

Mark Scheme

IGCSE Chemistry (4335)

June 2006

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June 2006

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IGCSE CHEMISTRY 4335, MARK SCHEME

Paper 1F

1. (a) atomic number (second box) 1
(b) hydrogen / H / H₂ 1
(c) silicon / Si 1
(d) lithium / Li 1
(e) three / all three correctly listed 1

Total 5 marks

2. (a) (i) from top to bottom: proton - electron - neutron 3
(ii) 8 1
(iii) Be/ Beryllium 1
(b) same number of protons /atomic number 1
different number of neutrons / atomic mass / mass number / nucleon number 1

Total 7 marks

3. (a) (i) bubbles / fizzing / effervescence / magnesium gets smaller / disappears **NOT** dissolves / gas made 1
(ii) increases / goes up **NOT** heat produced 1
(iii) magnesium + hydrochloric acid → magnesium chloride + hydrogen 1
(b) lighted splint / flame / burn 1
(squeaky) pop (**ONLY** if 1st mark awarded) 1
(c) ticks in 3rd, 4th and last boxes 3

Total 8 marks

4. (a) (iodine) element covalent
(magnesium oxide) compound ionic
(hydrogen chloride) compound covalent

bonding: all 3 correct = 2; 2 correct = 1

element/compound: all three correct = 2, 2 correct = 1 4

- (b) (i) allotropes 1
(ii) sulphur **ALLOW** phosphorus / oxygen / other correct 1
(c) (i) two electrodes/wires in solution (but not touching) 1
power supply in circuit 1
bulb/buzzer/ammeter in circuit 1
fizzing / bubbles at electrodes / bulb lights etc. 1
(ii) electrolyte(s) **ONLY** 1

Total 11 marks

5. (a) (i) A, C and D (any order) 1
(ii) C (accept B) 1
(iii) A and D (either order) 1
- (b) alkene(s) 1
- (c) C_nH_{2n+2} 1
- (d) add bromine (water) / Br_2 1
decolourised / (goes from orange to) colourless with A **NOT** 'clear' 1
remains orange/yellow/brown (or combination) / no change with C 1
- (e) fruity / pleasant 1
- (f) 46 1
- (g) (i) $C_2H_4 + H_2O \rightarrow C_2H_5OH$ 1
(ii) (concentrated) phosphoric acid 1

Total 12 marks

6. (a) aqueous / dissolved in water 1
gas 1
solid 1
- (b) (i) heat / heated 1
(ii) green 1
(to) black 1
(iii) carbon dioxide 1
- (c) nitric acid 1
- (d) magnesium oxide 1
copper (either order) 1
- (e) nitrogen dioxide 1
- (f) sulphuric acid / H_2SO_4 1

Total 12 marks

7. (a) 1 1
2 1
- (b) (i) sodium + water → sodium hydroxide + hydrogen 1
(ii) sodium moves around / floats
melts / becomes a ball / gets smaller / disappears
NOT dissolves
effervescence / fizzing / bubbles **NOT** gas made 2
any two - max one from each line
- (c) indicator **NOT** 'universal indicator' 1
blue 1
- (d) (i) $\text{Mg} + \text{H}_2\text{O} \rightarrow \text{MgO} + \text{H}_2$ 1
(ii) white 1
- (e) potassium / K 1
magnesium / Mg 1

Total 11 marks

8. (a) X: hydrochloric acid / HCl 1
Y: / limestone / calcium carbonate / marble / CaCO_3 1
- (b) in a syringe / by downward delivery or recognisable diagram / by 1
upward displacement of air
- (c) (i) yellow / orange **NOT** red 1
(ii) carbonic (acid) 1
 H_2CO_3 1
(iii) proton/ H^+ donor/source **OR** provides/loses/gives protons 1
- (d) ionic 1
covalent 1
- (e) carbonating drinks / fizzy drinks / fire extinguishers / dry ice 1
- (f) amount/percentage too small (any stated % under 1%) 1

