Neap

Final Examination 2022

NSW Year 11 Chemistry

Solutions and Marking Guidelines

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SECTION I

Answer and explanation	Syllabus content, outcomes and targeted performance bands
Question 1 **B** **B** is correct. Evaporation would remove the water and leave solid sodium chloride behind. **A** is incorrect. Distillation is used to separate liquids based on their individual boiling points. **C** is incorrect. Gravity filtration is used to separate liquids and solids when the liquid is to be obtained. **D** is incorrect. Vacuum filtration is used to separate liquids and solids when the solid is to be obtained. It is not a suitable technique to obtain sodium chloride from sea water as sodium chloride dissolves in water, meaning that sodium and chloride ions are in solution.	Mod 1 Properties and Structure of Matter CH11–4 Bands 2–4
Question 2 **A** **A** is correct. A compound's empirical formula is the smallest possible ratio of the elements in the compound. **B**, **C** and **D** are incorrect. They do not represent the smallest possible ratio of carbon, hydrogen and oxygen in glucose.	Mod 2 Introduction to Quantitative Chemistry CH11–6 Bands 4–6
Question 3 **D** **D** is correct. 1 mol of a gas will occupy 22.71 L at 100 kPa and 0°C (273.15 K). 64 g of SO_2 gives: $n(SO_2) = \frac{m}{MM}$ $= \frac{64}{64.07}$ $= 1.0\text{ mol}$ $n = \frac{V}{Vn}$ $V = n \times Vn$ $= 1.0 \times 22.71\text{ L}$ $= 22.71\text{ L}$ **A**, **B** and **C** are incorrect. The masses shown in each option do not equal 1 mol of the gas. 5.0 g of H_2 is 2.5 mol. 20 g of O_2 is 0.63 mol. 50 g of NO_2 is 1.1 mol.	Mod 2 Introduction to Quantitative Chemistry CH11–6 Bands 3–4

Answer and explanation	Syllabus content, outcomes and targeted performance bands
Question 4 D **D** is correct. Hydrated salts contain water molecules that need to be added to the molar mass calculation. $MM\left(\text{KAl}\left(\text{SO}_4\right)_2 \times 12\text{H}_2\text{O}\right)$ $= 39.10 + 26.98 + \left[\left(32.07 \times 2\right) + \left(16.00 \times 4 \times 2\right)\right] +$ $12\left[\left(1.008 \times 2\right) + 16.00\right]$ $= 474.46 \text{ g mol}^{-1}$ **A** is incorrect. The molar mass of water has not been included in the calculation. **B** is incorrect. The atomic mass of only 16 oxygens has been used in the calculation. **C** is incorrect. The atomic mass of aluminium has not been included in the calculation.	Mod 2 Introduction to Quantitative Chemistry CH11–6 Bands 2–3
Question 5 B **B** is correct. This equation is balanced as the total number of each element is equal on both sides of the equation. **A**, **C** and **D** are incorrect. The total number of elements on both sides of each equation are not equal.	Mod 2 Introduction to Quantitative Chemistry CH11–6 Bands 3–4
Question 6 B Magnesium chloride = MgCl_2, meaning 1 mol of MgCl_2 has 2 mol of chloride ions (Cl^-). Therefore, 0.100 mol of MgCl_2 has 0.200 mol of Cl^-. $\left(\text{number of Cl}^- \text{ ions}\right) = n \times N_A$ $= 0.200 \times 6.022 \times 10^{23}$ $= 1.20 \times 10^{23}$	Mod 2 Introduction to Quantitative Chemistry CH11–6 Bands 2–3

