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1 (a) (i) fractional distillation

(ii) A = flask (1)  
     B = condenser (1)
[2]

(b) alkanes are inflammable / risk of fire owtte
[1]

(c) octane
[1]

(d) temperature on the thermometer would rise / be 174°C / pause in the distillation of liquid
[1]

[Total: 6]

2 (a) (i) measuring cylinder

(ii) reaction will happen / is fast with cold acid
[1]

(b) solid / powder visible / no more solid dissolves / fizzing stops when powder added
   not precipitate forms, not stops reacting
[1]

(c) diagram of funnel (1) and filter paper within (1)
[2]

(d) heat to crystallising point owtte (1) to prevent loss of water of crystallisation (1)
   not heat and leave to cool
[2]

[Total: 7]

3 highest temperatures correct (1) 28, 30, 32, 32

temperature rises correct (1) 7, 9, 11, 11
[2]

(b) points plotted correctly (2), –1 any incorrect
   two straight lines through points, must use ruler (1)
[3]

(c) (i) 0.25 g (1) extrapolation shown (1)
   accept extrapolation to zero and subsequent mass

   (ii) all copper sulfate solution used up after 1.5 g zinc added / zinc is in excess / owtte
[1]

(d) sketch graph to left of original / steeper slope than original (1)
   rising above original (1)
[2]

[Total: 10]
4 (a) final volumes completed correctly (2)
   13.0 and 34.0
   initial volumes completed correctly (1)
   0.0 and 8.0
   differences correct (1)
   13.0 and 26.0
   –1 if any readings not to 1 dp, –1 if initial and final readings are reversed  [4]

(b) hydroxide  [1]

(c) (i) Experiment 2 / G  [1]
   (ii) Experiment 2 2× volume experiment 1  [1]
   (iii) alkaline solution G more concentrated / stronger (1) or converse
         2× as concentrated (2)  [2]

(d) 13 (1) cm³ (1)
    half volume of G used (1)  [3]

(e) (i) two sources of error
     e.g. using a measuring cylinder to measure alkalis / going past end point owtte /
     conical flask or measuring cylinder not cleaned  [2]
     (ii) two meaningful improvements related to above
          e.g. use a pipette / burette / repeat experiment or use different indicator /
          clean conical flask or measuring cylinder  [2]

[Total: 16]

5 (c) green (solid)  [1]

(d) (i) green (1) precipitate (1)  [2]
     (ii) white (1) precipitate (1)  [2]

(e) ammonia  [1]

(f) ammonium (1) sulfate (1) not a halide (1)  [3]

[Total: 9]
6  (a) powder has larger surface area (1) speeds up reaction / more collisions (1)  [2]

(b) red / brown / pink  [1]

(c) the ice / condensation  [1]

(d) test add anhydrous copper sulfate / cobalt chloride paper (1) result turns blue / pink (1)  [2]

[Total: 6]

7  (a) (i) less than 7  [1]

(ii) colour of orange drink obscures indicator colour owtte  [1]

(b) chromatography (1) apply orange drink to paper (1) use of solvent (1) comparison of spot heights or \( R_f \) with E numbers and/or carotenes (1)  [4]

[Total: 6]