

2001 HSC Chemistry Marking Guidelines

Question 16 (3 marks)

Outcomes assessed: H3, H4, H6

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Correctly names a radioisotope and relates at least two properties to its use 	3
<ul style="list-style-type: none"> Correctly names a radioisotope and relates at least one property to its use OR <ul style="list-style-type: none"> Correctly names a radioisotope and describes two properties OR <ul style="list-style-type: none"> Correctly names a radioisotope and describes a use 	2
<ul style="list-style-type: none"> Correctly names a radioisotope OR <ul style="list-style-type: none"> Describes a use of a radioisotope 	1

Question 17 (a) (1 mark)

Outcomes assessed: H7, H9, H10, H14

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> A valid reason 	1

Question 17 (b) (2 marks)*Outcomes assessed: H12***MARKING GUIDELINES**

Criteria	Marks
• Two adjustments given which improve accuracy	2
• One adjustment given which improves accuracy	1

Question 17 (c) (3 marks)*Outcomes assessed: H10, H12, H13***MARKING GUIDELINES**

Criteria	Marks
• Calculates ΔH and the moles of ethanol and calculates $\Delta_c H$ for ethanol	3
• Calculates ΔH and the moles of ethanol OR • Correct method for calculating but minor error in calculation of ΔH or moles	2
• Calculates ΔH or moles of ethanol	1

Question 18 (a) (1 mark)*Outcomes assessed: H13***MARKING GUIDELINES**

Criteria	Marks
• Correctly places salt bridge between the beakers and dipping into each solution	1

Question 18 (b) (2 marks)*Outcomes assessed: H6, H8, H10***MARKING GUIDELINES**

Criteria	Marks
• Both half equations/values correct and final calculation correct	2
• At least one half equation value correct	1

Question 18 (c) (3 marks)

Outcomes assessed: H6, H8, H13, H14

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Illustrates that copper ions from solution form copper metal: $\text{Cu}^{2+} + 2\text{e}^{-} \rightarrow \text{Cu (s)}$ Explains that an applied voltage changes the direction of electron flow 	3
<ul style="list-style-type: none"> Gives correct half equation $\text{Cu}^{2+} + 2\text{e}^{-} \rightarrow \text{Cu}$ with a statement that the cell reaction has been reversed 	2
<ul style="list-style-type: none"> Indicates that metallic copper forms from copper ions OR <ul style="list-style-type: none"> States the copper electrode is now a cathode, not an anode OR <ul style="list-style-type: none"> States the cell is now electrolytic not galvanic 	1

Question 19 (7 marks)

Outcomes assessed: H1, H3, H4, H5, H7, H8, H13

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Evaluates both named cell types in terms of chemistry and impact on society Answer illustrated with selected balanced symbol equations 	6–7
<ul style="list-style-type: none"> Names one other cell type and describes a number of features of it and one of the given cells in terms of chemistry and impact on society, illustrating answer with at least word equations and/or formulas OR <ul style="list-style-type: none"> Names one other cell type, evaluates it and one of the given cells in one area stated in the question, illustrating answer with word equations and/or formulas, if appropriate 	4–5
<ul style="list-style-type: none"> Names one other type of cell and describes at least one feature of it and the dry cell or lead-acid cell OR <ul style="list-style-type: none"> Describes a number of features of either the dry cell or lead-acid cell 	2–3
<ul style="list-style-type: none"> Names one other type of cell 	1

Question 20 (a) (1 mark)*Outcomes assessed: H13***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Any appropriate pH measuring device named	1

Question 20 (b) (3 marks)*Outcomes assessed: H8, H10, H13***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Explains the relationship between $[H^+]$ and pHIndicates that pH 1 means higher $[H^+]$ than pH 1.6Explains that HCl ionises more than citric acid	3
<ul style="list-style-type: none">Any two parts of the explanation	2
<ul style="list-style-type: none">Any one part of the explanation	1

Question 21 (a) (1 mark)*Outcomes assessed: H8***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Any technically correct name given	1

