



**BOARD OF STUDIES**  
NEW SOUTH WALES

## **2011 HSC Chemistry Marking Guidelines**

### **Section I, Part A**

#### **Multiple-choice Answer Key**

<b>Question</b>	<b>Answer</b>
1	A
2	D
3	C
4	D
5	B
6	A
7	B
8	C
9	A
10	C
11	D
12	D
13	C
14	C
15	A
16	B
17	D
18	A
19	B
20	B

**Section I, Part B****Question 21**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>• Demonstrates a thorough knowledge and understanding of the molecular structure and use of ethanol as a solvent</li><li>• Provides an appropriate diagram, eg ethanol hydrogen bonding to water</li><li>• Demonstrates coherence and logical progression and includes correct use of scientific principles and ideas</li></ul>	4
<ul style="list-style-type: none"><li>• Demonstrates a sound knowledge and understanding of the structure and use of ethanol as a solvent</li><li>• Provides correct structure for ethanol</li><li>• Communicates some scientific principles and ideas in a clear manner</li></ul>	3
<ul style="list-style-type: none"><li>• Demonstrates a basic knowledge of the structure and use of ethanol as a solvent</li></ul>	2
<ul style="list-style-type: none"><li>• Demonstrates a limited knowledge of the structure and use of ethanol as a solvent</li></ul> <p>OR</p> <ul style="list-style-type: none"><li>• Provides correct structure for ethanol</li></ul>	1

**Question 22 (a)**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>• Shows full depletion of ozone with correct equations</li></ul>	2
<ul style="list-style-type: none"><li>• Gives ONE correct equation</li></ul>	1

**Question 22 (b)**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>• Sketches in general terms a method used for monitoring ozone</li></ul>	2
<ul style="list-style-type: none"><li>• States a method used</li></ul>	1

**Question 23 (a)**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>• Gives ONE correct reason why an isotope such as copernicium-278 is unstable</li></ul>	1

**Question 23 (b)**

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides features of a method by which transuranic elements can be synthesised</li> </ul>	2
<ul style="list-style-type: none"> <li>Identifies a correct method by which transuranic elements can be synthesised</li> </ul>	1

**Question 24 (a)**

Criteria	Marks
<ul style="list-style-type: none"> <li>Calculates correct <math>E^\ominus</math></li> <li>Provides correctly balanced net ionic equation</li> </ul>	2
<ul style="list-style-type: none"> <li>Calculates correct <math>E^\ominus</math></li> </ul> OR <ul style="list-style-type: none"> <li>Provides correctly balanced net ionic equation</li> </ul>	1

**Question 24 (b) (i)**

Criteria	Marks
<ul style="list-style-type: none"> <li>Correctly calculates final mass of Ni electrode</li> </ul>	3
<ul style="list-style-type: none"> <li>Correctly calculates moles of Cu deposited</li> <li>Calculates mass of Ni lost</li> </ul>	2
<ul style="list-style-type: none"> <li>Correctly calculates moles of Cu deposited</li> </ul>	1

**Question 24 (b) (ii)**

Criteria	Marks
<ul style="list-style-type: none"> <li>Correctly calculates final concentration of Ni solution using moles of Ni lost from b (i)</li> </ul>	2
<ul style="list-style-type: none"> <li>Includes one correct relevant mole calculation</li> </ul>	1

**Question 25**

Criteria	Marks
<ul style="list-style-type: none"> <li>States the role of <math>\text{H}_2\text{PO}_4^-/\text{HPO}_4^{2-}</math> as a buffer system in the cell</li> <li>Provides TWO correct equations</li> </ul>	3
<ul style="list-style-type: none"> <li>States the role of <math>\text{H}_2\text{PO}_4^-/\text{HPO}_4^{2-}</math> as a buffer system in the cell AND provides ONE correct equation</li> </ul> OR <ul style="list-style-type: none"> <li>Provides TWO correct equations</li> </ul>	2
<ul style="list-style-type: none"> <li>States the role of <math>\text{H}_2\text{PO}_4^-/\text{HPO}_4^{2-}</math> as a buffer system in the cell</li> </ul> OR <ul style="list-style-type: none"> <li>Provides ONE correct equation</li> </ul>	1

**Question 26 (a)**

Criteria	Marks
<ul style="list-style-type: none"><li>Provides a valid reason</li><li>Correctly calculates both NaOH concentrations</li></ul> OR <ul style="list-style-type: none"><li>Indicates actual value is less than theoretical value</li></ul>	2
<ul style="list-style-type: none"><li>Provides a valid reason</li></ul> OR <ul style="list-style-type: none"><li>Correctly calculates TWO NaOH concentrations</li></ul>	1

**Question 26 (b)**

Criteria	Marks
<ul style="list-style-type: none"><li>Correctly calculates concentration of original solution of citric acid</li></ul>	4
<ul style="list-style-type: none"><li>Calculates concentration of original solution of citric acid using incorrect NaOH concentration or incorrect mole ratio or incorrect volume of HCl</li></ul> OR <ul style="list-style-type: none"><li>Correctly calculates concentration of diluted solution of citric acid</li></ul>	3
<ul style="list-style-type: none"><li>Calculates concentration of citric acid solution with TWO errors</li></ul>	2
<ul style="list-style-type: none"><li>Provides ONE correct step in the calculation</li></ul>	1

