

Mark schemes

Q1.

- (a) limestone 1
- sodium carbonate 1
- (b) (advantage) stronger 1
- (reason) less easily damaged 1
- (c) (advantage) lower density 1
- (reason) lighter (to install) 1
- (d)
- $$\begin{array}{cc}
 \text{H} & \text{Cl} \\
 | & | \\
 \text{C} & = & \text{C} \\
 | & & | \\
 \text{H} & & \text{H}
 \end{array}$$
- 1
- (e) (add damp) litmus paper 1
- (litmus paper) is bleached
or
(litmus paper) turns white
ignore (litmus paper) turns red 1
- (f) (polymers)
last a long time
ignore references to cost
allow break down slowly 1
- (wood)
renewable
allow trees can be replanted
allow aesthetic reasons 1
- (g) (percentage of aluminium =)
 $\frac{5.94}{6.00} \times 100$ 1

= 99 (%)

1

(h) (alloy is) harder (than pure aluminium)

allow (alloy is) stronger (than pure aluminium)

ignore references to cost

1

[14]

Q2.

(a) measuring cylinder

allow pipette / burette

1

(b) limewater turns milky

1

(c) all six points plotted correctly

allow a tolerance of $\pm \frac{1}{2}$ a small square

allow 1 mark for four or five points plotted correctly

2

line of best fit

1

(d) (volume =) 48 (cm³)

1

(rate=) $\frac{48}{60}$

allow correct use of an incorrectly determined value for volume

1

= 0.8 (cm³/s)

1

(e) (between 0 and 20 seconds) (volume of gas) increases

1

(between 80 and 100 seconds) no change (in volume of gas)

allow reaction stops

1

(f) systematic error

1

(g) (area of one face = 2 x 2 =) 4 (mm²)

1

(total surface area =) 4 x 6

allow correct use of an incorrectly

- calculated area of one face*
- 1
- = 24 (mm²)
- 1
- (h) faster
- 1
- [15]

Q3.

- (a) test: (use a) glowing splint
do not accept burning splint
- 1
- result: relights
dependent on correct test in MP1
ignore with a pop
- 1
- (b) starch
- 1
- cellulose
allow glycogen
- 1
- (c) 2
- 1
- (d) water
allow H₂O
- 1
- (e) ammonia
- 1
- nitrogen
if no other mark awarded, allow 1 mark
for NO / NO₂ / N₂O / NO_x or equivalent
named compounds
- 1
- (f) two polymer chains
allow two polymer strands
- 1
- four (different) monomers / nucleotides
allow four (different) bases
allow cytosine, guanine, adenine and
thymine
allow C G A T
- 1
- (double) helix

*allow spiral
if no other mark awarded, allow 1 mark
for DNA*

1
[11]

Q4.

(a) a glowing splint

1

(b) student A should measure the mass of manganese dioxide.

1

(c) calculate a mean but do not include any anomalous results.

1

(d)

*an answer of 0.173 (cm³/s) scores 4
marks*

(volume of oxygen formed =)
(58 - 20 =) 38 (cm³)

*allow values between 36 (cm³) and 40
(cm³) inclusive*

1

(time taken = 250 - 30 =) 220 (s)

1

$\frac{38}{220}$ or 0.1727 (cm³/s)

*allow a correct calculation using an
incorrectly determined value for volume
and / or time*

1

= 0.173 (cm³/s)

*allow a correctly calculated answer
given to 3 significant figures from an
incorrect attempt at the rate equation*

1

(e) line starts at the origin and steeper than existing line

1

final volume same as existing line

allow a tolerance of $\pm \frac{1}{2}$ a small square

1

(f) fine manganese dioxide powder has a larger surface area

1

[10]

Q5.

