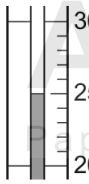
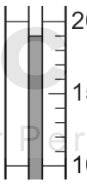
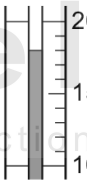
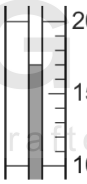
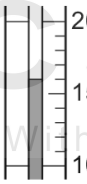
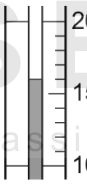
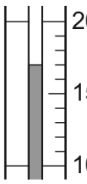
A little of the solution was poured into a test-tube for Experiment 3.

time / s	0	30	60	90	120	150	180
thermometer diagram							
temperature / °C							

[2]

(b) *Experiment 2*

Experiment 1 was repeated using solid **N**.
The temperature of the solution was measured every 30 seconds for three minutes.
Use the thermometer diagrams to record the results in the table.

time / s	0	30	60	90	120	150	180
thermometer diagram							
temperature / °C							

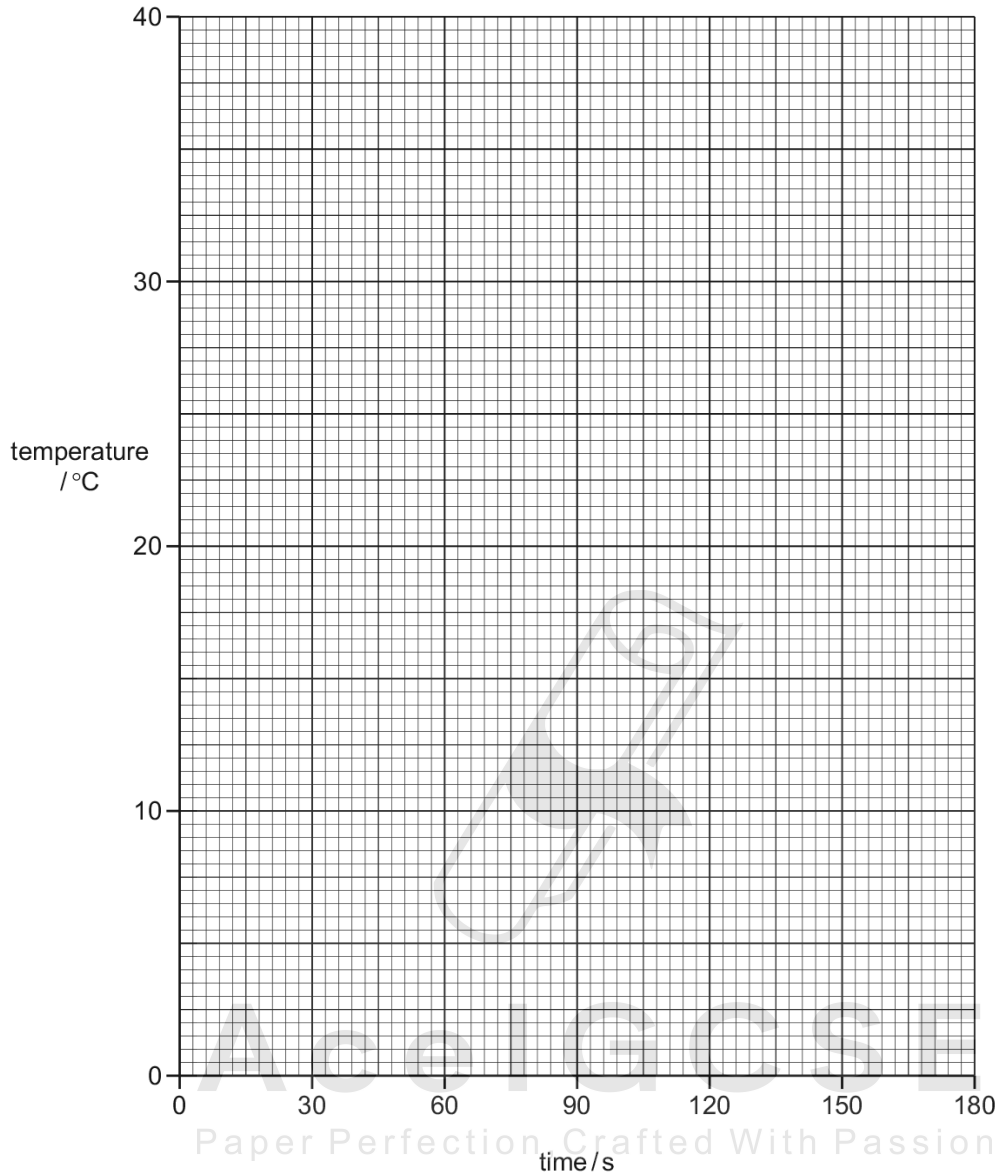
[2]

(c) *Experiment 3*

Dilute sulfuric acid was added to the solution from Experiment 1.

Rapid effervescence was observed.

(d) Plot the results for Experiments 1 and 2 on the grid and draw two smooth line graphs.
Clearly label your graphs.



[6]

(e) (i) **From your graph**, deduce the temperature of the solution in Experiment 1 after 45 seconds.
Show clearly **on the graph** how you worked out your answer.

..... °C [2]

(ii) **From your graph**, deduce how long it takes for the initial temperature of the solution in Experiment 2 to change by 2 °C.
Show clearly **on the graph** how you worked out your answer.

..... **s** [2]

(f) From the results in Experiment 2, what type of chemical process occurs when substance **N** dissolves in water?

..... [1]

(g) What conclusion can you draw from Experiment 3?

..... [1]

(h) Suggest the effect on the results if Experiment 1 was repeated using 50 cm^3 of water.

.....

..... [2]

(i) Predict the temperature of the solution in Experiment 2 after 1 hour. Explain your answer.

.....

..... [2]

(j) When carrying out the experiments, what would be the advantage of taking the temperature readings every 10 seconds?

.....

..... [1]

[Total: 21]

27. 0620_s14_qp_63 Q: 5

Two solids, **P** and **Q**, were analysed. **P** was a metal compound and **Q** was calcium iodide.
Tests were carried out on **P** and **Q** and some of the observations are in the following table.
Complete the observations for solid **Q**.

tests	observations
<u>tests on solid **P**</u> **(a)** Appearance of solid **P**.	black solid
(b) **(i)** Dilute sulfuric acid was added to solid **P** and the mixture warmed. The solution was divided into two equal portions in test-tubes. The following tests were carried out. **(ii)** Drops of aqueous sodium hydroxide were added to the first portion of the solution. Excess sodium hydroxide was then added to the mixture in the test-tube. **(iii)** Aqueous ammonia was added to the second portion of the solution until no further change was seen.	the solid reacted and a blue solution was formed blue precipitate formed blue precipitate insoluble blue precipitate formed which dissolved to form a deep blue solution

tests	observations
<u>tests on solid **Q**</u> **(c)** Distilled water was added to solid **Q** and the mixture shaken to dissolve solid **Q**. The solution was divided into three equal portions in separate test-tubes. **(i)** Aqueous sodium hydroxide was added to the first portion until no further change was seen. **(ii)** Aqueous ammonia was added to the second portion until no further change was seen. **(iii)** Dilute nitric acid and aqueous silver nitrate were added to the third portion.	.... [3] .... [1] ..... [1]

(d) Identify solid **P**.

..... [2]

[Total: 7]

28. 0620_s15_qp_61 Q: 5

Solid **C** was analysed. Solid **C** was a mixture of salts containing aluminium ions, sulfate ions and another cation (positive ion).
Tests on solid **C**, and some of the observations, are in the table.
Complete the observations in the table.

tests	observations
<u>tests on solid **C**</u> **(a)** Appearance of solid **C**.	white solid
(b) A little of solid **C** was heated gently and then strongly.	condensation was formed at the top of the test-tube
The gas given off was tested with damp pH indicator paper.	pungent gas, pH = 10
<u>tests on a solution of **C**</u> Water was added to solid **C** to produce an aqueous solution, solution **C**.	
(c) Drops of aqueous sodium hydroxide were added to solution **C** using a teat pipette.	.....
Excess aqueous sodium hydroxide was then added to the mixture.	..... [3]
The mixture was boiled gently and any gases given off were tested.	pungent gas, pH = 10
(d) Excess aqueous ammonia was added to solution **C**.	..... [1]
(e) A few drops of dilute nitric acid and aqueous silver nitrate were added to solution **C**.	..... [1]
(f) A few drops of dilute nitric acid and barium nitrate solution were added to solution **C**.	..... [2]

(g) What does the formation of condensation in test **(b)** tell you about the nature of solid **C**?

..... [1]

(h) What does test **(e)** tell you about the nature of solid **C**?

..... [1]

(i) **(i)** Name the gas given off in test **(b)**.

..... [1]

(ii) What is your conclusion about the identity of the other cation in solid **C**?

..... [1]

[Total: 11]

---

29. 0620_s15_qp_62 Q: 3

Three bottles of liquid have lost their labels. The liquids are known to be:

- aqueous potassium hydroxide,
- octane,
- pure water.

Outline tests you would do to identify and distinguish the liquid in each bottle.

liquid	test	result
aqueous potassium hydroxide		
octane		
pure water		

[6]

[Total: 6]

---

30. 0620_s15_qp_62 Q: 5

A mixture of two salts, **J** and **K**, was analysed. **J** was ammonium iodide which is water soluble and **K** is insoluble.
The tests on the mixture, and some of the observations are in the following table.
Complete the observations in the table.

tests	observations
(a) Appearance of the mixture.	white solid
Distilled water was added to the mixture. The mixture was shaken and filtered. <u>tests on the filtrate</u> The solution was divided into two equal portions in two test-tubes. **(b)** To the first portion of the solution, aqueous sodium hydroxide was added. The mixture was heated gently and the gas evolved was tested with pH indicator paper.	.... [2]
(c) To the second portion of the solution, dilute nitric acid and aqueous silver nitrate solution were added.	..... [2]
<u>tests on the residue</u> **(d)** Dilute hydrochloric acid was added to the residue in a test-tube. The gas given off was tested. Dilute sulfuric acid was added to the solution formed.	rapid effervescence limewater turned milky white precipitate formed

(e) What is the pH value of the gas given off in test **(b)**?

..... [1]

(f) Identify the gas given off in test **(d)**.

..... [1]

(g) What are your conclusions about solid **K**?

.....

..... [2]

[Total: 8]

31. 0620_s15_qp_63 Q: 5

Solid **H** was analysed. Solid **H** was a salt containing iron(III) ions, sulfate ions and one other cation (positive ion).
The tests on solid **H**, and some of the observations are in the following table.
Complete the observations in the table.

tests	observations
<u>tests on solid **H**</u> **(a)** Appearance of solid **H**.	pale yellow solid
(b) Solid **H** was heated gently and then strongly. The gas given off was tested with pH indicator paper.	condensation formed at the top of the test-tube pungent gas pH paper turned blue-green, pH 10
<u>tests on a solution of **H**</u> Water was added to solid **H** to produce an aqueous solution, solution **H**. **(c)** Drops of aqueous sodium hydroxide were added to 1 cm^3 of solution **H** and the test-tube shaken. Excess sodium hydroxide was then added to the test-tube. The mixture was heated gently and the gas given off was tested.	..... [2] ..... [1] pungent gas, red litmus paper turned blue
(d) Excess aqueous ammonia solution was added to solution **H**.	..... [1]
(e) Dilute nitric acid and aqueous silver nitrate were added to solution **H**.	..... [1]
(f) Dilute nitric acid and barium nitrate solution were added to solution **H**.	..... [2]

(g) What does the formation of condensation in test **(b)** tell you about the nature of solid **H**?

.....

..... [1]

(h) What does test **(e)** tell you about the nature of solid **H**?

..... [1]

(i) **(i)** Name the gas given off in test **(c)**.

..... [1]

(ii) What conclusions can you draw about the identity of the other cation in solid **H**?

..... [1]

[Total: 11]

32. 0620_s16_qp_61 Q: 3

Two substances, **C** and **D**, were analysed. Solid **C** was a salt and solution **D** was an aqueous solution of chromium(III) chloride.
The tests on solid **C**, and some of the observations, are in the following table.

tests	observations
<u>tests on solid **C**</u> Solid **C** was added to distilled water in a test-tube and shaken to dissolve. The solution was divided into two portions in test-tubes, and the following tests carried out. Appearance of the solution. The pH of the first portion of the solution was tested.	 colourless liquid pH = 7
Dilute nitric acid was added to the second portion of the solution followed by aqueous silver nitrate.	cream precipitate
A flame test was carried out on solid **C**.	yellow flame colour

(a) Identify solid **C**.

..... [2]

(b) Describe the appearance of solution **D**.

..... [1]

(c) Tests were carried out on solution **D**.

Complete the observations for tests 1, 2 and 3.

(i) test 1

Drops of aqueous sodium hydroxide were added to solution **D**.

Excess aqueous sodium hydroxide was then added to the mixture.

observations .....

..... [3]

(ii) test 2

Excess aqueous ammonia was added to solution **D**.

observations ..... [2]

(iii) test 3

Dilute nitric acid was added to solution **D** followed by aqueous silver nitrate.

observations ..... [1]

(d) Chromium(III) can be converted to chromium(VI). Chromium(VI) is hazardous.

Suggest **one** safety precaution when using chromium(VI).

..... [1]

[Total: 10]

33. 0620_s16_qp_62 Q: 3

Two solids, **E** and **F**, were analysed. Solid **E** was sodium sulfite. Both solids were found to be water soluble.
The tests on the solids, and some of the observations, are shown below.

tests on solid E

(a) Describe the appearance of the solid.

..... [1]

(b) Distilled water was added to solid **E** in a test-tube and shaken to dissolve.

The solution was divided into two portions in two test-tubes and the following tests carried out.

(i) Aqueous sodium hydroxide was added to the first portion of the solution.

observations ..... [1]

(ii) Dilute hydrochloric acid was added to the second portion of the solution. The mixture was warmed. The gas given off was tested with a piece of filter paper soaked in aqueous acidified potassium manganate(VII) solution.

observations .....

..... [2]

(c) A flame test was carried out on solid **E**.

observations ..... [1]

tests on solid F

tests	observations
The solid was heated. The gas given off was tested with damp, red litmus paper.	pungent gas evolved red litmus paper turned blue
Aqueous sodium hydroxide was added to solid **F** and the mixture heated. The gas given off was tested.	pungent gas evolved Universal Indicator paper showed pH 10

(d) Identify the gas given off in the tests on solid **F**.

..... [1]

(e) Identify **one** of the ions in solid **F**.

..... [1]

[Total: 7]

34. 0620_s16_qp_63 Q: 3

A mixture of two solids, **G** and **H**, was analysed. Solid **G** was zinc nitrate, which is water soluble, and solid **H** is insoluble in water.
The tests on the mixture, and some of the observations, are shown.

Distilled water was added to the mixture in a boiling tube and shaken. The contents of the boiling tube were filtered keeping the filtrate and the residue.

tests on filtrate

(a) The filtrate was divided into four test-tubes and the following tests carried out.

(i) Drops of aqueous sodium hydroxide were added to the first portion of the solution.
Excess aqueous sodium hydroxide was then added to the test-tube.

observations .....

.....

..... [3]

(ii) Using the second portion of the solution, the test in **(a)(i)** was repeated using aqueous ammonia instead of aqueous sodium hydroxide.

observations .....

..... [2]

(iii) Dilute nitric acid was added to the third portion of the solution followed by aqueous silver nitrate.

observations ..... [1]

(iv) Aqueous sodium hydroxide and aluminium foil were added to the fourth portion of the solution.
The mixture was warmed and the gas given off was tested.

observations .....

.....

..... [3]

tests on residue

Two tests are carried out and the following observations made.

tests	observations
A spatula was used to transfer some of the residue into a test-tube. Dilute hydrochloric acid was added to the residue. The gas given off was tested.	rapid effervescence, limewater turned milky
A flame test was carried out on the residue.	red flame colour

(b) Identify solid **H**.

.....

..... [2]

[Total: 11]

35. 0620_s17_qp_61 Q: 3

Two solids, **E** and **F**, were analysed. Solid **F** was potassium iodide. Tests were carried out on each solid. Some of the observations on solid **E** are shown.

tests on solid **E**	observations
Appearance of solid **E**.	green solid
test 1 Solid **E** was heated gently then strongly.	the solid turned black
test 2 Dilute sulfuric acid was added to solid **E**. The gas given off was tested. Excess aqueous ammonia was then added to the mixture in the test-tube.	rapid effervescence limewater turned milky a pale blue precipitate formed, which then dissolved to form a dark blue solution
test 3 A flame test was carried out on solid **E**.	blue-green colour

(a) **Test 1** states that the solid should be heated gently then strongly.

In terms of safety, explain why it is necessary to heat gently at first.

.....

..... [1]

(b) Identify the gas given off in **test 2**.

..... [1]

(c) Identify solid **E**.

..... [2]

tests on solid F

Complete the expected observations.

(d) Describe the appearance of solid **F**.

..... [1]

Distilled water was added to solid **F** in a test-tube and shaken to dissolve solid **F**.

(e) (i) To the first portion of the solution, an excess of aqueous sodium hydroxide was added.

observations ..... [1]

(ii) To the second portion of the solution, dilute nitric acid and aqueous silver nitrate were added.

observations ..... [2]

(f) A flame test was carried out on solid **F**.

observations ..... [1]

(g) Describe how you would carry out a flame test.

.....

.....

..... [2]

[Total: 11]

36. 0620_s17_qp_61 Q: 4

A sample of furniture cleaner contains aqueous sodium chloride, aqueous ammonia and sand.

(a) Give a test to show the presence of ammonia in the mixture.

..... [1]

(b) Plan an investigation to obtain a sample of

(i) pure water from the mixture, ...

.....

.....

..... [2]

(ii) pure sand from the mixture. .....

.....

.....

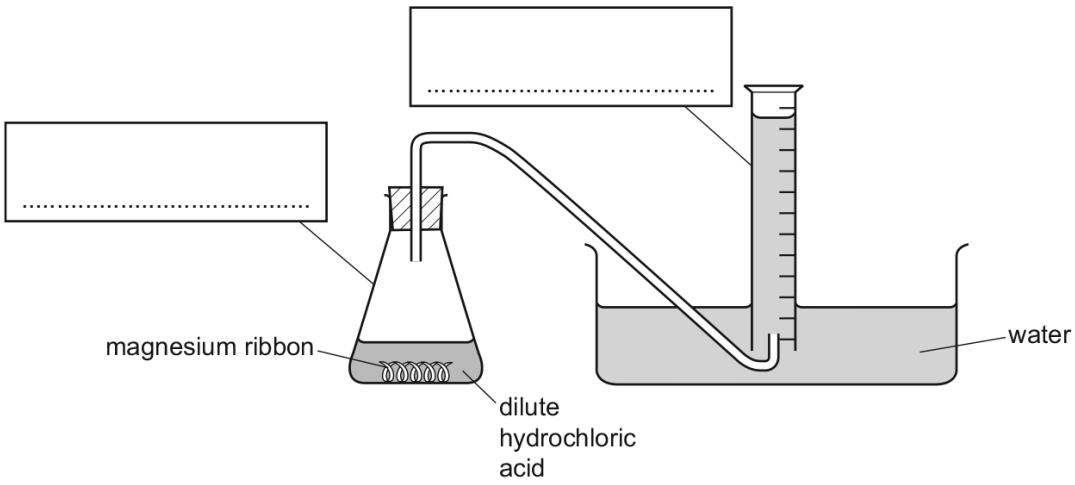
.....

..... [3]

[Total: 6]

37. 0620_s17_qp_62 Q: 1

A student investigated the rate of reaction between an excess of dilute hydrochloric acid and magnesium ribbon. The apparatus is shown.



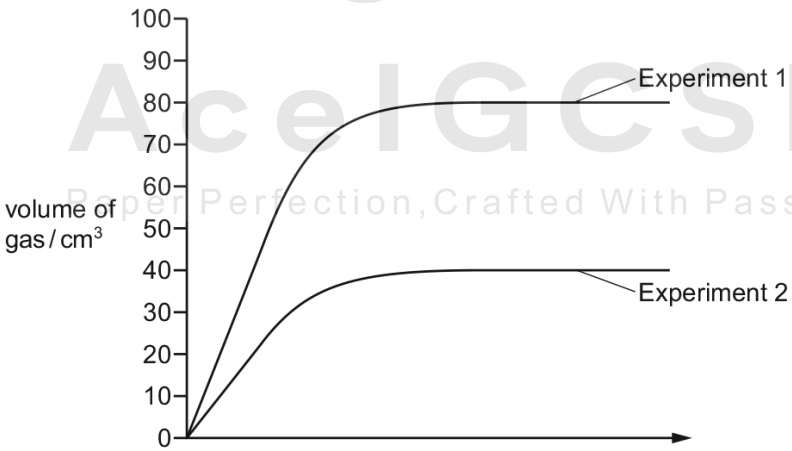
Two experiments were carried out. The temperature was the same in each case.

