BOARD OF STUDIES
NEW SOUTH WALES

2010 HSC Chemistry Marking Guidelines

Section I, Part A

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

Section I, Part B

Question 21

Criteria	Marks
• Identifies HCl as a strong acid which fully ionises in aqueous solution • Identifies ethanoic acid as a weak acid which does not fully ionise in aqueous solution • Identifies that the total concentration of ethanoic acid must be higher than that of HCl to give an equivalent $[H^+]$ and therefore pH, as $pH = -\log_{10} [H^+]$	3
• Identifies HCl as a strong acid or fully ionised • Identifies CH_3COOH acid as a weak acid or partially ionised • Identifies that CH_3COOH concentration needs to be higher than HCl to give equivalent $[H^+]$ and therefore pH	2
• H^+ concentration from HCl is equal to H^+ from CH_3COOH OR • Identifies HCl as a strong acid or is fully ionised and identifies CH_3COOH as a weak acid or is partially ionised	1

Question 22 (a)

Criteria	Marks
• Gives a valid use of esters	1

Question 22 (b)

Criteria	Marks
• Gives valid reasons for refluxing the mixture	2
• Gives a valid reason for refluxing the mixture	1

Question 22 (c)

Criteria	Marks
• Draws correct structural formulae and correctly names both molecules	3
• Draws correct structural formulae for both molecules and correctly names ONE OR • Draws correct structural formula for ONE molecule and correctly names both	2
• Gives correct names for both molecules OR • Draws correct structural formula for ONE	1

Question 23 (a)

Criteria	Marks
• Gives correctly balanced equation	1

Question 23 (b)

Criteria	Marks
• Calculates kJ mol^{-1} values correctly for each fuel or kJ g^{-1} for 1-butanol • Gives correct reason for identifying correct fuel	2
• Identifies correct fuel with all calculations shown but no reason OR • Identifies correct fuel with correct reasons but incorrect calculations OR • Identifies incorrect fuel but has correct calculations	1

Question 24 (a)

Criteria	Marks
• Gives balanced chemical equation and identifies type of reaction	2
• Gives balanced chemical equation OR • Identifies type of reaction	1

Question 24 (b)

Criteria	Marks
• States that bromine water decolourises in the presence of ethene • States that on adding bromine water sample should turn brown	2
• Identifies bromine water can be used to detect ethene OR • States colour change occurs in presence of ethene with bromine	1

Question 25

Criteria	Marks
• Demonstrates thorough knowledge and understanding of the relationship between DO and BOD and the importance of monitoring • Describes what DO and BOD are and how they are related • Gives reasons for monitoring both • Outlines effect of BOD on water quality • Demonstrates coherence and logical progression and includes correct use of scientific principles and ideas	5
• Demonstrates sound knowledge and understanding of the relationship between DO and BOD and the importance of monitoring • Outlines DO and BOD with link between the two • Gives reasons for monitoring both • Outlines effect of BOD on water quality • Communicates some scientific principles and ideas in a clear manner	4
• Demonstrates a basic knowledge and understanding of DO and BOD • Outlines DO and BOD – link between two • Outlines that BOD is a measure of water quality • Communicates some scientific principles and ideas in a clear manner	3
• Defines DO or BOD • States importance of DO or BOD • Relates BOD or DO to water quality • Communicates ideas in a basic form using general scientific terms	2
• Defines DO or BOD OR • Relates level of DO or BOD to water quality • Communicates simple ideas	1

Question 26

Criteria	Marks
• Gives correctly balanced equation with correct states of matter • Calculates volume of gas produced	4
• Gives correctly balanced equation • Calculates correct moles of H_2 produced OR • Calculates volume of $H_2(g)$ with correctly balanced equation, using correct mole ratio OR • Provides correct equation without recognising the limiting reagent	3
• Gives correctly balanced equation and correct number of moles of either reactant OR • Gives correct number of both reactants OR • Gives correct number of moles of either and correct volume calculation OR • Gives incorrect equation and moles but gives volume, mole ratio and limiting reagent	2
• Writes correct balanced equation OR • Calculates moles of either reactant	1