Question 21 (b) (3 marks)*Outcomes assessed: H2, H8, H10, H13, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Explains original conductivity, the equivalence point and subsequent increase using named chemicals from the reaction	3
<ul style="list-style-type: none">Explains two features of the graph in terms of chemicals involved OR <ul style="list-style-type: none">General explanation involving removal and addition of ions	2
<ul style="list-style-type: none">Explains either the decrease, equivalence point or increase conductivity in terms of chemicals involved OR <ul style="list-style-type: none">General overview in terms of ions given	1

Question 22 (6 marks)*Outcomes assessed: H8, H9, H11, H12, H13***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Detailed description of necessary equipment and the refluxing process or suitable labelled diagramJustification given for equipment, chemicals (including catalyst) and refluxingSpecifies chemicals for making the ester including the catalystAnswer illustrated with correct equation.	5–6
<ul style="list-style-type: none">Describes equipment and refluxing process or draws labelled diagramGives some reasoning for equipment and method usedIdentifies some chemicals used	3–4
<ul style="list-style-type: none">Outlines some equipment or chemicals used in esterification in general	1–2

Question 23 (a) (1 mark)*Outcomes assessed: H1, H6***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Correct definition stated	1

Question 23 (b) (3 marks)*Outcomes assessed: H6, H10, H13***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Correctly calculates the molar mass (units required)	3
<ul style="list-style-type: none">States the correct moles of HCl used and hence moles of NaX in titration and in 100 mL sample OR <ul style="list-style-type: none">Correct process used throughout, but error in calculation or transcription	2
<ul style="list-style-type: none">Balanced chemical equation for the reaction OR <ul style="list-style-type: none">States correct moles HCl used OR <ul style="list-style-type: none">Indicates moles in 100 mL is 5x moles in 20 mL sample OR <ul style="list-style-type: none">Provides a definition of molar mass OR <ul style="list-style-type: none">Gives correct answer and shows no working (units not required)	1

Question 24 (a) (1 mark)*Outcomes assessed: H3***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Any relevant use stated	1

Question 24 (b) (2 marks)*Outcomes assessed: H8, H13***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">States that the yield is increasedExplains the increase in terms of Le Chatelier's principle and the removal of product	2
<ul style="list-style-type: none">States that the yield increased OR <ul style="list-style-type: none">Indicates that equilibrium shifts right	1

Question 24 (c) (3 marks)*Outcomes assessed: H4, H8, H10***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Indicates the conflicting effect of temperature on reaction rate and yieldExplains the effect of pressure on yieldIdentifies that a compromise set of conditions must be used in equilibrium reactions	3
<ul style="list-style-type: none">Identifies that reaction has optimum conditions of temperature and pressure that affect reaction rate OR yield OR safety conditionsExplains how temperature OR pressure affect yield OR reaction rate	2
<ul style="list-style-type: none">Identifies that reaction has optimum conditions of temperature and pressure that affect reaction rate OR yield OR safety conditions	1

Question 25 (6 marks)*Outcomes assessed: H4, H8, H9, H13***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Displays extensive knowledge of possible different reaction products, either due to identified varying reaction conditions or due to the presence of impurities using an appropriate exampleExplains the need for monitoring these products to avoid problems	5–6
<ul style="list-style-type: none">Identifies at least one variation in reaction products using an appropriate example AND <ul style="list-style-type: none">Relates formation of this product to the need for monitoring to avoid problems	3–4
<ul style="list-style-type: none">Describes a specific chemical reaction OR <ul style="list-style-type: none">States purpose of monitoring	1–2

Question 26 (a) (1 mark)*Outcomes assessed: H13***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">All points plotted correctly on grid providedAnd line of best fit or points joined	1

Question 26 (b) (1 mark)*Outcomes assessed: H12, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Gives a value between 1.4 and 1.6	1

Question 26 (c) (2 marks)*Outcomes assessed: H4, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">A hypothesis which could be tested and is logical based on the data	2
<ul style="list-style-type: none">Any inference based on the patterns shown in the table	1