(a) Complete the boxes to identify the apparatus. [2]

(b) Give **one** observation expected during this reaction.

..... [1]

Graphs were drawn from the results for each experiment as shown.



(c) Label the *x*-axis of the graph. [2]

(d) (i) Give the volumes of gas at which the **two** graphs level out and compare these values.

.....

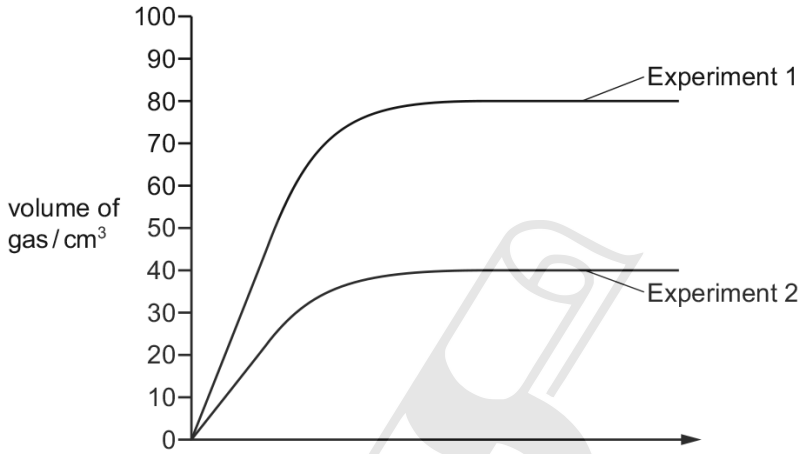
..... [2]

(ii) Suggest why the graphs level out at different volumes.

..... [1]

(iii) The graph has been drawn again.

Draw the curve expected if Experiment 1 were repeated using the same mass of magnesium powder instead of magnesium ribbon.



[2]

[Total: 10]

38. 0620_s17_qp_62 Q: 3

Two solids, **E** and **F**, which are both salts, were analysed. Solid **F** was lithium chloride.
Tests were carried out on each solid.
Some of the tests and observations are shown.

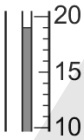
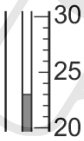
tests on solid E

tests on solid **E**	observations
test 1 A flame test was carried out on solid **E**.	yellow colour

test 2

10 cm^3 of distilled water were poured into a boiling tube. The initial temperature of the water was measured.
Solid **E** was added to the boiling tube and the boiling tube was shaken to dissolve solid **E**. The temperature of the solution was measured after 1 minute.

(a) Use the thermometer diagrams in the table to record the temperatures and complete the table.

temperature of the solution after 1 minute / °C		
initial temperature of the water / °C		
temperature difference / °C		

[2]

The solution was divided into two equal portions in two test-tubes and the following tests carried out.

tests on solid **E**	observations
test 3 Dilute hydrochloric acid was added to the first portion of the solution. The gas given off was tested with filter paper dipped into acidified aqueous potassium manganate(VII).	filter paper turned from purple to colourless
test 4 An excess of aqueous sodium hydroxide was added to the second portion of the solution.	no change

(b) What does the temperature change tell you about the process occurring in **test 2**?

..... [1]

(c) Name the gas given off in **test 3**.

..... [1]

(d) Identify solid **E**.

..... [2]

tests on solid F

Complete the expected observations.

(e) A flame test was carried out on solid **F**.

observations ..... [1]

Solid **F** was added to distilled water in a test-tube and the test-tube shaken to dissolve solid **F**.

(f) Dilute nitric acid and aqueous silver nitrate were added to the solution.

observations ..... [2]

[Total: 9]

39. 0620_s17_qp_63 Q: 3

Two substances, solid **J** and solution **K**, were analysed. Solution **K** was hydrogen peroxide. Tests on each substance were carried out. The observations are shown.

tests	observations
tests on solid J Appearance of solid **J**.	black solid
test 1 Dilute hydrochloric acid was added to solid **J**. The mixture was heated and the gas given off was tested with damp litmus paper.	blue litmus turned white
tests on solution K Solution **K** was divided into two equal portions in two test-tubes. **test 2** Iron(II) sulfate crystals were added to the first portion of the solution. The mixture was shaken and aqueous sodium hydroxide was added to the mixture.	red-brown precipitate formed
test 3 Solid **J** was added to the second portion of the solution. The gas given off was tested with a splint.	glowing splint relit solid **J** was unchanged

(a) Name the gas given off in **test 1**.

..... [1]

(b) (i) Name the precipitate formed in **test 2**.

..... [2]

(ii) A new **test 2** was carried out. Iron(II) sulfate crystals were added to **water**, the mixture was shaken and then aqueous sodium hydroxide was added.

What would be observed?

..... [2]

(c) Name the gas given off in **test 3**.

..... [1]

(d) What conclusions can you draw about solid **J**?

.....

..... [2]

[Total: 8]

---

40. 0620_s18_qp_61 Q: 3

Two substances, solution **A** and solid **B**, were analysed.

tests on solution A

Some of the tests and observations are shown.

tests on solution **A**	observations
Solution **A** was divided into three equal portions in three test-tubes. **test 1** The pH of the first portion of solution **A** was tested.	pH = 1
test 2 Magnesium ribbon was added to the second portion of solution **A**. The gas produced was tested.	effervescence gas 'popped' with a lighted splint
test 3 Dilute nitric acid and aqueous barium nitrate were added to the third portion of solution **A**.	white precipitate formed

(a) Identify the gas produced in **test 2**.

..... [1]

(b) Identify solution **A**.

..... [2]

tests on solid B

Solid **B** was zinc carbonate.

Complete the expected observations.

(c) Dilute nitric acid was added to solid **B**. The gas produced was tested.

observations .....

..... [2]

The zinc nitrate solution formed in the test in **(c)** was divided into two portions in two test-tubes.

(d) (i) Drops of aqueous sodium hydroxide were added to the first portion of the zinc nitrate solution.

observations ..... [2]

(ii) An excess of aqueous sodium hydroxide was then added to the mixture.

observations ..... [1]

(e) (i) Drops of aqueous ammonia were added to the second portion of the zinc nitrate solution.

observations ..... [1]

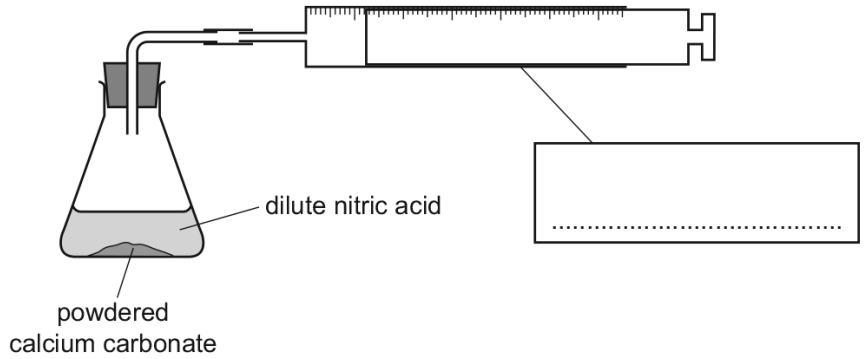
(ii) An excess of aqueous ammonia was then added to the mixture.

observations ..... [1]

[Total: 10]

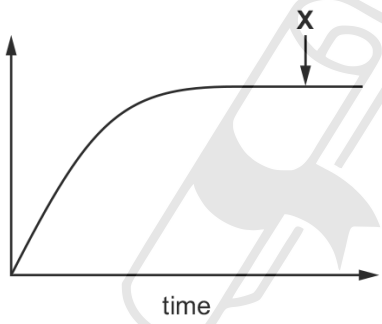
41. 0620_s18_qp_62 Q: 1

The rate of reaction between an excess of dilute nitric acid and powdered calcium carbonate was investigated. The carbon dioxide produced was collected. The apparatus used is shown.



(a) Complete the box to name the apparatus. [1]

A sketch graph of the results obtained is shown.



(b) (i) Label the *y*-axis. [1]

(ii) Explain why the sketch graph is horizontal at point **X**.

.....

..... [2]

(c) Draw **on the axes** the graph expected if the experiment were repeated using an equal mass of **lumps** of calcium carbonate. All other conditions were kept the same. [2]

(d) Describe a test for carbon dioxide.

test .....

result .....

[2]

[Total: 8]

42. 0620_s18_qp_62 Q: 3

Two substances, solid **E** and solution **F**, were analysed. Solid **E** was iron(II) sulfate. Tests were done on solid **E** and solution **F**.

tests on solid E

Complete the expected observations.

(a) Describe the appearance of solid **E**.

..... [1]

Solid **E** was added to distilled water in a test-tube. The test-tube was shaken to dissolve solid **E** and form solution **E**. Solution **E** was divided into four equal portions in four test-tubes.

(b) Dilute nitric acid and aqueous silver nitrate were added to the first portion of solution **E**.

observations ..... [1]

(c) Dilute nitric acid and aqueous barium nitrate were added to the second portion of solution **E**.

observations ..... [1]

(d) An excess of aqueous sodium hydroxide was added to the third portion of solution **E**.

observations ..... [2]

(e) An excess of aqueous ammonia was added to the fourth portion of solution **E**.

observations ..... [1]

tests on solution F

Solution **F** was an aqueous salt solution.

Some of the tests and observations are shown.

tests on solution **F**	observations
Solution **F** was divided into two equal portions in two test-tubes. **test 1** Drops of aqueous sodium hydroxide were added to the first portion of solution **F**. An excess of aqueous sodium hydroxide was then added to the mixture.	white precipitate formed white precipitate was insoluble
test 2 An excess of aqueous ammonia was added to the second portion of solution **F**.	no precipitate formed

(f) What conclusion can you draw about the cation present in solution **F**?

.....

..... [1]

[Total: 7]

43. 0620_s18_qp_63 Q: 3

Solution **T** and liquid **U** were analysed. Solution **T** was aqueous sodium hydroxide.
Tests were done on solution **T** and liquid **U**.

tests on solution T

Complete the expected observations.

Solution **T** was divided into four portions in three test-tubes and one boiling tube.

(a) (i) A flame test was done on the first portion of solution **T**.

observations ..... [1]

(ii) The pH of the first portion of solution **T** was tested.

pH = ... [1]

(b) • A few drops of aqueous zinc sulfate were added to the second portion of solution **T** in a test-tube. The test-tube was shaken to mix the solutions.

observations .....

• An excess of aqueous zinc sulfate was then added to the mixture.

observations .....
[3]

(c) Ammonium chloride was added to the third portion of solution **T** in a boiling tube. The mixture was heated and the gas produced was tested.

test .....

observations .....
[2]

(d) An excess of aqueous chromium(III) chloride was added to the fourth portion of solution **T** in a test-tube.

observations ..... [2]

tests on liquid U

Some of the tests and observations are shown.

tests on liquid **U**	observations
The appearance of liquid **U** was studied.	colourless, pleasant smelling
A few drops of liquid **U** were placed on to a watch glass. The surface of the liquid was touched with a lighted splint.	burned with a blue flame

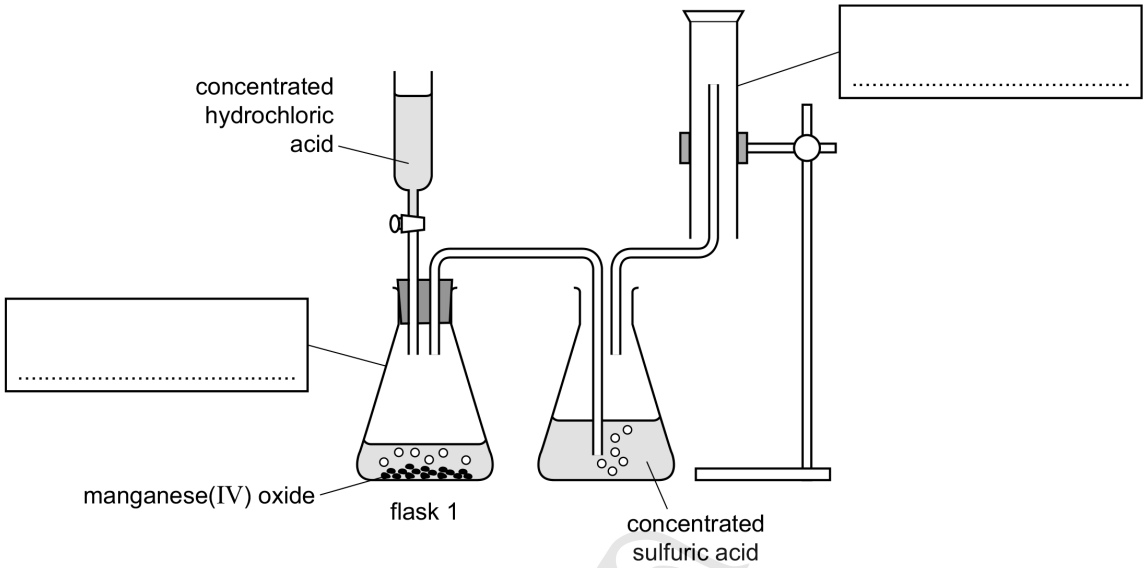
(e) What conclusion can you draw about liquid **U**?

..... [1]

[Total: 10]

44. 0620_s19_qp_61 Q: 1

The diagram shows the apparatus a student used to prepare a dry sample of chlorine gas. Chlorine is more dense than air.



(a) Complete the boxes to name the apparatus. [2]

(b) Use the diagram to identify **two** mistakes the student made.

1 .....

.....

2 .....

.....

[2]

(c) Suggest **one** reason why the gas produced in flask 1 is passed through concentrated sulfuric acid.

..... [1]

(d) Describe a test for chlorine.

test .....

observations .....

[2]

(e) Suggest why this experiment is done in a fume cupboard.

..... [1]

[Total: 8]

45. 0620_s19_qp_61 Q: 3

Two substances, solution **F** and solid **G**, were analysed. Solution **F** was dilute hydrochloric acid. Tests were done on solution **F** and solid **G**.

tests on solution F

Complete the expected observations.

Solution **F** was divided into four equal portions in four test-tubes.

(a) The pH of the first portion of solution **F** was tested.

pH = ... [1]

(b) Magnesium ribbon was added to the second portion of solution **F**. The gas produced was tested.

observations .....

.....

..... [3]

(c) Dilute nitric acid and aqueous silver nitrate were added to the third portion of solution **F**.

observations ..... [1]

(d) Dilute nitric acid and aqueous barium nitrate were added to the fourth portion of solution **F**.

observations ..... [1]

tests on solid G

Some of the tests and observations are shown.

tests on solid **G**	observations
The appearance of solid **G** was studied.	white solid
test 1 Dilute hydrochloric acid was added to solid **G**. The gas produced was tested. The solution formed was divided into two portions for **test 2**.	rapid effervescence limewater turned milky
test 2 An excess of aqueous sodium hydroxide was added to the first portion of the solution from **test 1**. An excess of aqueous ammonia was added to the second portion of the solution from **test 1**.	white precipitate formed which was insoluble in excess no precipitate formed

(e) Identify solid **G**.

..... [2]

[Total: 8]

46. 0620_s19_qp_62 Q: 2

A student investigated the rate of reaction between magnesium ribbon and solutions of dilute hydrochloric acid of different concentrations, solutions **H**, **I**, **J** and **K**. The dilute hydrochloric acid was in excess in all experiments.

Five experiments were done.

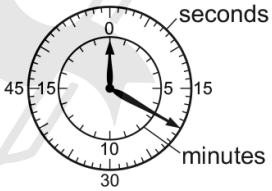
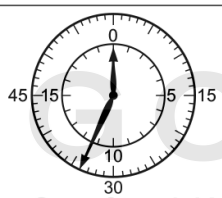
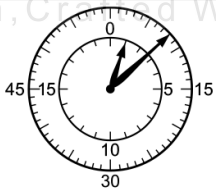
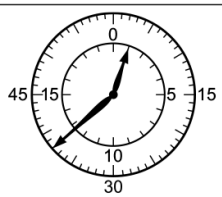
Experiment 1
- A measuring cylinder was used to pour 30 cm^3 of solution **H** into a beaker.
- A 5.0 cm length of magnesium ribbon was then added to the beaker.
- A timer was started immediately.
- The time taken for all of the magnesium ribbon to react and to disappear completely was measured.

Experiment 2
- Experiment 1 was repeated but using solution **I** instead of solution **H**.

Experiment 3
- Experiment 1 was repeated but using solution **J** instead of solution **H**.

Experiment 4
- Experiment 1 was repeated but using solution **K** instead of solution **H**.

(a) Use the stop-clock diagrams to record the time taken for each experiment in the table.

experiment	solution	concentration of hydrochloric acid in mol / dm^3	stop-clock diagram	time taken for the magnesium ribbon to disappear completely / s
1	**H**	2.0		
2	**I**	1.5		
3	**J**	1.0		
4	**K**	0.8		

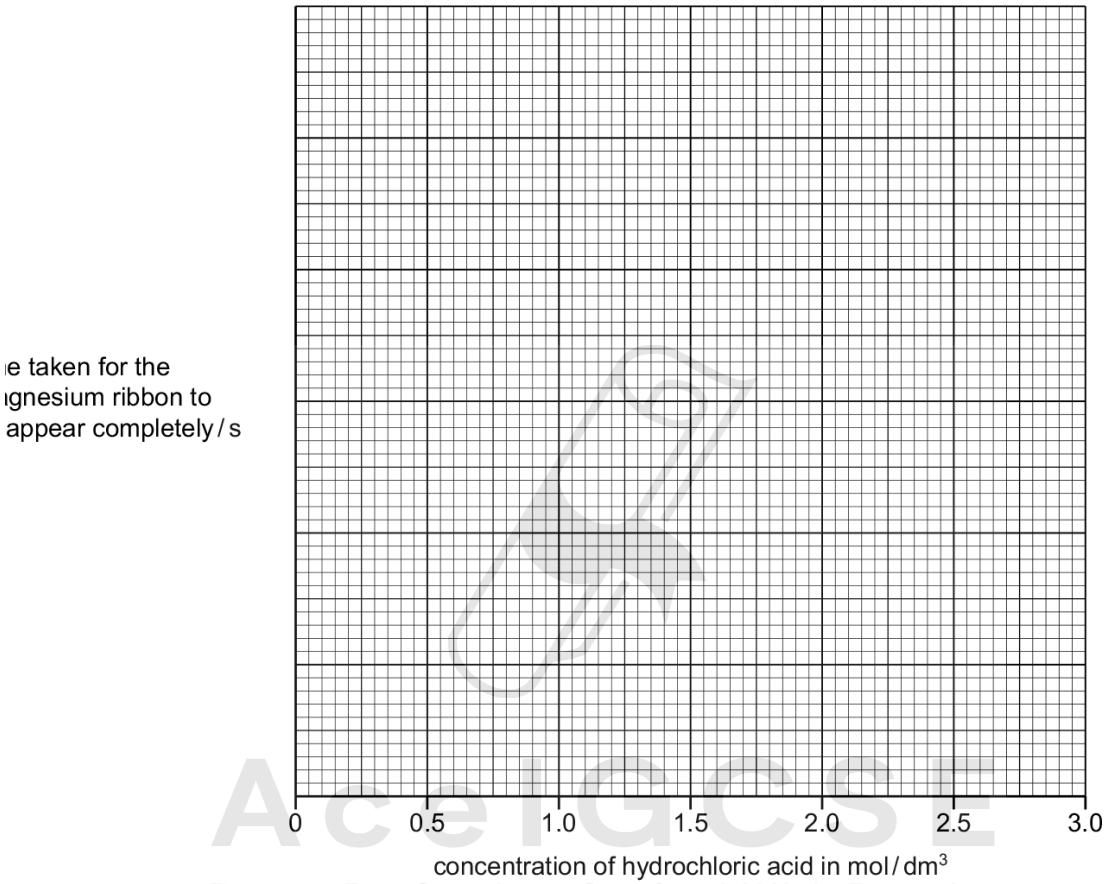
[3]

Experiment 5

Solution **J** was added to some magnesium ribbon in a test-tube. The gas produced was tested. The observations were recorded in the table.

observations	rapid effervescence and the test-tube felt hot lighted splint 'popped'

(b) Plot the results for Experiments 1–4 on the grid. Draw a smooth line graph.



