

## [ Chemical measurements (incl uncertainty) ]

### Q1.a(2018)

|                                                                  |   |     |                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------|---|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hydrochloric acid + sodium hydroxide → sodium chloride + water ✓ | 1 | 2.1 | <b>ALLOW</b> = for →<br><b>DO NOT ALLOW</b> and, or, & for +<br><b>ALLOW</b> mix of correct formulae and words<br>eg $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$<br>equation does not need to be balanced<br>Reactants can be in either order, products can be in either order |
|------------------------------------------------------------------|---|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Q1.b(2018)

|             |   |     |                                           |
|-------------|---|-----|-------------------------------------------|
| 34.8 (°C) ✓ | 1 | 2.1 | <b>ALLOW</b> answer written in the table. |
|-------------|---|-----|-------------------------------------------|

### Q1.c(2018)

|                                                                                                                                                     |   |      |                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|---|------|---------------------------------------------------------------------------------------|
| The temperature increases (from experiment A to C / as volume of $\text{HCl}$ increases / as volume of $\text{NaOH}$ decreases / as pH decreases) ✓ | 1 | 3.1a | <b>DO NOT ALLOW</b> any other qualification e.g. the temperature increase from 1 to 3 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|---|------|---------------------------------------------------------------------------------------|

### Q1.d(2018)

(pH) decreases (as the volume of  $\text{HCl}$  increases / as the volume of  $\text{NaOH}$  decreases / as the ratio of  $\text{HCl}$  to  $\text{NaOH}$  increases) / **ORA** ✓

### Q1.e(2018)

|                                                                                               |   |     |                                                                                                     |
|-----------------------------------------------------------------------------------------------|---|-----|-----------------------------------------------------------------------------------------------------|
| Use of universal indicator (solution / paper) ✓<br><b>OR</b><br>reference to pH meter/probe ✓ | 1 | 1.2 | <b>DO NOT ALLOW</b> use of litmus paper or other indicators<br><b>IGNORE</b> universal (on its own) |
|-----------------------------------------------------------------------------------------------|---|-----|-----------------------------------------------------------------------------------------------------|

### Q2.(2019)

|                                                                                                                                       |   |      |                                                      |
|---------------------------------------------------------------------------------------------------------------------------------------|---|------|------------------------------------------------------|
| <b>Type of bonding:</b> metallic ✓                                                                                                    | 2 | 3.2b | <b>ALLOW</b> <u>giant</u> covalent                   |
| <b>Reason:</b><br><b>Any one from:</b><br>It conducts electricity ✓<br>It has a high melting point ✓<br>It forms oxides with oxygen ✓ |   | 2.1  | Mark for reason dependent on correct type of bonding |

### Q3.a(2020)

|                      |   |      |                              |
|----------------------|---|------|------------------------------|
| Measuring cylinder ✓ | 1 | 3.3a | <b>ALLOW</b> burette/pipette |
|----------------------|---|------|------------------------------|

### Q3.b(2020)

18 (°C) ✓

Q3.c(2020)

|                                                                                            |   |      |                                                                                                                                 |
|--------------------------------------------------------------------------------------------|---|------|---------------------------------------------------------------------------------------------------------------------------------|
| Measure the temperature after the magnesium has reacted / at the end (of the experiment) ✓ | 1 | 3.3b | <b>ALLOW</b> ideas based upon obtaining a temperature change<br><b>ALLOW</b> measure temperature after magnesium has been added |
|--------------------------------------------------------------------------------------------|---|------|---------------------------------------------------------------------------------------------------------------------------------|

Q3.d(2020)

|                                        |   |     |                                                                                                                                       |
|----------------------------------------|---|-----|---------------------------------------------------------------------------------------------------------------------------------------|
| any temperature greater than 18 (°C) ✓ | 1 | 1.2 | <b>ALLOW ECF</b> from 12(b)<br>i.e. temperature greater than that given in 12(b)<br><b>ALLOW</b> the temperature will increase / rise |
|----------------------------------------|---|-----|---------------------------------------------------------------------------------------------------------------------------------------|

Q3.e(2020)

Some heat escaped from the top of the polystyrene cup

☒

The thermometer was left in the hydrochloric acid for too long

☐

Too much magnesium was added to the hydrochloric acid

☐

Q3.f(2020)

|                                                                                                       |   |     |                                 |
|-------------------------------------------------------------------------------------------------------|---|-----|---------------------------------|
| Idea that products are of a lower <u>energy</u> than the reactants ORA / <u>energy</u> is given out ✓ | 1 | 1.1 | <b>IGNORE</b> heat is given out |
|-------------------------------------------------------------------------------------------------------|---|-----|---------------------------------|

Q3.g(2020)

|                                                             |   |     |                                           |
|-------------------------------------------------------------|---|-----|-------------------------------------------|
| (Minimum amount of) energy needed for a reaction to start ✓ | 1 | 1.1 | <b>ALLOW</b> energy needed for a reaction |
|-------------------------------------------------------------|---|-----|-------------------------------------------|

Q3.h(2020)

Hydrogen ✓

1

1 x 1.1

**ALLOW** H<sub>2</sub>  
**IGNORE** H on its own

Q3.i(2020)

|                                                              |   |         |                                |
|--------------------------------------------------------------|---|---------|--------------------------------|
| Use a lighted spill / splint ✓<br>goes 'pop' / squeaky pop ✓ | 2 | 2 x 1.2 | <b>ALLOW</b> put it in a flame |
|--------------------------------------------------------------|---|---------|--------------------------------|

Q4.a(2021)

Conical flask ✓

Q4.b(2021)

(dropping pipette) is more accurate /  
measures volume to one decimal place ✓

1

3.1b

**ALLOW** idea that dropping pipette measures to 0.5 cm<sup>3</sup> whereas 0.5 cm<sup>3</sup> is difficult to get exactly with measuring cylinder

Assume "it" refers to dropping pipette if unqualified

Q4.c(2021)

All points plotted correctly = 2 marks ✓✓

**BUT**

3 or 4 points plotted correctly = 1 mark ✓

smooth line of best fit through all points ✓

3

2 x 2.2

**ALLOW** ± ½ square

1.2

Q4.d(2021)

6(.0) (cm<sup>3</sup>) ✓

Q4.e(2021)

3 correct = 2 marks ✓✓

1 or 2 correct = 1 mark ✓

2

1.2

**ALLOW** use of H<sup>+</sup>, OH<sup>-</sup>, H<sub>2</sub>O

The **hydrogen ions** in the dilute hydrochloric acid react with  
the **hydroxide ions** in the sodium hydroxide solution  
to make **water molecules**

Q5.(2024)

**B**

Q6.a(2024)

**First check answer on the answer line**

**If answer = 28.57 / 28.6 / 29 (%) award 2 marks**

4 ÷ 14 (x 100) ✓

= 28.57 / 28.6 / 29 (%) ✓

2

2 x 2.2

**ALLOW** any correct rounding of calculator answer of 28.571428

Q6.b(2024)

Idea that the diagram contains too many atoms of lithium  
/ too few aluminium atoms ✓

1

3.1b

**ECF** from an incorrectly calculated percentage relating to the diagram e.g. value is below 2% lithium

**IGNORE** any reference to percentage values