Answer and explanation	Syllabus content, outcomes and targeted performance bands
Question 7 **C** **C** is correct. Most metals have very high density. This is due to metallic bonding, which means the cations are arranged in a tightly packed crystal lattice and surrounded by delocalised electrons. The cations and electrons are held together in the lattice by strong electrostatic forces, which create the metallic bonding. The forces between molecules of non-metals are weaker than metallic bonds. As such, less energy is required to break those bonds, so non-metals have lower melting and boiling points. **A** is incorrect. Metals have high, not low, boiling points because they have strong electrostatic bonds. **B** is incorrect. Non-metals are not malleable. They are brittle; that is, they shatter when hit with another object, such as a hammer. **D** is incorrect. Non-metals have low density, as they are mainly gases and some liquids. The atoms in non-metals are held together by weak intermolecular forces and are not packed tightly together in a lattice. This causes them to have low density.	Mod 1 Properties and Structure of Matter CH11–8 Band 2
Question 8 **B** **B** is correct. Mixing solutions of silver acetate (ethanoate) (CH_3COOAg) and calcium chloride ($CaCl_2$) will produce a precipitate of silver chloride according to the following equation: $2CH_3COOAg(aq) + CaCl_2(aq) \rightarrow 2AgCl(s) + (CH_3COO)_2Ca(aq)$ **A**, **C** and **D** are incorrect. These reactions will not produce precipitates because the salts are soluble. The reactions occur according to the following equations: • **A:** $BaCl_2(aq) + Zn(NO_3)_2(aq) \rightarrow Ba(NO_3)_2(aq) + ZnCl_2(aq)$ • **C:** $MgSO_4(aq) + 2KBr(aq) \rightarrow MgBr_2(aq) + K_2SO_4(aq)$ • **D:** $NaOH(aq) + HNO_3(aq) \rightarrow NaNO_3(aq) + H_2O(l)$	Mod 3 Reactive Chemistry CH11–10 Bands 2–4
Question 9 **C** **C** is correct. The shape of the energy profile diagram represents an exothermic reaction. In exothermic reactions, energy is released into the surroundings, meaning that the energy of the reactants is higher than the energy of the products. **A** and **D** are incorrect. In endothermic reactions, energy is absorbed from the surroundings, so an energy profile diagram of an endothermic reaction would show the energy of the reactants as lower than the energy of the products. **B** is incorrect. The diagram shows the reactants and products having different energies.	Mod 4 Drivers of Reactions CH11–11 Bands 3–4

Answer and explanation	Syllabus content, outcomes and targeted performance bands
Question 10 **A** **A** is correct. Potassium is the most reactive as it appears highest in the electrochemical series. Silver is the least reactive as it appears lowest in the electrochemical series. **B**, **C** and **D** are incorrect. These options do not list the metals from highest in the electrochemical series to lowest in the electrochemical series.	Mod 3 Reactive Chemistry CH11–10 Band 2
Question 11 **A** **A** is correct. The reaction is a redox reaction. The oxidation numbers of zinc and hydrogen change as follows: • $Zn(s) \rightarrow Zn^{2+}(aq)$ • $2H^{+}(aq) \rightarrow H_2(g)$ **B** is incorrect. No precipitate is produced; therefore, the reaction is not a precipitation reaction. **C** is incorrect. There are two reactants; therefore, the reaction is not a decomposition reaction. **D** is incorrect. Zinc is not combusting/burning in the reaction; therefore, it is not a combustion reaction.	Mod 3 Reactive Chemistry CH11–10 Bands 3–4
Question 12 **D** **D** is correct. $NaOH(s) \rightarrow Na^{+}(aq) + OH^{-}(aq)$ $m(\text{NaOH}) = 2.43$ g $V = 500$ mL $= 0.500$ L $n(\text{NaOH}) = \frac{m}{MM} = \frac{2.43}{39.998} = 0.0608 \text{ mol}$ $c(\text{NaOH}) = \frac{n}{V} = \frac{0.0608}{0.500} = 0.1215 \text{ mol L}^{-1}$ **A** is incorrect. This option does not convert the volume to litres in the calculation. **B** is incorrect. This option states the number of moles, not the concentration. **C** is incorrect. This option uses an incorrect unit of measurement.	Mod 2 Introduction to Quantitative Chemistry CH11–9 Bands 3–4
Question 13 **D** **D** is correct, and **A** and **B** are incorrect. The standard state for Na and NaOH is solid. **C** is incorrect. The equation is not balanced.	Mod 2 Introduction to Quantitative Chemistry CH11–9 Bands 3–4