Question 27 (4 marks)
Outcomes assessed: H4, H5, H13, H14
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Compares the environmental effects of ozone in the upper and lower atmosphere, relating these to concentrations 	4
<ul style="list-style-type: none"> Compares the environmental effects of ozone in the upper and lower atmosphere 	3
<ul style="list-style-type: none"> Identifies the concentration of ozone (in the upper atmosphere) and one related environmental effect OR <ul style="list-style-type: none"> Identifies the concentration of ozone (in the lower atmosphere) and one related environmental effect OR <ul style="list-style-type: none"> Identifies two environmental effects of ozone 	2
<ul style="list-style-type: none"> Identifies that the upper atmosphere has a higher concentration of ozone than the lower atmosphere OR <ul style="list-style-type: none"> Identifies an environmental effect of ozone 	1

Question 28 (a) (i) (1 mark)
Outcomes assessed: H7, H13
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Any correct definition of electrolysis 	1

NB. do not accept an example isolated from a definition.

Question 28 (a) (ii) (2 marks)
Outcomes assessed: H7
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Correctly identifies that both electrolyses produce chlorine gas but that the other product for each is different and names that product 	2
<ul style="list-style-type: none"> Correctly identifies one product for both reactions OR <ul style="list-style-type: none"> Correctly identifies two products from one reaction 	1

Question 28 (b) (i) (2 marks)*Outcomes assessed: H10***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Writes the correct balanced equation using chemical symbols	2
<ul style="list-style-type: none">Writes a correct word equation	1
OR	
<ul style="list-style-type: none">Gives the correct formula for carbon monoxide and for chlorine gas	

Question 28 (b) (ii) (2 marks)*Outcomes assessed: H3, H8***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Correctly identifies one factor which influences the equilibrium and describes the way in which this factor can be used to maximise production of phosgene, using their answer in part (i)	2
<ul style="list-style-type: none">Correctly identifies one factor which influences the equilibrium	1
OR	
<ul style="list-style-type: none">Relates Le Chatelier's principle to maximising production by indicating correct equilibrium shift	

Question 28 (c) (5 marks)*Outcomes assessed: H3, H8, H10, H13***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Explains the importance of sulfuric acid as an industrial chemical based on a number of its properties and related useIncludes balanced chemical equations related to at least two properties	5
<ul style="list-style-type: none">Relates at least one use of sulfuric acid to its properties and includes a balanced chemical equation related to one property	4
<ul style="list-style-type: none">Relates one use of sulfuric acid to a property and includes a balanced equation for that property	3
<ul style="list-style-type: none">States one property and one use of sulfuric acid OR <ul style="list-style-type: none">States two properties of sulfuric acid OR <ul style="list-style-type: none">States two uses of sulfuric acid	2
<ul style="list-style-type: none">States one property of sulfuric acid OR <ul style="list-style-type: none">States one use of sulfuric acid OR <ul style="list-style-type: none">Correct relevant equation	1

Question 28 (d) (i) (1 mark)*Outcomes assessed: H9***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Saponification	1

Question 28 (d) (ii) (2 marks)*Outcomes assessed: H12***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Identifies suitable equipment and identifies both reactants and the heating process	2
<ul style="list-style-type: none">Identifies both reactants OR <ul style="list-style-type: none">Identifies one reactant and correct process	1

Question 28 (d) (iii) (3 marks)*Outcomes assessed: H12***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Describes a safety risk relevant to the procedure outlined and suggests a safe working practice to minimise the risk	3
<ul style="list-style-type: none">States one hazard and one safe work practice	2
<ul style="list-style-type: none">States one hazard or one safe work practice	1

