This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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1 (a) thermometer (1)  
condenser (1)  

(b) (i) ethanoic acid (1)  
lower boiling point / evaporates first (1)  

(ii) temperature reading will rise / gap in liquid coming over / no more collected at 118°C (1)  

(c) larger surface area (1)  

(d) test: named indicator / pH meter / pH paper (1)  
result: correct colour change / pH < 7 (1)  

2 (a) Table of results  
volume boxes completed correctly (3),  
all 7 correct (3)  
6 correct (2)  
5 correct (1)  
4 or fewer correct (0)  
0, 45, 48, 72, 74, 75, 75  

(b) points plotted correctly, including origin (3),  
all 7 correct (3)  
6 correct (2)  
5 correct (1)  
4 or fewer correct (0)  
Smooth line graph(1)  

(c) (i) point at 2 min / 3rd point / 48 cm³ (1)  
off curve (1)  

(ii) reading from graph, 62–64 (cm³) (1)  
indication (1)  

(d) curve to left of original (1)  
to same level (1)
3 (a) electrolys is (1) 

(b) aluminium would react/platinum is inert/less reactive (1) 

(c) (i) chlorine (1) 

(ii) colourless/bleached/pale yellow (1) 

4 (d) Table of results 

total volume of water boxes completed correctly (1), 10, 12, 14, 18 

temperature boxes completed (2) 
all 4 correct (2) 
3 correct (1) 
2 or fewer correct (0) 

91, 73, 65, 54 

(e) appropriate scale for y axis (1) 

note: must use at least 4 large squares vertically to plot points 

all points correctly plotted (3), all 4 correct (3) 
3 correct (2) 
2 correct (1) 
1 or fewer correct (0) 

note: origin should not be included 

smooth line graph (1) 

(f) value from graph for 20 cm³ water, 50–53 (1) ± half a small square 
shown clearly by extrapolation (1) 

unit, °C (1)
(g) clear/colourless liquid forms/no solid/crystals/salt visible (1) [1]

(h) salt would not all dissolve (1)
   use of figures (1)
   e.g. only 5.7 g would dissolve in 10 cm³ water at 100 °C [2]

(i) sketch graph always above line (1)
   label (1) [2]

(j) any one improvement from: (1)
   do not remove thermometer from solution
   use IT method/second person to note formation of crystals
   repeat
   do separate experiments
   use smaller volumes of water
   evaporation
   linked explanation (1)
   loss of solid on thermometer
   observing formation of first crystals may vary
   average
   more results to plot on graph
   method of avoiding evaporation e.g. separate experiments, lid [2]

5 tests on solution E

(a) yellow/green/any combination of yellow/green [1]

(b) white precipitate (1) [1]

(c) (i) green (1) precipitate (1) [2]
   (ii) indicator paper turns blue (1)
      pungent/sharp smell(1) [2]

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(d) brown precipitate (1) [1]

(g) hydrogen (1) [1]

(h) any two from:
transition metal (1)
different valencies/colours (1)
acidic solution (1) [2]

6 any seven from:

**extraction**
cut leaves up/small pieces/grind/crush (1)
use of pestle/mortar (1)
add water (1)
sand (1)
boil/heat/stir/mix/shake (1)

**separation**
decant/filter (1)

**obtaining crystals**
evaporate/heat solution (1)
to crystallising point/ until crystals start to form (1)
leave to cool (1) [7]