

**Syllabus 1036**  
**Science: Chemistry**  
**Paper 3H**

**MARK SCHEME - Summer 1999**

- |    |     |  |   |
|----|-----|--|---|
| 1. | (a) | methane;   | 1 |
|    | (b) | methane;   | 1 |
|    | (c) | 65 – 73;   | 1 |
|    | (d) | hydrogen;  | 1 |
|    | (e) | carbon dioxide/CO <sub>2</sub> ;<br>water/hydrogen oxide/H <sub>2</sub> O; | 2 |

**Total 6 marks**

- |    |     |  |    |   |
|----|-----|--|----|---|
| 2. | (a) | (i)  | B; | 1 |
|    |     | (ii)   | D; | 1 |
|    |     | (iii)  | C; | 1 |
|    |     | (iv)   | A; | 1 |
|    | (b) | A diagram to include:<br>1. circles touching nearest neighbours;<br>2. circles in a regular arrangement;   |    | 2 |
|    | (c) | A description to include three from:<br>1. lose regular arrangement/become random;<br>[Accept take on shape of container]<br>2. remain mostly in contact with nearest neighbours;<br>3. vibrate/move <b>more</b> ;<br>4. move <b>about/around</b> ;<br>5. move (slightly) further apart; |    |   |

[Ignore references to bonding/gaining energy] 3

**Total 9 marks**

3. (a) 1; 1
- (b) (i) red/pink;  
[Reject orange] 1
- (ii) purple/violet/blue;  
[Reject green] 1
- (c) (i) 7; 1
- (ii) 25 (cm<sup>3</sup>); 1
- (iii) sodium chloride: 1
- (iv) **white**/cubic crystals; 1
- (v) ionic; 1
- (vi) **water**;  
[Accept hydrogen oxide] 1

**Total 9 marks**

4. (a) (i) uses electricity/large amount of energy;  
[Accept magnesium chloride has a high melting point]  
[Reject electrolysis is expensive] 1
- (ii) chlorine; 1
- (b) (i) A diagram to include:  
1. two electrons in outer shell;  
2. 2 : 8 : 2 electron arrangement; 2
- (ii) An explanation to include:  
1. Mg **loses** electrons;  
2. **two** electrons; [dependent mark] 2
- (c) (i)  $2 \text{ Mg} + \text{O}_2 \longrightarrow 2 \text{ MgO}$   
correct formula O<sub>2</sub>;  
balancing; 2
- (ii) magnesium gains oxygen/magnesium loses electrons; 1
- (d) (i) gives out heat/energy; 1
- (ii) A description to include:  
1. temperature at start of experiment;  
[Reject temperature of room/magnesium]  
2. temperature change;  
3. **rise**; 3

**Total 13 marks**

5. (a) (i) HF - 20;  
HCl - 36.5;  
[Ignore g] 2
- (ii) A suggestion to include:  
1. lighter molecules/smaller relative formula mass;  
2. molecules move faster; 2
- (b) protons - 17;  
neutrons - 20;  
electrons - 17; 3
- (c) (i) covalent; 1
- (ii) shared (pair of electrons); 1

**Total 9 marks**

6. (a) 
$$\begin{array}{c} \text{H} & & \text{H} \\ | & & | \\ \text{H}-\text{C}-\text{C}=\text{C}-\text{H}; \\ | & | & \\ \text{H} & \text{H} & \end{array}$$
 1
- (b) 
$$\text{C}_{10}\text{H}_{22} \longrightarrow 2\text{C}_3\text{H}_6 + \text{C}_4\text{H}_{10}$$
  