[3]

(c) **From your graph**, deduce the time taken for the magnesium ribbon to disappear completely if a solution of hydrochloric acid of concentration 2.5 mol / dm^3 were used.

Show clearly **on the grid** how you worked out your answer.

..... [3]

(d) **(i)** Why was the same length of magnesium used in Experiments 1–4?

..... [1]

(ii) Suggest the effect on the results if Experiments 1–4 were repeated using 2.5 cm lengths of magnesium ribbon instead of 5.0 cm lengths of magnesium ribbon. Explain your answer.

.....

..... [1]

(e) Suggest a **different** method which a student could use to investigate the rate of reaction between magnesium ribbon and dilute hydrochloric acid. State the apparatus the student would use and the measurements the student would take.

apparatus .....

.....

measurements .....

.....

.....

[3]

(f) Use the observations from Experiment 5 to answer these questions.

(i) What type of chemical reaction occurs when magnesium ribbon reacts with dilute hydrochloric acid?

..... [1]

(ii) Identify the gas produced.

..... [1]

[Total: 16]

47. 0620_s19_qp_62 Q: 3

Two substances, solid **L** and solid **M**, were analysed. Solid **L** was hydrated ammonium sulfate. Tests were done on solid **L** and solid **M**.

tests on solid L

Complete the expected observations.

(a) Describe the appearance of solid **L**.

..... [1]

Solid **L** was divided into two portions.

(b) The first portion of solid **L** was heated in a hard-glass test-tube. Any gas produced was tested with cobalt(II) chloride paper.

observations .....

..... [3]

The second portion of solid **L** was added to distilled water. The mixture was shaken to dissolve solid **L** and form solution **L**. The solution of **L** was divided into two equal portions in two test-tubes.

(c) An excess of aqueous sodium hydroxide was added to the first portion of solution **L**. The mixture was heated and the gas produced was tested.

observations .....

..... [2]

(d) Dilute nitric acid and aqueous barium nitrate were added to the second portion of solution **L**.

observation ..... [1]

tests on solid M

Some of the tests and observations are shown.

tests on solid **M**	observations
Solid **M** was dissolved in water. The solution was divided into three portions. **test 1** An excess of aqueous sodium hydroxide was added to the first portion of the solution.	red-brown precipitate formed
test 2 An excess of aqueous ammonia was added to the second portion of the solution.	red-brown precipitate formed
test 3 Dilute nitric acid and aqueous silver nitrate were added to the third portion of the solution.	white precipitate formed

(e) Identify solid **M**.

..... [2]

[Total: 9]

48. 0620_s19_qp_63 Q: 3

Two substances, solid **N** and solid **O** were analysed. Solid **N** was hydrated aluminium sulfate. Tests were done on solid **N** and solid **O**.

tests on solid N

Complete the expected observations.

(a) Describe the appearance of solid **N**.

observation ..... [1]

Solid **N** was divided into two portions.

(b) The first portion of solid **N** was heated in a hard-glass test-tube. Any gas produced was tested with cobalt(II) chloride paper.

observations .....

..... [2]

The second portion of solid **N** was added to distilled water. The mixture was shaken to dissolve solid **N** and form solution **N**. Solution **N** was divided into two equal portions in two test-tubes.

(c) (i) Drops of aqueous sodium hydroxide were added to the first portion of solution **N** until a change was seen.

observations ..... [1]

(ii) An excess of aqueous sodium hydroxide was then added to the mixture from **(c)(i)**.

observations ..... [1]

(d) Dilute nitric acid and aqueous barium nitrate were added to the second portion of solution **N**.

observations ..... [1]

tests on solid O

Some of the tests and observations are shown.

tests on solid **O**	observations
test 1 A flame test was done on solid **O**.	lilac flame
Solid **O** was dissolved in water. The solution was divided into two portions. **test 2** An excess of aqueous sodium hydroxide was added to the first portion of the solution.	no change
test 3 Dilute nitric acid and aqueous silver nitrate were added to the second portion of the solution.	white precipitate formed

(e) Identify solid **O**.

..... [2]

[Total: 8]

49. 0620_s20_qp_61 Q: 3

Two solids, solid **G** and solid **H**, were analysed. Solid **G** was copper(II) carbonate.
Tests were done on each solid.

tests on solid G

Complete the expected observations.

(a) Solid **G** was placed in a boiling tube. An excess of dilute sulfuric acid was added to the boiling tube. Any gas produced was tested.

observations .....

.....

..... [3]

(b) Identify the gas produced in **(a)**.

..... [1]

(c) Aqueous ammonia was added slowly until in excess to the solution produced in **(a)**.

observations .....

.....

.....

..... [3]

Tests were done and the following observations were made.

tests on solid **H**	observations
test 1 Flame test	yellow flame
test 2 Some of solid **H** was placed in a boiling tube. The boiling tube was heated strongly.	condensation appeared near the mouth of the boiling tube
Solid **H** was dissolved in distilled water. The solution was divided into two equal portions. **test 3** About 1 cm^3 of dilute nitric acid followed by a few drops of aqueous silver nitrate were added to the first portion of the solution.	the solution remained colourless
test 4 About 1 cm^3 of dilute nitric acid followed by a few drops of aqueous barium nitrate were added to the second portion of the solution.	white precipitate

(d) What conclusion can be made from the result of **test 3**?

.....

..... [1]

(e) What conclusions can be made about solid **H** from the results of **test 1**, **test 2** and **test 4**?

.....

.....

..... [3]

[Total: 11]

50. 0620_s20_qp_62 Q: 3

Two solids, solid **L** and solid **M**, were analysed. Solid **L** was chromium(III) chloride.
Tests were done on each solid.

tests on solid L

Complete the expected observations.

Solid **L** was dissolved in distilled water to produce solution **L**. Solution **L** was divided into four portions in three test-tubes and a boiling tube.

(a) To the first portion of solution **L** in the boiling tube, about 1 cm depth of dilute hydrochloric acid was added. The boiling tube was warmed gently.

A strip of filter paper was dipped in acidified potassium manganate(VII) solution and held at the mouth of the boiling tube.

observations ..... [1]

(b) To the second portion of solution **L** aqueous sodium hydroxide was added slowly until it was in excess and no further changes were seen.

observations .....

.....

..... [2]

(c) To the third portion of solution **L** aqueous ammonia was added slowly until it was in excess and no further changes were seen.

observations .....

.....

..... [2]

(d) To the fourth portion of solution **L** about 1 cm depth of dilute nitric acid was added followed by about 1 cm depth of aqueous silver nitrate.

observations .....

..... [1]

tests on solid M

Tests were done and the following observations made.

tests on solid **M**	observations
test 1 Flame test	yellow flame seen
test 2 About 10 cm^3 of dilute nitric acid was added to solid **M**. Any gas produced was tested.	effervescence limewater turned milky
test 3 About 1 cm depth of aqueous barium nitrate was added to the solution formed by adding dilute nitric acid to solid **M** in **test 2**.	no change

(e) Identify solid **M**.

..... [2]

[Total: 8]

51. 0620_s20_qp_63 Q: 3

Two solids, solid **N** and solid **P**, were analysed.
Tests were done on each solid.

tests on solid N

Tests were done and the following observations made.

tests on solid **N**	observations
Solid **N** was dissolved in distilled water to produce solution **N**. The solution was divided into three equal portions in three boiling tubes. **test 1** Aqueous sodium hydroxide was added slowly until in excess to the first portion of solution **N**.	white precipitate formed, the precipitate dissolved in excess aqueous sodium hydroxide forming a colourless solution
test 2 Aqueous ammonia was added slowly until in excess to the second portion of solution **N**.	white precipitate formed, the precipitate dissolved in excess aqueous ammonia forming a colourless solution
test 3 Aluminium foil and aqueous sodium hydroxide were added to the third portion of solution **N**. The mixture was heated using a Bunsen burner. Any gas produced was tested with damp red litmus paper.	effervescence was seen, the damp red litmus paper turned blue

(a) Name the gas given off in **test 3**.

..... [1]

(b) Identify solid **N**.

.....

..... [2]

tests on solid P

Solid **P** was potassium iodide.

Complete the expected observations.

(c) Describe the appearance of solid **P**.

..... [1]

(d) A flame test was done on solid **P**.

observations ..... [1]

(e) Solid **P** was dissolved in distilled water to produce solution **P**. Solution **P** was divided into three equal portions in three test-tubes.

(i) About 1 cm depth of dilute nitric acid and a few drops of aqueous silver nitrate were added to the first portion of solution **P**.

observations .....

..... [1]

(ii) About 1 cm depth of dilute nitric acid and a few drops of aqueous barium nitrate were added to the second portion of solution **P**.

observations .....

..... [1]

(iii) A few drops of aqueous bromine were added to the third portion of solution **P**.

observations .....

..... [1]

[Total: 8]

52. 0620_s21_qp_61 Q: 3

3 Solid **E** and solution **F** were analysed.
Tests were done on each substance.

tests on solid E

tests	observations
test 1 About half of solid **E** was placed in a test-tube and heated gently.	steam was given off; condensation appeared near the mouth of the test-tube
The remaining solid **E** was dissolved in distilled water to produce solution **E**. The solution was divided into four equal portions in three test-tubes and a boiling tube. **test 2** About 1 cm^3 of dilute nitric acid followed by a few drops of aqueous silver nitrate were added to the first portion of solution **E**.	no visible change
test 3 About 1 cm^3 of dilute nitric acid followed by a few drops of aqueous barium nitrate were added to the second portion of solution **E**.	white precipitate
test 4 Excess aqueous ammonia was added to the third portion of solution **E**.	white precipitate
test 5 Aqueous sodium hydroxide was added dropwise and then in excess to the fourth portion of solution **E** in the boiling tube.	white precipitate which dissolved in excess to form a colourless solution
test 6 The product from **test 5** was warmed gently and any gas given off was tested with damp red litmus paper.	the red litmus paper turned blue

(a) State the conclusion that can be made from the observations in **test 1**.

.....

..... [1]

(b) State the conclusion that can be made from the observation in **test 2**.

.....

..... [1]

(c) Identify the **three** ions in solid **E**.

.....

..... [3]

tests on solution F

Solution **F** was aqueous sodium hydroxide.

Complete the expected observations.

(d) A flame test was carried out on solution **F**.

observations ..... [1]

(e) The remaining solution **F** was divided into two approximately equal portions in two test-tubes.

(i) To the first portion of solution **F** a few drops of universal indicator solution were added.

observations ..... [1]

(ii) To the second portion of solution **F** approximately 2 cm^3 of aqueous copper(II) sulfate was added.

observations ..... [1]

[Total: 8]

53. 0620_s21_qp_62 Q: 3

Solution **G** and solid **H** were analysed.

tests on solution G

tests	observations
Solution **G** was divided into three equal portions in three test-tubes. **test 1** Sodium hydroxide was added dropwise and then in excess to the first portion of solution **G**.	white precipitate which did not dissolve in excess
test 2 About 1 cm^3 of dilute nitric acid followed by a few drops of aqueous silver nitrate were added to the second portion of solution **G**.	yellow precipitate
test 3 About 10 cm^3 of aqueous hydrogen peroxide was added to the third portion of solution **G**. The gas produced was tested.	the mixture became brown and bubbled; the gas relit a glowing splint

(a) Identify the gas produced in **test 3**.

..... [1]

(b) Use the results of **test 1** and **test 2** to identify solution **G**.

.....

.....

..... [2]

tests on solid H

Solid **H** was hydrated copper(II) sulfate.

Complete the expected observations.

(c) About half of solid **H** was placed in a boiling tube and heated using a Bunsen burner.

observations .....

..... [2]

(d) A flame test was carried out on solid **H**.

observations ..... [1]

The remaining solid **H** was placed in a boiling tube. About 10 cm^3 of distilled water was added to the boiling tube. The tube was shaken to dissolve solid **H** and form solution **H**.

Solution **H** was divided into two approximately equal portions in two test-tubes.

(e) Aqueous ammonia was added dropwise and then in excess to the first portion of solution **H**.

observations .....

.....

..... [3]

(f) Approximately 1 cm^3 of dilute nitric acid followed by a few drops of aqueous barium nitrate were added to the second portion of solution **H**.

observations ..... [1]

[Total: 10]

Solution **G** and solid **H** were analysed.

tests on solution G

tests	observations
Solution **G** was divided into three equal portions in three test-tubes. **test 1** Sodium hydroxide was added dropwise and then in excess to the first portion of solution **G**.	white precipitate which did not dissolve in excess
test 2 About 1 cm^3 of dilute nitric acid followed by a few drops of aqueous silver nitrate were added to the second portion of solution **G**.	yellow precipitate
test 3 About 10 cm^3 of aqueous hydrogen peroxide was added to the third portion of solution **G**. The gas produced was tested.	the mixture became brown and bubbled; the gas relit a glowing splint

(a) Identify the gas produced in **test 3**.

..... [1]

(b) Use the results of **test 1** and **test 2** to identify solution **G**.

.....

.....

..... [2]

tests on solid H

Solid **H** was hydrated copper(II) sulfate.

Complete the expected observations.

(c) About half of solid **H** was placed in a boiling tube and heated using a Bunsen burner.

observations .....

..... [2]

(d) A flame test was carried out on solid **H**.

observations ..... [1]

The remaining solid **H** was placed in a boiling tube. About 10 cm^3 of distilled water was added to the boiling tube. The tube was shaken to dissolve solid **H** and form solution **H**.

Solution **H** was divided into two approximately equal portions in two test-tubes.

(e) Aqueous ammonia was added dropwise and then in excess to the first portion of solution **H**.

observations .....

.....

..... [3]

(f) Approximately 1 cm^3 of dilute nitric acid followed by a few drops of aqueous barium nitrate were added to the second portion of solution **H**.

observations ..... [1]

[Total: 10]

54. 0620_s21_qp_63 Q: 3

Solid **I** and solid **J** were analysed. Solid **I** was chromium(III) chloride.

tests on solid I

Complete the expected observations.

Solid **I** was placed in a boiling tube and about 10 cm^3 of distilled water was added to the boiling tube. The mixture was shaken to dissolve solid **I** and form solution **I**. Solution **I** was divided into four portions in four test-tubes.

(a) Aqueous sodium hydroxide was added dropwise and then in excess to the first portion of solution **I**.

observations .....

.....

..... [2]

(b) Aqueous ammonia was added dropwise and then in excess to the second portion of solution **I**.

observations .....

.....

..... [2]

(c) About 1 cm^3 of dilute nitric acid followed by a few drops of aqueous silver nitrate were added to the third portion of solution **I**.

observations ..... [1]

(d) About 1 cm^3 of dilute nitric acid followed by a few drops of aqueous barium nitrate were added to the fourth portion of solution **I**.

observations ..... [1]

tests on solid J

tests	observations
test 1 A flame test was carried out on solid **J**.	lilac flame
The remaining solid **J** was placed in a boiling tube and about 10 cm^3 of distilled water was added to the boiling tube. The mixture was shaken to dissolve solid **J** and form solution **J**. **test 2** About 5 cm^3 of dilute nitric acid was added to solution **J**. Any gas produced was tested.	effervescence the gas turned limewater milky
test 3 A few drops of aqueous silver nitrate were added to the mixture formed in **test 2**.	no visible change

(e) Identify the gas formed in **test 2**.

..... [1]

(f) Identify solid **J**.

.....

..... [2]

[Total: 9]

55. 0620_w12_qp_61 Q: 5

A mixture of two solids, **M** and **N**, was analysed.
Solid **M** was zinc sulfate which is water-soluble and solid **N** was insoluble.
The tests on the mixture, and some of the observations, are in the table.
Complete the observations in the table.

tests	observations
Distilled water was added to the mixture in a boiling tube and shaken. The contents of the tube were filtered and the filtrate and residue kept for the following tests.	
<u>tests on the filtrate</u> The filtrate was divided into four portions.	
(a) (i) Drops of aqueous sodium hydroxide were added to the first portion of the filtrate. Excess aqueous sodium hydroxide was then added. **(ii)** Drops of aqueous ammonia were added to the second portion of the filtrate. Excess aqueous ammonia was then added.	.... [3] .... [2]
(b) About 1 cm^3 of dilute nitric acid followed by silver nitrate solution was added to the third portion of the filtrate.	..... [1]
(c) About 1 cm^3 of dilute nitric acid followed by barium nitrate solution was added to the fourth portion of the filtrate.	..... [2]

tests	observations
<u>tests on the residue</u> **(d)** Appearance of the residue.	black solid
(e) Dilute hydrochloric acid was added to a little of the residue. The mixture was heated and the gas given off was tested with damp blue litmus paper.	effervescence pungent gas, bleached litmus paper
(f) Aqueous hydrogen peroxide was added to a little of the residue. The gas given off was tested.	effervescence glowing splint relit

(g) Identify the gas given off in test **(e)**.

..... [1]

(h) Identify the gas given off in test **(f)**.

..... [1]

(i) What conclusions can you draw about solid **N**?

.....

..... [2]

[Total: 12]

56. 0620_w12_qp_62 Q: 5

Two salt solutions, **J** and **K**, were analysed. **J** was aqueous iron(II) sulfate.
The tests on the solutions, and some of the observations, are in the table.
Complete the observations in the table.

tests	observations
<u>tests on solution **J**</u> **(a)** Appearance of solution **J**.	..... [1]
(b) To about 1 cm^3 of solution **J**, an equal volume of aqueous sodium hydroxide was added.	..... [2]
(c) To about 1 cm^3 of solution **J**, an equal volume of aqueous ammonia was added.	..... [1]
(d) To about 1 cm^3 of solution **J**, dilute nitric acid and aqueous silver nitrate were added.	..... [1]
(e) To about 1 cm^3 of solution **J**, dilute nitric acid and barium nitrate solution were added.	..... [2]
<u>tests on solution **K**</u> **(f)** Appearance of solution **K**.	dark pink liquid
(g) To about 1 cm^3 of solution **K**, an equal volume of aqueous sodium hydroxide was added.	blue precipitate formed
(h) To solution **K**, aqueous sodium hydroxide and aluminium powder were added. The mixture was heated. The gas given off was tested.	effervescence, pungent gas evolved damp red litmus turned blue

(i) Identify the gas given off in test **(h)**.

..... [1]

(j) What conclusions can you draw about solution **K**?

.....

..... [2]

[Total: 10]

---

57. 0620_w12_qp_63 Q: 4

A mixture of solids, **Y** and **Z**, was analysed. **Y** was calcium chloride, which is water-soluble and **Z** is an insoluble salt.

The tests on the mixture, and some of the observations, are in the following table.

Complete the observations in the table.

tests	observations
Distilled water was added to the mixture in a boiling tube. The mixture was shaken and filtered. The residue was saved and tests carried out on the filtrate.	
<u>tests on the filtrate</u> **(a)** The solution was divided into three test-tubes and the following tests were carried out. **(i)** To the first test-tube of solution, drops of aqueous sodium hydroxide were added. Excess aqueous sodium hydroxide was then added to the test-tube. **(ii)** Test **(i)** was repeated using aqueous ammonia instead of aqueous sodium hydroxide. **(iii)** To the third test-tube of the solution, dilute nitric acid was added followed by silver nitrate solution.	.... [3] ..... [1] ..... [2]
<u>tests on the residue</u> **(b)** Dilute nitric acid was added to the residue. The gas given off was tested with limewater. Distilled water was added to the solution followed by aqueous potassium iodide.	rapid effervescence limewater turned milky yellow precipitate formed

(c) Identify the gas given off in test **(b)**.

..... [1]

(d) What conclusions can you draw about solid **Z**?

..... [2]

[Total: 9]

58. 0620_w13_qp_61 Q: 4

Two liquids, **L** and **M**, were analysed. **L** was aqueous potassium iodide. **M** was a colourless liquid.
The tests on the liquids and some of the observations are in the following table.
Complete the observations in the table.

tests	observations
tests on liquid **L** **(a)** Appearance of liquid **L**.	..... [1]
Liquid **L** was divided into three equal portions in separate test-tubes. **(b) (i)** An iodine crystal was added to the first portion of liquid **L**. The test-tube was stoppered and the contents shaken. **(ii)** An equal volume of liquid **M** was added to the test-tube, the contents shaken and left to stand for five minutes.	liquid turned orange two layers were formed, pink top layer and orange lower layer
(c) To the second portion of liquid **L**, dilute nitric acid and barium nitrate solution were added.	..... [1]
(d) To the third portion of liquid **L**, dilute nitric acid and silver nitrate solution were added.	..... [2]

(e) Why does the colour of liquid **L** change in test **(b)(i)**?