Question 27

Criteria	Marks
• Correctly identifies all THREE components	2
• Correctly identifies anode and cathode OR • Correctly identifies electrolyte and identifies anode and cathode but in reverse	1

Question 28

Criteria	Marks
• Demonstrates a thorough understanding of all THREE steps by describing features of steps with appropriate reference to techniques and equipment used • Determines concentration of HCl correctly with correct equation	7–8
• Demonstrates a sound understanding of all THREE steps by outlining features of steps with appropriate reference to some techniques and equipment used • Provides ONE correct calculation and correct equation	5–6
• Demonstrates a limited understanding of all THREE steps. Refers to some techniques and equipment used • Calculates moles or mass of Na_2CO_3 or correct equation	3–4
• Demonstrates a basic understanding of some steps or refers to some techniques or equipment used OR • Calculates formula mass of Na_2CO_3 or titrated moles or mass of Na_2CO_3 with some outline of procedure OR • Calculates correct concentration of HCI OR • Provides correct equation and refers to some techniques or equipment used	2

Question 29 (a)

Criteria	Marks
• Lists at least TWO assumptions correctly • Explains validity of experiment in terms of correct outcomes for both	3
• Lists at least TWO correct assumptions • Explains validity of ONE, or outlines validity for both OR • Lists at least THREE assumptions, no assessment	2
• Lists ONE or TWO correct assumptions	1

Question 29 (b)

Criteria	Marks
• Gives correctly balanced (must have $BaSO_4$ (*s*)) equation • Correctly calculates mass of barium sulfate • Recognises moles of SO_4^{2-} = moles of $BaSO_4$	3
• Calculates mass of barium sulfate (with equation) but makes 1 error OR • Calculates mass of barium sulfate correctly without equation	2
• Writes correct equation OR • Correctly calculates mass of sulfate	1

Question 30 (a)

Criteria	Marks
• Identifies both types of polymerisation correctly • Describes each process • Writes TWO correct equations	3
• Identifies both types of polymerisation AND either • Gives TWO correct equations OR • Describes ONE process with correct equation	2
• Identifies both types of polymerisation correctly OR • Outlines main features of each process OR • Gives ONE correct equation OR • Names and outlines process for ONE monomer	1

Question 30 (b)

Criteria	Marks
• Identifies THREE polymers and relates properties of each to structure and uses • Demonstrates coherence and logical progression of ideas	5
• Identifies THREE polymers and relates properties of TWO to structure and uses • Demonstrates coherence and logical progression of ideas	4
• Identifies THREE polymers and relates uses • Relates structure and property of ONE OR • Identifies TWO polymers and relates properties of each to structure and use	3
• Identifies THREE polymers OR • Identifies TWO polymers and related uses OR • Identifies ONE polymer and relates structure to properties and uses	2
• Identifies TWO polymers OR • Identifies ONE polymer and related use	1

Question 31 (a) (i)

Criteria	Marks
• Calculates correct percentage of TDS to 2 sig. fig	2
• Calculates correct mass of TDS OR • %TDS to incorrect significant figures	1

Question 31 (a) (ii)

Criteria	Marks
• Gives a correct chemical test for Cl^- and a balanced chemical equation	2
• Identifies a way to detect Cl^- in a water sample OR • Gives an equation for the detection of Cl^-	1

Question 31 (b)

Criteria	Marks
• Correctly identifies a source and effect of a named ion that pollutes waterways	2
• Identifies a source of a named ion contamination OR • Identifies an effect of a named ion being present in waterways	1

Section II

Question 32 – Industrial Chemistry

Question 32 (a)

Criteria	Marks
• Identifies type of cell and sketches in general terms the process used to extract NaOH	3
• Identifies the cell AND ONE aspect of process OR • Sketches in general terms the process used to extract NaOH	2
• Identifies the type of cell OR • Identifies a step in the process of extracting NaOH	1

