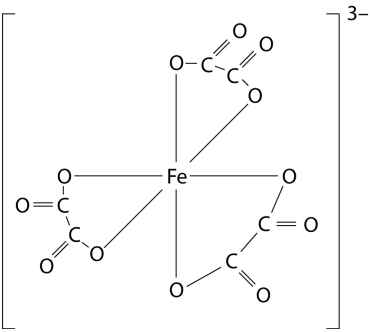


Answers to examination-style questions

Answers	Marks	Examiner's tips
<p>1 a) i) Two atoms each donating a lone pair or electron pair</p> <p>ii)</p> 	5	<p>Accept: forms two co-ordinate bonds. Do not accept: donates two lone pairs, since this could be from the same atom and this is not correct.</p> <p>The marks are given for:</p> <ul style="list-style-type: none"> ■ correct ligand structure ■ six correct O–Fe bonds ■ correct charge
<p>b) Cl⁻ is too large.</p>	1	
<p>c) i) Both ions are negative, so they repel each other.</p> <p>ii) A product of the reaction acts as a catalyst. Mn²⁺</p> <p>iii) Mn²⁺ is oxidised to Mn³⁺, which then reacts with the C₂O₄²⁻</p>	5	<p>The activation energy is therefore high.</p>
<p>2 iron catalyst in a different phase from that of the reactants. Poison is sulfur or a sulfur compound. Poison is adsorbed onto active sites. Poison is not desorbed.</p>	5	<p>Accept: the active sites are blocked.</p> <p>Accept: reactants not adsorbed or catalyst surface area reduced.</p>
<p>3 a) A ligand is a species which can donate a pair of electrons to a metal ion. A co-ordinate bond is a covalent bond in which both electrons are donated by one atom.</p>	3	
<p>b) i) e.g. [Co(H₂O)₆]²⁺ + 4Cl⁻ → [CoCl₄]²⁻ + 6H₂O pink blue</p>	8	<p>One mark is for the two correct complex ions and the other for a balanced equation.</p> <p>One mark is given for each of the colours of the complex ions.</p>

Answers to examination-style questions

Answers	Marks	Examiner's tips
ii) e.g. $[\text{Co}(\text{NH}_3)_6]^{2+} + 3\text{NH}_2\text{CH}_2\text{CH}_2\text{NH}_2$ $\rightarrow [\text{Co}(\text{NH}_2\text{CH}_2\text{CH}_2\text{NH}_2)_3]^{2+} + 6\text{NH}_3$		One mark is for the two correct complex ions and the other for a balanced equation.
More molecules and/or ions formed.		
Increase in entropy because the reaction involves an increase in the number of molecules and ions.		
4 a) A catalyst in the same phase as the reactants	1	
b) i) A reaction in which a product acts as a catalyst	2	Do not accept: self-catalysing. You could also have Mn^{3+} as a catalyst, since it is involved in the reaction and is regenerated.
ii) Mn^{2+}		
c) i) $2\text{CO} + 2\text{NO} \rightarrow 2\text{CO}_2 + \text{N}_2$ The reducing agent is CO.	5	Accept: $4\text{CO} + 2\text{NO}_2 \rightarrow 4\text{CO}_2 + \text{N}_2$
ii) Pt, Pd or Rh Deposited on a ceramic honeycomb or a mesh or sponge, which increases the surface area of the catalyst.		