**Question 27**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>• Demonstrates a thorough knowledge and understanding of the uses of BOTH polymers in terms of their properties</li><li>• Refers to polystyrene AND a named biopolymer</li><li>• Makes a judgement of the extract based on criteria</li><li>• Demonstrates coherence and logical progression and includes correct use of scientific principles and ideas</li></ul>	5
<ul style="list-style-type: none"><li>• Demonstrates a sound knowledge and understanding of the uses of BOTH polymers in terms of their properties</li><li>• Refers to polystyrene AND a named biopolymer</li><li>• Makes a judgement of the extract based on criteria</li><li>• Communicates scientific principles and ideas in a clear manner</li></ul>	4
<ul style="list-style-type: none"><li>• Demonstrates basic knowledge and understanding of the use of BOTH polymers in terms of their properties</li><li>• Refers to polystyrene AND a named biopolymer</li><li>• Communicates some scientific principles and ideas in a clear manner</li></ul>	3
<ul style="list-style-type: none"><li>• Demonstrates limited knowledge and understanding of the use of polymers in terms of their properties</li><li>• Refers to polystyrene only or a named biopolymer</li><li>• Communicates ideas in a basic form using general scientific terms</li></ul>	2
<ul style="list-style-type: none"><li>• Demonstrates some knowledge and understanding of the uses of polymers or their properties</li><li>• Communicates simple ideas</li></ul>	1

**Question 28**

Criteria	Marks
<ul style="list-style-type: none"> <li>• Demonstrates a thorough knowledge and understanding of TWO tests</li> <li>• Provides the main features of the chemical or physical principle of EACH test</li> <li>• Provides the main features of the procedure used for EACH test</li> </ul>	4
<ul style="list-style-type: none"> <li>• Demonstrates a sound knowledge and understanding of TWO tests</li> <li>• Outlines the chemical or physical principle of EACH test AND the procedure used for ONE test</li> </ul> OR <ul style="list-style-type: none"> <li>• Outlines the procedure used for EACH test AND the chemical or physical principle of ONE test</li> </ul>	3
<ul style="list-style-type: none"> <li>• Demonstrates a basic knowledge and understanding of at least ONE test</li> <li>• Outlines the principle of EACH test</li> </ul> OR <ul style="list-style-type: none"> <li>• Outlines the procedure used for EACH test</li> </ul> OR <ul style="list-style-type: none"> <li>• Outlines the principle AND procedure used for ONE test only</li> </ul>	2
<ul style="list-style-type: none"> <li>• Demonstrates a limited knowledge and understanding of ONE test</li> <li>• Outlines the principle of ONE test</li> </ul> OR <ul style="list-style-type: none"> <li>• Outlines the procedure of ONE test</li> </ul>	1

**Question 29 (a)**

Criteria	Marks
<ul style="list-style-type: none"> <li>• Demonstrates thorough knowledge and understanding of the Arrhenius AND Brönsted–Lowry definitions of acids and bases</li> <li>• Supports the statement with evidence</li> </ul>	3
<ul style="list-style-type: none"> <li>• Demonstrates a sound knowledge and understanding of the Arrhenius AND Brönsted–Lowry definitions</li> </ul> OR <ul style="list-style-type: none"> <li>• Demonstrates a sound knowledge and understanding of EITHER the Brönsted–Lowry OR the Arrhenius definition</li> <li>• Supports the statement with evidence</li> </ul> OR <ul style="list-style-type: none"> <li>• Demonstrates a basic knowledge and understanding of the Arrhenius AND Brönsted–Lowry definitions</li> <li>• Supports the statement with evidence</li> </ul>	2
<ul style="list-style-type: none"> <li>• Demonstrates a sound knowledge and understanding of EITHER the Arrhenius OR the Brönsted–Lowry definition</li> </ul> OR <ul style="list-style-type: none"> <li>• Provides a justification</li> </ul>	1

**Question 29 (b)**

Criteria	Marks
<ul style="list-style-type: none"><li>Provides a reason why the heat of reaction is approximately <math>-57 \text{ kJ mol}^{-1}</math> for neutralisation reactions of strong acids and strong bases</li></ul>	1

**Question 30**

Criteria	Marks
<ul style="list-style-type: none"><li>Demonstrates a thorough knowledge and understanding of equilibrium and Le Chateliers principle with reference to the THREE reactions</li><li>Relates the conditions required to the increased yield and production rate</li><li>Demonstrates coherence and logical progression and includes correct use of scientific principles and ideas</li></ul>	6
<ul style="list-style-type: none"><li>Demonstrates a sound knowledge and understanding of equilibrium and Le Chateliers principle with reference to the THREE reactions</li><li>Communicates some scientific principles and ideas in a clear manner</li></ul>	4–5
<ul style="list-style-type: none"><li>Demonstrates a basic knowledge and understanding of equilibrium and Le Chateliers principle with reference to flow chart</li><li>Communicates ideas in a basic form using general scientific language</li></ul>	2–3
<ul style="list-style-type: none"><li>Demonstrates a limited knowledge and understanding of equilibrium and Le Chateliers principle</li><li>Communicates simple ideas</li></ul>	1

**Question 31**

Criteria	Marks
<ul style="list-style-type: none"> <li>• Demonstrates a thorough knowledge and understanding of potential sources of contamination of waterways</li> <li>• Provides evidence of a thorough analysis of the data</li> <li>• Provides reasons for TWO possible sources of contamination</li> <li>• Demonstrates coherence and logical progression and includes correct use of scientific principles and ideas</li> </ul>	4
<ul style="list-style-type: none"> <li>• Demonstrates a sound knowledge and understanding of potential sources of contamination of waterways</li> <li>• Refers to data</li> <li>• Provides reasons for TWO possible sources of contamination</li> <li>• Communicates some scientific principles and ideas in a clear manner</li> </ul>	3
<ul style="list-style-type: none"> <li>• Demonstrates a basic knowledge and understanding of potential sources of contamination of waterways</li> <li>• Refers to data</li> <li>• Provides reasons for ONE possible source of contamination OR states TWO possible sources of contamination</li> <li>• Communicates ideas in a basic form using general scientific terms</li> </ul>	2
<ul style="list-style-type: none"> <li>• Demonstrates a limited knowledge of the potential sources of contamination of waterways</li> <li>• Communicates simple ideas</li> <li>• States at least ONE source of contamination</li> </ul>	1