.....

..... [1]

(f) What conclusions can you draw about liquid **M** from test **(b)(ii)**?

.....

..... [2]

[Total: 7]

59. 0620_w13_qp_62 Q: 5

Two different liquids, **A** and **B**, were analysed.
A was an aqueous solution of ethanoic acid and **B** was a pure liquid.
The tests on the liquids and some of the observations are in the following table.
Complete the observations in the table.

tests	observations
<u>tests on liquid **A**</u> Liquid **A** was divided into three equal portions in separate test-tubes.	
(a) Colour and smell of liquid **A**.	..... [1]
The liquid was added to Universal Indicator.	colour changed from green to ..... pH ..... [2]
(b) A piece of magnesium ribbon was added to the second portion of liquid **A**. The gas given off was tested with a splint.	.... [3]
(c) Calcium carbonate was added to the third portion of liquid **A**.	..... [1]

tests	observations
<u>tests on liquid **B**</u> **(d)** Dilute sulfuric acid was added to liquid **B** followed by aqueous potassium manganate(VII). The mixture was heated.	changed colour from purple to colourless .
(e) Liquid **B** was poured onto a dry watch glass. The surface of the liquid was touched with a lighted splint.	liquid burned with a yellow/blue flame

(f) What conclusions can you draw about liquid **B**?

.....

..... [2]

[Total: 9]

60. 0620_w13_qp_63 Q: 4

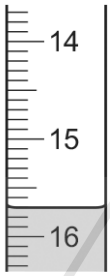
A student investigated the reaction between aqueous potassium manganate(VII), which is purple, and two different colourless acidic solutions, **D** and **E**.

Three experiments were carried out.

(a) *Experiment 1*

A burette was filled with the solution of potassium manganate(VII) to the 0.0 cm^3 mark. Using a measuring cylinder, 25 cm^3 of solution **D** was poured into a conical flask.

Potassium manganate(VII) solution was added to the flask until the mixture just turned permanently pink.
Use the burette diagram to record the final volume in the table and complete the table.



final reading

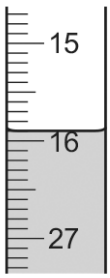
	burette reading
final burette reading / cm^3	
initial burette reading / cm^3	
difference / cm^3	

[2]

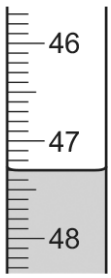
(b) *Experiment 2*

Experiment 1 was repeated using 25 cm^3 of solution **E** instead of solution **D**.

Use the burette diagrams to record the readings in the table and complete the table.



initial reading



final reading

	burette reading
final burette reading / cm^3	
initial burette reading / cm^3	
difference / cm^3	

[2]

(c) *Experiment 3*

Aqueous ammonia was added to solution **E** in a test-tube. A green precipitate was observed.
The mixture was left to stand for 5 minutes. The surface of the precipitate turned brown.

What conclusions can you draw from these observations?

.....

..... [3]

(d) **(i)** What colour change was observed as potassium manganate(VII) solution was added to the flask in Experiment 1?

..... [1]

(ii) Why was an indicator not added to the flask?

..... [1]

(e) **(i)** In which experiment was the greatest volume of potassium manganate(VII) solution used?

..... [1]

(ii) Compare the volumes of potassium manganate(VII) used in Experiments 1 and 2.

..... [1]

(iii) Suggest an explanation for the difference in volumes.

.....

.....

..... [2]

(f) If Experiment 2 was repeated using 12.5 cm^3 of solution **E**, what volume of potassium manganate(VII) solution would be used? Explain your answer.

.....

..... [2]

(g) Give one advantage and one disadvantage of using a measuring cylinder for solutions **D** and **E**.

advantage .....

disadvantage ..... [2]

[Total: 17]

61. 0620_w13_qp_63 Q: 5

Two liquids, **F** and **G**, were analysed. **G** was an aqueous solution of potassium chloride.
The tests on the liquids and some of the observations are in the following table.
Complete the observations in the table.

tests	observations
<u>tests on liquid **F**</u>	
(a) (i) Appearance of liquid **F**.	yellow solution
The pH of the liquid was tested.	pH = 7
(ii) An equal volume of dilute sulfuric acid was added to liquid **F**.	solution turned orange
Excess aqueous sodium hydroxide was then added to the mixture.	solution turned from orange to yellow
(b) Dilute sulfuric acid was added to liquid **F** followed by hydrogen peroxide.	rapid effervescence
The mixture was shaken and the gas given off tested with a splint.	glowing splint relit
<u>tests on liquid **G**</u>	
(c) Dilute nitric acid was added to liquid **G** followed by aqueous barium nitrate.	..... [1]
(d) Dilute nitric acid was added to liquid **G** followed by aqueous silver nitrate.	..... [2]

(e) What does test **(a)(i)** tell you about liquid **F**?

.....

..... [2]

(f) What type of reaction happened in test **(a)(ii)**? Explain your answer.

type of reaction .....

explanation .....

..... [2]

(g) Identify the gas given off in test **(b)**.

..... [1]

[Total: 8]

62. 0620_w14_qp_61 Q: 5

A solid **D**, which is a soluble metal sulfate, was analysed.
The tests on **D**, and some of the observations, are in the following table.
Complete the observations in the table.

tests	observations
<u>tests on solid **D**</u> **(a) (i)** Appearance of solid **D**.	pale green crystals
(ii) Solid **D** was heated in a test-tube gently and then strongly.	condensation formed at the top of the test-tube
<u>tests on the aqueous solution</u> Solid **D** was added to distilled water and shaken to dissolve. The solution was divided into four equal portions in separate test-tubes. **(b) (i)** Several drops of aqueous sodium hydroxide were added to the first portion of the solution.	green precipitate
Excess aqueous sodium hydroxide was added to the mixture.	green precipitate remained
(ii) Excess aqueous ammonia was added to the second portion of the solution.	green precipitate
(c) Aqueous silver nitrate and dilute nitric acid were added to the third portion of the solution.	..... [1]
(d) Aqueous barium nitrate and dilute nitric acid were added to the fourth portion of the solution.	..... [2]

(e) What does test **(a)** tell you about solid **D**?

..... [2]

(f) What conclusions can you draw about the identity of solid **D**?

.....

..... [3]

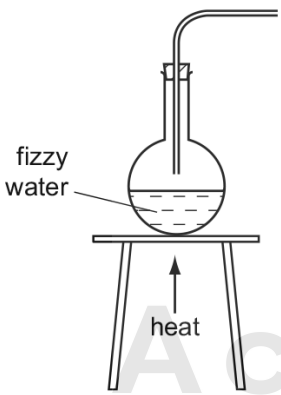
[Total: 8]

---

63. 0620_w14_qp_61 Q: 6

Fizzy water contains carbon dioxide dissolved under pressure. When the water is heated, the gas is given off.

(a) (i) Complete the labelled diagram to show how you could collect and measure the volume of gas given off when fizzy water is heated.



[2]

(ii) State a test for carbon dioxide.

.....

..... [2]

(b) A label on a bottle of fizzy water stated that 'when evaporated completely the mass of solid residue remaining is 200 mg / dm^3 of water'.
Plan an experiment to check the mass of solid formed when the fizzy water is completely evaporated. You are provided with a 500 cm^3 bottle of fizzy water. You can use the space below to draw a diagram of the apparatus used if you wish.

.....

.....

.....

.....

..... [4]

[Total: 8]

64. 0620_w14_qp_62 Q: 2

Four bottles of liquids have lost their labels.
The liquids are known to be:

a solution of chlorine in water

dilute sulfuric acid

hexene

limewater

Outline the chemical tests you could do to identify and distinguish between the liquids in each bottle.

liquid	chemical test	result
a solution of chlorine in water		
dilute sulfuric acid		
hexene		
limewater		

[8]

[Total: 8]

65. 0620_w14_qp_62 Q: 5

Two metallic salt solutions, **A** and **B**, were analysed. **A** was aqueous iron(III) chloride.
The tests on the solutions and some of the observations are in the table.
Complete the observations in the table.

tests	observations
<u>tests on solution **A**</u> **(a)** Appearance of solution **A**.	..... [1]
(b) Aqueous sodium hydroxide was added to about 1 cm^3 of solution **A**.	..... [2]
(c) Aqueous ammonia was added to about 1 cm^3 of solution **A**.	..... [1]
(d) Dilute nitric acid and aqueous silver nitrate were added to about 1 cm^3 of solution **A**.	..... [1]
<u>tests on solution **B**</u> **(e)** Appearance of solution **B**.	colourless liquid
(f) Drops of aqueous sodium hydroxide were added to solution **B**. Excess sodium hydroxide was then added to the mixture.	white precipitate formed precipitate dissolved
(g) Drops of aqueous ammonia were added to solution **B**. Excess ammonia was then added.	white precipitate formed precipitate remained
(h) Dilute nitric acid and aqueous barium nitrate were added to about 1 cm^3 of solution **B**.	white precipitate formed

(i) Identify solution **B**?

.....

..... [2]

[Total: 7]

---

66. 0620_w14_qp_63 Q: 5

Two aqueous solutions, **M** and **N**, were analysed. Solution **N** was aqueous sodium hydroxide.
The tests on **M** and **N**, and some of the observations are in the following table.
Complete the observations in the table.

tests	observations
<u>tests on solution **M**</u> Solution **M** was divided into four equal portions in separate test-tubes. **(a)** Appearance of solution **M**. The pH of the first portion of **M** was tested.	 colourless liquid pH 1
(b) Calcium carbonate was added to the second portion of **M**. The gas given off was tested with a splint.	effervescence lighted splint extinguished
(c) Magnesium ribbon was added to the third portion of **M**. The gas given off was tested with a splint.	effervescence lighted splint popped
(d) A few drops of dilute nitric acid and aqueous silver nitrate were added to the fourth portion of **M**.	white precipitate

tests	observations
<u>tests on solution **N**</u> Solution **N** was divided into three equal portions in separate test-tubes. **(e)** Appearance of solution **N**. The pH of the first portion of solution **N** was tested.	..... [1] pH = [1]
(f) Drops of aqueous zinc sulfate were added to the second portion of **N** and the mixture was shaken. Excess aqueous zinc sulfate was then added to the mixture and the mixture was shaken.	..... [1] ..... [2]
(g) Ammonium chloride was added to the third portion of **N**. The mixture was warmed and the gas tested with damp red litmus paper.	.... [2]

(h) **(i)** Identify the gas given off in test **(c)**.

..... [1]

(ii) Identify the gas given off in test **(g)**.

..... [1]

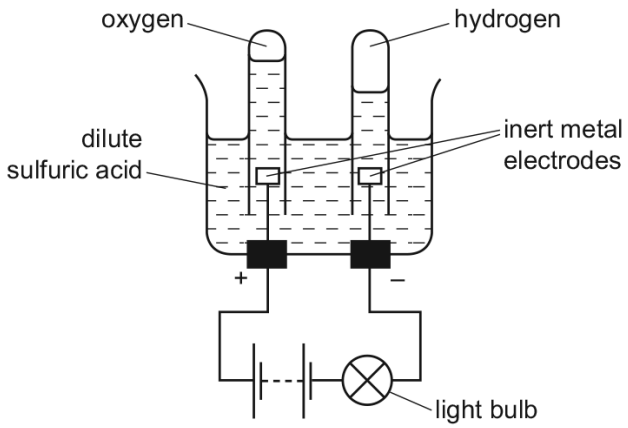
(i) Identify solution **M**.

..... [2]

[Total: 11]

67. 0620_w15_qp_61 Q: 3

Electricity was used to break down dilute sulfuric acid using the apparatus shown.



(a) What name is given to this process?

..... [1]

(b) Give **one** observation which could be made during this experiment.

..... [1]

(c) Suggest a suitable metal for the inert metal electrodes.

..... [1]

(d) Give a test for oxygen gas.

test .....

result .....

[2]

(e) Why does hydrogen form at the negative electrode?

..... [1]

(f) The experiment was repeated using concentrated hydrochloric acid.

Explain why this experiment was carried out in a fume cupboard.

.....

..... [2]

[Total: 8]

68. 0620_w15_qp_61 Q: 4

A student investigated the rate of reaction between magnesium ribbon and four different solutions of dilute sulfuric acid, **A**, **B**, **C** and **D**. The sulfuric acid was in excess in all experiments.

Four experiments were carried out.

(a) *Experiment 1*

Using a measuring cylinder, 30 cm^3 of aqueous sulfuric acid **A** was poured into a beaker. The stop clock was started and a 4 cm length of magnesium was added to the sulfuric acid in the beaker. The mixture was stirred constantly. The time taken for all of the magnesium to react and disappear was measured.
The beaker was rinsed out with distilled water.

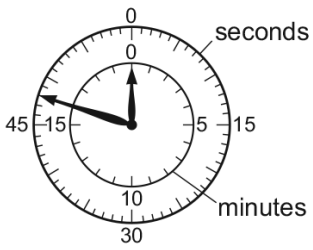
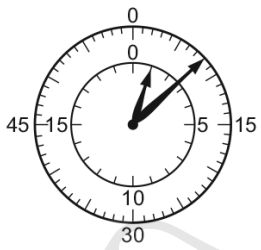
(b) *Experiment 2*

Experiment 1 was repeated using the solution **B** of sulfuric acid.

(c) *Experiments 3 and 4*

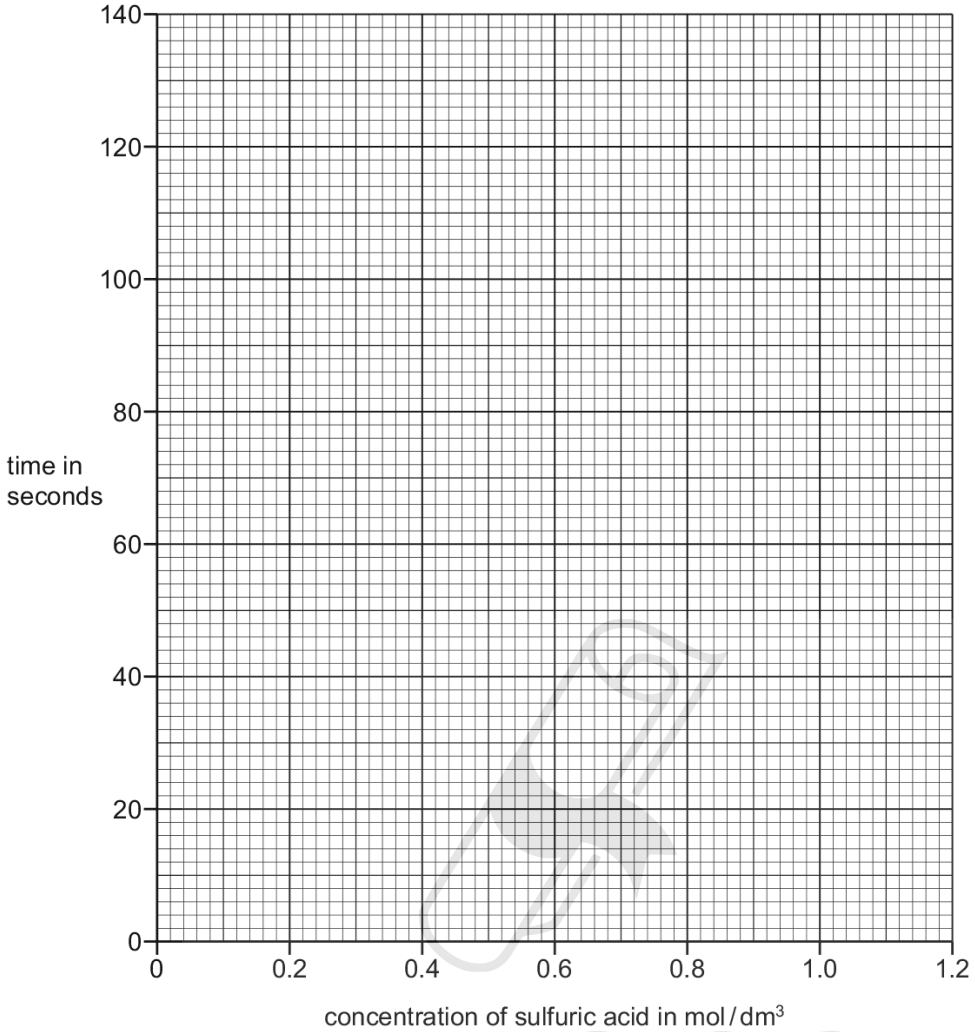
Experiment 1 was repeated, using the solutions **C** and **D** of sulfuric acid.

(d) Use the stop clock diagrams to record the times in the table.

Experiment number	concentration of sulfuric acid in mol / dm^3	stop clock diagram	time for magnesium to completely disappear in seconds
1	1.0		
2	0.8		
3	0.6		
4	0.5		

[4]

(e) Plot the results for Experiments 1, 2, 3 and 4 on the grid and draw a smooth line graph.



[3]

(f) (i) **From your graph**, deduce the concentration of the sulfuric acid if the time for the reaction was 80 s.
Show clearly **on the graph** how you worked out your answer.

..... mol / dm^3 [2]

(ii) **From your graph**, deduce how long the reaction would take if a solution of sulfuric acid of concentration 1.2 mol / dm^3 was used.
Show clearly **on the graph** how you worked out your answer.

..... **s** [2]

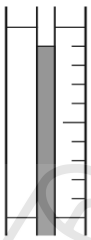
(g) Why was the same amount of magnesium used in Experiments 1, 2, 3 and 4?

..... [1]

(h) Another experiment was carried out.
A 4 cm length of magnesium ribbon was added to dilute sulfuric acid. The temperature of the solution was measured before and after the reaction. The observations were recorded and the gas given off tested.

Observations: Rapid effervescence and the tube felt hot. A lighted splint popped.

Use the thermometer diagrams to record the temperatures.

before addition of magnesium	temperature / °C	after addition of magnesium	temperature / °C
			

[2]

(i) **(i)** What type of chemical reaction occurred when magnesium reacted with sulfuric acid?

..... [1]

(ii) Identify the gas given off.

..... [1]

(iii) Suggest the effect on the temperature change if this experiment was repeated using 2 cm of magnesium ribbon.

.....

..... [2]

(j) Suggest a different method which could be used to investigate the rate of the reaction between magnesium and sulfuric acid. State the difference in the apparatus used and measurements to be taken.

apparatus .....

measurements .....

.....

..... [3]

[Total: 21]

69. 0620_w15_qp_61 Q: 5

Two metal salt solutions, **X** and **Y**, were analysed. Solution **X** was iron(II) chloride.
The tests on **X** and **Y**, and some of the observations, are given in the following tables.
Complete the observations in the table.

tests	observations
tests on solution **X** **(a)** Appearance of solution **X**.	..... [1]
The solution was divided into four equal portions. **(b)** Dilute nitric acid and aqueous silver nitrate were added to the first portion of solution.	..... [1]
(c) Aqueous sodium hydroxide was added to the second portion of solution and the mixture shaken.	..... [2]
(d) Excess aqueous ammonia was added to the third portion of solution.	..... [1]
(e) An oxidising agent was added to the fourth portion of the solution. Aqueous sodium hydroxide was then added to the mixture.	..... [2]

tests	observations
<u>tests on solution **Y**</u> The solution was divided into three equal portions. **(f)** Dilute hydrochloric acid was added to the first portion of the solution.	white precipitate formed
(g) Aqueous sodium hydroxide was added to the second portion of the solution and the mixture shaken. Aluminium powder was added to the mixture and it was warmed gently. The gas given off was tested with damp red litmus paper.	effervescence pungent gas evolved, litmus paper turned blue
(h) Aqueous potassium iodide was added to the third portion of the solution.	pale yellow precipitate

(i) What conclusions can you draw about solution **Y**?

.....

..... [2]

[Total: 9]

70. 0620_w15_qp_62 Q: 4

Three jars of gas have lost their labels. The gases are known to be

- ethene,
- ammonia,
- oxygen.