Question 32 (b)

Criteria	Marks
• Thoroughly compares the electrolysis of molten and aqueous sodium chloride and includes relevant half and full equations • Demonstrates coherence and logical progression of ideas and includes correct use of scientific principles and ideas	5
• Presents more than one comparison with half equations and overall reaction for one cell OR • Provides all half equations and full reactions for both types of electrolysis with only one stated comparison	4
• Presents only ONE comparison with half equations and overall reaction for one cell OR • Provides all half equations and full reactions for both types of electrolysis OR • Thoroughly compares the electrolysis of molten and aqueous sodium chloride with no equations	3
• Provides ONE comparison between the electrolysis of molten and liquid NaCl and ½ equations for ONE electrolysis OR • Provides all half equations and full reaction for ONE type of electrolysis OR • Provides ONE comparison between the electrolysis of molten and aqueous NaCl and ONE full reaction OR • Soundly compares the electrolysis of molten and aqueous sodium chloride with no equation	2
• States ONE feature of either electrolysis OR • Writes ONE overall reaction for either electrolysis or TWO ½ equations	1

Question 32 (c) (i)

Criteria	Marks
• Provides correct equation constant expression and value with evidence of working out	3
• Provides the correct equilibrium constant expression and concentration for two of SO_2 and SO_3 or O_2 OR • Provides correct chemical equilibrium reaction and equilibrium constant expression OR • Provides correct chemical equilibrium reaction and concentration for two of SO_2 and SO_3 or O_2 OR • Provides correct equilibrium constant expression and moles for SO_2, SO_3 and O_2	2
• Provides the correct equilibrium constant expression OR • Provides correct chemical equilibrium reaction OR • Provides correct concentration for any two of SO_2 and SO_3 or O_2 OR • Provides correct moles for all of SO_2 and SO_3 or O_2	1

Question 32 (c) (ii)

Criteria	Marks
• States the condition responsible for the change with an appropriate justification	2
• Identifies that temperature was a factor in changing equilibrium	1

Question 32 (d) (i)

Criteria	Marks
• Identifies type of reaction and reactant A	2
• Identifies type of reaction OR • Identifies reactant A	1

Question 32 (d) (ii)

Criteria	Marks
• Demonstrates a thorough knowledge of how saponification could be carried out in a school laboratory AND identifies at least TWO safety precautions for this activity	3
• Demonstrates a sound knowledge of how saponification could be carried out in a school laboratory • Identifies at least ONE safety precaution for this activity	2
• Demonstrates a limited knowledge of how saponification could be carried out in a school laboratory OR • Identifies at least ONE safety precaution for this activity	1

Question 32 (e)

Criteria	Marks
• Demonstrates thorough knowledge and understanding of the importance of the use of limestone and the resulting environmental impact • Provides relevant equations • Provides a judgement on importance and environmental impact • Demonstrates coherence and logical progression and includes correct use of scientific principles and ideas	6–7
• Demonstrates sound knowledge and understanding of the importance of the use of limestone and the resulting environmental impact • Provides a relevant equation • Communicates some scientific principles and ideas in a clear manner	4–5
• Demonstrates basic knowledge of the importance of the use of limestone and its environmental impact • Communicates ideas in a basic form using general scientific terms	2–3
• Demonstrates a limited knowledge of the importance of the use of limestone and its environmental impact • Communicates simple ideas	1

Question 33 – Shipwrecks, Corrosion and Conservation

Question 33 (a)

Criteria	Marks
• Demonstrates a sound knowledge and understanding of the effect the marine environment has on materials	3
• Demonstrates a sound knowledge and understanding of the effect the marine environment has on ONE material	2
• Demonstrates limited knowledge of the effect of the marine environment on TWO materials OR • Demonstrates basic knowledge of the effect of the marine environment on ONE material	1

Question 33 (b) (i)