Question 28 (e) (7 marks)*Outcomes assessed: H4, H8, H13, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Demonstrates an extensive knowledge of the Solvay process supported by at least one relevant chemical relationship• Describes environmental issues or potential issues associated with the process• Makes a judgement about the value of the way in which the environmental issues are addressed	6–7
<ul style="list-style-type: none">• Demonstrates a knowledge of the Solvay process• Identifies environmental issues or potential environmental issues associated with either reactants, intermediates or products of the process• Demonstrates knowledge of procedures used to address environmental issues	4–5
<ul style="list-style-type: none">• Identifies some reactants and/or products of the Solvay process OR <ul style="list-style-type: none">• Some knowledge of procedures used to control environmental issues or potential environmental issues OR <ul style="list-style-type: none">• States some environmental issues associated with the process	2–3
<ul style="list-style-type: none">• Identifies a reactant or product of the Solvay process OR <ul style="list-style-type: none">• States a procedure used to control a potential environmental problem associated with the process OR <ul style="list-style-type: none">• States an environmental problem associated with the process	1

Question 29 (a) (i) (1 mark)*Outcomes assessed: H6***MARKING GUIDELINES**

Criteria	Marks
• Iron or steel	1

Question 29 (a) (ii) (2 marks)*Outcomes assessed: H6, H7***MARKING GUIDELINES**

Criteria	Marks
• Correctly identifies formation of an oxide which creates an impervious layer to oxygen	2
• Correctly identifies the formation of an oxide layer OR • Correctly identifies the formation of an impervious layer OR • Correctly identifies that aluminium is a passivating metal	1

Question 29 (b) (i) (1 mark)*Outcomes assessed: H8***MARKING GUIDELINES**

Criteria	Marks
• Correctly identifies a metal	1

Question 29 (b) (ii) (3 marks)*Outcomes assessed: H4, H8***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Identifies that corrosion is prevented by preferential oxidation of the sacrificial anode AND <ul style="list-style-type: none">Relates this to the relevant reduction potentials for an appropriate sacrificial anode, and iron	3
<ul style="list-style-type: none">Identifies that corrosion is prevented by preferential oxidation of the sacrificial anode OR <ul style="list-style-type: none">States relevant reduction potentials for an appropriate sacrificial anode, and iron	2
<ul style="list-style-type: none">Identifies that corrosion of the hull metal is prevented	1

Question 29 (c) (5 marks)
Outcomes assessed: H3, H8, H13
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Identifies carbon as an essential component of steel and demonstrates a detailed knowledge of the effect of addition of two or more elements (one of which may be carbon) to iron on the properties and subsequent use of steel 	5
<ul style="list-style-type: none"> Describes 2 or more examples of how the addition of different elements changes the properties of iron and determines the subsequent use of the steel OR <ul style="list-style-type: none"> Describes how the addition of different proportions of an element to iron can produce varying properties and different uses of steels OR <ul style="list-style-type: none"> Provides a detailed description of how the added element alters the properties of the steel 	4
<ul style="list-style-type: none"> Describes how the addition of at least one other element changes the properties of iron and determines the subsequent use of the steel OR <ul style="list-style-type: none"> Gives 2 or more examples of how the addition of an element changes the properties of iron OR <ul style="list-style-type: none"> Gives 2 or more examples of how the addition of an element determines the subsequent uses of iron 	3
<ul style="list-style-type: none"> Identifies 2 or more elements that are added to iron to form a steel OR <ul style="list-style-type: none"> Identifies how the addition of an element changes the properties of iron OR <ul style="list-style-type: none"> Identifies that the addition of an element to iron determines the subsequent use of the steel 	2
<ul style="list-style-type: none"> Identifies one element that is added to iron to form a steel OR <ul style="list-style-type: none"> Identifies one property of iron that can be enhanced OR <ul style="list-style-type: none"> States one use of a steel 	1

Question 29 (d) (i) (1 mark)*Outcomes assessed: H8, H13***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Any correct definition of corrosion	1

Question 29 (d) (ii) (2 marks)*Outcomes assessed: H12***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Identifies a suitable corrosive mediumIdentifies suitable equipmentDescribe how the rate of corrosion will be monitored	2
<ul style="list-style-type: none">Identifies a suitable corrosive medium and identifies suitable equipment	1