Complete the table to show the chemical tests that could be used to identify each of these gases.

gas	chemical test	result of test
ethene	....	.... [2]
ammonia	....	.... [2]
oxygen	....	.... [2]

[Total: 6]

71. 0620_w15_qp_62 Q: 5

Two aqueous solutions, **K** and **L**, were analysed. Solution **L** was aqueous calcium iodide.
Tests on the solutions and some of the observations are in the following tables.
Complete the observations in the second table.

tests	observations
tests on solution **K** **(a)** Colour of solution **K**.	green/blue
(b) The solution was divided into four equal portions. **(i)** Aqueous sodium hydroxide was added to the first portion drop by drop and shaken. An excess of aqueous sodium hydroxide was then added to the mixture. **(ii)** Aqueous ammonia was added to the second portion drop by drop and shaken. An excess of aqueous ammonia was then added to the mixture. **(iii)** Dilute nitric acid and barium nitrate solution were added to the third portion. **(iv)** Dilute nitric acid and silver nitrate solution were added to the fourth portion.	 pale blue precipitate the precipitate was insoluble blue precipitate the precipitate dissolved to form a deep blue solution no visible change white precipitate formed

(c) Identify solution **K**.

..... [2]

tests	observations
<u>tests on solution **L**</u> **(d)** Colour of solution **L**.	..... [1]
(e) The solution was divided into three equal portions. **(i)** Aqueous sodium hydroxide was added to the first portion of the solution drop by drop and shaken. An excess of aqueous sodium hydroxide was then added to the mixture. **(ii)** Aqueous ammonia was added to the second portion of the solution drop by drop and shaken. An excess of aqueous ammonia was then added to the mixture and shaken. **(iii)** Dilute nitric acid and silver nitrate solution were added to the third portion of the solution.	..... [2] ..... [1] ..... [1] ..... [1] ..... [2]

[Total: 10]

72. 0620_w15_qp_63 Q: 4

A student investigated the reaction between an acidic solution of iron(II) sulfate, solution **L**, and two different solutions of aqueous potassium manganate(VII), solutions **M** and **N**.

Three experiments were carried out.

(a) *Experiment 1*

Excess aqueous sodium hydroxide was added to about 3 cm^3 of solution **L** in a test-tube.

What observations would be expected in Experiment 1?

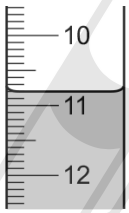
..... [2]

(b) *Experiment 2*

A burette was filled with the solution **M** of potassium manganate(VII) to the 0.0 cm^3 mark. Using a measuring cylinder, 25 cm^3 of solution **L** was poured into a conical flask.

Solution **M** was added to the flask until the mixture just turned permanently pink.

Use the burette diagram to record the readings in the table and complete the table.



final reading

final burette reading / cm^3	
initial burette reading / cm^3	
difference / cm^3	

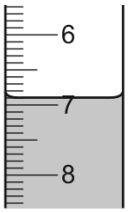
[2]

(c) *Experiment 3*

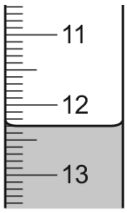
The burette was emptied and rinsed thoroughly with distilled water. A small volume of the solution **N** of aqueous potassium manganate(VII) was added to the burette and shaken.
This solution was discarded.
Solution **N** of potassium manganate(VII) was then poured into the burette.

Experiment 1 was repeated using solution **N** instead of solution **M**.

Use the burette diagrams to record readings in the table and complete the table.



initial reading



final reading

final burette reading / cm^3	
initial burette reading / cm^3	
difference / cm^3	

[2]

(d) Why was the burette washed before starting Experiment 3

(i) with distilled water,

.....

(ii) then with solution **N**?

.....

[2]

(e) Explain why an indicator was not needed.

..... [1]

(f) **(i)** In which experiment was the greater volume of potassium manganate(VII) solution used?

..... [1]

(ii) Compare the volumes of potassium manganate(VII) solution used in Experiments 2 and 3.

..... [1]

(iii) Suggest an explanation for the difference in volumes.

.....

.....

..... [2]

(g) If Experiment 3 was repeated using 12.5 cm^3 of solution **L**, what volume of potassium manganate(VII) solution would be used? Explain your answer.

.....

..... [2]

(h) Give **one** advantage and **one** disadvantage of using a measuring cylinder for solution **L**.

advantage .....

disadvantage .....

[2]

[Total: 17]

73. 0620_w15_qp_63 Q: 5

Two solids, **P** and **Q**, were analysed. **Q** was anhydrous copper(II) sulfate.
Tests on the solids and some of the observations are in the following tables.
Complete the observations in the table.

tests	observations
tests on solid **P** **(a)** Appearance of solid **P**.	white crystals
(b) Solid **P** was heated gently in a dry test-tube.	condensation formed at the top of the test-tube
tests on aqueous solution of **P** An aqueous solution of **P** was divided into three equal portions. The following tests were carried out. **(c)** The pH of the first portion of the solution was tested.	pH 5
(d) Copper(II) oxide was added to the second portion of the solution. The mixture was boiled and the mixture left to stand for one minute.	blue solution formed
(e) Magnesium powder was added to the third portion of the solution. The mixture was shaken and the gas evolved tested.	effervescence, lighted splint popped

(f) Identify the gas in test **(e)**.

..... [1]

(g) What conclusions can you draw about solid **P**?

.....

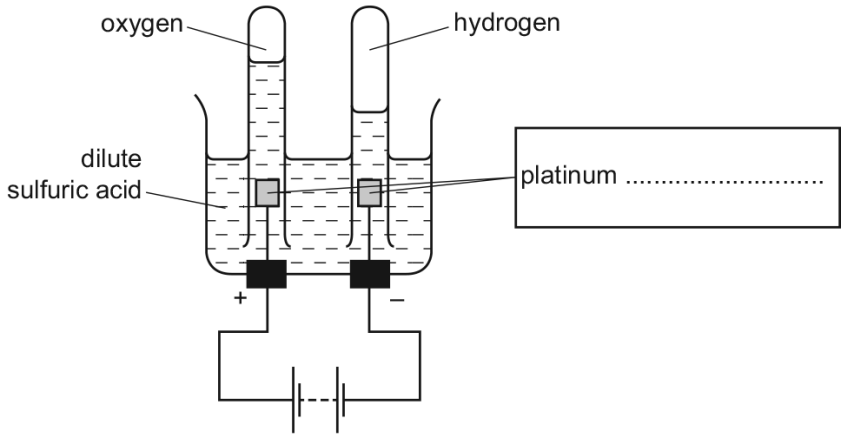
..... [2]

tests	observations
<u>tests on solid **Q**</u> **(h)** Appearance of solid **Q**.	..... [1]
(i) Solid **Q** was added to distilled water and stirred with a thermometer. The temperature of the mixture was measured and recorded after one minute.	temperature change ..... other observations .... [2]
The solution formed was divided into two equal portions. **(j)** An equal volume of aqueous sodium hydroxide was added to the first portion of the solution.	..... [2]
(k) Drops of aqueous ammonia were added to the second portion of the solution and shaken. Excess ammonia solution was then added.	.... [3]

[Total: 11]

74. 0620_w16_qp_61 Q: 1

The diagram shows the apparatus used to electrolyse dilute sulfuric acid.



(a) Complete the box to show the role of the platinum. [1]

(b) Give **one** observation made during this electrolysis.

..... [1]

(c) (i) Compare the volumes of oxygen and hydrogen produced.

.....

..... [2]

(ii) Which substance breaks down to form these gases?

..... [1]

(d) Give **one** test to distinguish between oxygen and hydrogen.

test .....

result with oxygen .....

result with hydrogen .....

[2]

[Total: 7]

75. 0620_w16_qp_61 Q: 3

Solid **P**, which is an aluminium salt, was analysed.
The tests on solid **P**, and some of the observations, are shown.

tests on solid P

(a) test 1

Solid **P** was divided into three portions. The first portion of solid **P** was heated.

observations *condensation formed on the sides of the test-tube*

Any gases given off were tested with cobalt(II) chloride paper.

observations *cobalt(II) chloride paper turned from blue to pink*

What does **test 1** tell you about solid **P**?

..... [1]

(b) test 2

A flame test was carried out on the second portion of solid **P**.

observations ..... [1]

tests on a solution of P

Distilled water was added to the rest of solid **P** in a test-tube and shaken to dissolve.

(c) The solution was divided into four equal portions in four test-tubes. The following tests were carried out.

(i) test 3

Several drops of aqueous sodium hydroxide were added to the first portion of the solution.

Excess aqueous sodium hydroxide was then added to the mixture.

observations .....

.....

..... [3]

(ii) test 4

Several drops of aqueous ammonia were added to the second portion of the solution.

Excess aqueous ammonia was then added to the mixture.

observations .....

..... [2]

Two further tests were carried out and the following observations made.

tests on a solution of **P**	observations
test 5 Dilute nitric acid and aqueous silver nitrate were added to the third portion of the solution.	no visible reaction
test 6 Dilute nitric acid and aqueous barium nitrate were added to the fourth portion of the solution.	white precipitate formed

(d) What does **test 5** tell you about solid **P**?

..... [1]

(e) Identify solid **P**.

..... [1]

(f) Describe the appearance of solid **P**.

..... [1]

[Total: 10]

76. 0620_w16_qp_62 Q: 3

Two solutions, solution **S** and solution **T**, were analysed. Solution **S** was dilute hydrochloric acid. The tests on solution **S** and solution **T**, and some of the observations, are shown.

tests on solution S

(a) Solution **S** was divided into four equal portions in four test-tubes. The following tests were carried out.

Complete the observations for **tests 1–4**.

(i) test 1

The pH of the first portion of solution **S** was tested.

pH ..... [1]

(ii) test 2

Copper(II) oxide was added to the second portion of the solution. The mixture was heated.

observations .....

.....

..... [2]

(iii) test 3

Solid sodium carbonate was added to the third portion of the solution. The gas given off was tested.

observations .....

..... [3]

(iv) test 4

Dilute nitric acid and aqueous silver nitrate were added to the fourth portion of the solution.

observations ..... [1]

tests on solution T

(b) Tests were carried out on solution **T** and the following observations made.

tests	observations
Solution **T** was divided into three equal portions in three test-tubes. Appearance of the solution.	 yellow solution
Drops of aqueous sodium hydroxide were added to the second portion of the solution and the test-tube shaken. Excess aqueous sodium hydroxide was then added to the test-tube.	red-brown precipitate no visible change
Aqueous sodium hydroxide and aluminium foil were added to the third portion of the solution and the mixture heated. The gas given off was tested with pH indicator paper.	pungent gas formed, pH 10

Identify solution **T**.

.....

..... [2]

[Total: 9]

77. 0620_w16_qp_63 Q: 3

Two solutions, solution **Q** and solution **R**, were analysed. Solution **Q** was aqueous sulfuric acid.

tests on solution Q

(a) Solution **Q** was divided into four equal portions in four test-tubes. The following tests were carried out.

Complete the observations for **tests 1–4**.

(i) test 1

The pH of the first portion of solution **Q** was measured.

pH ..... [1]

(ii) test 2

Magnesium ribbon was added to the second portion of solution **Q**. The gas given off was tested.

observations .....

..... [3]

(iii) test 3

Sodium carbonate was added to the third portion of solution **Q**. The gas given off was tested.

observations .....

..... [3]

(iv) test 4

Dilute nitric acid and aqueous barium nitrate were added to the fourth portion of solution **Q**.

observations ..... [1]

tests on solution R

Solution **R** was divided into three equal portions in three test-tubes.
The following tests were carried out.

tests	observations
test 5 The pH of the first portion of solution **R** was measured.	pH = 10
test 6 Drops of aqueous sodium hydroxide were added to the second portion of solution **R** and the test-tube shaken. Excess aqueous sodium hydroxide was then added to the test-tube.	white precipitate no visible change
test 7 Aqueous iron(II) sulfate was added to the third portion of solution **R** and the mixture shaken.	green precipitate formed

(b) Identify solution **R**.

.....

..... [2]

[Total: 10]

78. 0620_w17_qp_61 Q: 3

Two solid salts, **F** and **G**, were analysed. Solid **F** was iron(III) nitrate.
Tests were carried out on each solid.

tests on solid F

Complete the expected observations.

Solid **F** was dissolved in distilled water to produce solution **F**. Solution **F** was divided into three equal portions in three test-tubes.

(a) (i) A few drops of aqueous sodium hydroxide were added to the first portion of solution **F** until a change was seen.

observations ..... [2]

(ii) An excess of aqueous sodium hydroxide was then added to the mixture from **(a)(i)**.

observations ..... [1]

(b) An excess of aqueous ammonia was added to the second portion of solution **F** until a change was seen.

observations ..... [1]

(c) Aluminium foil and aqueous sodium hydroxide were added to the third portion of solution **F**. The mixture was heated and the gas which was produced was tested.

test for gas .....

test result .....
[2]

(d) Identify the gas produced in **(c)**.

..... [1]

tests on solid G

Tests were carried out and the following observations made.

tests on solid **G**	observations
test 1 A flame test was carried out on solid **G**.	red colour
test 2 Dilute nitric acid was added to solid **G**. The gas produced was passed through limewater.	rapid effervescence limewater turned milky

(e) Identify solid **G**.

..... [2]

[Total: 9]

79. 0620_w17_qp_62 Q: 3

Two solid salts, **U** and **W**, were analysed. Solid **U** was sodium carbonate.
Tests were carried out on each solid.

tests on solid U

Complete the expected observations.

(a) Describe the appearance of solid **U**.

..... [1]

About half of solid **U** was dissolved in distilled water to produce solution **U**. Solution **U** was divided into two equal portions in two test-tubes.

(b) Dilute hydrochloric acid was added to the first portion of solution **U**.
The gas produced was tested.

observations .....

..... [3]

(c) Name the gas produced in **(b)**.

..... [1]

(d) A flame test was carried out on solid **U**.

observations ..... [1]

tests on solid W

Tests were carried out and the following observations made.

tests on solid **W**	observations
Appearance of solid **W**.	white crystals
Solid **W** was dissolved in distilled water to produce solution **W**. The solution was divided into two equal portions in two test-tubes. **test 1** Dilute nitric acid and aqueous silver nitrate were added to the first portion of solution **W**.	white precipitate formed
test 2 The second portion of solution **U** was added to the second portion of solution **W**.	white precipitate formed
An excess of dilute hydrochloric acid was then added to the mixture.	rapid effervescence white precipitate dissolved

(e) What conclusions can you draw about solid **W**?

..... [2]

[Total: 8]

80. 0620_w17_qp_63 Q: 3

Two solutions, **Y** and **Z**, were analysed.
Solution **Y** was aqueous chromium(III) nitrate.
Tests were carried out on both solutions.

tests on solution Y

Complete the expected observations.

The solution was divided into two equal portions in two test-tubes.

(a) (i) A few drops of aqueous sodium hydroxide were added to the first portion of solution **Y** and the test-tube shaken to mix the solutions.

observations ..... [2]

(ii) An excess of aqueous sodium hydroxide was then added to the mixture.

observations ..... [1]

(iii) The mixture from **(a)(ii)** was poured into a boiling tube and a small piece of aluminium foil was added.
The mixture was heated and the gas produced was tested.

observations .....

..... [3]

(b) Identify the gas produced in **(a)(iii)**.

..... [1]

tests on solution Z

Tests were carried out and the following observations made.

tests on solution **Z**	observations
Solution **Z** was divided into three equal portions in three test-tubes. **test 1** The pH of the first portion of solution **Z** was tested.	pH 10
test 2 A few drops of aqueous copper(II) sulfate were added to the second portion of solution **Z**. An excess of aqueous copper(II) sulfate was then added to the mixture.	dark blue solution formed light blue precipitate formed
test 3 The second portion of solution **Y** was added to the third portion of solution **Z**.	grey-green precipitate formed

(c) Identify solution **Z**.

..... [1]

[Total: 8]

81. 0620_w18_qp_61 Q: 3

Two solid salts, solid **G** and solid **H**, were analysed. Tests were done on each solid.

tests on solid G

Some of the tests and observations are shown.

tests on solid **G**	observations
test 1 A flame test was done on solid **G**.	lilac colour
Solid **G** was dissolved in distilled water. **test 2** Dilute hydrochloric acid was added to the solution. The solution was warmed gently. The gas produced was tested with filter paper which had been dipped in acidified aqueous potassium manganate(VII).	filter paper turned from purple to colourless

(a) Name the gas produced in **test 2**.

..... [1]

(b) Identify solid **G**.

.....

..... [2]

tests on solid H

Solid **H** was calcium nitrate.

Complete the expected observations.

Solid **H** was added to distilled water in a test-tube. The test-tube was shaken to dissolve solid **H**. The solution was divided into four portions in four test-tubes.

(c) (i) Drops of aqueous sodium hydroxide were added to the first portion of the solution.

observations ..... [2]

(ii) An excess of aqueous sodium hydroxide was then added to the mixture from **(c)(i)**.

observations ..... [1]

(d) An excess of aqueous ammonia was added to the second portion of the solution.

observations ..... [1]

(e) Dilute nitric acid and aqueous silver nitrate were added to the third portion of the solution.

observations ..... [1]

(f) Aluminium foil and aqueous sodium hydroxide were added to the fourth portion of the solution. The mixture was warmed and the gas produced was tested.

observations .....

..... [2]

[Total: 10]

82. 0620_w18_qp_62 Q: 3

Solid **N** and solid **O** were analysed. Solid **N** was ammonium sulfate. Tests were done on each solid.

tests on solid N

Complete the expected observations.

(a) Describe the appearance of solid **N**.

..... [1]

Solid **N** was dissolved in distilled water to form solution **N**. Solution **N** was divided into two portions in two test-tubes.

(b) Dilute nitric acid and aqueous barium nitrate were added to the first portion of solution **N**.

observations ..... [2]

(c) Aqueous sodium hydroxide was added to the second portion of solution **N**. The mixture was heated and the gas produced was tested.

observations .....

..... [2]

(d) Name the gas produced in **(c)**.

..... [1]

tests on solid O

Some of the tests and observations are shown.

tests on solid **O**	observations
The appearance of solid **O** was studied.	white crystals
Distilled water was added to some of solid **O** to form solution **O**. Solution **O** was divided into two equal portions in two test-tubes. **test 1** An excess of aqueous sodium hydroxide was added to the first portion of solution **O**.	no reaction
test 2 Dilute nitric acid and aqueous silver nitrate were added to the second portion of solution **O**.	white precipitate
test 3 A flame test was done on the rest of solid **O**.	lilac colour

(e) What conclusion can you draw about the identity of solid **O** from **test 1**?

..... [1]

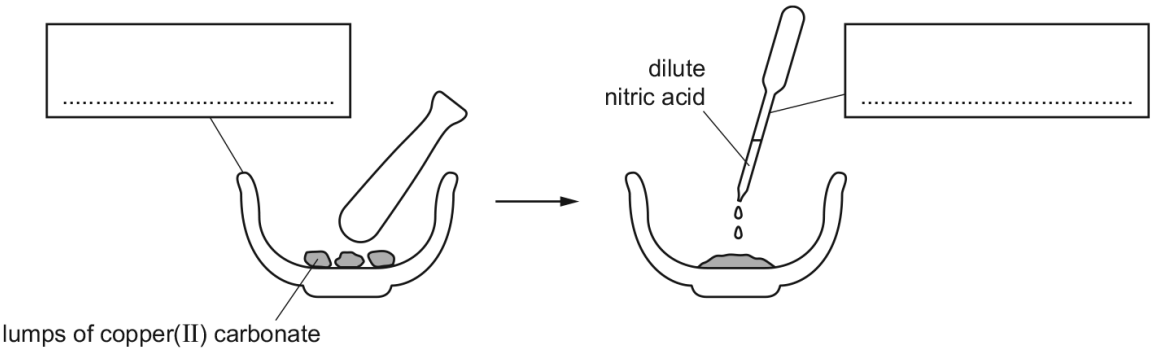
(f) Identify solid **O**.

..... [2]

[Total: 9]

83. 0620_w18_qp_63 Q: 1

A sample of copper was prepared from lumps of copper(II) carbonate. The first step was to make a solution of copper(II) nitrate as shown. Carbon dioxide was produced.



(a) Complete the boxes to name the apparatus. [2]

(b) Describe a test for carbon dioxide.

test .....

result .....
[2]

(c) Explain why the lumps of copper(II) carbonate were crushed before adding the dilute nitric acid.

.....

..... [2]

(d) Suggest how a sample of copper could be obtained from the solution of copper(II) nitrate. Explain your suggestion.

.....

.....

..... [2]

[Total: 8]

84. 0620_w18_qp_63 Q: 3

Solid **P** and solid **Q** were analysed. Solid **P** was lithium nitrate. Tests were done on each solid.

tests on solid P

Complete the expected observations.

(a) Describe the appearance of solid **P**.