**Question 32 (a)**

Criteria	Marks
<ul style="list-style-type: none"> <li>• Provides correct reason</li> </ul>	1

**Question 32 (b)**

Criteria	Marks
<ul style="list-style-type: none"> <li>• Determines correct soil pH resulting in identification of suitable plant</li> </ul>	2
<ul style="list-style-type: none"> <li>• Identifies correct plant</li> </ul> OR <ul style="list-style-type: none"> <li>• Determines correct soil pH</li> </ul>	1

**Question 32 (c)**

Criteria	Marks
<ul style="list-style-type: none"> <li>• Sketches in general terms a method using several solutions of known pH</li> </ul>	2
<ul style="list-style-type: none"> <li>• Sketches in general terms a method</li> </ul> OR <ul style="list-style-type: none"> <li>• Provides some solutions to be tested</li> </ul>	1



## Section II

### Question 33 (a)

Criteria	Marks
<ul style="list-style-type: none"><li>Relates cause and effect of the colour change</li><li>Provides a relevant chemical equation</li></ul>	3
<ul style="list-style-type: none"><li>Outlines relevant features of the chemical process involved</li></ul>	2
<ul style="list-style-type: none"><li>Provides a relevant feature of the process involved</li></ul>	1

### Question 33 (b) (i)

Criteria	Marks
<ul style="list-style-type: none"><li>Provides chemical equations showing production and usage of <math>\text{CO}_2(g)</math> in the Solvay process</li><li>States a reason to support statement</li></ul>	3
<ul style="list-style-type: none"><li>Provides a chemical equation demonstrating either production or usage of <math>\text{CO}_2(g)</math> in the Solvay process</li><li>States a reason to support statement</li></ul>	2
<ul style="list-style-type: none"><li>Provides a chemical equation demonstrating production or usage of <math>\text{CO}_2(g)</math> in the Solvay process</li></ul> <p>OR</p> <ul style="list-style-type: none"><li>States a reason to support statement</li></ul>	1

### Question 33 (b) (ii)

Criteria	Marks
<ul style="list-style-type: none"><li>Calculates correct mass of <math>\text{CaCl}_2</math></li></ul>	2
<ul style="list-style-type: none"><li>Uses correct molar ratio</li><li>Uses correct moles NaCl</li></ul> <p>OR</p> <ul style="list-style-type: none"><li>Uses correct method with incorrect molar ratio</li></ul>	1

**Question 33 (c) (i)**

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides reasons for ALL observations</li> <li>Provides BOTH fully balanced chemical half equations</li> </ul>	3
<ul style="list-style-type: none"> <li>Provides reasons for SOME observations</li> <li>Provides BOTH fully balanced chemical half equations</li> </ul> OR <ul style="list-style-type: none"> <li>Provides reasons for ALL observations</li> <li>Provides ONE fully balanced chemical half equation</li> </ul>	2
<ul style="list-style-type: none"> <li>Provides reasons for SOME observations</li> </ul> OR <ul style="list-style-type: none"> <li>Provides ONE fully balanced chemical equation</li> </ul>	1

**Question 33 (c) (ii)**

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides reasons for TWO specific energy conversions and their requirements</li> </ul>	2
<ul style="list-style-type: none"> <li>Provides a general statement regarding energy requirements</li> </ul>	1

**Question 33 (d) (i)**

Criteria	Marks
<ul style="list-style-type: none"> <li>Indicates the main features of a physical model that demonstrates equilibrium</li> </ul>	2
<ul style="list-style-type: none"> <li>States a feature of or sketch of a physical procedure that models equilibrium</li> </ul>	1

**Question 33 (d) (ii)**

Criteria	Marks
<ul style="list-style-type: none"> <li>Gives a value judgement based upon the information collected providing factors that promote validity</li> <li>Indicates the limitations of the model that compromise validity</li> </ul>	3
<ul style="list-style-type: none"> <li>Discusses factors that promote validity of the information collected</li> <li>Gives a value judgement</li> </ul>	2
<ul style="list-style-type: none"> <li>Identifies a limitation that relates to the model that compromises its validity</li> </ul> OR <ul style="list-style-type: none"> <li>Provides a factor that relates to the model that promotes validity</li> </ul>	1

**Question 33 (e)**

Criteria	Marks
<ul style="list-style-type: none"> <li>• Demonstrates thorough knowledge and understanding of the environmental issues of THREE industrial processes studied</li> <li>• Provides a judgement about these issues in terms of the overall impact on society</li> <li>• Uses correct and relevant chemistry</li> <li>• Demonstrates coherence and logical progression and includes correct use of scientific principles and ideas</li> </ul>	6–7
<ul style="list-style-type: none"> <li>• Demonstrates sound knowledge and understanding of the environmental issues of THREE industrial processes studied</li> <li>• Outlines the overall impact that these issues have had on society</li> <li>• Uses some correct and relevant chemistry</li> <li>• Communicates some scientific principles and ideas in a clear manner</li> </ul>	4–5
<ul style="list-style-type: none"> <li>• Demonstrates a basic understanding of the environmental issues of the industrial processes studied</li> <li>• Identifies some impacts these issues have had on society</li> <li>• Communicates ideas in a basic form using general scientific terms</li> </ul>	2–3
<ul style="list-style-type: none"> <li>• Demonstrates a limited knowledge and understanding of the environmental issues of the industrial processes studied</li> <li>• Communicates simple ideas</li> </ul>	1