Total 11 marks

9. (a) carbon and hydrogen 1
- (b) (i) fractional distillation 1
(ii) (group of) compounds with same / similar boiling points 1
(iii) crude oil heated / boiled 1
(vapour) passed into column / tower 1
fractions collect at different heights 1
- (c) (i) gasoline 1
(ii) fuel oil 1
(iii) (refinery) gases **NOT** natural gas 1
bitumen 1
naphtha
- (d) (i) carbon monoxide 1
(ii) poisonous / toxic / lethal / causes death 1
reduces capacity of blood to carry oxygen / combines with 1
haemoglobin

Total 13 marks

10. (a) acts as solvent
mixture melts at lower temperature / reduces operating temperature
/ allows lower temperature to be used
increases conductivity of mixture (Any two) 2
- (b) (i) carbon / graphite / C 1
(ii) oxygen 1
(iii) they burn/combine with oxygen/form carbon dioxide 1
- (c) (aluminium) more reactive than carbon / too reactive 1
- (d) electricity / replacing anodes 1
- (e) (aeroplanes) low density **NOT** light 1
(overhead power cables) (good) conductor of electricity 1
low density (if not scored above)
(pans for cooking food) (good) conductor of heat 1

(Accept *resists corrosion* once as alternative for any of the above)

Total 10 marks

PAPER TOTAL 100 MARKS

Paper 2H

1. (a) 1 1
2 1
- (b) (i) sodium + water \rightarrow sodium hydroxide + hydrogen 1
(ii) sodium moves around / floats
melts / becomes a ball / gets smaller / disappears
NOT dissolves
effervescence / fizzing / bubbles **NOT** 'gas made' 2
any two - max one from each line
- (c) indicator **NOT** 'universal indicator' 1
blue 1
- (d) (i) $\text{Mg} + \text{H}_2\text{O} \rightarrow \text{MgO} + \text{H}_2$ 1
(ii) white 1
- (e) potassium / K 1
magnesium / Mg 1

Total 11 marks

2. (a) X: hydrochloric acid / HCl 1
Y: / limestone / calcium carbonate / marble / chalk / CaCO_3 1
- (b) in a syringe / by downward delivery or recognisable diagram / by upward displacement of air 1
- (c) (i) yellow / orange **NOT** red 1
(ii) carbonic (acid) 1
 H_2CO_3 1
(iii) proton/ H^+ donor/source **OR** provides/loses/gives protons 1
- (d) ionic 1
covalent 1
- (e) carbonating drinks / fizzy drinks / fire extinguishers / dry ice 1
- (f) amount/percentage too small (any stated % under 1%) 1

Total 11 marks

3. (a) carbon and hydrogen 1
- (b) (i) fractional distillation 1
(ii) (group of) compounds with same / similar boiling points 1
(iii) crude oil heated / boiled 1
(vapour) passed into column / tower 1
fractions collect at different heights 1
- (c) (i) gasoline 1
(ii) fuel oil 1
(iii) (refinery) gases **NOT** 'natural gas' 1
bitumen 1
naphtha
- (d) (i) carbon monoxide 1
(ii) poisonous / toxic / lethal / causes death 1
reduces capacity of blood to carry oxygen / combines with 1
haemoglobin

Total 13 marks

4. (a) acts as solvent
mixture melts at lower temperature / reduces operating temperature
/ allows lower temperature to be used
increases conductivity of mixture (Any two) 2
- (b) (i) carbon / graphite / C 1
(ii) oxygen 1
(iii) they burn/combine with oxygen/form carbon dioxide 1
- (c) (aluminium) more reactive than carbon / too reactive 1
- (d) electricity / replacing anodes 1
- (e) (aeroplanes) low density **NOT** light 1
(overhead power cables) (good) conductor of electricity 1
low density (if not scored above)
(pans for cooking food) (good) conductor of heat 1