..... [1]

Solid **P** was divided into three portions.

(b) Aqueous sodium hydroxide and a small piece of aluminium foil were added to the first portion of solid **P**. The mixture was heated and the gas produced was tested.

observations .....

.....

..... [3]

(c) The second portion of solid **P** was dissolved in distilled water. Dilute nitric acid and aqueous barium nitrate were then added to the solution.

observations ..... [1]

(d) A flame test was done on the third portion of solid **P**.

observations ..... [1]

tests on solid Q

Some of the tests and observations are shown.

tests on solid **Q**	observations
The appearance of solid **Q** was studied.	pink crystals
Solid **Q** was heated in a hard glass test-tube.	condensation formed at the top of the test-tube
Dilute nitric acid and aqueous silver nitrate were added to an aqueous solution of solid **Q**.	white precipitate

(e) What conclusions can you draw about the identity of solid **Q**?

.....

..... [2]

[Total: 8]

85. 0620_w19_qp_61 Q: 3

Two substances, solid **A** and solid **B**, were analysed. Solid **A** was zinc nitrate.
Tests were done on the substances.

tests on solid A

Complete the expected observations.

Solid **A** was added to distilled water and the mixture shaken to dissolve solid **A** and produce solution **A**. Solution **A** was divided into three equal portions in three test-tubes.

(a) (i) A few drops of aqueous sodium hydroxide were added to the first portion of solution **A**.

observations ..... [2]

(ii) An excess of aqueous sodium hydroxide was then added to this mixture.

observations ..... [1]

(b) (i) A few drops of aqueous ammonia were added to the second portion of solution **A**.

observations ..... [1]

(ii) An excess of aqueous ammonia was then added to this mixture.

observations ..... [1]

(c) Aluminium foil and aqueous sodium hydroxide were added to the third portion of solution **A**. The mixture was heated and the gas produced was tested with litmus paper.

observations .....

..... [2]

tests on solid B

Some of the tests and observations are shown.

tests on solid **B**	observations
test 1 A flame test was done on solid **B**.	red flame
test 2 Solid **B** was dissolved in water. Dilute nitric acid and aqueous silver nitrate were added to the solution.	yellow precipitate formed

(d) Identify solid **B**.

..... [2]

[Total: 9]

86. 0620_w19_qp_62 Q: 3

Two substances, solid **P** and solid **Q**, were analysed. Solid **P** was copper(II) nitrate.
Tests were done on solid **P** and solid **Q**.

tests on solid P

Complete the expected observations.

(a) A flame test was done on solid **P**.

observations ..... [1]

Solid **P** was added to distilled water and the mixture shaken to dissolve solid **P** and form solution **P**.
Solution **P** was divided into three equal portions in two test-tubes and one boiling tube.

(b) An excess of aqueous sodium hydroxide was added to the first portion of solution **P** in a test-tube.

observations ..... [1]

(c) **(i)** A few drops of aqueous ammonia were added to the second portion of solution **P** in a test-tube.

observations ..... [1]

(ii) An excess of aqueous ammonia was then added to this mixture.

observations ..... [2]

(d) Aluminium foil and aqueous sodium hydroxide were added to the third portion of solution **P** in a boiling tube. The mixture was heated and the gas produced tested.

observations .....

..... [2]

tests on solid Q

Some of the tests and observations are shown.

tests on solid **Q**	observations
test 1 A flame test was done on solid **Q**.	lilac colour
test 2 Solid **Q** was dissolved in water. Dilute nitric acid and aqueous silver nitrate were added to the solution.	cream precipitate formed

(e) Identify solid **Q**.

..... [2]

[Total: 9]

87. 0620_w19_qp_63 Q: 3

Two substances, solid **U** and liquid **V**, were analysed. Solid **U** was chromium(III) nitrate.
Tests were done on solid **U** and liquid **V**.

tests on solid U

Complete the expected observations.

Solid **U** was added to distilled water and shaken to dissolve solid **U** and form solution **U**.

(a) Describe the colour of solution **U**.

..... [1]

Solution **U** was divided into three equal portions in three test-tubes.

(b) (i) A few drops of aqueous sodium hydroxide were added to the first portion of solution **U** until a change was seen.

observations ..... [2]

(ii) An excess of aqueous sodium hydroxide was then added to the mixture.

observations ..... [1]

(c) An excess of aqueous ammonia was added to the second portion of solution **U**.

observations ..... [1]

(d) Aluminium foil and aqueous sodium hydroxide were added to the third portion of solution **U**. The mixture was heated and the gas produced was tested.

observations .....

..... [2]

tests on liquid V

One of the tests done on liquid **V** and the observations made are shown.

tests on liquid **V**	observations
A lighted splint was used to touch about 1 cm^3 of liquid **V**.	liquid **V** set on fire and burned with a smoky blue flame

(e) Draw **one** conclusion about liquid **V**.

..... [1]

[Total: 8]

88. 0620_w20_qp_61 Q: 3

Solid **Y** and solid **Z** were analysed.
Tests were done on each solid.

tests on solid **Y**	observations
Solid **Y** was dissolved in distilled water to form solution **Y**. Solution **Y** was divided into four portions in four boiling tubes. **test 1** Aqueous ammonia was added dropwise and then in excess to the first portion of solution **Y**.	a white precipitate formed which was insoluble in excess
test 2 Aqueous sodium hydroxide was added dropwise and then in excess to the second portion of solution **Y**.	a white precipitate formed which dissolved in excess to form a colourless solution
test 3 A piece of aluminium foil was added to the solution formed in **test 2**. The mixture was warmed and any gas given off was tested.	the gas turned damp red litmus paper blue
test 4 About 1 cm^3 of dilute nitric acid and a few drops of aqueous silver nitrate were added to the third portion of solution **Y**.	the solution remained colourless, no precipitate formed

(a) Name the gas given off in **test 3**.

..... [1]

(b) Identify solid **Y**.

.....

..... [2]

(c) A strip of universal indicator paper was dipped into the fourth portion of solution **Y**.
The universal indicator paper turned orange.

What additional information does this give about solution **Y**?

..... [1]

tests on solid Z

Solid **Z** was iron(II) sulfate.

Complete the expected observations.

Solid **Z** was dissolved in water to produce solution **Z**. Solution **Z** was split into three equal portions in three boiling tubes.

(d) Aqueous ammonia was added dropwise and then in excess to the first portion of solution **Z**.

observations .....

.....

..... [2]

(e) About 2 cm^3 of dilute hydrochloric acid was added to the second portion of solution **Z**.

observations ..... [1]

(f) The solution from **(e)** was warmed and a piece of filter paper soaked in acidified aqueous potassium manganate(VII) was held at the mouth of the boiling tube.

observations ..... [1]

(g) About 1 cm^3 of dilute nitric acid followed by a few drops of aqueous barium nitrate were added to the third portion of solution **Z**.

observations ..... [1]

[Total: 9]

89. 0620_w20_qp_62 Q: 3

Solid **Q** and solid **R** were analysed. Solid **Q** was zinc carbonate.
Tests were done on each solid.

tests on solid Q

Complete the expected observations.

(a) Solid **Q** was placed in a boiling tube. About 10 cm^3 of dilute sulfuric acid was added to the boiling tube. Any gas produced was tested.
The contents of the boiling tube were kept for **(c)**.

observations .....

.....

..... [3]

(b) Identify the gas given off in **(a)**.

..... [1]

(c) The reaction mixture from **(a)** was filtered.
The filtrate was solution **S**. 1 cm depth of solution **S** was poured into a boiling tube.

(i) Aqueous sodium hydroxide was added dropwise and then in excess to solution **S** in the boiling tube.

observations .....

.....

..... [2]

(ii) Explain why it is **not** possible to identify the cation contained in solution **S** from your observations in **(c)(i)**.

.....

..... [1]

(iii) Suggest an additional test that can be done on solution **S** to confirm the cation was Zn^{2+}.

.....

..... [1]

tests on solid R

Tests were done and the following observations were made.

tests on solid **R**	observations
test 1 A flame test was done on solid **R**.	yellow flame
Solid **R** was dissolved in distilled water to produce solution **R**. The solution was divided into two equal portions in two test-tubes. **test 2** About 1 cm^3 of dilute nitric acid followed by a few drops of aqueous silver nitrate were added to the first portion of solution **R**.	yellow precipitate formed
test 3 The second portion of solution **R** was added to 1 cm^3 of aqueous bromine in a test-tube.	the solution changed colour from orange to brown

(d) Identify solid **R**.

.....

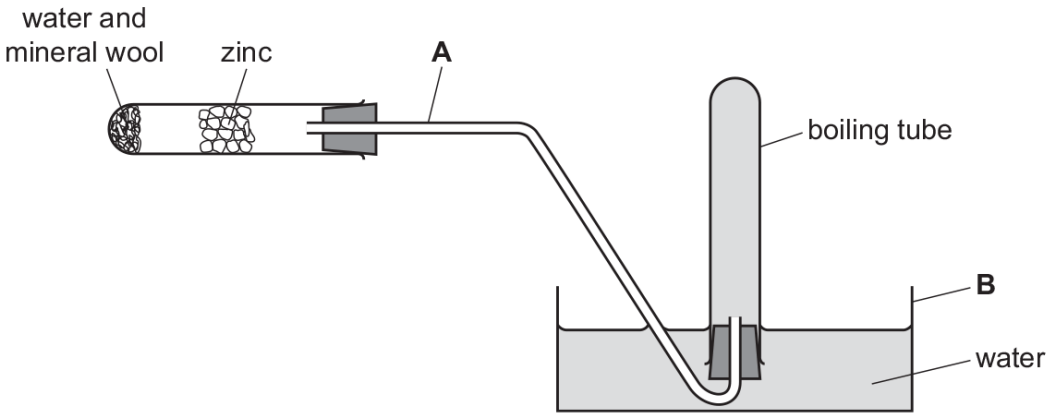
..... [2]

[Total: 10]

90. 0620_w20_qp_63 Q: 1

Hot zinc reacts with steam to make zinc oxide and hydrogen gas.

A student wanted to use the apparatus shown to react zinc with steam and to collect the hydrogen.



(a) Name the items of apparatus labelled **A** and **B**.

A .....

B .....

[2]

(b) State the purpose of the mineral wool.

.....

..... [1]

(c) The apparatus shown is dangerous to use because of an error in the way it has been set up.

Identify this error.

Explain why this error makes it dangerous to use the apparatus.

error .....

.....

explanation .....

.....

[2]

(d) Add **two** arrows to the diagram to show the two places where the apparatus should be heated once the error in **(c)** has been corrected. [1]

(e) Describe the test for hydrogen gas.

test .....

result .....
[2]

[Total: 8]

---

91. 0620_w20_qp_63 Q: 3

Two solids, solid **C** and solid **D**, were analysed.
Tests were done on each solid.

tests on solid C

Tests were done and the following observations were made.

tests on solid **C**	observations
test 1 Half of solid **C** was placed in a test-tube. The solid was heated gently and then strongly.	steam was given off and condensation appeared at the mouth of the test-tube, the remaining solid became black
The remaining solid **C** was dissolved in distilled water to produce solution **C**. The solution was divided into two equal portions in two test-tubes. **test 2** A few drops of universal indicator solution were added to the first portion of solution **C**.	the solution became orange
test 3 A spatula measure of solid sodium carbonate was added to the second portion of solution **C**. Any gas produced was tested.	effervescence was seen, the gas turned limewater milky

(a) Suggest the pH of solution **C**.

pH = ... [1]

(b) Identify the gas produced in **test 3**.

..... [1]

(c) What conclusions can you make about solid **C**?

.....

..... [2]

tests on solid D

Solid **D** was calcium chloride.

Complete the expected observations.

Solid **D** was dissolved in water to form solution **D**. Solution **D** was divided into four approximately equal portions in four test-tubes.

(d) (i) A few drops of aqueous sodium hydroxide were added to the first portion of solution **D**.

observations ..... [1]

(ii) An excess of aqueous sodium hydroxide was added to the mixture from **(d)(i)**.

observations ..... [1]

(e) Aqueous ammonia was added dropwise and then in excess to the second portion of solution **D**.

observations .....

..... [2]

(f) About 1 cm^3 of dilute nitric acid and a few drops of aqueous silver nitrate were added to the third portion of solution **D**.

observations ..... [1]

(g) About 1 cm^3 of dilute nitric acid and a few drops of aqueous barium nitrate were added to the fourth portion of solution **D**.

observations ..... [1]

[Total: 10]

92. 0620_w21_qp_61 Q: 3

Solution **Y** and solution **Z** were analysed.
The following tests were done on the solutions.

tests on solution Y

tests	observations
Solution **Y** was divided into four portions in four test-tubes. **test 1** A strip of universal indicator paper was dipped into the first portion of solution **Y**.	the universal indicator paper turned blue
test 2 Aqueous copper(II) sulfate was added to the second portion of solution **Y**.	a blue precipitate formed
test 3 A flame test was done using the third portion of solution **Y**.	a red flame was seen
test 4 2 cm^3 of dilute sulfuric acid was added to the fourth portion of solution **Y**.	no visible change; the test-tube became slightly warmer

(a) Suggest the pH of solution **Y**.

..... [1]

(b) Identify solution **Y**.

.....

..... [2]

tests on solution Z

Solution **Z** was aqueous ammonium sulfite.

Complete all of the expected observations.

Solution **Z** was divided into three portions in two boiling tubes and a test-tube.

(c) 5 cm^3 of dilute hydrochloric acid was added to the first portion of solution **Z** in a boiling tube. The mixture was warmed and a piece of filter paper soaked in acidified aqueous potassium manganate(VII) held at the mouth of the boiling tube.

State the colour change of the acidified aqueous potassium manganate(VII).

from ..... to ..... [2]

(d) Name the gas being tested for in **(c)**.

..... [1]

(e) 5 cm^3 of aqueous sodium hydroxide was added to the second portion of solution **Z** in a boiling tube. The mixture was warmed and the gas given off was tested.

result of gas test .....

..... [1]

(f) Identify the gas given off in **(e)**.

..... [1]

(g) About 1 cm^3 of dilute hydrochloric acid followed by a few drops of aqueous barium nitrate were added to the third portion of solution **Z**.

observations ..... [1]

[Total: 9]

---

93. 0620_w21_qp_62 Q: 3

Solid **O** and liquid **P** were analysed. Solid **O** was ammonium bromide.
Tests were done on each substance.

tests on solid O

Complete the expected observations.

Solid **O** was dissolved in water to form solution **O**. Solution **O** was divided into four approximately equal portions in four test-tubes.

(a) To the first portion of solution **O**, approximately 2 cm^3 of aqueous ammonia was added.

observations ..... [1]

(b) To the second portion of solution **O**, approximately 2 cm^3 of aqueous sodium hydroxide was added. The mixture formed was warmed. A gas was given off.

(i) The gas given off was tested with damp red litmus paper.

observations ..... [1]

(ii) Identify the gas given off.

..... [1]

(c) To the third portion of solution **O**, approximately 1 cm^3 of dilute nitric acid followed by a few drops of aqueous silver nitrate were added.

observations ..... [1]

(d) To the fourth portion of solution **O**, approximately 1 cm^3 of aqueous chlorine was added.

observations ..... [1]

tests on liquid P

tests	observations
test 1 A few drops of liquid **P** were placed in a crucible. A lighted splint was applied to the surface of liquid **P** in the crucible.	burned with an orange flame and lots of smoke; soot was left around the top of the crucible
test 2 A few drops of liquid **P** were added to a test-tube containing 1 cm^3 of aqueous bromine.	colour changed from orange to colourless

(e) State what conclusions can be made about liquid **P**.

.....

..... [2]

[Total: 7]

94. 0620_w21_qp_63 Q: 3

Solid **S** and solid **T** were analysed.
Tests were done on each substance.

tests on solid S

tests	observations
test 1 Solid **S** was placed in a boiling tube and 10 cm^3 of dilute hydrochloric acid was added.	effervescence
The solution formed in **test 1** was decanted from the remaining solid **S**. The solution is solution **U**. **test 2** Aqueous sodium hydroxide was added dropwise and then in excess to solution **U**.	white precipitate, insoluble in excess

The gas given off in **test 1** was carbon dioxide.

(a) Describe how the gas produced in **test 1** could be tested to show that it was carbon dioxide. Give the expected result of the test.

test .....

result ..... [2]

(b) Identify solid **S**.

.....

..... [2]

tests on solid T

Solid **T** was iron(III) chloride.

Solid **T** was dissolved in water to form solution **T**. Solution **T** was divided into four equal portions in four test-tubes.

(c) To the first portion of solution **T**, aqueous sodium hydroxide was added dropwise and then in excess.

observations .....

..... [2]

(d) To the second portion of solution **T**, 2 cm^3 of aqueous ammonia was added.

observations ..... [1]

(e) To the third portion of solution **T**, 1 cm^3 of dilute nitric acid followed by a few drops of aqueous silver nitrate were added.

observations ..... [1]

(f) To the fourth portion of solution **T**, 1 cm^3 of dilute nitric acid followed by a few drops of aqueous barium nitrate were added.

observations ..... [1]

[Total: 9]

01. 0620_m15_ms_62 Q: 5

tests on solution **E**

(a) yellow / green / any combination of yellow/green [1]

(b) white precipitate (1) [1]

(c) **(i)** green (1) precipitate (1) [2]

(ii) indicator paper turns blue (1)

pungent / sharp smell(1) [2]

(d) brown precipitate (1) [1]

(g) hydrogen (1) [1]

(h) any **two** from:
transition metal (1)

different valencies / colours (1)

acidic solution (1) [2]

---

02. 0620_m16_ms_62 Q: 3

(a)	blue / green (solid / crystals);	**1**
(b)(i)	(pale) blue; precipitate; royal / deep blue; dissolves / solution;	**4**
(b)(ii)	(pale) blue precipitate;	**1**
(b)(iii)	white precipitate;	**1**
(b)(iv)	no reaction / change / precipitate;	**1**
(c)	ammonium; iodide;	**2**

03. 0620_m17_ms_62 Q: 1

(a)	electrode(s)	1
(b)	diagram of test-tube over either electrode	1
	containing liquid	1
(c)	test: glowing splint result: relights	1
(d)(i)	carbon dioxide	1
(d)(ii)	oxygen reacted with carbon	1
(e)	solution became more acidic / more concentrated	1
	water was broken down / electrolysed	1

04. 0620_m17_ms_62 Q: 3

(a)(i)	white	1
	precipitate	1
(a)(ii)	(white precipitate) dissolves	1
(b)(i)	white precipitate	1
(b)(ii)	(white precipitate) dissolves	1
(c)	cream	1
	precipitate	1
(d)	sodium	1
	iodide	1

05. 0620_m17_ms_62 Q: 4

(a)	any 4 from: **M1** measure initial temperature of (solid) ammonium chloride / barium hydroxide **M2** add barium hydroxide / ammonium chloride / other solid **AND** mix / stir **M3** use a thermometer **M4** measure the temperature of the mixture / final temperature **M5** temperature decreases / test-tube feels cold	4
(b)	**M1** add (aqueous) sodium hydroxide (and warm)	1
	M2 gas produced turns (red) litmus blue	1

06. 0620_m18_ms_62 Q: 3

	tests on solution **M**	
(a)	yellow / brown	1
(b)	white	1
	precipitate	1
(c)	no reaction / change / precipitate	1
(d)(i)	brown	1
	precipitate	1
(d)(ii)	no change / precipitate remains / insoluble	1

	tests on solid **N**	
(e)	carbon dioxide	**1**
(f)	copper / transition element	**1**
	carbonate	**1**

07. 0620_m19_ms_62 Q: 1

1(a)	Electrolysis	**1**
1(b)	Open (air hole / collar)	**1**
1(c)	Fizzing / bubbles / green gas	**1**
	Chlorine / Cl_2	**1**
1(d)	Iron reacts (with chlorine) / iron is reactive / not inert	**1**
1(e)(i)	Bubbles / effervescence / fizzing	**1**
	Hydrogen (is below zinc in the reactivity series)	**1**
1(e)(ii)	Litmus	**1**
	Bleached / turns white	**1**
1(f)	Wear gloves / goggles	**1**

