Q1.

(a) it goes up / increases

1

because the reaction is exothermic **or** transfers energy to the surroundings

allow gives out thermal / heat energy

1

(b) H^+ (aq) + OH^-(aq) → H_2O(l)

1

(c) copper sulfate

1

(d) **X** bubbles of gas

1

Y no bubbles of gas

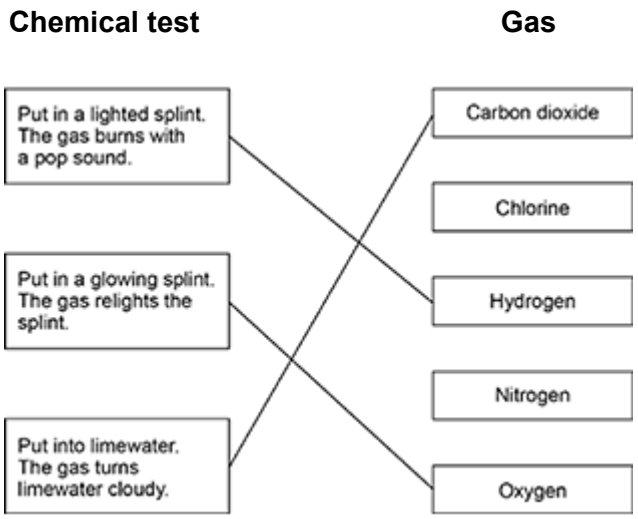
1

(e) calcium>magnesium>zinc>copper

*if not all correct allow **1** mark for at least two metals in the correct position*

2

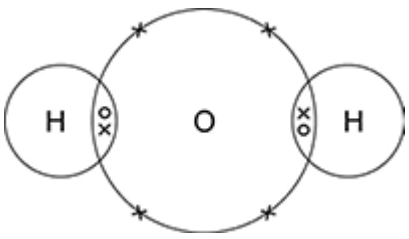
(f)



extra lines from a test negate the mark

3

(g)



two pairs of shared electrons

1

oxygen has four other electrons not bonded

1

[13]

Q2.

(a) (i) iron

either order

1

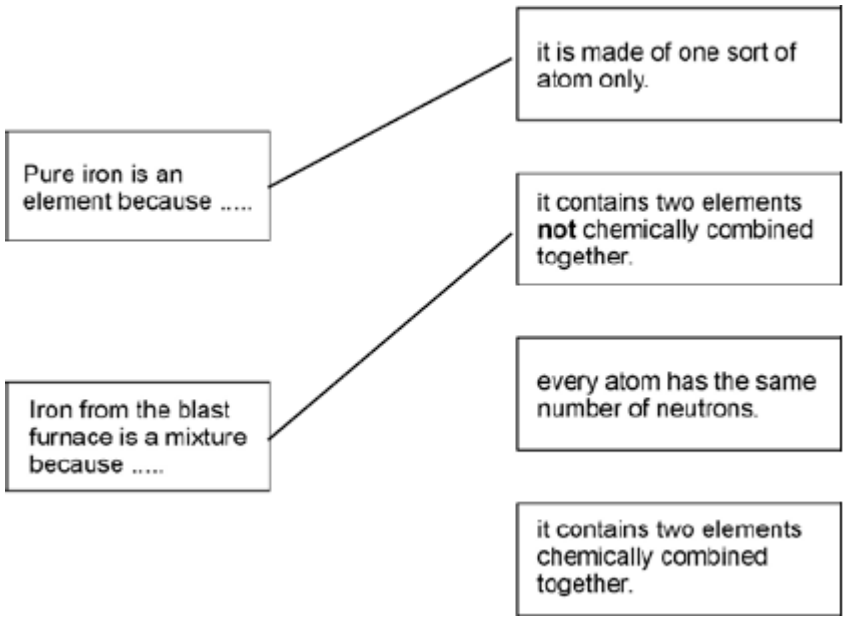
carbon dioxide

1

(ii) reduced

1

(b) (i)



*each correct line gains **1** mark*

extra lines from statement negate the mark

max. 2

(ii) the layers / rows are distorted / disrupted **or** it doesn't occur in layers **or** the atoms are different

1

so cannot **slide** over one another **or slide** less easily

1

[7]

Q3.

