NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

# Level 1, 2003

# Chemistry: Classify reactions, complete word equations, and carry out chemical calculations (90171)

## National Statistics

## Assessment Report

## Assessment Schedule

## Chemistry: Classify reactions, complete word equations, and carry out chemical calculations (90171)

### National Statistics

| Number of | Percentage achieved | | | |
|---|---|---|---|---|
| Results | Not Achieved | Achieved | Merit | Excellence |
| 3,448 | 18.3% | 28.8% | 26.0% | 26.9% |

### Assessment Report

#### General Comments

Every candidate for a National Certificate of Educational Achievement examination paper is expected to:

- read the question and do what the question asks
- allow adequate time to complete answers
- be accurate: check and/or proofread
- use appropriate technical terms
- bring the correct equipment
- write and/or draw clearly
- use pen if work is to be eligible for reconsideration.

Candidates displayed a high level of understanding for this standard. It is pleasing to note the large number of candidates able to converse accurately in the use of chemical terminology. There is however a concern that some candidates do not seem aware of the difference between an inference and an observation. For example, candidates would state exothermic as an observation rather than the temperature of the reaction mix increased. Candidates also need to be aware that fizzing, bubbling and a gas given off are not three different observations.

Many candidates used incorrect formulae when asked for word equations or names of chemicals. An incorrect formula is not acceptable in place of a name, and an incorrectly balanced equation is not an acceptable alternative when a word equation is asked.

An improvement in the achievement level for many candidates would occur if:

(1)    all working for calculations was shown, and set out clearly.

(2)    all questions were attempted, and not the first few questions only. All questions in the examination paper offer opportunities for candidates to provide evidence for Achievement, Merit or Excellence. Errors made in the first few questions often resulted in the candidate not achieving the standard when many of the later questions were not attempted.

**Assessment Schedule**

**Chemistry: Classify reactions, complete word equations, and carry out chemical calculations (90171)**

**Evidence Statement**

| Question | Evidence | Evidence contributing to Achievement | Evidence contributing to Achievement with Merit | Evidence contributing to Achievement with Excellence | Code |
|---|---|---|---|---|---|
| ONE | (a) N   (b) O   (c) T   (d) P   (e) N | 4 correct. | | | A1 |
| TWO(a) | barium sulfate | 2 correct. (must not include other compounds) | | | |
| (b) | magnesium hydroxide | | | | A1 |
| (c) | no precipitate | | | | |
| THREE(a) | hydrochloric acid OR HCl | 2 equations correct. Any order for products in (b) and (c). | | | |
| (b) | zinc sulfate + hydrogen<br>OR   $ZnSO_4$ + $H_2$ | | | | A1 |
| (c) | magnesium nitrate + lead chloride<br>OR   $Mg(NO_3)_2$ + $PbCl_2$ | | | | |
| FOUR (a) | $H_2SO_4 + 2\,NaOH \rightarrow Na_2SO_4 + 2\,\mathbf{H_2O}$ | 3 of the compounds in bold correctly identified (name or correct formula). | 3 of the equations completed correctly and balanced. | | A1 |
| (b) | $Fe_3O_4 + 4\,CO \rightarrow 3\,Fe + 4\,CO_2$ | | | | |
| (c) | $MgCO_3 + \mathbf{H_2SO_4} \rightarrow MgSO_4 + \mathbf{CO_2} + \mathbf{H_2O}$ | | | | M |
| (d) | $Pb^{2+} + 2\,OH^- \rightarrow \mathbf{Pb(OH)_2}$<br>(must have brackets) | | | | |
| FIVE (a) | Fizzing occurs OR bubbles are formed.<br>The magnesium metal disappears.<br>The reaction mixture gets hot.<br>Product(s): magnesium chloride / $MgCl_2$ / hydrogen / $H_2$<br>$Mg(s) + 2\,HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$<br>OR $Mg(s) + 2H^+ \rightarrow Mg^{2+}(aq) + H_2(g)$ | 1 correct product identified for 2 of the reactions in Q5. | A correct product identified for 2 of the reactions in Q5 and 4 correct observations. (not accepting gas given off for (c) since this is in the question) | 4 correct observations and 4 correct balanced equations from Q5 and Q6. (Q6(b) does not need ppt identified). States are not required. | A1<br><br>M |
| (b) | A white light is formed / given off.<br>Heat is given off.<br>A white powder is formed.<br>Product: magnesium oxide / MgO<br>$2\,Mg(s) + O_2(g) \rightarrow 2\,MgO(s)$ | | | | |
| (c) | The (green) solid goes black.<br>The limewater goes cloudy.<br>Product(s): copper oxide / CuO / carbon dioxide / $CO_2$ (OR $CaCO_3 + H_2O$)<br>$CuCO_3(s) \rightarrow CuO(s) + CO_2(g)$ | | | | |

| Question | Evidence | Evidence | Evidence | Evidence | Code |
|---|---|---|---|---|---|
| SIX (a) | $Cl_2(aq) + 2\,I^-(aq) \rightarrow 2\,Cl^-(aq) + I_2(aq)$ | | | Equation must | |
| (b) | $Zn^{2+}(aq) + CO_3^{2-}(aq) \rightarrow ZnCO_3(s)$ | | | Equation must | E1 |

| SEVEN | (a) 115.9   (b) 241.9   (c) 159.8 | 2 correct. (Ignore units of $g\ mol^{-1}$.) | | | A2 |
|---|---|---|---|---|---|
| EIGHT (a) | 180 g glucose produces $6 \times 44.0$ g $CO_2$<br><br>50.0 g glucose produces $66 \times 44 \times \dfrac{50.0}{180}$ g<br><br>= 73.3 g $CO_2$ | Correct relative molecular masses determined for 2 of:<br><br>$C_6H_{12}O_6$ (180),<br>$C_2H_5OH$ (46),<br>$CO_2$ (44). | Evidence of correct use of ratio of relative molecular masses for 2 calculations. | 2 calculations correct. | A2 |
| (b) | 88.0 g $CO_2$ produced with $2 \times 46.0$ g ethanol<br><br>22.0 g $CO_2$ produced with $2 \times 46.0 \times \dfrac{22.0}{88.0}$ g<br><br>= 23.0 g ethanol | | | | M |
| (c) | $2 \times 44.0$ g $CO_2$ produced from 46.0 g ethanol<br><br>13.2 g of $CO_2$ produced from $46.0 \times \dfrac{13.2}{88.0}$ g<br><br>= 6.90 g | | | | E2 |

**Judgement Statement**

Judgement statements (formerly referred to as sufficiency statements) help students understand how their overall results for each standard were arrived at.

| | |
|---|---|
| ACHIEVEMENT | FOUR of the achievement opportunities must be achieved, including at least one A2. |
| | Candidates must show evidence of ability to do a calculation. The ability to balance equations may be used as evidence for calculations. |
| MERIT | Achievement plus TWO of the merit opportunities. |
| EXCELLENCE | Merit plus both excellence opportunities. |