Question 29 (d) (iii) (3 marks)*Outcomes assessed: H12***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Clearly distinguishes between accuracy and reliability with examples of how to improve both	3
<ul style="list-style-type: none">States one way to improve accuracy and one way to improve reliability OR <ul style="list-style-type: none">States more than one way to improve accuracy OR <ul style="list-style-type: none">States more than one way to improve reliability OR <ul style="list-style-type: none">Distinguishes between accuracy and reliability in general terms	2
<ul style="list-style-type: none">States one way to improve accuracy or one way to improve reliability	1

Question 29 (e) (7 marks)*Outcomes assessed: H4, H8, H13, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Demonstrates an extensive knowledge and correct order of the steps in all 3 processes for a named metal AND <ul style="list-style-type: none">• Makes a judgement on the relevance of each step in the recovery of the artefact	6–7
<ul style="list-style-type: none">• Demonstrates a thorough knowledge of a number of steps in all 3 processes OR <ul style="list-style-type: none">• Describes two processes with an evaluation of one process.	4–5
<ul style="list-style-type: none">• Outlines cleaning or preserving or stabilising, and describes at least one step in each of the other two processes OR <ul style="list-style-type: none">• Gives examples of isolated steps across cleaning, preserving and stabilising	2–3
<ul style="list-style-type: none">• States one step in cleaning or preserving or stabilising.	1

Question 30 (a) (i) (1 mark)*Outcomes assessed: H9***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Adenosine triphosphate	1

Question 30 (a) (ii) (2 marks)*Outcomes assessed: H9***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Correctly identifies the biologically important part AND <ul style="list-style-type: none">• Explains the reaction that releases energy OR <ul style="list-style-type: none">• An equation outlining the process (not including water)	2
<ul style="list-style-type: none">• Correctly identifies the biologically important part OR <ul style="list-style-type: none">• An equation outlining the process	1

Question 30 (b) (i) (2 marks)*Outcomes assessed: H9***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Identifies the molecule and states its function	2
<ul style="list-style-type: none">• Identifies the molecule OR <ul style="list-style-type: none">• States its function	1

Question 30 (b) (ii) (2 marks)*Outcomes assessed: H4, H9***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Relates oxidative phosphorylation to ATP production and identifies the link to the oxidation of NADH or FADH₂	2
<ul style="list-style-type: none">• Relates oxidative phosphorylation to ATP production or to the oxidation of NADH or FADH₂	1

Question 30 (c) (5 marks)*Outcomes assessed: H2, H9, H13***MARKING GUIDELINES**

Criteria	Marks
• Relates properties of enzyme specificity and catalysis to how the model works	4–5
• States one property of an enzyme and describes/draws a model of enzyme activity	2–3
• Describes/draws a model of enzyme activity	1

Question 30 (d) (i) (1 mark)*Outcomes assessed: H13***MARKING GUIDELINES**

Criteria	Marks
• Defines viscosity	1

Question 30 (d) (ii) (2 marks)*Outcomes assessed: H12***MARKING GUIDELINES**

Criteria	Marks
• Describes an appropriate procedure	2
• States a time comparison is necessary	1
OR	
• States identical experimental conditions	

Question 30 (d) (iii) (3 marks)*Outcomes assessed: H12***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Clearly distinguishes between accuracy and reliability with examples of how to improve both	3
<ul style="list-style-type: none">States one way to improve accuracy and one way to improve reliability OR <ul style="list-style-type: none">States more than one way to improve accuracy OR <ul style="list-style-type: none">States more than one way to improve reliability OR <ul style="list-style-type: none">Distinguishes between accuracy and reliability in general terms	2
<ul style="list-style-type: none">States one way to improve accuracy or one way to improve reliability	1

Question 30 (e) (7 marks)