Answer and explanation	Syllabus content, outcomes and targeted performance bands
Question 14 **C** **C** is correct. β-decay of thorium-232 produces an element with an atomic number of 91, which is protactinium. **A** is incorrect. This option shows thorium-230 and does not show β-decay. **B** and **D** are incorrect. These options do not show β-decay.	Mod 1 Properties and Structure of Matter CH11–7 Bands 2–3
Question 15 **D** **D** is correct. Steam (water vapour) has the highest entropy because it is a gas and has a high temperature, which increases entropy. **A**, **B** and **C** are incorrect. Having a low temperature and changing state from gas to liquid and from liquid to solid reduces entropy.	Mod 4 Drivers of Reactions CH11–11 Bands 3–4

SECTION II

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
Question 16	
For example: 1. Pure anhydrous sodium hydrogen carbonate ($NaHCO_3$) is placed in a clean and dry beaker and accurately weighed on a balance. 2. The solid is transferred into a volumetric flask using a clean and dry funnel. 3. The beaker is rinsed with distilled water, and the distilled water used is poured into the flask. 4. More distilled water is added to the flask until it is half-full. A stopper is placed in the flask, and the flask is swirled to dissolve the solid. 5. The flask is filled with distilled water until the bottom of the meniscus of the solution lines up with the relevant mark. 6. The flask is shaken to ensure the concentration of the solution is even.	Mod 2 Introduction to Quantitative Chemistry CH11–6 Bands 3–4 • Describes all steps in the correct order for the preparation, including weighing, qualitative transfer, dissolving and filling up to the mark. AND • Refers to suitable glassware and equipment 4
	• Describes all steps in the correct order with some errors. AND • Refers to suitable glassware and equipment 3
	• Describes all steps in the correct order with some errors. AND • Refers to suitable glassware OR equipment 2
	• Provides some relevant information 1

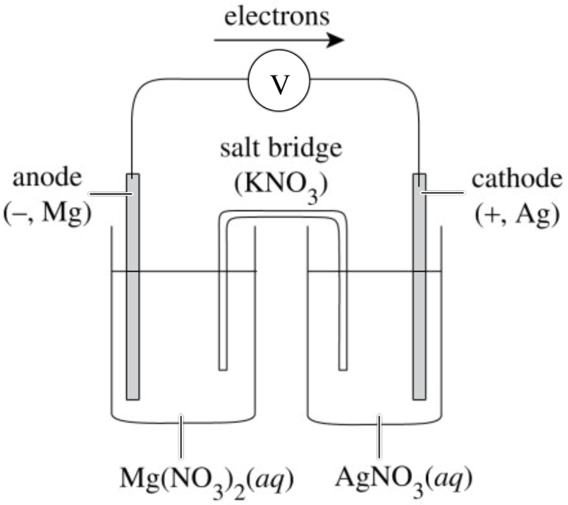
Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
Question 17	
$2C_4H_{10}(g) + 13O_2(g) \rightarrow 8CO_2(g) + 10H_2O(g)$ $PV = nRT$ $P = 1.8 \text{ atm}$ $= 1.8 \times 101.3$ $= 182.34 \text{ kPa}$ $T = 200°\text{C}$ $= 200 + 273.15$ $= 473.15 \text{ K}$ $R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$ $V = 35.0 \text{ L}$ $n(CO_2) = \frac{PV}{RT}$ $= \frac{182.34 \times 35.0}{8.314 \times 473.15}$ $= 1.6223 \text{ mol}$ $n(C_4H_{10}) = n(CO_2) \times \frac{2}{8}$ $= 1.6223 \times \frac{2}{8}$ $= 0.4056 \text{ mol}$ $MM(C_4H_{10}) = 58.12 \text{ g mol}^{-1}$ $m(C_4H_{10}) = n \times MM$ $= 0.4056 \times 58.12$ $= 24 \text{ g}$	Mod 2 Introduction to Quantitative Chemistry CH11–6 Bands 4–5 • Provides the correct balanced chemical equation. AND • Calculates the mass of butane reacted. AND • Uses correct unit conversions and the ideal gas law . . . . 3 • Any TWO of the above points. . . . 2 • Provides some relevant calculations 1

