

**UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS**

General Certificate of Education O Level

**MARK SCHEME for the June 2005 question paper**

**5070 CHEMISTRY**

**5070/02**

**Paper 2 (Theory 1), maximum mark 75**

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**JUNE 2005**

GCE O Level

**MARK SCHEME**

**MAXIMUM MARK: 75**

**SYLLABUS/COMPONENT: 5070/02**

**CHEMISTRY**  
**Paper 2 (Theory 1)**



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### Section A

Maximum 45 marks

- A1** four names at (1) each: penalise correct formulae once only
- (a) nitrogen dioxide
- (b) silicon dioxide
- (c) aluminium oxide
- (d) lead(II) iodide **[Total: 4]**
- A2** (a) iron has positive ions and delocalised electrons (1)  
the electrons are free to move (1)  
moving electrons is an electric current (1) **[3]**
- (b) high carbon steels are strong or are brittle (allow harder) (1)  
low carbon steels are soft or are more easily shaped  
(allow more malleable) (1) **[2]**
- (c) (i) conditions are air (oxygen) and water or moist air (1)
- (ii) magnesium is above iron in the reactivity series  
(or is more reactive) (1)  
hence it corrodes before the iron (1) **[3]**
- (d) any two from:  
coloured compounds/variable oxidation states/can act as  
catalysts/valency/form complex ions **[2]**
- (e) calculation  
for idea of dividing by correct  $A_r$  (1)  
dividing by the smallest (1)  
for final formula only if first 2 fully correct (1)
- |   |          |    |          |   |          |   |          |
|---|----------|----|----------|---|----------|---|----------|
| K | 0.547/39 | Fe | 0.195/56 | C | 0.252/12 | N | 0.294/14 |
|   | 0.0140   |    | 0.00348  |   | 0.0210   |   | 0.0210   |
|   | 4        |    | 1        |   | 6        |   | 6        |
- i.e.  $K_4FeC_6N_6$  or  $K_4Fe(CN)_6$  **[3]**
- [Total: 13]**

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- A3** (a) Group 0 or the noble gas group or Group 8 [1]
- (b) Any two sensible suggestions at (1) each  
e.g: Mendeleev's table has:  
Groups and periods reversed (only allow once)  
no A,  
no atomic numbers  
no transition metals  
periods 4 and/or 5 and all or a specific group has two elements  
group numbers Arabic rather than Roman [2]
- (c) any two observations at (1) each  
fizzes/runs on the surface/flame/dissolves/explodes/melts  
equation (1)  
 $2 \text{Rb} + 2 \text{H}_2\text{O} \rightarrow 2 \text{RbOH} + \text{H}_2$  [3]
- [Total:6]**
- A4** (a) boiling point [1]
- (b) (i) making chemicals or feedstock or make petrol  
not make plastics (1)
- (ii) for road surfaces (1) [2]
- (c) (i) saturated is single bonds or no double/triple bonds  
or maximum number of hydrogen atoms (1)  
hydrocarbon is carbon and hydrogen only (1)
- (ii) correct methane structure (all dots = 1) (2) [4]
- (d) any two ideas at (1) each:  
enables supply to match demand (allow more useful)  
make more petrol  
make hydrogen  
make alkenes e.g. ethene [2]
- [Total: 9]**
- A5** (a) (i) hydrogen is below sodium in the reactivity series (1)
- (ii) chloride ions are removed (leaving hydroxide ions) (1) [2]
- (b) (i) chlorine bleaches litmus or turns starch/iodide paper blue (1)
- (ii) hydrogen pops with a burning splint (1) [2]
- (c) chlorine kills bacteria  
(not just sterilises the water) [1]
- (d) burning hydrogen does not produce pollutants or only forms  
water or hydrogen is not a finite resource, is renewable [1]

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- (e) (i) no products or no reaction (1)
- (ii) sodium chloride and bromine, both needed for (1)  
(allow NaCl and Br<sub>2</sub>) [2]

[Total: 8]

- A6** (a) sodium ion shown as 2.8 (1)  
chloride ion shown as 2.8.8 (1)  
(charges not needed. Outer shell only = 0) [2]

- (b) (i) strong attraction between oppositely charged ions (1)
- (ii) higher charges on the ions (1)  
hence stronger attraction (1)  
(independent marks) [3]

- (c) ions cannot move in the solid but can move in the melt [1]

[Total: 6]

[Section A: score any 45 from 46]