**Question 34 (a)**

Criteria	Marks
<ul style="list-style-type: none"> <li>• Identifies a suitable material for X</li> <li>• States that the sacrificial anode, X, is preferentially oxidised</li> <li>• Relates this to the relevant reduction potentials for X and iron or relative activity</li> </ul>	3
<ul style="list-style-type: none"> <li>• Identifies that corrosion is prevented by preferential oxidation of the named sacrificial anode</li> </ul> OR <ul style="list-style-type: none"> <li>• States relevant reduction potentials for an appropriate X, and iron or relative activity</li> </ul>	2
<ul style="list-style-type: none"> <li>• States that X acts as a sacrificial anode</li> </ul> OR <ul style="list-style-type: none"> <li>• Identifies a suitable material for X</li> </ul> OR <ul style="list-style-type: none"> <li>• States that X is oxidised</li> </ul>	1

**Question 34 (b) (i)**

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides an overall balanced equation for the relevant cell</li> <li>Clearly identifies the structure of this galvanic cell including electrolyte</li> </ul>	4
<ul style="list-style-type: none"> <li>Provides correct half equations for this cell</li> <li>States that aluminium is the more reactive metal</li> <li>States that a galvanic cell is formed</li> </ul>	3
<ul style="list-style-type: none"> <li>TWO of the following:               <ul style="list-style-type: none"> <li>States that aluminium is more reactive than silver</li> <li>States that aluminium is oxidised</li> <li>States that a galvanic cell is formed</li> </ul> </li> </ul>	2
<ul style="list-style-type: none"> <li>States that aluminium is more reactive than silver</li> </ul> OR <ul style="list-style-type: none"> <li>States that aluminium is oxidised</li> </ul> OR <ul style="list-style-type: none"> <li>States that a galvanic cell is formed</li> </ul>	1

**Question 34 (b) (ii)**

Criteria	Marks
<ul style="list-style-type: none"> <li>States that the electrochemical method is restorative, and hence preferable</li> </ul>	1

**Question 34 (c) (i)**

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides a detailed diagram of the cell</li> </ul>	3
<ul style="list-style-type: none"> <li>Provides a basic diagram of the cell</li> </ul>	2
<ul style="list-style-type: none"> <li>Provides a limited diagram of the cell</li> </ul>	1

**Question 34 (c) (ii)**

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides balanced equations at correct electrodes</li> </ul>	2
<ul style="list-style-type: none"> <li>Provides ONE balanced equation at correct electrode</li> </ul> OR <ul style="list-style-type: none"> <li>Provides TWO balanced equations but incorrect electrodes</li> </ul>	1

**Question 34 (d) (i)**

Criteria	Marks
<ul style="list-style-type: none"><li>Provides features of an appropriate method</li><li>Provides a reason for the treatment</li></ul>	2
<ul style="list-style-type: none"><li>Provides features of an appropriate method</li></ul> OR <ul style="list-style-type: none"><li>Provides a reason for the treatment</li></ul>	1

**Question 34 (d) (ii)**

Criteria	Marks
<ul style="list-style-type: none"><li>Provides a value judgement on the validity of the data collected with examples of limitations and positive attributes of the experimental design</li></ul>	3
<ul style="list-style-type: none"><li>Discusses the limitations and positive attributes of experimental design</li></ul> OR <ul style="list-style-type: none"><li>Discusses limitations or attributes of experimental design and gives a judgement</li></ul>	2
<ul style="list-style-type: none"><li>Gives value judgement in terms of validity of the data collected</li></ul> OR <ul style="list-style-type: none"><li>Identifies a limitation of the investigation's design</li></ul> OR <ul style="list-style-type: none"><li>Identifies an attribute</li></ul> OR <ul style="list-style-type: none"><li>Identifies a controlled variable</li></ul> OR <ul style="list-style-type: none"><li>Relates validity to control of variables</li></ul>	1

**Question 34 (e)**

Criteria	Marks
<ul style="list-style-type: none"> <li>• Demonstrates thorough knowledge and understanding of the significance of the conditions prevailing at great depths in terms of corrosion of shipwrecks</li> <li>• Makes value judgement based on criteria (or evidence)</li> <li>• Uses correct and relevant chemistry with correct equations</li> <li>• Demonstrates coherence and logical progression and includes correct use of scientific principles and ideas</li> </ul>	6–7
<ul style="list-style-type: none"> <li>• Demonstrates sound knowledge and understanding of the significance of the conditions prevailing at great depths in terms of corrosion of shipwrecks</li> <li>• Writes a relevant and correct equation</li> <li>• Communicates some scientific principles and ideas clearly</li> </ul>	4–5
<ul style="list-style-type: none"> <li>• Demonstrates a basic knowledge of the significance of the conditions prevailing at great depths and their effect on corrosion of shipwrecks</li> <li>• Communicates ideas in a basic form using general scientific terms</li> </ul>	2–3
<ul style="list-style-type: none"> <li>• Demonstrates a limited knowledge of conditions at great depths and their effect on corrosion of a shipwreck</li> <li>• Communicates simple ideas</li> </ul>	1