Criteria	Marks
• Draws fully labelled diagram • Provides both relevant half equations • Provides overall reaction equation	4
• Draws labelled diagram with some errors • Provides relevant half equation and full overall equation OR • Draws fully labelled diagram • Provides a relevant half equation	3
• Draws a diagram with some correct labels • Writes ONE correct half equation OR • Writes both relevant half equations and overall equations, no diagram OR • Draws a fully labelled diagram – no equations	2
• Draws a diagram with some correct labels OR • Writes ONE correct half equation	1

Question 33 (b) (ii)

Criteria	Marks
• Clearly indicates how the cathode would be identified	1

Question 33 (c)

Criteria	Marks
• Provides a thorough explanation of the properties and related uses of the steels based on the carbon content AND/OR the presence of other elements • Communicates ideas using scientific principles in a logical manner with the reference to the information in the table	5
• Provides a sound explanation of the properties and related uses of the steels based on the carbon content AND/OR the presence of other elements • Communicates ideas using scientific principles with reference to the information in the table	4
• Provides a sound understanding of the properties and uses of steels	3
• Demonstrates a basic knowledge of the properties and uses of some steels	2
• Demonstrates a limited knowledge of the properties OR uses of steels	1

Question 33 (d) (i)

Criteria	Marks
• Provides features of a test which identifies the THREE factors and describes appropriate methods to assess their effect on the rate of corrosion • Demonstrates coherence and logical progression and includes use of scientific principles and ideas	4
• Provides features of a test which identifies THREE factors • Describes relevant tests for TWO factors • Communicates some scientific principles and ideas in a clear manner	3
• Outlines a test for ONE factor, linking the test to the factor • Communicates simple ideas OR • Provides features of a test which identifies THREE factors	2
• Demonstrates a limited knowledge of factors and tests associated with corrosion of iron OR • Communicates simple ideas	1

Question 33 (d) (ii)

Criteria	Marks
• Lists ONE environmental relevant method of protection	1

Question 33 (e)

Criteria	Marks
• Demonstrates thorough knowledge and understanding of restoration and conservation techniques for the TWO materials • Compares process for the TWO materials • Uses equations to describe restoration of copper or wood • Provides a judgement on suitability of techniques • Demonstrates coherence and logical progression and includes correct use of scientific principles and ideas	6–7
• Demonstrates sound knowledge and understanding of restoration and preservation of the TWO materials • Provides a judgement on suitability of techniques • Communicates scientific principles clearly and uses an equation when discussing copper or wood restoration	4–5
• Demonstrates basic knowledge and understanding of restoration and preservation of the TWO materials • Communicates in basic form using general scientific principles OR • Demonstrates a sound knowledge and understanding for ONE material • Communicates in basic form using general scientific principles	2–3
• Demonstrates a limited knowledge of EITHER restoration OR preservation for ONE of the materials • Communicates simple ideas	1

Question 34 (a)

Criteria	Marks
• Correctly names molecule • Relates ADP to ATP • States importance in energy transfer and storage	3
• Correctly names molecule • Relates ADP to ATP OR • States importance in energy transfer and storage	2
• Correctly names molecule OR • Links molecule to energy transfer or storage OR • Relates ADP to ATP	1

Question 34 (b) (i)

Criteria	Marks
• States that oxidation of glucose is a multistep process • States that small amounts of energy are produced at each step	2
• ONE of the above	1

Question 34 (b) (ii)

Criteria	Marks
• Identifies lactic acid as the cause of change in pH • Recognises pH is lowered • Gives a correctly balanced equation	3
• Identifies lactic acid as the cause of change AND EITHER • Recognises pH is lowered OR • Gives a correctly balanced equation	2
• Identifies lactic acid as the cause of change in pH OR • Recognises pH is lowered OR • Gives a correctly balanced equation	1

Question 34 (c)

