





RECOGNISING ACHIEVEMENT

**Subject: How Far, How Fast? Code: 2813**

**Session: January Year: 2005**

**Mark Scheme**

MAXIMUM MARK

**45**

## ADVICE TO EXAMINERS ON THE ANNOTATION OF SCRIPTS

1. Please ensure that you use the **final** version of the Mark Scheme.  
You are advised to destroy all draft versions.
2. Please mark all post-standardisation scripts in red ink. A tick (✓) should be used for each answer judged worthy of a mark. Ticks should be placed as close as possible to the point in the answer where the mark has been awarded. The number of ticks should be the same as the number of marks awarded. If two (or more) responses are required for one mark, use only one tick. Half marks ( $\frac{1}{2}$ ) should never be used.
3. The following annotations may be used when marking. No comments should be written on scripts unless they relate directly to the mark scheme.  
Remember that scripts may be returned to Centres.  
  
x = incorrect response (errors may also be underlined)  
^ = omission mark  
bod = benefit of the doubt (where professional judgement has been used)  
ecf = error carried forward (in consequential marking)  
con = contradiction (in cases where candidates contradict themselves in the same response)  
sf = error in the number of significant figures
4. The marks awarded for each part question should be indicated in the margin provided on the right hand side of the page. The mark total for each question should be ringed at the end of the question, on the right hand side. These totals should be added up to give the final total on the front of the paper.
5. In cases where candidates are required to give a specific number of answers, (e.g. 'give three reasons'), mark the first answer(s) given up to the total number required. Strike through the remainder. In specific cases where this rule cannot be applied, the exact procedure to be used is given in the mark scheme.
6. Correct answers to calculations should gain full credit even if no working is shown, unless otherwise indicated in the mark scheme. (An instruction on the paper to 'Show your working' is to help candidates, who may then gain partial credit even if their final answer is not correct.)
7. Strike through all blank spaces and/or pages in order to give a clear indication that the whole of the script has been considered.
8. An element of professional judgement is required in the marking of any written paper, and candidates may not use the exact words that appear in the mark scheme. If the science is correct and answers the question, then the mark(s) should normally be credited. If you are in doubt about the validity of any answer, contact your Team Leader/Principal Examiner for guidance.

- 1(a) any two from  
 produces heat/ exothermic/ produces high temperature (1)  
 has low toxicity (1)  
 is easily ignited/ easily flammable/ burns easily (1) [2]
- (b)(i) reaction carried out at 298K and 1 atm pressure (or other relevant units) (1) [1]
- (ii) enthalpy change when 1 mole (1)  
 (of substance) is burnt in excess oxygen (1) [2]
- (iii)  $4\text{CO}_2 + 5\text{H}_2\text{O}$  at lower energy than reagents (1)  
 $E_a$  marked correctly (1)  
 $\Delta H$  marked correctly (1) [3]
- (c)(i)  $4\text{C}(\text{s}) + 5\text{H}_2(\text{g}) \rightarrow \text{C}_4\text{H}_{10}(\text{g})$   
 reagents and products (1)  
 state symbols (1) [2]
- (ii)
- $$4\text{C} + 5\text{H}_2 \xrightarrow{\text{X}} \text{C}_4\text{H}_{10}$$
- $$4(-394) \quad 5(-286) \quad -2877$$
- $$4\text{CO}_2 \quad 5\text{H}_2\text{O}$$
- cycle (1)  
 correct values (1)  
 answer (1)
- $$\text{X} - 2877 = 4(-394) + 5(-286)$$
- $$\text{X} = -129 \text{ (kJ mol}^{-1}\text{)} \quad [3]$$

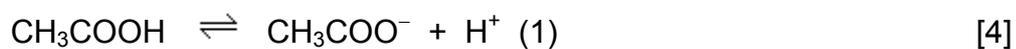
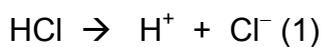
[Total: 13]

- 2(a) if the **conditions** on a system in **equilibrium** are changed (1)  
the equilibrium moves to try to minimise the effects of the change (1) [2]
- (b)(i) time less (1)  
 $E_a$  lowered (1) [2]
- (ii) time less (1)  
more collisions/ particles **exceed**  $E_a$  (1) [2]
- (iii) time more (1)  
particles are **further apart** and therefore less (frequent) collisions (1) [2]
- (c)(i) no effect because it only increases rate of reaction (1) [1]
- (ii) moves to LHS/ more  $N_2$  and  $H_2$ / less  $NH_3$  (1)  
**forward** reaction is exothermic (1) [2]
- (iii) moves to LHS / more  $N_2$  and  $H_2$ / less  $NH_3$  (1)  
fewer moles on RHS (1) [2]
- (d) temperature is compromise – high gives better rate but lower yield (1)  
danger/costs of higher pressure not justified by increased rate/ by increased yield / 200 atm gives a high rate and a high yield (1) [2]

[Total: 15]

3(a) acids are proton/ H<sup>+</sup> **donors** (1)

a strong acid is completely dissociated but a weak acid is partly dissociated (1)



(b)(i) hydrogen/ H<sub>2</sub> (1) [1]

(ii) marks are for reason

(to produce hydrogen at the same rate), each acid must have the same concentration of H<sup>+</sup> (1)

the ethanoic acid was more **concentrated** (1) [2]

[Total: 7]



reagents and products (1)

balancing (1) [2]

(ii) from nitrogen in air and oxygen (1) [1]

(b)(i) any two from Pt/ Rh/ Pd [1]

(ii) **adsorbed** (1)

bonds within molecule weakened (1)

desorbed/ description (1) [3]



reagents and products (1)

balancing (1) [2]

(c) ozone/  $NO_2$ / nitric acid (1) [1]

[Total: 10]