(Accept resists corrosion once as alternative for any of the above)

Total 10 marks

5. (a) $\text{Mg(s)} + 2\text{HCl(aq)} \rightarrow \text{MgCl}_2\text{(aq)} + \text{H}_2\text{(g)}$ 1
 all formulae correct 1
 state symbols correct 1
 balanced 1
- (b) (i) line steeper 1
 same final volume 1
 (ii) line not as steep 1
 produces half the final volume of gas 1
- (c) particles/ions move faster / have more energy 1
 more collisions per second / more frequent collisions / greater chance 1
 of collisions
 more successful/effective/fruitful collisions / idea of more collisions 1
 with E_A
- (d) add nitric acid 1
 and silver nitrate (solution) 1
 white ppt (**ONLY** if silver nitrate mark awarded) 1

Total 13 marks

6. (a) (i) titanium 1
 (ii) electrons 1
 (iii) Na^+ / sodium ions 1
 Cl^- / chloride ions 1
- (b) (i) uv light / sunlight / sun 1
 (ii) (goes red then) bleached / goes white / decolorised / colourless 1
 (iii) goes red / pink 1
- (c) (i) division of percentages by A_r values 1
 division of numbers of moles by the smallest 1
 CH_2Cl 1
 (ii) $\text{C}_2\text{H}_4\text{Cl}_2$ only 1

Total 11 marks

7. (a) Company A
- fermentation 1
 - (agricultural area so) grows sugar (cane) 1
- Company B
- reaction of ethene with steam 1
 - (crude) oil available / needs pure ethanol / ethene comes from oil 1
- (b) 1: conc sulphuric acid/conc phosphoric acid/aluminium oxide(+heat) / pumice / porous pot 1
- 2: acidified potassium dichromate(VI) / potassium manganate(VII) 1
- 3: sodium 1
- (c) (i) correct (ester) linkage between monomer units 1
- repeat unit correct (with continuation bonds) 1
-
- (ii) condensation / polyester 1

Total 10 marks

8. (a) $C + O_2 \rightarrow CO_2$ 1
- C / carbon reacted with oxygen 1
- equation correct 1
- (b) $ZnO + CO \rightarrow Zn + CO_2$ 1
- $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$ 1
- all formulae correct 1
- balancing correct 1
- (c) limestone decomposes 1
- to make CaO 1
- or $CaCO_3 \rightarrow CaO + CO_2$ (2)**
- this reacts with silicon dioxide 1
- to form slag / calcium silicate 1
- or $CaO + SiO_2 \rightarrow CaSiO_3$ (2)**
- (d) zinc has lower boiling point than silicon dioxide 1
- evaporates / vaporises 1
- leaving impurities behind 1
- (last two points could be awarded by saying 'zinc distils off')*
- (e) prevents rusting 1
- zinc more reactive than iron 1
- oxidises /corrodes instead of iron 1

Total 15 marks

9. (a) $\text{Cu}_2\text{O} / \text{Cu}^+$ 1
 it gains an electron / loss of oxygen / causes (Mg) to lose electrons /
 oxidation number decreases 1
- (b) brown gas / fizzing / bubbling / effervescence 1
 blue / blue-green solution 1
- (c) $32 \times 300 \text{ seconds} = 9600 \text{ coulombs}$ 1
 $9600/96000 = 0.1 \text{ faradays}$ 1
 $0.1/2 = 0.05 \text{ moles of copper}$ 1
 $0.05 \times 63.5 = 3.175\text{g} / 3.2\text{g copper}$ 1
- (d) (i) atoms/particles/ions in layers 1
 slip / move / slide over each other (can get this from diagram) 1
 (ii) tin atoms/particles/ions large(r) 1
 prevents (layers) sliding / slipping / moving 1

