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CAMBRIDGE
International Examinations

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mark scheme abbreviations

; separates marking points
/
alternative responses for the same marking point
not

do not allow
allow
accept the response
ecf
error carried forward
avp
any valid point
ora
or reverse argument
owtte
or words to that effect
underline
actual word given must be used by candidate (grammatical variants excepted)
( )
the word / phrase in brackets is not required but sets the context
max
indicates the maximum number of marks
Any [number] from: accept the [number] of valid responses
note: additional marking guidance
1 (a) volume, at time = 0 given; volume correctly completed in ascending order; allow: maximum of 2 consecutive identical numbers [1]

(b) volume, at time = 0 given; volume correctly completed in ascending order; allow: maximum of 2 consecutive identical numbers [1]

(c) appropriate scale on x-axis and y-axis and labels and units; note: scale should cover at least half of grid points plotted to ± half a small square accuracy; note: >12 correct = 2, 10-12 correct = 1, <10 correct = 0 two labelled smooth line graphs and must plot volume at t = 0; [1]

(d) Experiment 1 / acid X and statement that acid X is stronger or more concentrated / ora [1]

(e) value from graph to ± half a small square accuracy and indication shown on graph [1]

(f) correct calculation of rate; allow: ecf on (d) cm³/s / cm³s⁻¹ / cm³ per s; allow: sec [1]

(g) Any two from: magnesium has an oxide coating; rubbing exposes magnesium to the acid / removes oxide coating; gives true rate / owtte; [2]

(h) advantage: convenient / easy / quick to use; disadvantage: reference to inaccurate measurement; [1]

(i) graduated pipette / burette / gas syringe / mass of magnesium rather than strips / repeats and take average / take more frequent readings / suitable method for reducing initial loss of gas and any suitable comment on improved accuracy; note: explanation must relate to reason [1]

2 (a) (i) white precipitate [1]

(ii) no change / precipitate remains [1]

(b) no precipitate / slight (white) precipitate [1]
(c) Any two from:
  effervescence / fizz / bubbles;
  (damp) pH paper blue / purple;
  ammonia smell;  [2]

(d) calcium;
  nitrate;  [1]

(e) yellow / brown / orange colour when hot;
  colour fades / goes white when cool;  [1]

(f) (i) effervescence / bubbles / fizz;
  limewater turns milky;  [1]

  (ii) white precipitate;
  precipitate dissolves in excess / colourless solution formed;  [1]

  (iii) white precipitate;
  precipitate dissolves in excess / colourless solution formed;  [1]

(g) zinc;
  allow: aluminium dependent on (f)(iii)
  carbonate;  [1]

3 (a) Universal indicator / pH paper;
  pH of 3–6 / 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]
  note: marks can be obtained from a labelled diagram