Criteria	Marks
• Demonstrates a thorough knowledge of the chemical bonding that determines the secondary and tertiary structures of a protein	4–5
• States side chains determine 3-dimensional structure • Outlines THREE of the types of forces • Refers to structure	3
• Outlines TWO types of the forces with reference to structures OR • Outlines THREE types of forces – no reference to structures OR • Lists FOUR forces – no reference to structures	2
• Lists TWO of the forces OR • Outlines ONE force	1

Question 34 (d)

Criteria	Marks
• Identifies THREE stages of aerobic respiration • States correct ATP output at each stage • Identifies TWO intermediates • Constructs a logical and sequential flowchart	5
• Identifies THREE stages of aerobic respiration • Identifies TWO intermediates • States overall ATP but not at each stage • Constructs a logical and sequential flowchart	4
• Identifies THREE stages of aerobic respiration • States overall ATP production • Constructs a simplified flowchart	3
• Identifies TWO stages of aerobic respiration OR • States ATP production and identifies ONE stage OR • Constructs a simplified flowchart	2
• Identifies ONE stage OR • States overall ATP production OR • Constructs simple flowchart	1

Question 34 (e)

Criteria	Marks
• Demonstrates a thorough knowledge and understanding of skeletal muscles and how this has influenced training regimes • Justifies use of specific training regimes • Demonstrates coherence and logical progression and includes correct use of scientific principles and ideas	6–7
• Demonstrates a sound knowledge and understanding of skeletal muscles – includes both Type 1 and Type 2 cells • States use of specific training regimes • Communicates some scientific principles and ideas in a clear manner	4–5
• Demonstrates a basic knowledge of skeletal muscles – Type 1 and Type 2 cells • Communicates ideas in basic form using general scientific terms	2–3
• Demonstrates a limited knowledge of skeletal muscles • Communicates simple ideas	1

Question 35 (a)

Criteria	Marks
• Identifies the element • Provides a valid justification for the choice	3
• Identifies the element and the trend across a period OR • Identifies an element with the highest electronegativity in its period but not period 3 and trend across a period OR • Gives a valid explanation for the trend in electronegativity across a period but incorrectly identifies the most-electronegative element	2
• Identifies the element correctly OR • Correctly identifies the trend across a period in the periodic table OR • Defines electronegativity	1

Question 35 (b) (i)

Criteria	Marks
• Identifies correct ligand type	1

Question 35 (b) (ii)

Criteria	Marks
• States colours correctly • Identifies the number of valence electrons correctly and relates it to energy levels • Valid explanation of the presence or lack of colour for the two complex ions	4
• States colours correctly AND EITHER • Identifies the number of valence electrons correctly OR • Gives a valid explanation of the presence or lack of colour for the two complex ions	3
• States colours correctly • Gives a limited explanation of the presence or lack of colours OR • Explains the basis of colour	2
• States the colour for ONE complex ion OR • Number of valence electrons for ONE OR • Identifies reasons for colour	1

Question 35 (c) (i)

Criteria	Marks
• Draws correct reflectance spectrum • Identifies pigment colour	2
• Draws resulting reflectance spectrum OR • Identifies pigment colour	1

Question 35 (c) (ii)

Criteria	Marks
• Outlines IR radiation • Outlines method of use and target compounds/pigments • Outlines advantages and disadvantages of the method of analysis	3
• Outlines method of use and target compounds/pigments AND EITHER • Outlines advantages and disadvantages of the method of analysis OR • Outlines IR radiation	2
• Identifies TWO or more pigments/compounds detected by IR OR • Outlines the method of analysis with advantages and risks OR • Outlines the advantage or disadvantage of the method of analysis	1

Question 35 (d)