- (a) glowing splint
do not accept burning splint 1
- (which) relights
dependent on correct test in MP1
ignore with a pop 1
- (b) place the conical flask in a water bath at constant temperature. 1
- use a mass of 1 g manganese dioxide each time. 1
- (c)
an answer of 0.092 (cm³/s) scores 3 marks
allow an answer of 0.091666 (cm³/s) correctly rounded to at least 2 significant figures for 2 marks
allow an answer of 0.033 (cm³/s) for 2 marks
allow an answer of 0.033333 (cm³/s) for 1 mark
- 11 (cm³) and 120 (seconds) 1
- (mean rate of reaction = $\frac{11}{120}$)
 = 0.09167
allow a correct calculation using incorrectly determined value(s) for difference in volume and / or time 1
- = 0.092 (cm³/s)
allow a correctly calculated answer given to 2 significant figures from an incorrect attempt at the rate equation 1
- (d) line starts at origin and less steep than solid line 1
- line levelling off at 40 (cm³)
allow a tolerance of $\pm \frac{1}{2}$ a small square 1
- (e) (because) surface area (of fine manganese dioxide powder) greater
allow converse for coarse lumps 1
- (so) more collisions (with hydrogen peroxide molecules / particles) per unit time
do not accept references to changes in

*kinetic energy or speed (of molecules / particles)
ignore references to activation energy.*

1
[11]

Q6.

(a) 83 (cm³)

allow 83.0 / 83.00

1

(b) mass of magnesium powder

1

temperature of hydrochloric acid

1

$$\frac{(46 + 47 + 49)}{3}$$

(c)

3

allow 47.3(333) (cm³) for 1 mark

1

= 47 (cm³) (2 sf)

an answer of 43 (cm³) scores 1 mark

1

an answer of 47 (cm³) scores 2 marks

(d) all points plotted correctly
(inc 0,0)

allow a tolerance of $\pm\frac{1}{2}$ a square

allow ecf from question (c)

ignore line

allow 1 mark for four points plotted correctly

2

(e) $\frac{80}{50}$

allow 80 ± 2

1

= 1.6 (cm³/s)

allow 1.60 ± 0.04

1

an answer of 1.6 (cm³/s) scores 2 marks

(f) rate is greatest at start

allow rate is faster at start

1

(then) rate decreases

allow (then) rate slows down

	1
reaction stops	1
(g) there are more particle collisions each second	1
there are more particles in the same volume	1
(h) (gas is) not carbon dioxide <i>ignore does not react with limewater</i>	1
(i) hydrogen <i>allow H2</i>	1
pop sound	1
	[17]

Q7.

(a) sodium chloride or salt <i>allow dissolved salts</i>	1
(b) expensive	1
(c) to remove solids	1
(d) to sterilise the water <i>allow to kill microorganisms</i>	1
(e) test: (damp) litmus paper result: bleached or turns white	1
(f) pH: 7.0 mass of dissolved solid: 0.0(g)	1

(g) 0.05 g

1

(h) did not immerse the thermometer (bulb)

1

1

[10]

Q8.

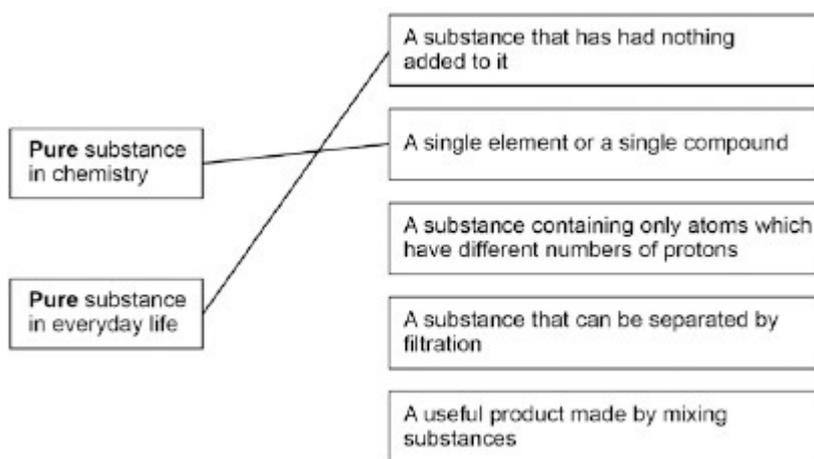
(a) Air

2

Steel

1

(b)



Allow 1 mark for the correct meanings linked to context but incorrect way around

1

(c) Damp litmus paper turns white

1

(d) Iron(III)

1

[6]