Outcomes assessed: H7, H9, H13, H14

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Relates type 1 and type 2 skeletal muscle to the correct respiratory pathways and rate and amount of ATP production by both aerobic and anaerobic pathways during different types of exercise <p>AND</p> <ul style="list-style-type: none"> Shows how these respiratory pathways are interrelated. Equations or a flow chart are used to summarise the respiratory pathways 	6–7
<ul style="list-style-type: none"> Summarises both aerobic and anaerobic respiratory pathways and interrelates these in terms of their energy production. Molecules are correctly identified <p>OR</p> <ul style="list-style-type: none"> Identifies both types of muscle and describes the energy requirement for different types of exercise and connects these to the correct respiratory pathways and amount of ATP produced without necessarily showing the interrelationship of the pathways 	4–5
<ul style="list-style-type: none"> Relates the type of muscle to the correct respiratory pathway and amount of ATP <p>OR</p> <ul style="list-style-type: none"> Identifies all reactants and products including the number of ATP either anaerobic or aerobic respiration <p>OR</p> <ul style="list-style-type: none"> Compares energy production in both aerobic and anaerobic respiration <p>OR</p> <ul style="list-style-type: none"> Compares the type of muscle used and the energy requirement for different type of exercise 	2–3
<ul style="list-style-type: none"> Identifies a muscle type <p>OR</p> <ul style="list-style-type: none"> Mentions a condition for energy production in muscle <p>OR</p> <ul style="list-style-type: none"> Identifies a reactant or product of glucose metabolism 	1

Question 31 (a) (i) (1 mark)*Outcomes assessed: H8***MARKING GUIDELINES**

Criteria	Marks
• Any suitable mineral source of a pigment	1

Question 31 (a) (ii) (2 marks)*Outcomes assessed: H8***MARKING GUIDELINES**

Criteria	Marks
• Describes how a separation process can be used to obtain a pigment	2
• Partially correct description of a separation process	1

Question 31 (b) (i) (2 marks)*Outcomes assessed: H6, H14***MARKING GUIDELINES**

Criteria	Marks
• Identifies barium and chromium only	2
• 1 correct element identified OR	1
• Identifies 2 correct elements and 1 other that is incorrect	

Question 31 (b) (ii) (2 marks)*Outcomes assessed: H2, H6***MARKING GUIDELINES**

Criteria	Marks
• Explains that an element must be excited for a subsequent emission to occur and that only certain energies are emitted from an element and that these correspond to certain frequencies/wavelength of light	2
• States that an element must be excited to a higher energy state OR	1
• States that only certain energies are emitted from an element	

Question 31 (c) (5 marks)*Outcomes assessed: H2, H6, H13***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Provides a detailed description of the Bohr model of the atomIdentifies a merit of the model and a limitation of the model	5
<ul style="list-style-type: none">Describes the Bohr model of the atom and identifies a merit of the model OR <ul style="list-style-type: none">Describes the Bohr model and identifies a limitation	3–4
<ul style="list-style-type: none">Partially describes the Bohr model of the atom	2
<ul style="list-style-type: none">States the Bohr model refers to electrons	1

Question 31 (d) (i) (1 mark)*Outcomes assessed: H6***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Any transition element given	1

Question 31 (d) (ii) (2 marks)*Outcomes assessed: H12***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Nominates reactants and colour change	2
<ul style="list-style-type: none">Nominates reactants OR <ul style="list-style-type: none">Correctly links a colour to a metal's oxidation state	1

Question 31 (d) (iii) (3 marks)
Outcomes assessed: H12
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Describes a safety risk and suggest a safe working practice to minimise the risk 	3
<ul style="list-style-type: none"> States one hazard and one safe work practice 	2
<ul style="list-style-type: none"> States one hazard OR <ul style="list-style-type: none"> One safe work practice 	1