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
Question 18	
$n(\text{hexane}) = \frac{m}{MM}$ $= \frac{2.38}{86.172}$ $= 0.0276 \text{ mol}$ $\Delta H = \frac{q}{n}$ $q = \Delta H \times n$ $= 4163 \times 0.0276$ $= 114.9786 \text{ kJ}$ $= 114\,978.6474 \text{ J}$ $q = mc\Delta T$ $114\,978.6474 = 600 \times 4.18 \times \Delta T$ $\Delta T = 45.8448^\circ$ $\Delta T = T_2 - T_1$ $T_2 = \Delta T + T_1$ $= 45.8448 + 23.0$ $= 68.9^\circ\text{C}$	Mod 4 Drivers of Reactions CH11–6, 11–7 Bands 4–5 • Calculates the amount of hexane in moles. AND • Calculates the energy released (*q*). AND • Calculates the change in the temperature of the water. AND • Calculates the final temperature of the water . . . . 4 • Any THREE of the above points. . 3 • Any TWO of the above points. . . . 2 • Provides some relevant calculations 1
Question 19	
(a) $2\text{Al}(s) + 6\text{HCl}(aq) \rightarrow 2\text{AlCl}_3(aq) + 3\text{H}_2(g)$	Mod 3 Reactive Chemistry CH11–10 Band 4 • Provides the correct balanced chemical equation 1
(b) $2\text{H}_2\text{O}_2(aq) \rightarrow 2\text{H}_2\text{O}(l) + \text{O}_2(g)$	Mod 3 Reactive Chemistry CH11–10 Band 4 • Provides the correct balanced chemical equation 1
(c) $2\text{C}_3\text{H}_8(g) + 7\text{O}_2(g) \rightarrow 6\text{CO}(g) + 8\text{H}_2\text{O}(g)$ **OR** $\text{C}_3\text{H}_8(g) + 3\text{O}_2(g) \rightarrow 2\text{CO}(g) + 4\text{H}_2\text{O}(g) + \text{C}(s)$	Mod 3 Reactive Chemistry CH11–10 Band 4 • Provides the correct balanced chemical equation 1
(d) $\text{Ba(OH)}_2(aq) + 2\text{HNO}_3(aq) \rightarrow \text{Ba(NO}_3)_2(aq) + 2\text{H}_2\text{O}(l)$	Mod 3 Reactive Chemistry CH11–10 Band 4 • Provides the correct balanced chemical equation 1

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
Question 20	
(a) $H_2(g) + I_2(s) \rightarrow 2HI(g)$ $n(H_2) = \frac{m}{MM}$ $= \frac{13.0}{2.016}$ $= 6.45 \text{ mol}$ $n(I_2) = \frac{m}{MM}$ $= \frac{11.68}{253.8}$ $= 0.04602 \text{ mol}$ Iodine is the limiting reagent and hydrogen is the excess reagent.	Mod 2 Introduction to Quantitative Chemistry CH11–9 Bands 3–4 • Identifies the limiting reagent. AND • Identifies the excess reagent . . . . . 2 • Provides some relevant calculations 1
(b) $n(H_2 \text{ in excess}) = 6.45 - 0.04602$ $= 6.40 \text{ mol}$ *Note: Consequential on answer to* ***Question 20(a)***.	Mod 2 Introduction to Quantitative Chemistry CH11–9 Bands 3–4 • Calculates the correct amount of excess reagent 1
(c) $n(HI) = 2 \times n(I_2)$ $= 2 \times 0.04602$ $= 0.09204 \text{ mol}$ $m(HI) = n \times MM$ $= 0.09204 \times 127.908$ $= 11.77 \text{ g}$ *Note: Consequential on answer to* ***Question 20(a)***.	Mod 2 Introduction to Quantitative Chemistry CH11–9 Bands 3–4 • Calculates the amount of hydrogen iodide produced. AND • Calculates the mass of hydrogen iodide produced . . . . 2 • Provides some relevant calculations 1