Criteria	Marks
• Provides a thorough discussion of the Bohr model by: – Describing the Bohr model of the atom – Applying the Bohr model to explain phenomena of emission spectra – Stating a merit of the Bohr model was that it predicted spectrum for hydrogen – Referring to spectra of other elements to demonstrate at least two limitations • Demonstrates coherence and logical progression of ideas using scientific principles	4–5
• Provides a thorough discussion of the Bohr model by: – Outlining the Bohr model of the atom – Applying the model to explain the phenomena of emission spectra – Stating a merit of the Bohr model – Referring to spectra of other elements to demonstrate a limitation	2–3
• Outlines the Bohr model of the atom OR • Applies the Bohr model to explain the phenomena of emission spectra OR • States a merit of the Bohr model OR • Refers to spectra of other elements to demonstrate a limitation of the model	1

Question 35 (e)

Criteria	Marks
• Demonstrates thorough knowledge and understanding of potential health risks associated with cosmetics used by ancient cultures • Provides a judgement on use of these cosmetics over time • Demonstrates coherence and logical progression and includes TWO pigments, with chemical formulae and names	6–7
• Demonstrates sound knowledge and understanding of potential health risks associated with cosmetics used by ancient cultures • Identifies ONE pigment with chemical formula and name • Communicates some scientific principles and ideas in a clear manner	4–5
• Demonstrates a basic knowledge of potential health risks of cosmetics of ancient cultures • Identifies ONE pigment with its use and risk • Communicates ideas in a basic form using general scientific terms	2–3
• Demonstrates a limited knowledge of the potential health risks of cosmetics of ancient cultures OR • Identifies ONE pigment • Communicates simple ideas	1

Question 36 (a)

Criteria	Marks
• Identifies A and B • Sketches in general terms the difference in structure • Identifies the origin of A and B	3
TWO of: • Identifies A and B • Sketches in general terms the difference in structure of named A and B • Identifies the origin of named A and B	2
• Identifies A and B OR • Sketches in general terms the difference in structure of named A and B OR • Identifies the origin of named A and B	1

Question 36 (b) (i)

Criteria	Marks
• Identifies that the amino acids move because of an electrical potential difference • Identifies factors that cause the separation of amino acids	2
• Identifies that the amino acids move because of an electrical potential difference OR • Identifies factors that cause the separation of amino acids	1

Question 36 (b) (ii)

Criteria	Marks
• Identifies each amino acid correctly with an appropriate reason • Clearly indicates that the top of the tray is positive (or the bottom is negative)	3
• Gives a correct identification and appropriate reason for two amino acids	2
• Gives a correct identification and appropriate reason for one amino acid OR • Identifies all three amino acids	1

Question 36 (c) (i)

Criteria	Marks
• Identifies the manufacturer of the pottery	1

Question 36 (c) (ii)

Criteria	Marks
• Demonstrates thorough knowledge and understanding of emission spectra	4
• Demonstrates sound knowledge and understanding of emission spectra	3
• Demonstrates a basic knowledge of emission spectra	2
• Demonstrates a limited knowledge of emission spectra	1

Question 36 (d) (i)

Criteria	Marks
• Names FOUR appropriate properties	2
• Names TWO appropriate properties	1

Question 36 (d) (ii)

Criteria	Marks
• Names an appropriate organic and an inorganic test • Gives description of both tests	3
• Names an appropriate organic and an inorganic test • Gives a description of ONE test	2
• Names an appropriate organic and an inorganic test OR • Gives a description of ONE test	1

Question 36 (e)

Criteria	Marks
• Demonstrates thorough knowledge and understanding of both the polymerase chain reaction and DNA electrophoresis and their application in forensic analysis • Provides a range of uses for DNA analysis • Demonstrates coherence and logical progression and includes correct use of scientific principles and ideas	6–7
• Demonstrates sound knowledge and understanding of the process used to analyse DNA • Provides some uses for DNA analysis • Communicates some scientific principles and ideas in a clear manner	4–5
• Demonstrates basic knowledge of DNA analysis • Provides a use for DNA analysis • Communicates ideas in a basic form using general scientific terms	2–3
• Demonstrates a limited knowledge of some of the processes of DNA analysis OR • The use that this analysis can be put to • Communicates simple ideas	1

