

# Chemistry A (1530)

## Paper 3H

### MARK SCHEME – Summer 2003

1. (a)  $2 \text{Mg} + \text{O}_2 \rightarrow 2 \text{MgO}$   
reactants;  
products;  
balancing the correct formulae; 3
- (b) An explanation to include:  
1. magnesium and oxygen / two or more than one elements;  
2. have (chemically) combined together; 2
- plus one communication mark for presenting relevant information in a form that suits its purpose 1
- (c) (i) Mg: 12 12 12 ....  
Mg<sup>2+</sup>: 12 12 10 ....  
[Deduct 1 mark for each error] 4
- (ii) A suggestion to include:  
1. oxygen gains;  
[Reject molecules] 2  
2. **two** electrons;
- Total 12 marks**
2. (a) nitrogen;  
oxygen;  
argon **only**; 3
- (b) (i) volcanoes / inside the Earth; 1
- (ii) limestone / marble / chalk / any suitable named rock;  
[Reject chemical names] 1
- (iii) fossils;  
[Reject dead organisms]  
layers / grains / crumbly / no (observable) crystals;  
[Ignore sediments] 2
- (c) (i) ore; 1

- (ii) iron - haematite / magnetite / (iron) pyrites / limonite; 2  
 aluminium - bauxite / cryolite;
- (d)  $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$  2  
 all formulae correct;  
 balancing the correct formulae;  
 [Ignore state symbols]

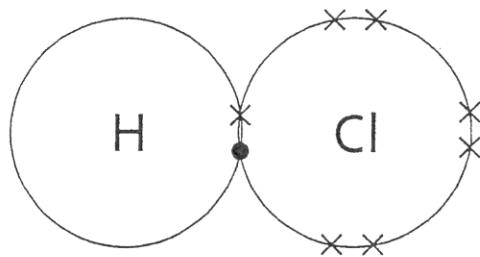
**Total 12 marks**

3. (a) **alkali** (metals); 1
- (b) 2, 8; 2  
 1;
- (c) (i) heat / exothermic / temperature rises / 1  
 particle description of melting / low melting point;
- (ii) more heat / energy produced with potassium / 1  
 potassium more reactive;
- (d) (i) suitable properties of a metal, for example: 2  
 1. conducts electricity;  
 2. reaction with water / acid to form **hydrogen**;  
 3. produced at cathode;  
 4. conducts heat;  
 5. malleable;  
 6. ductile;  
 [Ignore shiny]
- (ii) soft / easy to cut / low melting point / **very** reactive (with water) / 1  
 reacts with water giving (lilac) flame / burns with a (purple) flame;
- (iii) one electron / same number; 2  
 in the outer shell;

**Total 10 marks**

4. (a)  $\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$  3  
 reactants;  
 products;  
 balancing the correct formulae;

(b)



shared pair between hydrogen and chlorine;  
fully correct;  
[Deduct 1 mark for incorrect inner electrons]

2

(c)

add / react with / dissolve in / water / OWTTE;

1

**Total 6 marks**

5. (a) (i)  $\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l/g})$   
formulae;  
balancing the correct formulae;  
state symbols for any three of these four species;

3

- (ii) An explanation to include:  
1. energy required to break bonds /  
energy released in making bonds;  
2. more energy released than required;

2

(b) A calculation to include:

**Either**

- 16 g  $\text{CH}_4 \rightarrow 44$  g  $\text{CO}_2$ ;
- 2 / 3.  $1000 \text{ g CH}_4 \rightarrow \frac{44}{16}$ ;  $\times 1000$ ; g  $\text{CO}_2 = 2750$  g
4. mass of  $\text{CO}_2$  in 5 hours =  $2750 \times 5 = 13\,750$  g;  
[unit required]

4

[Allow ecf from incorrect equation in part (a)(i)]

**or**

1.  $\frac{1000}{16} = 62.5$  (moles);
2. 62.5 (moles)  $\text{CO}_2$ ;
3.  $62.5 \times 44 = 2750$  (g);
4.  $2750 \times 5 = 13750$  g [unit required]

[Note: Indicate **on script** where marks awarded]

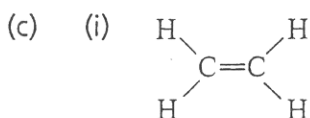
**Total 9 marks**

6. (a) Any three from:
1. mixture of hydrocarbons;
  2. heated / starts as gas or vapour;
  3. fractionating tower / fractional distillation;
  4. fractions separate;
  5. due to different boiling points;
  6. naphtha collects high in tower;

3



2

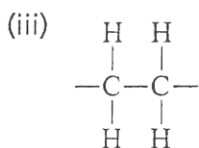


$> C = C <;$   
 remainder;

2

- (ii) A description to include:
1. add bromine (water);
  2. turns from orange / yellow / brown;  
 [Reject red]
  3. to colourless / decolourises;  
 [Reject clear]

3



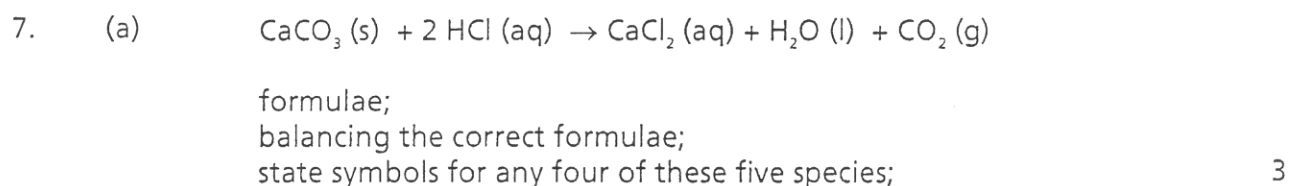
C – C for two carbon chain only;  
 linking bonds on C;  
 [Ignore ( )<sub>n</sub>]

2

- (iv) An explanation to include:
1. double bonds break open;
  2. monomers link;

2

**Total 14 marks**



3

- (b) (i) An explanation to include:
1. gas / carbon dioxide;
  2. is lost from the flask;

2

- (ii) A suggestion to include:  
1. stops (acid) spray;  
2. from leaving flask / would cause extra mass loss; 2

- (c) x-axis: 1 large square = 1 minute, y-axis: 1 large square = 0.4 or 0.5 g;  
all points correctly plotted;;  
[Deduct 1 mark for each incorrectly plotted point]  
best fit curve; 4

- (d) rate of reaction falls/slows;  
fewer reacting particles / lower surface area;  
fewer collisions; 3

plus one communication mark for ensuring that spelling, punctuation  
and grammar are accurate, so that the meaning is clear 1

**Total 15 marks**

8. (a) forward and back reactions occurs at the same time;  
same rate / concentrations constant; 2  
[Stating reaction is reversible – insufficient for a mark]

- (b) yield / percentage of conversion decreases;  
higher pressure reduces volume;  
favours reactants (side) / LHS / fewer molecules on LHS; 3

- (c) yield / percentage of conversion decreases;  
lower temperature favours exothermic reaction;  
which is the back reaction; 3

- (d) no effect on yield;  
catalyst increases rate reactions;  
of forward and backward equally; 3

plus one communication mark for using a suitable structure and style  
of writing; 1

**Total 12 marks**

**TOTAL MARK 90**