<table>
<tr><th>Sample answer</th><th>Syllabus content, outcomes, targeted performance bands and marking guide</th></tr>
<tr><td>Question 21</td><td></td></tr>
<tr><td>Dichloromethane and water are immiscible, so they do not mix and, instead, form separate layers. As a result, they can be separated effectively with a separating funnel. The density of dichloromethane is higher than the density of water, so the dichloromethane will be the lower layer and the water will be the upper layer.
The liquids could also be separated effectively through distillation. Dichloromethane has a lower boiling point than water (39.6°C). As such, it will be the first fraction to be collected during distillation.</td><td>Mod 1 Properties and Structure of Matter
CH11–7, 11–8 Bands 3–4
• States that a separating funnel AND distillation are both effective techniques.
AND
• Assesses the effectiveness of a separating funnel based on different densities.
AND
• Assesses the effectiveness of distillation based on different boiling points 3
• States that a separating funnel OR distillation is an effective technique.
AND
• Assesses the effectiveness of the technique 2
• Provides some relevant information . . . . 1</td></tr>
<tr><td>Question 22</td><td></td></tr>
<tr><td>
<table>
<tr><th><i>Isotope</i></th><th><i>Number of protons</i></th><th><i>Number of neutrons</i></th><th><i>Electron configuration</i></th></tr>
<tr><td>$^{13}_{6}C$</td><td>6</td><td>13 – 6
= 7</td><td>$1s^22s^22p^2$</td></tr>
<tr><td>$^{20}_{10}Ne$</td><td>10</td><td>20 –10
= 10</td><td>$1s^22s^22p^6$</td></tr>
<tr><td>$^{24}_{11}Na$</td><td>11</td><td>24 – 11
= 13</td><td>$1s^22s^22p^63s^1$</td></tr>
<tr><td>$^{81}_{35}Br$</td><td>35</td><td>81 – 35
= 46</td><td>$1s^22s^22p^63s^23p^64s^23d^{10}4p^5$</td></tr>
</table>
<i>Note: Calculations are not required to obtain full marks.</i></td><td>Mod 1 Properties and Structure of Matter
CH11–8 Bands 3–4
• Provides FOUR correct rows. 4
• Provides THREE correct rows.
OR
• Provides correct information for all four isotopes with some errors 3
• Provides TWO correct rows.
OR
• Provides correct information for at least three isotopes with some errors 2
• Provides some relevant information . . . . 1</td></tr>
</table>

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
Question 23	
Water has polar molecules, strong hydrogen bonds between the molecules and weak intermolecular forces. A high amount of energy is needed to break the strong hydrogen bonds, resulting in water having a high boiling point and molar heat of vaporisation. Dichloromethane, propane and tetrafluoromethane have non-polar molecules and weak intermolecular forces. The weak intermolecular forces do not require a lot of energy to be broken, so these compounds have lower boiling points and lower molar heats of vaporisation.	Mod 1 Properties and Structure of Matter CH11–7, 11–8 Bands 3–4 • States that water is polar and the other compounds are non-polar. AND • Explains why the intermolecular bonding in water results in a high boiling point and molar heat of vaporisation. AND • Explains why the intermolecular bonding in the non-polar compounds results in lower boiling points and molar heats of vaporisation . . . . 3 • Any TWO of the above points. . . . 2 • Provides some relevant information 1
Question 24	
(a) magnesium and silver	Mod 3 Reactive Chemistry CH11–10 Bands 2–3 • Identifies that magnesium and silver have the highest potential difference 1

