

Chemistry Calculations – Marking Scheme

1.

$(A_r =) \frac{(69 \times 60) + (71 \times 40)}{100}$		1
= 69.8		1

2.

$(3 \times M_r \text{ H}_2\text{O} = 3 \times (2 + 16) =) 54$		1
$(A_r \text{ R} = 150 - 54 =) 96$	ignore units	1
alternative approach: $(M_r \text{ RO}_3 = 150 - 6 =) 144 (1)$		
$(A_r \text{ R} = 144 - (3 \times 16) =) 96 (1)$	ignore units	

Answers	Extra information	Mark
(R =) molybdenum / Mo	allow ecf from question 03.1	1

3.

(total M_r of reactants) = 163		1
(% atom economy =) $\frac{119}{163} (\times 100)$	allow correct use of an incorrectly calculated value of total M_r	1
= 73 (%)	allow 73.00613 (%) correctly rounded to at least 2 significant figures	1

4.

(moles Fe = $\frac{14}{56}$ =) 0.25 (mol)		1
(moles Cl_2 = $\frac{3}{2} \times 0.25$ =) 0.375 (mol)	allow correct use of an incorrectly calculated number of moles of Fe	1
(volume Cl_2 = 24×0.375) = 9.0 (dm^3)	allow correct use of an incorrectly calculated number of moles of Cl_2	1

5.

<p>(concentration = $90 \times 0.0480 =$ 4.32 (g/dm³)</p>		1
<p>(mass = $4.32 \times \frac{250}{1000} =$ 1.08 (g)</p>	<p>allow correct use of an incorrectly calculated value of concentration in g/dm³</p>	1
<p>alternative approach: (moles = $0.0480 \times \frac{250}{1000} =$ 0.012 (mol) (1)</p>		
<p>(mass = $0.012 \times 90 =$ 1.08 (g) (1)</p>	<p>allow correct use of an incorrectly calculated value of number of moles</p>	

$\text{(moles H}_2\text{C}_2\text{O}_4 = \frac{15.0}{1000} \times 0.0480)$ $= 0.00072 \text{ (mol)}$		1
(moles NaOH = $\text{moles H}_2\text{C}_2\text{O}_4 \times 2 =)$ 0.00144 (mol)	allow correct use of an incorrectly calculated value of number of moles of H ₂ C ₂ O ₄	1
$\text{(concentration = } \frac{0.00144}{25.0} \times 1000)$ $= 0.0576 \text{ (mol/dm}^3)$	allow 0.058 (mol/dm ³) allow correct use of an incorrectly calculated value of number of moles of NaOH	1
<p>alternative approach:</p> $\frac{\text{volume} \times \text{conc (acid)}}{\text{volume} \times \text{conc (NaOH)}} = \frac{1}{2} \text{ (1)}$	allow inverse	
(conc NaOH =) $2 \times \frac{15.0 \times 0.0480}{25.0} \text{ (1)}$ $= 0.0576 \text{ (mol/dm}^3) \text{ (1)}$	allow correct use of incorrect mole ratio	

6.

(conversion) $200 \text{ km} = 200,000 \text{ m}$		1
$\text{(moles =) } \frac{200000 \times 1.95 \text{ (mol)}}{1300}$	allow correct use of incorrect / no conversion for distance	1
$= 300 \text{ (mol)}$		1