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## Section B

Answer any three questions

- B7** (a) ozone is formed by photochemical reactions  
(or sparks in air, u.v on O<sub>2</sub>) [1]
- (b) ozone removed by reaction with chlorine (atoms) (1)  
derived from CFC's (1)  
ozone loss causes skin cancers or cataracts or crop damage  
or skin diseases or eye damage (1)  
(allow O<sub>3</sub> + CFC for (1)) [3]
- (c) (i) bond breaking is endothermic/absorbs energy (1)  
and bond forming is exothermic/releases energy  
more energy released than absorbed (only if first point scored) (1)
- (ii) as temperature increases molecules move faster  
or increased k.e. (1)  
hence more frequent collisions  
or more molecules energy exceeds the activation energy (1)
- (iii) calculation  
48 g ozone releases 143 kJ (1)  
16 g ozone releases 47.66 kJ or 47.7 kJ (1)  
(answer alone (1), units needed)  
(if 6 x 16 = 96 g ozone used, then (0))  
(if 0.33 used, answer = 47.2) [6]
- [Total: 10]
- B8** (a) calculation (2)  
143.5 g AgCl contains 108 g Ag  
0.287 g AgCl contains 0.216 g Ag  
(answer alone (1), units needed) [2]
- (b) oxidation is electron loss or an increase in O.N. (1)  
copper(I) is oxidised because it loses an electron  
or its O.N. increases (1)  
chlorine is reduced because it gains an electron  
or its O.N. decreases (1) [3]
- (c) equation (1)  
 $\text{Ag} + \text{CuCl}_2 \rightarrow \text{AgCl} + \text{CuCl}$  [1]
- (d) (i) equation (1) state symbols (1)  
 $\text{CuCl}_2(\text{aq}) + 2 \text{NaOH}(\text{aq}) \rightarrow \text{Cu}(\text{OH})_2(\text{s}) + 2 \text{NaCl}(\text{aq})$ ,  
(or ionic,  $\text{Cu}^{2+} + 2\text{OH}^- \rightarrow \text{Cu}(\text{OH})_2$ )  
(scores (1) for states)
- (ii) name is copper(II) hydroxide (allow copper hydroxide) (1)  
colour is blue or blue-green (1)  
(colour only for correct name) [4]
- [Total: 10]

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- B9** (a) (i) the catalyst is iron or  $\text{Fe}_2\text{O}_3$  (1)
- (ii) equation  
 $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$  (1)
- (iii) the temperature is  $280^\circ\text{C}$  (1)  
the pressure is 400 atmos (1)
- (iv) higher temperature gives faster reaction (1)  
(higher yield = -1) [5]
- (b) a catalyst increases reaction rate (1)  
(not alters the rate)  
a lower activation energy (1)  
hence saves energy (1)  
(third mark only if  $E_a$  given) [3]
- (c) equation (1)  
 $\text{Ca}(\text{OH})_2 + 2\text{NH}_4\text{NO}_3 \rightarrow \text{Ca}(\text{NO}_3)_2 + 2\text{H}_2\text{O} + 2\text{NH}_3$   
ammonia lost as a gas (1) [2]
- [Total: 10]
- B10** (a) name is butanoic acid (not butenoic) (1)
- (b) formula is  $\text{C}_5\text{H}_{11}\text{CO}_2\text{H}$  (not  $\text{C}_6\text{H}_{12}\text{O}_2$ ) (1)
- (c) structure of ethyl ethanoate (1)  
allow full structure or condensed version,  $\text{CH}_3\text{CO}_2\text{C}_2\text{H}_5$
- (d) allow any suitable named oxidising reagent (1)  
e.g. (acidified) potassium dichromate(VI) or air or oxygen  
(allow formula) [(a) to (d) 4]
- (e) equation (1)  
 $\text{Mg} + 2\text{CH}_3\text{CO}_2\text{H} \rightarrow \text{Mg}(\text{CH}_3\text{CO}_2)_2 + \text{H}_2$   
calculation (2)  
 $50\text{ cm}^3$  acid is 0.05 mol      0.025 mol Mg needed  
 $24 \times 0.025 = 0.60\text{ g}$   
(answer alone (1), unit needed) [3]
- (f) ethanoic acid is weak and hydrochloric is strong (1)  
lower  $[\text{H}^+]$  concentration in ethanoic acid (1) [2]
- (g) ionic equation (1)  
 $\text{H}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O}$  [1]
- [Total: 10]