Total 12 marks

10. (a) stoichiometric coefficients are: 2:3:2:2 1
- (b) (i) energy in = 2468 / correct working 1
 energy out = 2958 / or correct working 1
 energy change = - 490(kJ/mol) 1
 (ii) exo/endothemic diagram 1
 enthalpy change and vertical energy axis labelled 1
 reagents / products labelled (names or formulae) 1
- (c) (i) pipette to measure sulphuric acid 1
 sodium hydroxide in burette 1
 indicator used and colour change (**NOT** universal indicator) 1
 add sodium hydroxide gradually near end point (and swirl) 1
 (ii) 0.00167 (3 or 4 s.f.) 1
 (iii) (ii) $\div 2$ 1
 (iv) (iii) $\times 100 = 0.0835$ 1

Total 14 marks

PAPER TOTAL 120 MARKS

Paper 3

- | | | | | |
|----|-----|-------|----------------------|---|
| 1. | (a) | A | pipette | 1 |
| | | B | fractionating column | 1 |
| | | C | syringe | 1 |
| | | D | conical flask | 1 |
| | (b) | (i) | A / name | 1 |
| | | (ii) | C / name | 1 |
| | | (iii) | B / name | 1 |

Total 7 marks

- | | | | |
|----|-----|---|---|
| 2. | (a) | wear eye protection/gloves / wipe up spills
NOT glasses / don't get on skin | 1 |
| | (b) | 20.2 | 1 |
| | | 1.6 | 1 |
| | | 18.6 | 1 |
| | (c) | (i) ticks under 27.45 and 27.25 | 1 |
| | | (ii) 27.35 (to 2 or 3 decimal places) | 1 |

Total 6 marks

- | | | | |
|----|-----|---|---|
| 3. | (a) | 2.7 (g) | 1 |
| | | 45 (%) | 1 |
| | (b) | (i) it would dissolve more quickly / would take less time | 1 |
| | | (ii) less | 1 |
| | (c) | dry the filter paper / residue | 1 |
| | | THEN | |
| | | weigh filter paper with insoluble impurities (1) | |
| | | weigh the original/new filter paper/subtract mass of filter paper (1) | |
| | | OR | |
| | | remove insoluble impurities from filter paper (1) | |
| | | weigh insoluble impurities (1) | 2 |

Total 7 marks

4. (a) polystyrene is a (better) insulator / to reduce heat loss / glass conducts heat 1
- (b) 18.6 1
22.8 1
4.2 **IGNORE** sign 1
- (c) points for 1-3 1
line (**NOT** curve) of best fit for 1-3 **MUST use ruler** 1
points for 4-6 1
line (**NOT** curve) of best fit for 4-6 **MUST use ruler** 1
- (d) 27.2 - 27.4 °C 1
44 - 45 (cm³) 1
56 - 55 (cm³) 1
- (e) use 44 cm³ of KOH and 56 cm³ of nitric acid 1
MUST give two volumes, which total 100 cm³
- (f) KOH, because smaller volume than acid 1

Total 13 marks

5. (a) (i) 5 (cm) 1
(ii) 40 (seconds) 1
- (b) (i) 1 cm represents 1 cm for y axis 1
all points correct (deduct 1 for each error) 2
smooth line of best fit 1
(ii) any time between 85 and 90 (s) / cq on graph 1
- (c) (i) same surface area / powdered 1
same amount / same number of moles 1
NOT same mass or same quantity
(ii) same proportions **OR** volumes of acid and detergent
same volume of mixture *any two*
same concentration of acid 2
(any of these could be scored in (iii) instead)
(iii) temperature 1
(this could be scored in (ii) instead of here)
could score metal points here if not in (i)
- (d) (i) 2 1
(ii) Metal 3 for student S / 105 sec 1
(iii) clock read incorrectly / thought 100 sec = 1 min / used too little metal or mixture / did not use powder 1
(iv) 2 and 4 1
(v) results overlap / some times are same for both metals / results similar 1

Total 17 marks

PAPER TOTAL 50 MARKS

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