

Syllabus 1036
Science: Chemistry
Paper 4H
MARK SCHEME – Summer 2001

1. (a) $\text{Fe} + 2\text{HCl} \longrightarrow \text{FeCl}_2 + \text{H}_2$
 LHS;
 RHS; 2
 [All four formulae correct – 1 mark]
- (b) (i) diagram showing collection over water;; 2
 [Deduct 1 mark for 1 error in diagram]
- (ii) hydrogen flammable/explosive; 1
- (c) A description to include:
 • add sodium/ammonium hydroxide (solution);
 • green;
 • precipitate; 3
- (d) iron(II)/iron carbonate; 1

Total 9 marks

2. (a) (i) Solute - potassium nitrate;
 Solvent - water; 2
- (ii) cannot dissolve any more **solute**; 1
- (iii) 70;
 g; 2
- (iv) 44;
 °C; 2
 [Allow ecf from part (iii)]
- (b) 83.0-83.5 **and** 36;
 subtracting 2 figures;
 47-47.5 g; 3
 [Allow ecf for **one** reading error]
 [Cannot score the third marking point if unit incorrect]

Total 10 marks

3. (a) calcium;
magnesium; 2
- (b) **Either** ion - sodium;
colour of flame - yellow/orange;
- or** ion - calcium;
colour of flame - red;
[Flame colour must match ion for second mark] 2
- (c) (i) (become) soft/hardness removed; 1
- (ii) (soapless) detergent; 1
- (iii) lather; 1
- (d) (i) pipes can become blocked; 1
- (ii) An explanation to include:
 - prevents lead dissolving/protective layer;
 - lead is poisonous;
2

Total 10 marks

4. (a) An explanation to include:
 - bonds broken - none;
 - bonds formed - H—O bonds/water **only**;
2
- (b) A description to include four from:
 - burette **and** pipette;
 - acid in burette/alkali in pipette;
 - suitable named indicator;
[Reject Universal indicator]
 - correct alkali \rightarrow acid colour change;
[methyl orange: yellow \rightarrow orange
phenolphthalein: red \rightarrow colourless]
 - further relevant point;
4
- (c) A calculation to include:
 - amount of acid = $\frac{20}{1000} \times 0.5 = 0.01$ (mol);
 - amount of alkali = amount of acid;
 - concentration of alkali = $0.01 \times \frac{1000}{25} = 0.4$ (mol dm⁻³);
3
[Accept 0.625 with some working shown for 2 marks]

- (d) A calculation to include:
- NaOH = 40;
 - concentration of NaOH = $40 \times 0.4 = 16 \text{ (g dm}^{-3}\text{)}$;
 - mass of NaOH = $16 \times \frac{250}{1000} = 4 \text{ (g)}$
- [Allow ecf from part (c) ie
answer to part (d) = $10 \times$ answer to part (c)]

Total 12 marks

5. (a) (i) yeast/zymase; 1
- (ii) (fractional) distillation/fractionation; 1
- (b) (i) $\text{C}_2\text{H}_4(\text{g}) + \text{H}_2\text{O}(\text{g}) \longrightarrow \text{C}_2\text{H}_5\text{OH}(\text{g})$
correct LHS formulae;
correct RHS formulae;
correct state symbols;
[All formulae correct but incorrect balancing – 1 mark] 3
- (ii) Any two from:
- **high** temperature;
[Allow 100 – 500 °C]
 - high pressure/above 1atm;
 - catalyst/phosphoric acid;
- (c) Country **A** - fermentation;
can grow **sugar**/oil expensive to import;
Country **B** - hydration of ethene;
ethene made from crude oil/
no land for **sugar**;
[Allow 1 mark max for **both** methods correct but no
explanation] 4
- (d) (i) H_2O ; 1
- (ii) A calculation to include:
- amount of ethanol = $\frac{2300}{46} = 50 \text{ (mol)}$;
 - volume of ethene = 50×24 ;
 - = 1200 **dm**³;
- (iii) A description and an explanation to include four from:
- dissolved in (concentrated) sulphuric acid;
 - cannot dissolve in water/forms mist with water;
 - makes fuming sulphuric acid/oleum;
 - solution diluted;
 - $\text{SO}_3 + \text{H}_2\text{SO}_4 \longrightarrow \text{H}_2\text{S}_2\text{O}_7$;
 - $\text{H}_2\text{S}_2\text{O}_7 + \text{H}_2\text{O} \longrightarrow 2\text{H}_2\text{SO}_4$;
 - $\text{SO}_3 + \text{H}_2\text{O} \longrightarrow \text{H}_2\text{SO}_4$;
- [N.B. max 3 marks if no equation] 4

Total 19 marks

TOTAL MARKS 60