MARK SCHEME

GCSE

CHEMISTRY

AQA - COMBINED SCIENCE

C6 - TEST 5

RATE OF REACTION

Advanced

Mark schemes

1.

(a) (i) 2.25

correct answer gains three marks

if incorrect allow 1 mark for 2 correct readings (130 and 175) and further mark for 45 ÷ 20

allow e.c.f.

3

(ii) concentration of reactant(s) lower

1

fewer collisions per second / time unit

1

(b) labour costs lower / enzymes costs lower

***not** stop and start*

1

[6]

2.

(a) same number of (gaseous) molecules / moles / volume on both sides of the equation

allow particles for molecules

*do **not** accept atoms*

ignore amount

1

(b) (forward) reaction is exothermic

accept reverse answer

1

(c) any **three** from:

- particles gain energy
- particles move faster

  allow particles collide faster / quicker

  ignore move more / vibrate more
- particles collide more **or** more collisions
- more of the collisions are successful **or** more of the particles have the activation energy **or** particles collide with more force / energy

3

(d) any **two** from:

- more product (obtained in shorter time)

  accept better yield (of product)

- less fuel needed

  accept less energy / heat / electricity needed

  or

  lower fuel costs

  ignore cheaper unqualified

- less pollution caused by burning fuels

  or

  less specified type of pollution caused by producing heat / burning fuels

  *allow correct specified pollutants caused by burning fossil fuels eg CO_2 / greenhouse gases **or** correct effect of burning fossil fuels eg global warming*

  accept thermal / heat pollution

- using less fuel conserves resources

  accept sustainable

  accept fossil fuels are non-renewable

2

[7]

3. (a) all points correctly plotted

*allow **1** mark for 5 points correctly plotted*

2

line of best fit

1

(b) time decreases as temperature increases

1

rate of change decreases

1

comparison of two values from graph

1

(c) correctly drawn tangent

1

values correctly read from graph

1

calculation

1

unit: s / (mol /dm^3)

allow seconds per mol per dm^3

1

(d) fewer particles per unit volume

1

decreased frequency of collisions

1

[12]

4. (a) (s) (aq) (aq) (g)

must be in this order
***2** marks if all four correct*
***1** mark if 2 or 3 correct*

2

(b) (i) 55

ignore units

1

(ii) 54

*allow ecf from **(b)(i)***

1

(iii) 0.92

*correct answer with or without working gains **2** marks*
*ecf from volume in **(b)(i)***
accept 2 d.p. up to calculator value
*if answer incorrect, allow rate = (b)(i) / 60 for **1** mark*

2

(c) (i) circle round point at (48,22)

1

(ii) problem (1) and explanation (1)

*explanation **must** give lower volume of gas or slower reaction*

ignore human error unless qualified

problem with bung

e.g. bung not placed in firmly / quickly enough

so gas lost

or

problem with reagent

e.g. acid was diluted **or** acid not replaced

so reaction slower

or

problem with temperature

e.g. temperature was lower than recorded temperature

so reaction slower

or

problem with measurement

e.g. length of magnesium less than 8 cm **or** timed for less than a minute

so less gas produced

2

(d) repeat the experiment (several times)

1

because anomalous results could be excluded

1

and then the mean can be determined / calculated

*accept suggestion of alteration to method, which is explained as to why it would reduce the error, for **3** marks (e.g. place the magnesium in a container within the flask (1) so it can be tipped into the acid once the bung is in place (1). This will prevent anomalous results or gas loss (1))*

ignore idea of more accurate gas syringe
ignore shorter time intervals

1

(e) (i) use clean magnesium **or** use magnesium without oxide coating

1

compare results

1

(ii) **either**

measure the temperature of the acid before (adding magnesium)

1

and after adding magnesium

or

place the conical flask in a water bath (at 40 °C) (1)

compare results (1)

1

[16]