Chemistry

2010 HSC Examination Mapping Grid

Question	Marks	Content	Syllabus outcomes
Section I Part A			
1	1	9.2.2.2.3	H9
2	1	9.2.5.2.2	H6
3	1	9.3.1.2.2	H8
4	1	9.4.4.2.9	H9
5	1	9.4.5.3.2, 9.4.5.2.1	H8
6	1	9.2.1.2.7	H9
7	1	9.3.3.2.2, 9.3.3.2.6	H10
8	1	9.3.4.2.1	H2
9	1	9.4.2.2.2	H8
10	1	9.4.3.3.1, 9.4.5.2.1, 9.4.3.2.1, 14.1d	H8, H14
11	1	9.2.3.2.1, 9.2.3.2.9	H9
12	1	9.2.4.2.3, 12.4b	H10, H12
13	1	9.2.4.2.4, 9.2.4.2.6	H8
14	1	14.1a	H9, H14
15	1	9.2.3.3.4, 9.2.3.3.5, 14.1d	H12, H10
16	1	9.4.4.2.5, 13.1e	H6
17	1	12.4b, 14.1a	H12
18	1	9.3.2.2.4	H8
19	1	9.3.2.2.9, 12.4b	H10, H12
20	1	12.3c, 12.4b, 14.1a, 14.1f	H10, H12, H14
Section I Part B			
21	3	9.3.3.2.3, 9.3.3.2.4, 9.3.3.2.6, 9.3.3.2.7, 14.1g	H8, H14
22 (a)	1	9.3.5.3.2	H9
22 (b)	2	9.3.5.2.6, 9.3.5.3.1	H8, H9
22 (c)	3	9.3.5.2.2, 13.1e	H9, H10, H13
23 (a)	1	9.2.3.3.6	H9, H10
23 (b)	2	9.2.3.3.6, 12.4b	H9, H10, H12
24 (a)	2	9.2.1.2.3	H10, H9
24 (b)	2	9.2.1.3.2	H9
25	5	9.4.5.2.1, 14.3b	H4, H8, H14
26	4	9.2.1.3.1, 9.3.2.2.9, 12.4b	H8, H10, H12
27	2	9.2.4.2.4, 9.2.4.2.6	H8, H10
28	8	9.3.4.2.8, 9.3.4.3.3, 12.4b, 11.3a	H8, H10, H11, H12
29 (a)	3	9.4.3.3.3, 11.2e, 12.4a	H8, H10, H11, H12
29 (b)	3	9.4.3.3.3, 12.4b	H8, H10, H12