**Question 35 (a)**

Criteria	Marks
<ul style="list-style-type: none"> <li>• Correctly identifies process X</li> <li>• Shows the difference in oxygen requirements by identifying glycolysis as anaerobic and the chemical processes in the mitochondria as aerobic</li> </ul>	3
<ul style="list-style-type: none"> <li>• Correctly identifies process X</li> <li>• Identifies glycolysis as anaerobic</li> </ul> OR <ul style="list-style-type: none"> <li>• Correctly identifies process X</li> <li>• Identifies the chemical processes in the mitochondria as aerobic</li> </ul> OR <ul style="list-style-type: none"> <li>• Shows the difference in oxygen requirements by identifying glycolysis as anaerobic and the chemical processes in the mitochondria</li> </ul>	2
<ul style="list-style-type: none"> <li>• Correctly identifies process X</li> </ul> OR <ul style="list-style-type: none"> <li>• Identifies glycolysis as anaerobic</li> </ul> OR <ul style="list-style-type: none"> <li>• Identifies the chemical processes in the mitochondria as aerobic</li> </ul>	1

**Question 35 (b) (i)**

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides correctly balanced equation</li> </ul>	2
<ul style="list-style-type: none"> <li>Provides the general formula of an amino acid</li> </ul>	1

**Question 35 (b) (ii)**

Criteria	Marks
<ul style="list-style-type: none"> <li>Clearly explains how changes in pH and increases in temperature will affect the molecular structure of a protein</li> <li>Refers to secondary and tertiary structure</li> </ul>	3
<ul style="list-style-type: none"> <li>States how changes in pH will affect the molecular structure of a protein</li> <li>States how increases in temperature will affect the molecular structure of a protein</li> </ul>	2
<ul style="list-style-type: none"> <li>States how changes in pH will affect the molecular structure of a protein</li> </ul> OR <ul style="list-style-type: none"> <li>States how increases in temperature will affect the molecular structure of a protein</li> </ul>	1

**Question 35 (c) (i)**

Criteria	Marks
<ul style="list-style-type: none"> <li>Demonstrates a thorough knowledge and understanding of Types 1 and 2 muscle cells</li> <li>Provides reasons for the different usage of muscle cell types</li> <li>Refers to EACH activity</li> <li>Demonstrates coherence and logical progression and includes correct use of scientific principles and ideas</li> </ul>	3
<ul style="list-style-type: none"> <li>Demonstrates a sound knowledge and understanding of Types 1 and 2 muscle cells</li> <li>Refers to at least TWO activities</li> <li>Communicates some scientific principles and ideas in a clear manner</li> </ul>	2
<ul style="list-style-type: none"> <li>Demonstrates a basic knowledge and understanding of Types 1 and 2 muscle cells</li> <li>Refers to at least ONE activity</li> <li>Communicates ideas in a basic form using general scientific terms</li> </ul>	1

**Question 35 (c) (ii)**

Criteria	Marks
<ul style="list-style-type: none"> <li>Demonstrates a thorough knowledge of the chemistry involved by using a relevant chemical equation showing the production of ATP including consideration of energy</li> </ul>	2
<ul style="list-style-type: none"> <li>Demonstrates a knowledge of some of the chemistry involved by using a relevant chemical equation showing the production of ATP without the addition of energy</li> </ul> OR <ul style="list-style-type: none"> <li>Demonstrates a knowledge of some of the chemistry involved by using a chemical equation to show the formation of ADP (Energy ATP → ADP + Pi)</li> </ul>	1

**Question 35 (d) (i)**

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides reasons for the fact that there is an optimal temperature for enzyme function</li> </ul>	2
<ul style="list-style-type: none"> <li>Provides only a simple reason for an optimal temperature</li> </ul> OR <ul style="list-style-type: none"> <li>Gives a basic description of the effect of temperature on enzyme function</li> </ul>	1

**Question 35 (d) (ii)**

Criteria	Marks
<ul style="list-style-type: none"> <li>Gives a value judgement on the validity of the data collected with examples of limitations and positive attributes of the experimental design</li> </ul>	3
<ul style="list-style-type: none"> <li>Discusses the interpretation of the independent variable in this investigation</li> </ul> OR <ul style="list-style-type: none"> <li>Discusses the control of variables in this investigation</li> </ul> OR <ul style="list-style-type: none"> <li>Analyses the way results are collected in this investigation</li> </ul>	2
<ul style="list-style-type: none"> <li>Gives a value judgement in terms of the validity of the investigation</li> </ul> OR <ul style="list-style-type: none"> <li>Identifies a limitation of the investigation's validity</li> </ul> OR <ul style="list-style-type: none"> <li>Relates validity to control of variables</li> </ul> OR <ul style="list-style-type: none"> <li>Identifies a controlled variable</li> </ul>	1



**Question 35 (e)**

Criteria	Marks
<ul style="list-style-type: none"> <li>• Demonstrates a thorough knowledge and understanding of the energy availability of fats and carbohydrates</li> <li>• Explains how this knowledge has improved society's understanding of nutrition</li> <li>• Refers to metabolic pathways</li> <li>• Demonstrates coherence and logical progression and includes correct use of scientific principles and ideas</li> </ul>	7
<ul style="list-style-type: none"> <li>• Demonstrates a sound knowledge and understanding of the energy availability of fats and carbohydrates</li> <li>• Describes how this knowledge has improved society's understanding of nutrition</li> <li>• Refers to at least ONE metabolic pathway</li> <li>• Communicates some scientific principles and ideas in a clear manner</li> </ul>	5–6
<ul style="list-style-type: none"> <li>• Demonstrates a basic knowledge and understanding of the energy availability of fats and carbohydrates</li> </ul> OR <ul style="list-style-type: none"> <li>• Describes how this knowledge has improved society's understanding of nutrition</li> <li>• Refers to at least ONE metabolic pathway</li> <li>• Communicates ideas in a basic form using general scientific terms</li> </ul>	3–4
<ul style="list-style-type: none"> <li>• Demonstrates a limited knowledge and understanding of the energy availability of fats and carbohydrates</li> <li>• Communicates simple ideas</li> </ul>	1–2

