

Chemistry A (1530)

Paper 4H

MARK SCHEME – Summer 2004

1. (a) suitable named rock, for example, limestone / gypsum / rock salt / chalk / marble / dolomite etc;
[ignore rock types] 1
- (b) scum / white precipitate;
[Ignore no lather]
presence of Ca^{2+} / Mg^{2+} ions / calcium (ions) / magnesium (ions) / hard water; 2
- (c) (i) A suggestion to include:
1. prevents lead (ions) entering water / dissolving / corroding / prevents contact;
2. lead (ions) toxic / harmful etc; 2
- (ii) scale causes blockage / furring of hot water pipes / reduces diameter of pipes / energy or efficiency argument; 1
- (d) (i) to inform the public / suitable alternative;
[Reject selling water filters] 1
- (ii) to prevent growth of bacteria / to kill bacteria etc; 1
- (iii) filter loses effectiveness / bacteria build up (on cartridge) / clogged; 1
- (iv) to slow growth of bacteria (as no chlorine present) / prevent it becoming contaminated; 1
- Total 10 marks**
2. (a) (i) ammonia / NH_3 ; 1
- (ii) ammonium ion / NH_4^+ ; 1
- (iii) silver chloride / AgCl ; 1
- (iv) chloride ion / Cl^- ;
[Reject chlorine] 1
- (b) (i) barium sulphate / BaSO_4 ; 1

- (ii) potassium;
sulphate;
[Must be **compound** to score any marks] 2
- (iii) A description to include two from:
1. wire into (concentrated) hydrochloric acid / clean wire;
2. wire into solid;
3. hold wire in Bunsen / (blue) flame; [Reject burn] 2
- plus one communication mark for ensuring that spelling, punctuation and grammar are accurate so that the meaning is clear 1

Total 10 marks

3. (a) $S + O_2 \longrightarrow SO_2$
reactants;
products;
[Do not allow 2 marks if incorrectly balanced] 2
- (b) (i) oxygen;
[Reject air] 1
- (ii) vanadium oxide / V_2O_5 ; 1
- (iii) to increase amount of sulphur trioxide formed / OWTTE;
[Ignore rate ideas] 1
- (c) any suitable industrial use; 1

Total 6 marks

4. (a) (i) near to (hot) air inlet / bottom / OWTTE; 1
- (ii) reaction **provides** heat energy **for other reactions**;
[Ignore fact of exothermic, **use** of heat required] 1
- (b) $C(s) + CO_2(g) \longrightarrow 2CO(g)$
product;
balancing;
state symbols for these three species; 3
- (c) An explanation to include:
1. oxygen passed over / through (molten iron);
2. reacts with carbon (to form carbon dioxide);
[Ignore air] 2

Total 7 marks

5. (a) (i) esters; 1
- (ii)
- $$\begin{array}{ccccccc}
 & \text{H} & \text{H} & & \text{O} & & \\
 & | & | & & // & & \\
 \text{H} & - \text{C} & - \text{C} & - & \text{C} & & \\
 & | & | & & \backslash & & \\
 & \text{H} & \text{H} & & \text{O} & - & \text{C} & - & \text{C} & - & \text{H} \\
 & & & & & & | & & | & & \\
 & & & & & & \text{H} & & \text{H} & & \\
 & & & & & & | & & | & & \\
 & & & & & & \text{H} & & \text{H} & &
 \end{array}$$
- ester functional group;
rest of molecule; 2
- (b) $\text{CH}_3\text{CH}_2\text{COOH} / \text{C}_2\text{H}_5\text{COOH} / \text{C}_3\text{H}_6\text{O}_2$; 1
- (c) (i) $\text{C}_2\text{H}_4 + \text{H}_2\text{O} \longrightarrow \text{CH}_3\text{CH}_2\text{OH} / \text{C}_2\text{H}_6\text{O}$ 2
 reactants;
 product;
 [Do not allow 2 marks if incorrectly balanced]
- (ii) A suggestion to include two valid points, for example,
 1. availability of raw material;
 2. economic aspects; 2
- plus one communication mark for presenting relevant information in a form that suits its purpose 1

Total 9 marks

6. (a) An explanation to include two from:
 1. electrolysis / aluminium anode;
 2. oxygen produced (at anode);
 3. aluminium **reacts** with oxygen; 2
- (b) (i) A description to include:
 1. white / gelatinous **precipitate** / solid etc forms;
 2. in excess, precipitate dissolves / colourless solution; 2
- (ii) $\text{Al}^{3+} + 3\text{OH}^- \longrightarrow \text{Al}(\text{OH})_3$
 reactants;
 product;
 balanced correct equation; 3
- (c) A calculation to include:
 1. $\frac{2.70}{27.0}$ moles of aluminium
 2. $\frac{3}{2} \times \frac{2.70}{27.0}$ moles of hydrogen;
 3. volume of hydrogen = $\frac{3}{2} \times \frac{2.70}{27.0} \times 24 = 3.6 \text{ (dm}^3\text{)}$; 3
 [Allow $1.8 \text{ dm}^3 / 2.4 \text{ dm}^3$ for 2 marks]

Total 10 marks

7. (a) to obtain consistent / reliable result;
[Ignore accurate / average / correct] 1
- (b) A description to include:
1. use of pipette **and** burette for **correct** substance;
 2. titration technique – add (few drops of) suitable indicator / add sodium hydroxide slowly / swirl flask;
[Reject Universal indicator / litmus]
 3. end point comment – stop when colour just changes / correct colour change / add alkali drop by drop; 3

(c) A calculation to include:

either

1. 17.75 (cm³);
2. $\frac{17.75 \times 0.5}{1000}$ moles of sodium hydroxide ;
3. reacts with $\frac{17.75 \times 0.5}{1000}$ moles of ethanoic acid ;
4. concentration of ethanoic acid = $\frac{17.75 \times 0.5}{1000} \times \frac{1000}{10}$
= 0.8875 (mol dm³) ;

or

1. 17.75 (cm³);
2. 10.0cm³ x moldm⁻³ vinegar reacts with 17.75 cm³ 0.500 moldm⁻³ of sodium hydroxide solution ;
3. $\frac{\text{no of moles of ethanoic acid reacting}}{\text{no of moles of sodium hydroxide reacting}}$
 $\frac{10.0x}{1000}$
= $\frac{17.75 \times 0.500}{1000}$
= 1/1 ;
4. therefore x = $\frac{17.75 \times 0.50}{10.0} = 0.8875$ (mol dm⁻³) ; 4

[May use formula as alternative method]

Total 8 marks

TOTAL MARK 60