08. 0620_m19_ms_62 Q: 2

2(a)	Table of results for Experiment 1 Initial and final volumes completed correctly 1.1, 16.1	**1**
	Difference 15.0	**1**
2(b)	Table of results for Experiment 2 Initial, final volumes and difference completed correctly 1.9, 31.9, 30.0	**1**
	All readings to 1 dp in **(a)** and **(b)**	**1**
2(c)(i)	Solution A	**1**
	Smaller volume / less (of potassium manganate used) / solution A	**1**
2(c)(ii)	2 □ (times) as concentrated	**1**
2(d)(i)	2 □ (times) value from table for Experiment 2, 60 cm^3	**1**
	Double volume (of C) used	**1**
2(d)(ii)	Volume of potassium manganate solution added > 50 cm^3	**1**
	Use more than one burette / refill burette	**1**
2(e)	Advantage easy to use / quick	**1**
	Disadvantage not as accurate owtte	**1**
2(f)	(Solution C) contains iron(II) (ions) / Fe^{2+}	**1**
	Reference to oxidation / (iron(II)) → iron(III) / Fe^{3+}	**1**

09. 0620_m19_ms_62 Q: 3

Tests on solution D		
3(a)	1–3	**1**
3(b)	Bubbles / fizz / effervescence	**1**
	Lighted splint / flame	**1**
	'Pops'	**1**
3(c)	No reaction / no change / no precipitate	**1**
3(d)	White precipitate	**1**
Tests on solid E		
3(e)	Carbon dioxide	**1**
3(f)	Calcium	**1**
	Carbonate	**1**

10. 0620_m20_ms_62 Q: 3

Question	Answer	Marks
	Tests on solution J	**1**
(a)	1	**1**
(b)	carbon dioxide	**1**
(c)(i)	hydrochloric acid / HCl hydrogen (ions) / H^+ chloride (ions) / Cl^-	**2**
	Tests on solid K	**1**
(d)	no change	**1**

Question	Answer	Marks
(e)	(red) litmus	**1**
	(litmus) turns blue	**1**

Question	Answer	Marks
	Tests on solution J	1
(a)	1	1
(b)	carbon dioxide	1
(c)(i)	hydrochloric acid / HCl hydrogen (ions) / H^+ chloride (ions) / Cl^-	2
	Tests on solid K	1
(d)	no change	1

11. 0620_m21_ms_62 Q: 3

Question	Answer	Marks
(a)	ammonia / NH_3	1
(b)	lithium nitrate lithium (ions) / Li^+	1
	nitrate / NO_3^-	1
(c)	white precipitate	1
	dissolves / disappears / forms colourless solution	1
(d)	white precipitate	1
	remains / does not dissolve / no further change / white precipitate / nothing happens	1
(e)	no change	1
(f)	white precipitate	1

12. 0620_p20_ms_60 Q: 3

(a) platinum / graphite / carbon [1]

(b) damp blue litmus paper / Universal indicator paper / pH paper; [1]
bleaches / turns white; [1]

(c) hydrogen [1]

13. 0620_p20_ms_60 Q: 4

(a) (i) white precipitate [1]

(ii) precipitate dissolves in excess; [1]

(iii) white precipitate; [1]
no change / precipitate remains; [1]

(b) contains water / hydrated [1]

(c) ammonia
not: ammonium [1]

(d) Any two from:
nitrate;
hydrated salt / contains water;
it is not a sulfate; [2]

(e) sodium hydroxide is hazardous / irritant / caustic; [1]
allow: toxic
boiling causes mixture to spit / blow-out; [1]

---

14. 0620_p20_ms_60 Q: 5

(a) Universal indicator / pH paper; [1]
pH of 4–6 / yellow / orange; [1]
note: any suitable test with appropriate result

(b) Any four from:
chromatography;
description of applying food colouring to paper;
use of solvent;
results / number of spots;
compare results to known sample / reference to R_f value; [4]
marks can be obtained from a labelled diagram

---

15. 0620_s12_ms_61 Q: 5

(c) fizz/bubbles/effervescence (1) limewater (1)
milky/cloudy/white ppt (1) **cond**: on limewater [3]

(e) ammonia (1) [1]

(f) non-transition metal (1)
ammonium (salt or carbonate) (2) **not**: ammonia max [2]

[Total: 6]

---

16. 0620_s12_ms_62 Q: 3

(a) bulb/lamp lights/water level falls/green-yellow gas (1) [1]

(b) arrows labelling electrodes as anode/cathode or + – or the electrodes or Pt (1)
allow: labels either way round **not**: the wires labelled [1]

(c) **(i)** hydrogen (1) [1]

(ii) lighted splint (1) if Cl_2 in **(c)(i)** allow ecf for damp litmus/indicator paper
no ecf for anything other than Cl_2

pops (1) if Cl_2 in **(c)(i)** allow ecf for bleached/white/decolourised [2]
note: These are conditional marks so the result is conditional on the test, i.e. glowing splint pops = 0/2

(d) chlorine (1) soluble/dissolves/reacts (1) [2]

[Total: 7]

---

17. 0620_s12_ms_62 Q: 6

(d) appearance colourless (1) **ignore**: clear
smell vinegar/pungent/sour/sharp (1) **ignore**: sweet/strong [2]

(e) pH 2–6 (1) [1]

(f) carbon dioxide (1) [1]

(g) copper/Cu^{2+} (1) carbonate/CO_3^{2-} (1) [2]

[Total: 6]

---

18. 0620_s12_ms_63 Q: 2

bromine (water) (1) not: bromide
colourless (1)
aqueous silver nitrate (1)
yellow precipitate (1)
named indicator/solution of copper salt (1)
correct colour change/pH/blue precipitate (1) [6]

[Total: 6]

---

19. 0620_s12_ms_63 Q: 5

(c) bubbles/fizz/effervescence (1) [1]
limewater (1) milky (1) [2]

(d) **(i)** blue (1) precipitate (1) [2]

(ii) blue precipitate (1) [1]
dark/deep blue (1) solution/dissolves (1) [2]

(e) barium/calcium (1) chloride (1) **not**: chlorine ions [2]

[Total: 10]

---

20. 0620_s13_ms_61 Q: 1

(a) electrode(s) / anode / cathode(either) (1)
allow: electrodes labelled wrong way round **not:** carbon/platinum

bulb / lamp / light (1) [2]

(b) lighted splint (1) pops (1) glowing splint = 0 [2]

(c) graduated test-tube / measuring cylinder (1) **not:** gas syringe as will not work

filled with electrolyte / acid / water inverted over electrode / owtte (1) [2]

(d) **(i)** sodium hydroxide (1) [1]

(ii) universal indicator with pH>7 / litmus turns blue (1) [1]
note: mark not awarded if **(d)(i)** is incorrect

---

21. 0620_s13_ms_61 Q: 2

(a) to prevent air / oxygen / bacteria entering jar (1) [1]

(b) pestle and / or mortar (1) [1]

(c) diagram of funnel and filter paper (1) labelled (1) [2]

(d) yeast would not work at high temperatures / kills yeast / denatures enzymes / owtte (1) [1]
allow: kills enzyme

(e) **(i)** bubbles / froth (1) [1]
not: gas / CO_2 given off / turns cloudy

(ii) (collect gas) and measure volume / count bubbles (1)

over certain time interval (1) [2]
allow: one mark for timing until bubbles / reaction stopped

(f) fractional distillation (1) [1]

---

22. 0620_s13_ms_62 Q: 4

(a) colourless (1) **ignore:** clear, **not:** white [1]

(b) white (1) precipitate (1)

dissolves / clears (1) [3]

(c) white precipitate (1) insoluble / does not dissolve (1) [2]

(d) no change / colourless solution / no reaction (1) [1]

(e) white (1) precipitate (1) [2]

(g) carbon dioxide / CO_2 (1) [1]

(h) calcium / Ca^{2+} (1) **accept:** any Group 2 metals carbonate / CO_3^{2-} (1)
note: $CaCO_3$ = 2 [2]

---

23. 0620_s13_ms_63 Q: 4

tests on solid **H**

(a) blue / green (1) [1]

(b) blue (1) precipitate (1) [2]

(c) blue (1) precipitate (1) [2]

with excess deep blue (1) solution / clear / dissolves (1) [2]

(d) forms a carbonate on heating / carbon dioxide present (1)

organic / ethanoate (1) [2]

---

24. 0620_s14_ms_61 Q: 5

(d) white (1)

precipitate (1) [2]

(e) no reaction / no change / no precipitate (1) [1]
allow: colourless solution

(f) not a chloride / halide (1) [1]

(g) oxygen / O_2 (1) [1]
not O

(h) transition metal / manganese (1)

hydrated salt (1)
ignore: sulfate

allow: catalyst (1) max [2]

---

25. 0620_s14_ms_62 Q: 5

(b) pH paper turns blue / pH > 7 / reference to smell of the gas (1) [1]

(c) **(i)** paper turns blue / pH > 7 (1)

reference to smell of gas (1)
ignore: fizzing

(ii) white (1)

precipitate (1)

(f) zinc (1)
allow: Zn^{2+}
ignore: incorrect formulae

carbonate (1)
allow: CO_3^{2-}
ignore: incorrect formulae

---

26. 0620_s14_ms_63 Q: 4

(a) temperature boxes correctly completed (2),
25, 36, 38, 37, 36, 35, 34 [2]
guidance: 7 correct (2); 6 correct (1); 5 or fewer correct (0)

(b) temperature boxes completed correctly
25, 19, 18, 17, 16, 16, 17 [2]
guidance: 7 correct (2); 6 correct (1); 5 or fewer correct (0)

(d) all points correctly plotted(3)
guidance: 7 correct (2); 6 correct (1); 5 or fewer correct (0)

smooth line graphs (2)

labels (1) [6]

(e) **(i)** value from graph (1) 37.5 s

shown clearly (1) [2]

(ii) value from graph (1) 6 s

shown clearly (1) [2]

(f) endothermic (1) [1]

(g) M is a carbonate / carbon dioxide given off (1) [1]

(h) lower temperature changes (1)

greater volume / more water (1) [2]

(i) room temperature or 25 °C (1)

reaction finished (1) [2]

(j) more readings / points / more accurate / better graph (1) [1]

---

27. 0620_s14_ms_63 Q: 5

(c) **(i)** white (1)

precipitate(1)

insoluble(1) [3]

(ii) no / thin precipitate (1) [1]

(iii) yellow precipitate (1) [1]

(d) copper (1)

oxide (1) [2]

---

28. 0620_s15_ms_61 Q: 5

(c)	white; precipitate; dissolves / clears;	3	
(d)	white precipitate;	1	
(e)	no reaction / no change / no precipitate / colourless solution;	1	
(f)	white; precipitate;	2	
(g)	hydrated / water;	1	
(h)	not a halide / not a named halide;	1	
(i)(i)	ammonia / NH_3;	1	
(i)(ii)	ammonium / NH_4^+;	1	

29. 0620_s15_ms_62 Q: 3

	aqueous potassium hydroxide named indicator e.g. red litmus; correct colour e.g. turns blue; **OR** pH paper / indicator / meter / probe; >7; **OR** chemical test e.g. copper sulfate solution; correct result e.g. blue precipitate; *octane* lighted splint; liquid catches fire; **OR** add to water; immiscible; *pure water* boiling point / melting point; 100 °C / 0 °C;	**6**	note: any correct tests allowable for these liquids **I** pH scale, but **A** measure pH, **A** the observation in both cases **A** burn it **I** chemical tests for water **I** indicators / pH tests **I** tests that would also work for KOH(aq)

30. 0620_s15_ms_62 Q: 5

(b)	pungent smell; paper turns blue / purple / green;	**2**	**A** sharp **I** pH
(c)	(pale) yellow; precipitate;	**2**	**R** bright yellow
(e)	pH 8–14;	**1**	**A** above 7 / 7–14
(f)	carbon dioxide;	**1**	
(g)	barium / lead / calcium / silver; carbonate;	**2**	

31. 0620_s15_ms_63 Q: 5

(c)	red brown; precipitate; no change;	**3**	
(d)	red brown precipitate;	**1**	
(e)	no change / no precipitate / no reaction / nothing;	**1**	
(f)	white; precipitate;	**2**	
(g)	hydrated / water;	**1**	
(h)	not a halide / not a named halide;	**1**	
(i)(i)	ammonia / NH_3;	**1**	
(i)(ii)	ammonium / NH_4^+;	**1**	

32. 0620_s16_ms_61 Q: 3

(a)	sodium; bromide;	**2** 1 1
(b)	green;	**1**
(c)(i)	green; precipitate; with excess, green solution / clear / dissolves;	**3** 1 1 1
(c)(ii)	grey-green; precipitate;	**2** 1 1
(c)(iii)	white precipitate;	**1**
(d)	fume cupboard / protective clothing, e.g. gloves or goggles;	**1**

33. 0620_s16_ms_62 Q: 3

(a)	white (solid / crystals / powder);	1
(b)(i)	no change;	1
(b)(ii)	turns from purple / pink; to colourless / white;	2 1 1
(c)	yellow / orange (flame);	1
(d)	ammonia / NH_3;	1
(e)	ammonium / NH_4^+;	1

34. 0620_s16_ms_63 Q: 3

(a)(i)	white; precipitate; dissolves;	3 1 1 1
(a)(ii)	white precipitate; dissolves;	2 1 1
(a)(iii)	no reaction / change / precipitate;	1
(a)(iv)	any 3 from: effervescence / fizz / bubbles; red litmus / pH paper; blue / pH > 7; pungent smell;	3
(b)	lithium; carbonate;	2 1 1

35. 0620_s17_ms_61 Q: 3

(a)	solid spits out of the tube / the tube might crack	1
(b)	carbon dioxide	1
(c)	copper / Cu^{2+}	1
	carbonate / CO_3^{2-}	1
(d)	white	1
(e)(i)	no reaction / change	1
(e)(ii)	yellow	1
	precipitate	1
(f)	lilac	1

(g)	any 2 from: □ blue / roaring / hot flame □ use of a splint / wire to introduce the solid into the flame □ use of (concentrated) hydrochloric acid	2

36. 0620_s17_ms_61 Q: 4

(a)	(red) litmus turns blue	1
(b)	heat / boil the mixture	1
	condense the vapour	1
(c)	filter / decant	1
	wash residue (with water)	1
	dry	1

37. 0620_s17_ms_62 Q: 1

(a)	measuring cylinder	1
	conical flask	1
(b)	bubbles / fizz / effervescence	1
(c)	time (taken)	1
	s / seconds / secs	1
(d)(i)	80 and 40 (cm^3)	1
	Experiment 1 at twice / double the volume of Experiment 2	1
(d)(ii)	two times as much / mass / amount / length magnesium used (in Experiment 1)	1
(d)(iii)	curve drawn is steeper than Experiment1	1
	curve drawn finishes at the same level as Experiment 1	1

38. 0620_s17_ms_62 Q: 3

(a)	initial temperature and final temperature recorded correctly: 19, 23	1
	temperature difference correctly calculated: 4	1
(b)	endothermic	1
(c)	sulfur dioxide	1
(d)	sodium / Na^+	1
	sulfite / SO_3^{2-}	1
(e)	red	1
(f)	white	1
	precipitate	1

39. 0620_s17_ms_63 Q: 3

(a)	chlorine	1
(b)(i)	iron(III)	1
	hydroxide	1
(b)(ii)	green	1
	precipitate	1
(c)	oxygen	1
(d)	catalyst	1
	transition element compound / manganese oxide	1

40. 0620_s18_ms_61 Q: 3

(a)	hydrogen / H_2	1
(b)	sulfuric	1
	acid	1
(c)	limewater	1
	milky / cloudy / white ppt.	1
(d)(i)	white	1
	precipitate	1
(d)(ii)	dissolves / clears / goes colourless	1
(e)(i)	white precipitate	1
(e)(ii)	dissolves / clears / goes colourless	1

41. 0620_s18_ms_62 Q: 1

(a)	(gas) syringe	1
(b)(i)	volume of gas / volume of carbon dioxide	1
(b)(ii)	reaction finished / no more gas given off	1
	calcium carbonate used up	1
(c)	sketch less steep at beginning	1
	to same level / volume / final amount of gas	1
(d)	limewater / calcium hydroxide solution	1
	milky / cloudy / white ppt.	1

42. 0620_s18_ms_62 Q: 3

(a)	(pale) green (solid / crystals)	1
(b)	no change / no reaction / no precipitate / no observation	1
(c)	white precipitate	1
(d)	green	1
	precipitate	1
(e)	green precipitate	1
(f)	calcium	1

43. 0620_s18_ms_63 Q: 3

(a)(i)	yellow	1
(a)(ii)	pH 11–14	1
(b)	white precipitate	1
	clears / dissolves	1
	white precipitate	1
(c)	pH / litmus paper	1
	turns pH >7 / turns blue	1
(d)	grey-green	1
	precipitate	1

(e)	organic / fuel / flammable	1

44. 0620_s19_ms_61 Q: 1

(a)	(conical) flask (1) gas jar (1)	2
(b)	no bung in second flask (1) gas jar should not be inverted (1)	2
(c)	to dry the gas / remove water	1
(d)	litmus (1) turns white/bleaches (1)	2
(e)	chlorine / gas is poisonous / toxic	1

45. 0620_s19_ms_61 Q: 3

	Tests on solution F	
(a)	0–3	1
(b)	bubbles / fizz / effervescence (1) lighted splint / flame (1) pops (1)	3
(c)	white precipitate	1
(d)	no reaction/change	1
	Tests on solid G	
(e)	calcium (1) carbonate (1)	2

46. 0620_s19_ms_62 Q: 2

(a)	table of results	2
	time boxes completed 20, 34, 68, 98 in seconds	1
(b)	appropriate scale for *y*-axis	1
	all points plotted correctly	1
	best fit smooth line graph between plotted points	1
(c)	extrapolation shown clearly	1
	value from graph	1
	unit … s	1
(d)(i)	(length) is a control variable	1
(d)(ii)	times / results would be lower / smaller / less (because less magnesium is used)	1
(e)	apparatus: **M1** gas syringe / measuring cylinder over water	1
	measurement 1: **M2** volume of gas	1
	measurement 2: **M3** time	1

(f)(i)	exothermic / redox / displacement	1
(f)(ii)	hydrogen / H_2	1

47. 0620_s19_ms_62 Q: 3

	Tests on solid L	
(a)	white (solid / crystals)	1
(b)	condensation / drops on side of tube	1
	cobalt(II) chloride paper turns from blue	1
	to pink	1
(c)	any **two** from: □ (red) litmus paper □ turns blue □ pungent smell	2
(d)	white precipitate	1
(e)	iron(III) / Fe^{3+}	1
	chloride / Cl^-	1

48. 0620_s19_ms_63 Q: 3

	Tests on solid N	
(a)	white (solid)	1
(b)	condensation / drops on side of tube	1
	cobalt(II) chloride paper turns (from blue) to pink	1
(c)(i)	white precipitate	1
(c)(ii)	precipitate dissolves / clears / soluble	1
(d)	white precipitate	1
	Tests on solid O	
(e)	potassium	1
	chloride	1

49. 0620_s20_ms_61 Q: 3

Question	Answer	Marks
	Tests on solid G	
(a)	any **three** from: • bubble / fizz / effervescence • blue solution formed • (gas made turns) limewater • milky	3
(b)	• carbon dioxide / CO_2	1

Question	Answer	Marks
(c)	blue	1
	precipitate	1
	dark(er) / royal blue and dissolves / solution	1
(d)	not a halide	1
	tests on solid H	
(e)	hydrated	1
	sodium / Na^+ sulfate / SO_4^{2-} sodium sulfate = 2 Na_2SO_4 = 2	1

50. 0620_s20_ms_62 Q: 3

Question	Answer	Marks
	Tests on solution L	
(a)	stays purple **or** no change	1
(b)	green ppt	1
	(dissolves / soluble) producing a green solution	1
(c)	grey-green precipitate	1
	remains in excess / does not dissolve	1
(d)	white precipitate	1

Question	Answer	Marks
	Tests on solid M	
(e)	sodium / Na^+	1
	carbonate / CO_3^{2-}	1

51. 0620_s20_ms_63 Q: 3

Question	Answer	Marks
	Tests on solid N	
(a)	ammonia	1
(b)	zinc / Zn^{2+}	1
	nitrate / NO_3^-	1
	Tests on solid P	
(c)	white	1
(d)	lilac	1
(e)(i)	(pale) yellow precipitate	1

Question	Answer	Marks
(e)(ii)	no change	1
(e)(iii)	becomes brown / orange / yellow	1

52. 0620_s21_ms_61 Q: 3

Tests on solid E		
(a)	hydrated / contains water (of crystallisation)	1
(b)	not a halide	1
(c)	ammonium / NH_4^+	1
	aluminium / Al^{3+}	1
	sulfate / SO_4^{2-}	1
Tests on solid F		
(d)	yellow	1
(e)(i)	blue	1
(e)(ii)	blue ppt	1