**Question 36 (a)**

Criteria	Marks
<ul style="list-style-type: none"> <li>• Provides detailed reasons for the difference in colour</li> </ul>	3
<ul style="list-style-type: none"> <li>• Provides reasons for the difference in colour</li> </ul>	2
<ul style="list-style-type: none"> <li>• Provides a reason for the difference in colour</li> </ul>	1

**Question 36 (b) (i)**

Criteria	Marks
<ul style="list-style-type: none"> <li>• Provides one correct cation and one correct anion</li> </ul>	2
<ul style="list-style-type: none"> <li>• Provides one correct cation or anion</li> </ul>	1

**Question 36 (b) (ii)**

Criteria	Marks
<ul style="list-style-type: none"><li>Identifies THREE key points of electron configuration, orbital energy and multiple electron loss in transition elements</li><li>Clearly shows the relationship between the properties of Groups I and II metals and the transition metals</li></ul>	3
<ul style="list-style-type: none"><li>Identifies TWO key points of electron configuration, orbital energy and multiple electron loss in transition elements</li></ul>	2
<ul style="list-style-type: none"><li>Identifies ONE of the key points of electron configuration, orbital energy and multiple electron loss in transition elements</li></ul>	1

**Question 36 (c) (i)**

Criteria	Marks
<ul style="list-style-type: none"><li>Provides features of the method to obtain values in the table</li></ul>	2
<ul style="list-style-type: none"><li>Includes one of: sample emission or measurement of emitted radiation</li></ul>	1

**Question 36 (c) (ii)**

Criteria	Marks
<ul style="list-style-type: none"><li>Provides a diagram showing FOUR transition arrows, all with the same final energy level, with arrow heads showing downward direction and labelled with correct wavelengths with appropriate spacing</li></ul>	3
<ul style="list-style-type: none"><li>Provides a diagram showing THREE correct features such as arrow directions, common final energy level, correct labelling for at least TWO transitions</li></ul>	2
<ul style="list-style-type: none"><li>Provides a diagram showing TWO correct features such as arrow directions, common final energy level, correct labelling for at least ONE transition</li></ul>	1

**Question 36 (d) (i)**

Criteria	Marks
<ul style="list-style-type: none"><li>Provides features of the experiment</li></ul>	2
<ul style="list-style-type: none"><li>Provides a limited feature of the experiment</li></ul>	1

**Question 36 (d) (ii)**

Criteria	Marks
<ul style="list-style-type: none"><li>• Gives a value judgement on the validity of the data collected with examples of limitations and positive attributes of the experimental design</li></ul>	3
<ul style="list-style-type: none"><li>• Discusses limitations and positive attributes of experimental design</li></ul> OR <ul style="list-style-type: none"><li>• Discusses limitations or attributes of experimental design and gives a judgement of the validity of the data</li></ul>	2
<ul style="list-style-type: none"><li>• Gives a value judgement in terms of the validity of the investigation</li></ul> OR <ul style="list-style-type: none"><li>• Identifies a limitation or a positive attribute of the investigation's validity</li></ul> OR <ul style="list-style-type: none"><li>• Identifies a controlled variable</li></ul>	1

**Question 36 (e)**

Criteria	Marks
<ul style="list-style-type: none"><li>• Demonstrates a thorough knowledge and understanding of the techniques and the composition of pigments, AND relates this to spectroscopic techniques</li><li>• Demonstrates coherence and logical progression and includes correct use of scientific principles and ideas</li></ul>	7
<ul style="list-style-type: none"><li>• Demonstrates a sound knowledge and understanding of the techniques and the composition of pigments AND relates this to spectroscopic techniques</li><li>• Communicates some scientific principles and ideas clearly</li></ul>	5–6
<ul style="list-style-type: none"><li>• Demonstrates a basic knowledge and understanding of the techniques OR the composition of pigments</li><li>• Communicates ideas in a basic form using general scientific terms</li></ul>	3–4
<ul style="list-style-type: none"><li>• Demonstrates a limited knowledge of the technique OR pigments</li><li>• Communicates simple ideas</li></ul>	1–2

**Question 37 (a)**

Criteria	Marks
<ul style="list-style-type: none"> <li>Correctly names the structure</li> <li>Identifies the free carbonyl group</li> <li>States that it can be oxidised/reducing sugar</li> </ul>	3
<ul style="list-style-type: none"> <li>Correctly names the structure</li> <li>Identifies the free carbonyl group</li> </ul> OR <ul style="list-style-type: none"> <li>States that it can be oxidised/reducing sugar</li> </ul>	2
<ul style="list-style-type: none"> <li>Names the structure as a sugar</li> </ul> OR <ul style="list-style-type: none"> <li>Identifies the free carbonyl group</li> </ul>	1

**Question 37 (b) (i)**

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides correctly balanced equation</li> </ul>	2
<ul style="list-style-type: none"> <li>Provides formula for amino acid</li> </ul>	1

**Question 37 (b) (ii)**

Criteria	Marks
<ul style="list-style-type: none"> <li>Shows clearly how the principles of paper chromatography can separate to amino acids</li> </ul>	3
<ul style="list-style-type: none"> <li>Describes the principles of paper chromatography with reference to amino acids</li> </ul>	2
<ul style="list-style-type: none"> <li>Demonstrates a basic knowledge of the principles of paper chromatography</li> </ul>	1