(a) any **three** from:

- concentration of (salt) solution
- volume of (salt) solution

ignore amount of solution

- **initial** temperature (of the solution)
  ignore room temperature
- surface area / form of metal
- moles of metal
  allow mass / amount
  ignore time
  ignore size of tube

3

(b) 20

1

32

1

12

allow ecf

1

(c) (i) four bars of correct height
tolerance is + / - half square
*3 correct for **1** mark*

2

bars labelled

1

(ii) *one variable* is non-continuous / categoric
accept qualitative or discrete
accept no values between the metals

1

(iii) magnesium

1

because biggest temperature change
accept gives out most energy
ignore rate of reaction
dependent on first mark

1

(iv) does not react / silver cannot displace copper

1

because silver not more reactive (than copper) **or** silver below copper in reactivity series
*do **not** accept silver is less reactive than copper sulfate*

1

(v) replace the copper sulfate
could be implied

1

with any compound of a named metal less reactive than copper
allow students to score even if use an insoluble salt

1

[16]

Q4.

(a) (i) copper is less reactive than hydrogen **or** copper is unreactive

1

(ii) Zinc and dilute hydrochloric acid

1

(b) (gas) syringe

1

(c) (i) 35

allow 3

1

because not close to others

accept it is <u>much</u> lower than the others

ignore references to trends or patterns

dependent on the first mark

1

(ii) (49 + 50 + 48) / 3

= 49

*correct answer with or without working gains **2** marks*

1

*allow ecf from anomaly identified in (i) for **2** marks:*

- *Exp 1 anomalous gives 43.3*
- *Exp. 2 anomalous gives 44*
- *Exp. 4 anomalous gives 44.7*

*answer of 45.5 or 46 (anomaly not excluded) gains **1** mark*

*correct working **excluding anomaly** but with wrong answer gains **1** mark*

1

(iii) so that a mean can be calculated

*accept improves accuracy of the mean **or** so anomalies can be identified / discarded **or** to reduce effect of random errors*

ignore makes it a fair test

ignore reliability, validity, repeatability, reproducibility

1

(d) (i) idea of mixing with oxygen / air, letting air / oxygen in

accept converse

1

(ii) H_2O

do not accept incorrect additional products

1

balancing 2 … (1) … 2

allow fractions or multiples

dependent on first mark

1

[11]

Q5.

(a) (acids) <u>react</u> with calcium carbonate / shells

1

(so) shells will be (chemically) eroded

*do **not** allow melts*

allow dissolved / are thinner / worn away / corroded

ignore weakened / break down

1

(b) (i) mass of products should equal mass of reactants

allow loss in mass

or

4.4 g lost

1

(there is a difference because the) gas <u>escapes</u>

ignore gas produced / evaporated

1

[4]

Q6.

(a) pure copper is twice as good a conductor as 99% pure copper

accept reverse argument

*accept answers quoting 2 correct values from the graph scores **2***

*qualitative answer (e.g. pure copper is a better conductor than impure copper) scores **1***

or

*answers quoting a conductivity value from the graph scores **1***

2

(b) Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response.

0 marks
No relevant content

Level 1 (1–2 marks)
Simple list of a limited number of points given, with no linking between ideas

Level 2 (3–4 marks)
A broader set of points made. There will probably not be links between ideas

Level 3 (5–6 marks)

Answer includes linking between ideas, showing the consequence of either not recycling or the advantage of recycling. Answers such as less fossil fuel needed so less carbon dioxide produced **or** less carbon dioxide produced so less global warming

examples of the points made in the response

resources

(recycling) conserves supplies of ores
copper available for longer
as (at present rate of use) copper ores will run out in about 35 years
(recycling) conserves supplies of fossil fuels **or** energy
less fuel used at a lower cost

land pollution
mining scars landscape **or** produces noise pollution
mining destroys wildlife habitats
(recycling) less need to mine ores / fossil fuels
so less habitat destroyed or less scarring of landscape
(recycling) less need to use landfill for waste

atmospheric pollution
burning fossil fuels produces carbon dioxide / greenhouse gas
which (may) cause global warming **or** climate change
extraction produces sulfur dioxide
which causes acid rain
which can kill trees / fish

6

(c) grow plants

accept plants absorb copper (through roots)

1

then plants are burned

1

ash (from burning) contains copper compounds

1

[11]