correct balanced equation;;  
[Allow 1 mark for  $\text{C}_{10}\text{H}_{22} \longrightarrow 2\text{C}_3\text{H}_8 + \text{C}_4\text{H}_6$   
 $\text{C}_{10}\text{H}_{22} \longrightarrow \text{C}_3\text{H}_6 + \text{C}_7\text{H}_{16}$ ] 2
- (c) (i) C=C/double bond/unsaturated; 1
- (ii) 
$$\begin{array}{c} \text{CH}_3 & \text{H} \\ | & | \\ -\text{C}-\text{C}- \\ | & | \\ \text{H} & \text{H} \end{array}$$
 scores 2 marks
- $$\begin{array}{c} \text{H} & \text{H} & \text{H} \\ | & | & | \\ -\text{C}-\text{C}-\text{C}- \\ | & | & | \\ \text{H} & \text{H} & \text{H} \end{array}$$
 or 
$$\begin{array}{c} \text{CH}_3 & \text{H} \\ | & | \\ \text{C}-\text{C} \\ | & | \\ \text{H} & \text{H} \end{array}$$
 score 1 mark 2
- (iii) poly(propene) stronger than poly(ethene)/  
can stand the pressure; 1

**Total 7 marks**

7. (a) (i) most reactive - zinc  
lead  
copper  
least reactive - silver  
All correct – 1 mark 1
- (ii) no. of moles of silver;  
no. of moles of copper;  
mass of copper;
- eg  $2 \times 108 / 216 \text{ g Ag} \longrightarrow 63.5 \text{ g Cu};$   
 $5 \text{ g Ag} \longrightarrow 5 \times \frac{63.5}{216} \text{ g Cu};$   
 $= 1.47 / 1.50 \text{ g Cu};$   
 [Accept 5.88 g or 2.94 g for 2 marks and 0.74 g for 1 mark] 3
- (iii)  $\text{Pb(s)} + 2\text{AgNO}_3(\text{aq}) \longrightarrow \text{Pb(NO}_3)_2(\text{aq}) + 2\text{Ag(s)}$   
 correct formulae;  
 balanced;  
 correct state symbols;  
 [MUST be this equation] 3
- (b) (i) compound containing  $\text{H}^+$  - any suitable acid;  
 compound containing  $\text{I}^-$  - any soluble iodide;  
 [Reject water] 2
- (ii) zinc loses electrons; 1
- (iii)  $2\text{I}^- \longrightarrow \text{I}_2 + 2\text{e}^-;$  2

**Total 12 marks**

8. (a) (i)  $\text{N}_2 + 3\text{H}_2 \rightleftharpoons 2\text{NH}_3$   
 correct formulae;  
 balanced;  
 [Ignore equilibrium sign] 2
- (ii) fully correct;;  
 [Allow 1 mark for one correct N-H bond] 2
- (iii) An explanation to include:  
 1. energy needed to break bonds;  
 2. energy released when bonds formed;  
 3. more energy released than needed/OWTTE; 3
- (b) (i) An explanation to include three from:  
 1. **more** methanol formed/**higher** yield of methanol/  
 faster reaction;  
 2. higher pressure reduces volume;  
 3. **either** **more** frequent collisions;  
**or** **equilibrium** moves to the right; 3

- (ii) One disadvantage from:  
 1. greater safety risks;  
 2. more expensive **qualified**; 1
- (iii) An explanation to include three from:  
 1. **more** methanol formed/**higher** yield of methanol/  
 cheaper to operate;  
 2. as reaction is exothermic;  
 3. so equilibrium moves to the right; 3
- (iv) An explanation to include two from:  
 1. slower reaction;  
 2. particles **collide** with less energy/less frequently;  
 [Reject longer time unqualified] 2

**Total 16 marks**

9. (a) igneous rock;  
 plus a description to include three from:  
 1. formed when magma/molten rock;  
 2. solidifies or cools down;  
 3. different rates give different crystal sizes; 4

(b) (i)  $\text{Sn} = \frac{3.57}{119}$        $\text{O} = \frac{0.96}{16}$        $\frac{\text{mass}}{\text{R.A.M.}}$ ;  
 = 0.03      = 0.06

Sn : O = 1 : 2      correct ratio;

SnO<sub>2</sub>      formula; 3

- (ii) An explanation to include:  
 1. strong forces between particles;  
 2. giant/ionic/lattice structure;  
 [Ignore covalent/type of bonding] 2

**Total 9 marks**

**TOTAL MARKS 90**