**Question 37 (c) (i)**

Criteria	Marks
<ul style="list-style-type: none"> <li>Demonstrates a thorough knowledge of the principle of the analysis of DNA</li> <li>States how it is used in the identification of relationships</li> </ul>	4
<ul style="list-style-type: none"> <li>Demonstrates a sound knowledge of the principle of the analysis of DNA</li> <li>States how it is used in the identification of relationships</li> </ul>	3
<ul style="list-style-type: none"> <li>Demonstrates a basic knowledge of the principle of the analysis of DNA and how it can be used to identify relationships</li> </ul>	2
<ul style="list-style-type: none"> <li>Demonstrates a limited knowledge of the principle of the analysis of DNA</li> </ul> OR <ul style="list-style-type: none"> <li>States how it can be used to identify relationships</li> </ul>	1

**Question 37 (c) (ii)**

Criteria	Marks
• Correctly identifies the DNA of the child	1

**Question 37 (d) (i)**

Criteria	Marks
<ul style="list-style-type: none"><li>• Demonstrates a thorough knowledge of the principles of identification of all FOUR unknown compounds</li><li>• Relates the tests to the properties of the compounds</li><li>• Demonstrates coherence and logical progression of ideas</li></ul>	4
<ul style="list-style-type: none"><li>• Demonstrates a sound knowledge of the principles of identification of THREE unknown compounds</li><li>• Communicates ideas in a clear manner</li></ul>	3
<ul style="list-style-type: none"><li>• Demonstrates a basic knowledge of the principles of identification of the unknown compounds</li><li>• Communicates ideas in a basic form</li></ul>	2
<ul style="list-style-type: none"><li>• Demonstrates a limited knowledge of the principles of identification of the unknown compounds</li><li>• Communicates simple ideas</li></ul>	1

**Question 37 (d) (ii)**

Criteria	Marks
• Correctly identifies both tests	1

**Question 37 (e)**

Criteria	Marks
<ul style="list-style-type: none"><li>• Demonstrates a thorough knowledge and understanding of THREE instrumental techniques and their optimal use in forensic analysis</li><li>• Makes a value judgement for each instrument</li><li>• Demonstrates coherence and logical progression and includes correct use of scientific principles and ideas</li></ul>	6–7
<ul style="list-style-type: none"><li>• Demonstrates a sound knowledge and understanding of THREE instrumental techniques and their optimal use in forensic analysis</li><li>• Communicates some scientific principles and ideas in a clear manner</li></ul>	4–5
<ul style="list-style-type: none"><li>• Demonstrates a basic knowledge and understanding of the instrumental techniques and their use in forensic analysis</li><li>• Communicates in a basic form using general scientific terms</li></ul>	2–3
<ul style="list-style-type: none"><li>• Demonstrates a limited knowledge and understanding of the instrumental techniques and their use</li><li>• Communicates simple ideas</li></ul>	1

# Chemistry

## 2011 HSC Examination Mapping Grid

### Section I Part A

Question	Marks	Content	Syllabus outcomes
1	1	9.2.3.2.2, 9.2.3.3.1	H9
2	1	9.2.3.2.5/6, 9.2.3.3.4/5	H9
3	1	9.3.1.2.1, 9.3.1.3.3	H8
4	1	9.4.4.2.8, 9.4.4.3.1	H8, H9
5	1	9.4.5.2.3, 9.4.5.3.3	H8
6	1	9.2.3.2.9, 9.3.5.2.3	H9
7	1	9.2.5.2.1	H6
8	1	9.3.5.2.2	H9
9	1	9.4.4.2.6	H6
10	1	9.4.3.2.1, 9.4.3.3.1	H8, H14
11	1	9.2.1.2.3, 9.2.1.3.2, 9.4.4.2.9	H9, H10
12	1	9.2.4.2.2, 9.2.4.3.4	H7, H8, H14
13	1	9.3.2.2.4, 9.3.2.2.5	H8, H14
14	1	9.4.4.2.9	H13
15	1	9.3.3.2.4, 9.3.3.3.4, 9.3.4.3.3	H8, H10, H14
16	1	9.3.3.2.3, 9.3.4.2.4, 9.3.4.3.2	H8, H14
17	1	9.2.3.2.7/9	H9, H12, H13
18	1	9.3.4.3.3	H8, H10, H12
19	1	9.3.2.2.9, 9.3.2.3.1	H12
20	1	9.4.1.2.3	H9, H10, H12

### Section I Part B

Question	Marks	Content	Syllabus outcomes
21	4	9.2.3.2.3, 9.2.3.2.9	H9, H13, H14
22 (a)	2	9.4.4.3.1	H6, H9, H13
22 (b)	2	9.4.4.2.11	H6, H11
23 (a)	1	9.2.5.2.1, 9.2.5.2.2	H6, H14
23 (b)	2	9.2.5.2.2	H6, H12
24 (a)	2	9.2.4.3.4, 9.2.4.2.4	H7, H12, H13
24 (b) (i)	3	9.2.4.2.1, 9.2.4.2.4	H10, H12, H14
24 (b) (ii)	2	9.2.4.2.1, 9.2.4.2.4	H10, H12, H14
25	3	9.3.4.2.3/5/6/9	H8, H10, H13
26 (a)	2	9.3.4.3.3, 9.3.4.2.8	H7, H10, H12, H14
26 (b)	4	9.3.4.3.3, 9.3.4.2.8	H10, H12, H14
27	5	9.2.2.3.1, 9.2.1.2.8	H1, H4, H9, H12, H14
28	4	9.4.5.2.1, 9.4.5.3.1/2, 9.4.3.3.1	H8, H11, H14