Question 31 (e) (7 marks)
Outcomes assessed: H6, H13, H14
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Discusses the composition of 2 pigments including the formula of each coloured compound, and the oxidation state of each metal involved AND <ul style="list-style-type: none"> Relates the colour of each pigment to electronic transitions eg between d orbitals in transition metals 	6–7
<ul style="list-style-type: none"> Discusses the composition of 2 pigments including the formula of each coloured compound, and the oxidation state of each metal involved OR <ul style="list-style-type: none"> Relates the colour of each pigment to electron transition eg between d orbitals in the two transition metals 	4–5
<ul style="list-style-type: none"> Names two pigments and gives the chemical composition of one of the pigments 	3
<ul style="list-style-type: none"> Names two pigments OR <ul style="list-style-type: none"> Names two transition metals OR <ul style="list-style-type: none"> Names a pigment and gives its chemical composition 	2
<ul style="list-style-type: none"> Names a pigment OR <ul style="list-style-type: none"> Names a transition metal 	1

Question 32 (a) (i) (1 mark)

Outcomes assessed: H9, H13

MARKING GUIDELINES

Criteria	Marks
• A correct definition is given	1

Question 32 (a) (ii) (2 marks)

Outcomes assessed: H9

MARKING GUIDELINES

Criteria	Marks
• Correctly identifies a class of organic compounds AND • Describes a correct test with correct results to identify that class	2
• Correctly identifies a class of organic compounds OR • States a test that identifies a class of organic compounds	1

Question 32 (b) (i) (1 mark)

Outcomes assessed: H14

MARKING GUIDELINES

Criteria	Marks
• Tallow	1

Question 32 (b) (ii) (3 marks)
Outcomes assessed: H4, H9
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Relates the fatty acid structure and length of hydrocarbon chain in fatty acids and the carboxyl group to the solubility of fatty acids in water 	3
<ul style="list-style-type: none"> Describes the fatty acid molecule and describes solubility in water of the carboxylic acid group OR <ul style="list-style-type: none"> Relates the length of hydrocarbon chain in fatty acids to the solubility of fatty acids in water 	2
<ul style="list-style-type: none"> Describes the fatty acid molecule OR <ul style="list-style-type: none"> Describes solubility in water of the carboxylic acid group 	1

Question 32 (c) (5 marks)
Outcomes assessed: H2, H3, H6
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Assess the usefulness of mass spectrometry in forensic chemistry in terms of a number of its advantages such as determining RMM, range of elemental isotopes present, relative amounts of isotopes, very small samples 	4–5
<ul style="list-style-type: none"> Describes the usefulness of mass spectrometry in forensic chemistry with a suitable example 	2–3
<ul style="list-style-type: none"> Identifies one area of usefulness of mass spectrometry e.g. very small samples or range of elemental isotopes present 	1

Question 32 (d) (i) (1 mark)
Outcomes assessed: H9
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> A technique correctly identified 	1

Question 32 (d) (ii) (2 marks)*Outcomes assessed: H12***MARKING GUIDELINES**

Criteria	Marks
• Describes the method and details of the materials used	2
• Gives details of the materials used	1

Question 32 (d) (iii) (3 marks)*Outcomes assessed: H12***MARKING GUIDELINES**

Criteria	Marks
• Clearly distinguishes between accuracy and reliability with examples of how to improve both	3
• States one way to improve accuracy and one way to improve reliability OR • States more than one way to improve accuracy OR • States more than one way to improve reliability	2
• States one way to improve accuracy or one way to improve reliability OR • Distinguishes between accuracy and reliability in general terms	1

Question 32 (e) (7 marks)*Outcomes assessed: H1, H3, H9, H13, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Relates the unique nature of individual DNA to the use of DNA analysis in forensic chemistryDiscusses the role of DNA analysis in forensic chemistry by comparing it to another method and referring to points for and against the use of the technique	6–7
<ul style="list-style-type: none">Relates the unique nature of individual DNA to the use of DNA analysis in forensic chemistry AND <ul style="list-style-type: none">Compares the role of DNA analysis in forensic chemistry with another method	4–5
<ul style="list-style-type: none">Identifies the unique nature of individual DNA and describes at least one use of DNA analysis in forensic chemistry	2–3
<ul style="list-style-type: none">Identifies the unique nature of individual DNA OR <ul style="list-style-type: none">Identifies a use of DNA analysis in forensic chemistry	1