53. 0620_s21_ms_62 Q: 3

Question	Answer	Marks
	Tests on solid G	
(a)	oxygen / O_2	1
(b)	calcium / Ca^{2+}	1
	iodide / I^-	1
	Tests on solid H	
(c)	any 2 from: • white fumes given off • condensation at mouth of tube • solid (changes from blue and) becomes white	2
(d)	blue-green	1

Question	Answer	Marks
(e)	(light) blue precipitate	1
	dissolves / forms a solution / soluble (in excess)	1
	which is a darker / deep blue	1
(f)	white precipitate	1

54. 0620_s21_ms_63 Q: 3

Question	Answer	Marks
	Tests on solid I	
(a)	green precipitate	1
	dissolves in excess (forming a green solution)	1
(b)	grey-green precipitate	1
	remains / does not dissolve	1
(c)	white ppt	1
(d)	no change	1
	Tests on solid J	
(e)	carbon dioxide / CO_2	1

Question	Answer	Marks
(f)	potassium / K^+	1
	carbonate / CO_3^{2-}	1

55. 0620_w12_ms_61 Q: 5

(a) (i) white (1) precipitate (1) dissolves (1) [3]

(ii) white precipitate (1) dissolves (1) [2]

(b) no reaction/change (1) [1]

(c) white (1) precipitate (1) [2]

(g) chlorine (1) **not:** chloride [1]

(h) oxygen (1) [1]

(i) transition metal present (1) catalyst (1) **allow:** copper oxide for one mark [2]

manganese (1) oxide (1) max 2

56. 0620_w12_ms_62 Q: 5

(a) green (1) [1]

(b) green (1)
precipitate (1) [2]

(c) green precipitate (1) [1]

(d) no reaction/no precipitate/no change/no observation/nothing (1) [1]

(e) white (1)
precipitate (1) [2]

(i) ammonia (1) [1]

(j) transition metal/cobalt (1) ignore copper
nitrate (1) [2

---

57. 0620_w12_ms_63 Q: 4

tests on filtrate

(a) **(i)** white (1) precipitate (1) with excess does not dissolve/clear (1) [3]

(ii) no precipitate/very slight precipitate/no reaction [1]

(iii) white (1) precipitate (1) [2]

(c) carbon dioxide/CO_2 (1) [1]

(d) lead/silver (1) carbonate (1) [2]

---

58. 0620_w13_ms_61 Q: 4

tests on liquid L

(a) colourless (liquid) [1]
allow: (pale) yellow

(c) no reaction / change (1) [1]

(d) yellow (1) precipitate (1) [2]

(e) iodine dissolves / owtte (1) [1]

(f) organic (1) solvent (1) liquids do not mix (1) max [2]

---

59. 0620_w13_ms_62 Q: 5

(a) colourless **and** smells acidic / vinegar / pungent / choking / sour (1) [1]
not: strong
red / orange / yellow (1) pH 1–6 (1) [2]

(b) fizzes / effervescence (1)
lighted splint (1) pops (1) [3]
not: glowing splint pops

(c) effervescence / fizz / bubbles (1) [1]
not: carbon dioxide unless limewater test described as an observation

(f) organic / hydrocarbon (1) fuel / flammable (1) reducing agent (1) max [2]
allow: 2 marks for alcohol / ethanol

---

60. 0620_w13_ms_63 Q: 4

(a) table of results for experiment 1

initial and final volumes and differences completed correctly (1)
15.7, 0.0 and 15.7
to 1 decimal place (1) [2]
allow: 2 decimal places

(b) table of results for experiment 2
initial and final volumes completed correctly (1)
47.3 and 15.9
differences completed correctly (1)
31.4 [2]

(c) iron / Fe (1) (II) / 2+ (1) oxidised / reacts with air / to iron(III) (1) [3]

(d) **(i)** colourless to pink / purple (1) [1]
not: clear **allow:** reverse

(ii) not an acid and alkali reaction / potassium manganate is coloured / owtte / indicator not needed / a colour change already occurs / potassium manganate acts as an indicator (1) [1]

(e) **(i)** experiment 2 (1) [1]

(ii) experiment 2 2× volume experiment 1 [1]

(iii) solution E more concentrated / stronger (1) or converse
2 × as concentrated (2) [2]

(f) half value from table result for Experiment 2 / 15.7 cm^3 (1)
half volume of E used (1) [2]

(g) advantage
easy to use / quick / convenient (1)

disadvantage
not accurate / owtte (1) [2]

61. 0620_w13_ms_63 Q: 5

(c) no reaction / no change / no precipitate (1) [1]

(d) white (1) precipitate (1) [2]

(e) neutral (1) transition metal (ion) present (1) [2]

(f) reversible / equilibrium / neutralisation / (1)
solution returned to original colour / solution turns back to yellow (1) [2]

(g) oxygen (1) [1]

---

62. 0620_w14_ms_61 Q: 5

(c) no reaction / no change / no precipitate (1) [1]

(d) white (1)
precipitate (1) [2]

(e) transition metal present (1)
allow: iron
water / hydrated (1) [2]

(f) hydrated (1) iron (1) (II) (1) (sulfate) [3]

---

63. 0620_w14_ms_61 Q: 6

(a) **(i)** gas syringe / inverted measuring cylinder in trough of water (1)
labelled (1) [2]

(ii) limewater (1)
milky (1) [2]

(b) measured volume of water (1)
in named weighed container (1)
evaporate to dryness (1)
reweigh / measure mass of solid (1)
conclusion: e.g. double the mass of residue if 500 cm^3 water used to check mass in 1000 cm^3 (1) max [4]

---

64. 0620_w14_ms_62 Q: 2

a solution of chlorine in water
named indicator (1)
bleaches / turns white (1) [2]
do not allow: halide test

sulfuric acid
named indicator (1)
result (1)
or
add barium nitrate (1)
white precipitate (1)
or
carbonate (1)
fizzes (1) [2]
allow: other valid alternatives

hexene
bromine (water) (1)
decolourises (1) [2]
allow: lighted splint (1)
ignites (1)

limewater
pass carbon dioxide (1)
milky / cloudy (1) [2]
allow: named indicator (1)
correct result (1)

---

65. 0620_w14_ms_62 Q: 5

tests on solution **A**

(a) yellow / brown / orange (1) [1]
allow: combination of above colours
do not allow: red, but **allow:** red-brown

(b) (orange / red) brown (1)
allow: rusty
precipitate (1) [2]

(c) (orange / red) brown precipitate (1) [1]

(d) white precipitate (1) [1]

(i) aluminium (1)
sulfate (1) [2]
list principle applies here

---

66. 0620_w14_ms_63 Q: 5

tests on solution **N**

(e) appearance colourless (1) [1]
pH 11–14 (1) [1]

(f) colourless / no change (1)
white (1)
precipitate (1) [3]

(g) litmus paper turns blue (1)
pungent smell (1) [2]

(h) **(i)** hydrogen / H_2 (1) [1]

(ii) ammonia (1) [1]

(i) hydrochloric acid (2) [2]
acid or chloride only, 1 mark.

---

67. 0620_w15_ms_61 Q: 3

(a)	electrolysis;	1	
(b)	bulb lights / bubbles;	1	
(c)	platinum;	1	**R:** copper
(d)	glowing splint; relights;	1 1	**R:** relights a lighted splint **A:** lighted splint glows brighter
(e)	hydrogen (ions) positive / opposites attract	1	
(f)	chlorine produced; poisonous / toxic;	1 1	

68. 0620_w15_ms_61 Q: 4

(d)	all time readings correctly recorded: 48, 68, 96, 132 4 correct = 3 3 correct = 2 2 correct = 1 0 or 1 correct = 0 in seconds;	3 1	
(e)	all points correctly plotted: 48, 68, 96, 132 4 correct = 2 3 correct = 1 2 or fewer correct = 0 smooth line graph;	2 1	
(f)(i)	value from the graph, 0.7; shown clearly on the graph;	1 1	

(f)(ii)	value from the graph, e.g. 34 s; extrapolation shown clearly;	1 1	
(g)	idea of fair test / comparability;	1	
(h)	21 (°C); 49 (°C);	1 1	
(i)(i)	exothermic / redox / displacement;	1	**I:** neutralisation
(i)(ii)	hydrogen;	1	
(i)(iii)	values halved;	2	'smaller temperature change' = 1 mark
(j)	*apparatus* gas syringe / thermometer; *measurements* volume of gas / temperature of reaction; over time;	 1 1 1	

69. 0620_w15_ms_61 Q: 5

(a)	yellow / green;	1	**R:** reference to ppt.
(b)	white precipitate;	1	
(c)	green; precipitate;	1 1	
(d)	green precipitate;	1	
(e)	brown; precipitate;	1 1	
(i)	silver / lead; nitrate;	1 1	

70. 0620_w15_ms_62 Q: 4

	 tests on ethene bromine (water); turns colourless; *ammonia* red litmus / pH paper; turns blue / pH > 7; *oxygen* glowing splint; relights;	 1 1 1 1 1 1	**A:** Allow any test which gives only a **unique detectable result** for that substance, e.g. lighted splint / ethene burns. **R:** relights a lighted splint **A:** lighted splint glows brighter

71. 0620_w15_ms_62 Q: 5

(c)	copper; chloride;	1 1	**I:** any reference to copper's oxidation state
(d)	colourless;	1	**R:** white / pale yellow
(e)(i)	white; precipitate ; insoluble / no change / no reaction ;	1 1 1	**R:** colourless
(e)(ii)	no precipitate / slight white precipitate; no change / no reaction;	1 1	
(e)(iii)	yellow; precipitate;	1 1	

72. 0620_w15_ms_63 Q: 4

(a)	green; precipitate;	1 1	use list principle for extra incorrect observations
(b)	correct table of results for Experiment 1: final volumes, initial volumes and difference: 10.8 0.0 10.8; all readings in **both** tables to 1 decimal place;	1 1	
(c)	correct table of results for Experiment 2: final volumes and initial volumes: 12.3 6.9; difference correct: 5.4;	1 1	**A:** ecf (usually 6.6)
(d)(i)	to remove **M** / residue / impurities / to clean it;	1	
(d)(ii)	to remove water / so **N** is not diluted;	1	**R:** **N** reacts with water
(e)	there is already a colour change / self-indicating / it goes pink / owtte; **M** and **N** change colour or show when the reaction is complete;	1 1	**A:** it is not acid-alkali / potassium permanganate or solutions **I:** potassium permanganate / solutions **M** and **N** are coloured
(f)(i)	Experiment 2 / solution **M** / the first titration;	1	
(f)(ii)	Experiment 2 uses 2 × volume of Experiment 3 ora;	1	**A:** (nearly) 2 × / (13.7 *v.* 6.6)
(f)(iii)	twice as concentrated / strong ora;	2	**A:** solution **N** more concentrated / stronger for 1 mark ora **R:** references to conc. of solution **L** (iron(II) sulfate)
(g)	half value from table result for Experiment 3 / 2.7; half volume (of **L**) used;	1 1	**R:** just 'half the volume' **A:** this shown by calculation
(h)	*advantage* easy to use / quick / convenient; *disadvantage* not accurate owtte;	1 1	**I:** reference to large volumes

73. 0620_w15_ms_63 Q: 5

(f)	hydrogen / H_2;	1	
(g)	hydrated / water; acid;	1 1	**A:** hydrous **I:** other conclusions unless contradictory
(h)	(grey /) white (solid);	1	**I:** crystals **R:** pale blue
(i)	temperature increase / rise; blue (solution);	1	additional incorrect observations, such as bubbles, contradicts a correct observation **I:** state and starting colour
(j)	blue; precipitate;	1 1	
(k)	blue precipitate; dissolves / soluble / solution; deep / dark / royal blue (solution);	1 1 1	

74. 0620_w16_ms_61 Q: 1

(a)	electrodes	1
(b)	bubbles / fizz / effervescence	1
(c)(i)	more hydrogen twice as much hydrogen / half as much oxygen	1 1
(c)(ii)	water	1
(d)	*lighted splint* no effect / brighter light for oxygen 'pops' for hydrogen **OR** *glowing splint* relights for oxygen no effect for hydrogen	 1 1 1 1

75. 0620_w16_ms_61 Q: 3

(a)	water present / hydrated	1
(b)	no change / colour	1
(c)(i)	white precipitate dissolves	1 1 1
(c)(ii)	white precipitate no change	1 1
(d)	not a halide	1
(e)	(aluminium) sulfate	1
(f)	white (crystals)	1

76. 0620_w16_ms_62 Q: 3

(a)(i)	pH 1–3	1
(a)(ii)	solid disappears / dissolves blue / green colour	1 1
(a)(iii)	solid dissolves limewater turns milky	1 1 1
(a)(iv)	white precipitate	1
(b)	iron(III) nitrate	1 1

77. 0620_w16_ms_63 Q: 3

(a)(i)	pH 1–3	1
(a)(ii)	effervescence / fizzing / bubbling / solid disappears / dissolves lighted splint 'pops'	1 1 1
(a)(iii)	effervescence / fizzing / bubbling / solid disappears / dissolves limewater milky	1 1 1
(a)(iv)	white precipitate	1
(b)	calcium / Ca^{2+} hydroxide / OH^-	1 1

78. 0620_w17_ms_61 Q: 3

(a)(i)	red-brown	1
	precipitate	1
(a)(ii)	insoluble / no change	1
(b)	red-brown precipitate	1
(c)	(red) litmus paper	1
	turns blue	1
(d)	ammonia	1
(e)	lithium	1
	carbonate	1

79. 0620_w17_ms_62 Q: 3

(a)	white (crystals)	1
(b)	bubbles / fizz	1
	limewater	1
	(turns) milky	1
(c)	carbon dioxide	1
(d)	yellow	1
(e)	non-transition metal / Group II metal / barium / calcium / magnesium	1
(e)	chloride	1

80. 0620_w17_ms_63 Q: 3

(a)(i)	green	1
	precipitate	1
(a)(ii)	green solution / precipitate dissolves	1
(a)(iii)	bubbles / fizzing / effervescence	1
	(red) litmus paper / Universal Indicator paper	1
	(red litmus paper) turns blue / (Universal Indicator paper) turns purple	1
(b)	ammonia / NH_3	1
(c)	(aqueous) ammonia / NH_3	1

81. 0620_w18_ms_61 Q: 3

(a)	Sulfur dioxide;	1
(b)	Potassium	1
	sulfite;	1
(c)(i)	White	1
	precipitate;	1
(c)(ii)	insoluble / remains / no change	1
(d)	No / (very) slight white precipitate;	1
(e)	No precipitate / reaction / change / remains colourless	1
(f)	(red)litmus / pH paper / universal indicator paper	1
	turns blue / pH>7 / alkaline	1

82. 0620_w18_ms_62 Q: 3

	Tests on solid N	
(a)	White(solid/crystals)	1
(b)	White	1
	precipitate	1
(c)	pH / (red)litmus paper	1
	>7 / blue	1
(d)	Ammonia	1

	Tests on solid O	
(e)	Group 1 cation present or named group 1 cation present	1
(f)	potassium	1
	chloride	1

83. 0620_w18_ms_63 Q: 1

(a)	mortar	1
	(Teat / dropping) pipette / dropper	1
(b)	**M1** Limewater	1
	M2 milky	1
(c)	**M1** Larger surface area	1
	M2 Increases rate of reaction	1
(d)	**M1** Add magnesium / zinc / iron	1
	M2 More reactive metal / displacement reaction	1

84. 0620_w18_ms_63 Q: 3

	Tests on solid P	
(a)	White (solid / crystals / powder)	1
(b)	**M1** Bubbles / fizz	1
	M2 pH / (red) litmus paper / universal indicator	1
	M3 pH>7 / turns blue / alkaline	1
(c)	No reaction / (remains) colourless / no change	1
(d)	red	1

	Tests on solid Q	
(e)	□ Transition metal / element	1
	□ Chloride / Cl^-	1

85. 0620_w19_ms_61 Q: 3

(a)(i)	white	1
	precipitate	1
(a)(ii)	clears / dissolves / colourless solution	1
(b)(i)	white precipitate	1
(b)(ii)	clears / dissolves / colourless solution	1
(c)	bubbles / effervescence	1
	litmus turns blue	1

(d)	lithium	1
	iodide	1

86. 0620_w19_ms_62 Q: 3

(a)	blue-green	1
(b)	blue precipitate	1
(c)(i)	blue precipitate	1
(c)(ii)	deep / royal blue	1
	solution / dissolves / soluble	1
(d)	litmus / pH paper	1
	turns blue / pH > 7	1
(e)	potassium	1
	bromide	1

87. 0620_w19_ms_63 Q: 3

(a)	blue / purple / green / violet	1
(b)(i)	green	1
	precipitate	1
(b)(ii)	green solution / precipitate dissolves	1
(c)	grey-green precipitate	1
(d)	any **two** from: □ effervescence □ (damp red / purple) litmus / pH paper □ turns blue / pH 8–10	2
(e)	fuel / organic	1

88. 0620_w20_ms_61 Q: 3

Question	Answer	Marks
	Tests on solid Y	
(a)	ammonia	1
(b)	aluminium / Al^{3+}	1
	nitrate / NO_3^-	1
(c)	(weakly) acidic	1
	Tests on solid Z	
(d)	green precipitate	1
	precipitate insoluble / remains / no further change	1
(e)	no change	1
(f)	no change / remains purple	1
(g)	white precipitate	1

89. 0620_w20_ms_62 Q: 3

Question	Answer	Marks
	Tests on solid Q	
(a)	fizzing / effervescence / bubbles	1
	(some of the) solid dissolves / disappears **OR** colourless solution	1
	limewater turns milky	1
(b)	carbon dioxide / CO_2	1
(c)(i)	white precipitate	1
	dissolves / forms a colourless solution	1
(c)(ii)	aluminium (ions) give the same result	1
(c)(iii)	add (excess) ammonia (solution)	1
(d)	**Tests on solid R**	
	sodium / Na^+	1
	iodide / I^-	1

90. 0620_w20_ms_63 Q: 1

Question	Answer	Marks
(a)	**A** delivery tube	1
	B trough	1
(b)	to hold / absorb / soak up the water	1
(c)	error: bung in (collecting) tube / the apparatus is sealed / water cannot get out of the boiling tube	1
	explanation: (pressure would increase and so the apparatus / tube would) explode / break	1
(d)	arrows under both zinc and mineral wool	1
(e)	test: lighted splint	1
	result: pops	1

91. 0620_w20_ms_63 Q: 3

Question	Answer	Marks
(a)	4	1
(b)	carbon dioxide / CO_2	1
(c)	hydrated	1
	acid / contains H^+ / hydrogen ions	1
(d)(i)	white precipitate	1
(d)(ii)	no change **OR** remains **OR** does not dissolve	1

Question	Answer	Marks
(e)	drops: no reaction **OR** no change **OR** remains colourless **OR** faint / slight (white) precipitate	1
	excess: no reaction **OR** no change **OR** remains colourless **OR** faint / slight (white) precipitate / precipitate remains / does not dissolve	1
(f)	white precipitate	1
(g)	no reaction **OR** no change **OR** remains colourless	1

92. 0620_w21_ms_61 Q: 3

Question	Answer	Marks
(a)	11–14	1
(b)	lithium / Li^+	1
	hydroxide / OH^-	1
(c)	(from) purple	1
	(to) colourless	1
(d)	sulfur dioxide / SO_2	1
(e)	(red) litmus turns blue	1
(f)	ammonia / NH_3	1

Question	Answer	Marks
(g)	no change / no reaction	1

93. 0620_w21_ms_62 Q: 3

Question	Answer	Marks
	Tests on solid O	
(a)	no change / colourless / no reaction / no observation	1
(b)(i)	(red litmus) becomes blue	1
(b)(ii)	ammonia / NH_3	1
(c)	cream precipitate	1
(d)	(solution becomes) orange / yellow	1
	Tests on a liquid P	
(e)	any two from: flammable / fuel unsaturated / alkene / any named alkene organic / contains carbon / hydrocarbon	2

94. 0620_w21_ms_63 Q: 3

Question	Answer	Marks
Tests on solid S		
(a)	test: (bubble the gas through) limewater	1
	result: turns milky	1
(b)	calcium / Ca^{2+}	1
	carbonate / CO_3^{2-}	1
Tests on solid T		
(c)	red-brown precipitate	1
	remains / insoluble in excess	1
(d)	red-brown precipitate	1
(e)	white precipitate	1
(f)	no change	1