29 (a)	3	9.3.4.2.1, 9.3.4.2.2	H2, H8, H14
29 (b)	1	9.3.4.2.7	H7, H14
30	6	9.3.2.2.4, 9.4.2.2.5/6/7/8	H7, H8, H10, H14
31	4	9.4.5.2.1/2, 9.4.5.3.3	H14
32 (a)	1	9.3.1.2.3, 9.4.3.3.3, 9.4.3.3.1	H6, H14
32 (b)	2	9.3.1.2.2/3	H4, H14
32 (c)	2	9.3.1.2.2, 9.3.1.3.1	H8, H14

**Section II**
**Question 33 — Industrial Chemistry**

Question	Marks	Content	Syllabus outcomes
(a)	3	9.5.3.2.6	H7, H8, H13
(b) (i)	3	9.5.6.2.3, 9.5.6.2.4	H4, H8, H13, H14
(b) (ii)	2	9.5.6.2.3, 9.5.6.3.2	H8, H10, H14
(c) (i)	3	9.5.4.3.2	H7, H12, H13, H14
(c) (ii)	2	9.5.4.2.1	H7, H14
(d) (i)	2	9.5.2.3.1	H2, H11
(d) (ii)	3	9.5.2.3.1	H2, H11, H14
(e)	7	9.5.3.2.2, 9.5.4.2.3, 9.5.5.3.5, 9.5.6.2.4	H4, H8, H13, H14

**Section II**
**Question 34 — Shipwrecks, Corrosion and Conservation**

Question	Marks	Content	Syllabus outcomes
(a)	3	9.6.4.2.2, 9.6.4.3.4	H3, H6, H14
(b) (i)	4	9.6.4.2.2, 9.6.4.2.4, 9.6.7.2.5	H7, H8, H13, H14
(b) (ii)	1	9.6.7.2.5	H4, H8, H14
(c) (i)	3	9.6.3.2.2	H7, H12, H13, H14
(c) (ii)	2	9.6.3.2.1	H7, H12, H13, H14
(d) (i)	2	9.6.4.3.2	H8, H11
(d) (ii)	3	9.6.4.3.2	H8, H11, H14
(e)	7	9.6.5.2.1, 9.6.5.2.2, 9.6.5.2.4, 9.6.5.3.2, 9.6.6.1, 9.6.6.2, 9.6.6.2.3	H1, H2, H8, H13, H14

**Section II**
**Question 35 — The Biochemistry of movement**

Question	Marks	Content	Syllabus outcomes
(a)	3	9.7.1.2.5, 9.7.8.2.1/5	H7, H9, H12, H14
(b) (i)	2	9.7.4.2.1, 9.7.4.2.2, 9.7.4.3.2.3, 9.7.4.3.1	H8, H9, H10, H13
(b) (ii)	3	9.7.4.2.6, 9.7.4.3.2, 9.7.4.2.5	H8, H14
(c) (i)	3	9.7.8.1, 9.7.8.2.5, 9.7.8.3.1, 9.7.10.2.1	H7, H8, H12, H14
(c) (ii)	2	9.7.9.2.3	H8, H7, H9, H13
(d) (i)	2	9.7.4.3.2	H8, H9, H11
(d) (ii)	3	9.7.4.3.2	H11, H14
(e)	7	9.7.2.1, 9.7.3.1, 9.7.6.1	H1, H4, H7, H8, H9, H14

**Section II**
**Question 36 — The Chemistry of Art**

Question	Marks	Content	Syllabus outcomes
(a)	3	9.8.4.2.3, 9.8.4.2.4	H6, H12, H13, H14
(b) (i)	2	9.8.3.2.1, 9.8.3.2.4	H6, H13, H14
(b) (ii)	3	9.8.3.2.4, 9.8.3.2.6, 9.8.4.2.3	H2, H6, H12
(c) (i)	2	9.8.2.2.4, 9.8.2.3.2	H2, H3, H6, H7, H11
(c) (ii)	3	9.8.2.2.5, 9.8.2.3.2	H2, H6, H7, H13
(d) (i)	2	9.8.2.2.1, 9.8.2.3.1	H6, H7, H11
(d) (ii)	3	9.8.2.2.1, 9.8.2.3.1	H11, H14
(e)	7	9.8.2.1, 9.8.2.2.4, 9.8.2.2.9	H3, H6, H7, H11, H14

**Section II**
**Question 37 — Forensic Chemistry**

Question	Marks	Content	Syllabus outcomes
(a)	3	9.9.2.2.2, 9.9.2.2.3	H6, H9, H13
(b) (i)	2	9.9.3.2.3, 9.9.3.2.4	H9, H10, H13
(b) (ii)	3	9.9.3.2.5, 9.9.3.3.2, 9.9.3.3.3, 9.9.3.3.4	H8, H9, H14
(c) (i)	4	9.9.4.2.3	H8, H9, H11, H14
(c) (ii)	1	9.9.4.2.2	H1, H12, H14
(d) (i)	4	9.9.1.2.1, 9.9.1.3.4, 9.9.1.3.3, 9.9.2.3.1, 9.9.3.3.2	H8, H9, H11, H14
(d) (ii)	1	9.9.5.2.1	H8, H9, H11
(e)	7	9.9.3.2.6, 9.9.3.3.5, 9.9.5.2.2, 9.9.5.2.3, 9.9.6.3.1	H3, H4, H11, H14