Question	Marks	Content	Syllabus outcomes
30 (a)	3	9.2.1.2.5, 9.2.1.2.6, 14.1f, 9.2.2.2.3, 9.2.2.2.2, 9.2.2.2.4, 14.3d	H9, H10, H14
30 (b)	5	9.2.1.2.8, 9.2.2.4, 9.2.2.2.5, 14.3d	H4, H9, H14
31 (a) (i)	2	9.4.5.2.1, 12.4d	H12
31 (a) (ii)	2	9.4.3.3.1, 11.2c	H8, H10, H11
31 (b)	2	9.4.3.3.2	H4
Section II **Question 32 — Industrial Chemistry**			
32 (a)	3	9.5.4.2.2, 9.5.4.2.3, 12.3c	H7, H8, H12
32 (b)	5	9.5.4.3.1, 9.5.4.3.2, 14.3b	H13, H7, H14
32 (c) (i)	3	9.5.2.2.2, 9.5.2.3.3, 12.3c	H12, H13
32 (c) (ii)	2	9.5.2.2.1, 9.5.2.2.3, 12.3c, 14.1d	H12, H14
32 (d) (i)	2	9.5.5.2.1, 12.3c	H9, H10, H12
32 (d) (ii)	3	9.5.5.2.1, 9.5.5.2.2, 9.5.5.3.1, 12.1d	H11, H12
32 (e)	7	9.5.6.2.1, 9.5.6.2.3, 9.5.6.2.4, 14.3b, 13.1d	H4, H13, H14
Section II **Question 33 — Shipwrecks, Corrosion and Conservation**			
33 (a)	3	9.6.7.2.1, 9.6.2.2.4, 14.1d	H8, H14
33 (b) (i)	4	9.6.3.2.1, 9.6.3.2.2, 13.1d	H7, H8, H10, H13
33 (b) (ii)	1	9.6.3.2.1, 14.1d	H7, H14
33 (c)	5	9.6.2.2.3, 9.6.2.3.3, 14.1c, 12.3c	H8, H12, H14
33 (d) (i)	4	9.6.5.2.1, 9.6.5.3.1, 11.3a, 12.2b	H4, H6, H7, H8, H11, H12
33 (d) (ii)	1	9.6.4.2.1, 14.2a	H4, H14
33 (e)	7	9.6.7.2.3, 9.6.7.2.4, 9.6.7.2.5, 13.1d 14.1g, 14.2a, 14.3b	H3, H13, H8, H14
Section II **Question 34 — The Biochemistry of movement**			
34 (a)	3	9.7.1.2.3, 9.7.1.3.1, 14.1f	H7, H14
34 (b) (i)	2	9.7.8.2.2, 9.7.8.2.5, 9.7.8.3.2, 9.7.8.2.3, 14.1g	H7, H8, H14
34 (b) (ii)	3	9.7.10.2.2, 13.1 d, 14.1a	H9, H10, H12, H13
34 (c)	5	9.7.4.2.1, 9.7.4.2.2, 9.7.4.2.5, 14.1f	H9, H14
34 (d)	5	9.7.8.3.1, 13.1e	H7, H9, H10, H13
34 (e)	7	9.7.10.2.1, 9.7.8, 9.7.10, 14.3b	H1, H3, H7, H14
Section II **Question 35 — The Chemistry of Art**			
35 (a)	3	9.8.3.2.7, 14.1a	H6, H14
35 (b) (i)	1	9.8.5.2.5, 114.1f	H14
35 (b) (ii)	4	9.8.4.2.4, 14.1d	H14
35 (c) (i)	2	9.8.2.2.4, 12.3c, 13.1f	H12, H13
35 (c) (ii)	3	9.8.2.2.8, 9.8.2.3.3, 14.2d	H14
35 (d)	5	9.8.2.3.4, 9.8.2.2.3, 9.8.2.2.5, 14.1c	H1, H2, H6, H14
35 (e)	7	9.8.1.3.2, 9.8.1.2.3, 14.1b	H1, H4, H14

Question	Marks	Content	Syllabus outcomes
Section II **Question 36 — Forensic Chemistry**			
36 (a)	3	9.2.2.2.2, 9.9.2.2.4, 9.9.2.3.2, 13.1e	H9, H13
36 (b) (i)	2	9.9.3.2.2, 9.9.3.2.6, 9.9.3.2.3, 9.9.3.3.5, 11.2c	H8, H9, H11
36 (b) (ii)	3	9.9.3.2.2, 9.9.3.2.6, 9.9.3.2.3, 9.9.3.3.5, 13.1e	H8, H9, H13
36 (c) (i)	1	9.9.6.2.2, 9.9.6.2.5, 9.9.6.2.3, 9.9.6.3.2, 14.1a	H7, H14
36 (c) (ii)	4	9.9.6.2.1, 9.9.6.2.3, 9.9.6.2.2, 9.9.6.2.4, 14.1f	H7, H14
36 (d) (i)	2	9.9.1.2.4, 9.9.1.3.3, 11.2c, 12.1a	H8, H12
36 (d) (ii)	3	9.9.1.1.1, 9.9.1.3.3, 9.9.1.2.4, 11.2c, 12.2a	H4, H8, H11, H12
36 (e)	7	9.9.4.2.2, 9.9.4.3.1, 9.9.4.2.3, 14.3b	H4, H9, H14