Sample answer	**Syllabus content, outcomes, targeted performance bands and marking guide**
(b)  $Mg(s) + 2Ag^+(aq) \rightarrow Mg^{2+}(aq) + 2Ag(s)$	Mod 3 Reactive Chemistry CH11–4, 11–10 Bands 4–6 • Draws a clear diagram. AND • Labels ALL of: – anode (with charge and Mg) – cathode (with charge and Ag) – electron flow from anode to cathode – electrolytes – salt bridge. AND • Provides the correct balanced chemical equation 5
	• Draws a clear diagram. AND • Labels at least FOUR of the above points. AND • Provides the correct balanced chemical equation 4
	• Draws a clear diagram. AND • Labels at least THREE of the above points. AND • Provides the correct balanced chemical equation 3
	• Draws a clear diagram. AND • Labels at least TWO of the above points. AND • Provides the correct balanced chemical equation 2
	• Provides some relevant information 1

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
(c) cathode: Ag, E° = 0.80 V anode: Mg, E° = –2.36 V $E^\circ_{cell} = E^\circ_{cathode} - E^\circ_{anode}$ $= 0.80 - (-2.36)$ $= 3.16$ V	Mod 3 Reactive Chemistry CH11–4 Band 3 • Calculates the cell potential 1
Question 25	
(a) $6H_2O(l) + 6CO_2(g) \xrightarrow{\text{sunlight}} C_6H_{12}O_6(s) + 6O_2(g)$ $\Delta H^\circ_{reaction} = \Sigma\Delta H^\circ f(\text{products}) - \Sigma\Delta H^\circ f(\text{reactants})$ $= (-1271 + 0) - [(-393.5 \times 6) +$ $(-285.8 \times 6)]$ $= +2805 \text{ kJ mol}^{-1}$	Mod 4 Drivers of Reactions CH11–6, 11–11 Band 3 • Provides the correct balanced chemical equation. AND • Calculates the enthalpy change. AND • Provides the correct sign . . . . 3 • Calculates the enthalpy change. AND • Provides the correct sign . . . . 2 • Calculates the enthalpy change with some errors 1
(b) *MM*(glucose) = 180.156 g mol^{-1} *M*(glucose) = 65.0 g $n(\text{glucose}) = \frac{65.0}{180.156}$ $= 0.3608$ mol $q = n \times \Delta H^\circ_{reaction}$ $= 0.3608 \times 2805$ $= +1012$ kJ *Note: Consequential on answer to **Question 25(a)**.*	Mod 4 Drivers of Reactions CH11–6, 11–11 Band 4 • Calculates the amount of glucose in moles. AND • Calculates the amount of energy in kilojoules . . . . 2 • Any ONE of the above points 1

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
(c) $\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$ Calculating ΔS° gives: $\Delta S^\circ = \Sigma\Delta S^\circ(\text{products}) - \Sigma\Delta S^\circ(\text{reactants})$ $\Sigma\Delta S^\circ(\text{products}) = 209.2 + (205.0 \times 6)$ $= 1439.2 \text{ J mol}^{-1} \text{ K}^{-1}$ $\Sigma\Delta S^\circ(\text{reactants}) = (70.00 \times 6) + (213.8 \times 6)$ $= 1702.8 \text{ J mol}^{-1} \text{ K}^{-1}$ $\Delta S^\circ = 1439.2 - 1702.8$ $= -263.6 \text{ J mol}^{-1} \text{ K}^{-1}$ $= -0.2636 \text{ kJ mol}^{-1} \text{ K}^{-1}$ $\Delta H^\circ = +2805 \text{ kJ mol}^{-1}$ $T = 25^\circ\text{C}$ $= 298.15 \text{ K}$ $\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$ $= +2805 - 298.15 \times (-0.2636)$ $= +2884 \text{ kJ mol}^{-1}$ $\Delta H^\circ > 0$ $\Delta S^\circ < 0$ $\Delta G^\circ > 0$ Therefore, the reaction is not spontaneous at 25°C. *Note: Consequential on answer to* ***Question 25(a)***.	Mod 4 Drivers of Reactions CH11–6, 11–11 Bands 5–6 • Calculates the entropy change. AND • Calculates the Gibbs free energy with the correct conversion of units. AND • States that the reaction is not spontaneous . . . . 3 • Calculates the entropy change AND Gibbs free energy with some errors. AND • States that the reaction is not spontaneous . . . . 2 • Provides some relevant information 1

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
Question 26	
The four factors that can influence the rate of a reaction are the surface area of solid reactants, the concentration of reactants that are in solution, the pressure for gaseous reactants and the temperature. Increasing the surface area of a solid reactant increases the number of particles that can react with the other reactants. This increases the frequency of successful collisions, which increases the rate of reaction. Increasing the concentration of a reactant that is in solution increases the number of reactant particles in a given volume. This increases the frequency of successful collisions, which increases the rate of the reaction. Increasing the pressure for gaseous reactants increases the concentration of reactant particles. This increases the frequency of successful collisions, which increases the rate of reaction. Increasing the temperature increases the kinetic energy of reactant particles. This means more particles have sufficient energy to overcome the activation energy, which means the amount of successful collisions rises. Therefore, the rate of reaction increases.	Mod 3 Reactive Chemistry CH11–10 Bands 4–5 • Identifies FOUR factors that can increase the rate of reaction. AND • Explains, using the collision theory, how each factor influences the rate of reaction . . . . 7–8 • Identifies THREE factors that can increase the rate of reaction. AND • Explains, using the collision theory, how each factor influences the rate of reaction . . . . 5–6 • Identifies TWO factors that can increase the rate of reaction. AND • Explains, using the collision theory, how each factor influences the rate of reaction . . . . 3–4 • Identifies ONE factor that can increase the rate of reaction. AND • Explains, using the collision theory, how the factor influences the rate of reaction. OR • Provides some relevant information 1–2

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
Question 27	
(a) dissociation	Mod 4 Drivers of Reactions CH11–6, 11–7 Band 2 • Names the type of reaction 1
(b) $n(\text{KCl}) = \frac{m}{MM}$ $= \frac{1.45}{74.55}$ $= 0.0195 \text{ mol}$ $q = mc\Delta T$ $= 51.45 \times 4.18 \times 1.60$ $= 344.0976 \text{ J}$ $= 0.3441 \text{ kJ}$ $\Delta H_{\text{sol}} = \frac{q}{n}$ $= \frac{0.3441}{0.0195}$ $= +17.7 \text{ kJ mol}^{-1}$	Mod 4 Drivers of Reactions CH11–6, 11–11 Bands 3–4 • Calculates the amount of solute in moles. AND • Calculates the molar enthalpy of the dissolution. AND • Provides the correct sign . . . . 3 • Provides the above points with some errors . . . . 2 • Provides some relevant calculations 1
Question 28	
(a) $n(\text{NaOH}) = cV$ $= 2.65 \times 1.50$ $= 3.975 \text{ mol}$ $m(\text{NaOH}) = n \times MM$ $= 3.975 \times 39.998$ $= 159 \text{ g}$	Mod 2 Introduction to Quantitative Chemistry CH11–6, 11–9 Bands 3–4 • Calculates the amount of NaOH in moles. AND • Calculates the mass of NaOH in grams . . . . 2 • Provides some relevant calculations 1
(b) $c_1V_1 = c_2V_2$ $c_2 = \frac{c_1V_1}{V_2}$ $= \frac{2.65 \times 0.5}{1.50}$ $= 0.9 \text{ mol L}^{-1}$	Mod 2 Introduction to Quantitative Chemistry CH11–6, 11–9 Bands 4–5 • Calculates the concentration of NaOH after dilution. 1