Topic 15: Energetics (8 hours)

15.1 Standard enthalpy changes of reaction

1.5 hour

	Assessment statement	Obj	Teacher's notes
15.1.1	Define and apply the terms *standard state, standard enthalpy change of formation* (ΔH_f°) and *standard enthalpy change of combustion* (ΔH_c°).	2	
15.1.2	Determine the enthalpy change of a reaction using standard enthalpy changes of formation and combustion.	3	

15.2 Born–Haber cycle

2.5 hours

	Assessment statement	Obj	Teacher's notes
15.2.1	Define and apply the terms *lattice enthalpy* and *electron affinity*.	2	
15.2.2	Explain how the relative sizes and the charges of ions affect the lattice enthalpies of different ionic compounds.	3	The relative value of the theoretical lattice enthalpy increases with higher ionic charge and smaller ionic radius due to increased attractive forces.
15.2.3	Construct a Born–Haber cycle for group 1 and 2 oxides and chlorides, and use it to calculate an enthalpy change.	3	
15.2.4	Discuss the difference between theoretical and experimental lattice enthalpy values of ionic compounds in terms of their covalent character.	3	A significant difference between the two values indicates covalent character.

15.3 Entropy

1.5 hours

	Assessment statement	Obj	Teacher's notes
15.3.1	State and explain the factors that increase the entropy in a system.	3	
15.3.2	Predict whether the entropy change (ΔS) for a given reaction or process	3	

	is positive or negative.		
15.3.3	Calculate the standard entropy change for a reaction (ΔS°) using standard entropy values (S°).	2	

15.4 Spontaneity

2.5 hours

	Assessment statement	Obj	Teacher's notes
15.4.1	Predict whether a reaction or process will be spontaneous by using the sign of ΔG°.	3	
15.4.2	Calculate ΔG° for a reaction using the equation $\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$ and by using values of the standard free energy change of formation, ΔG_f°.	2	
15.4.3	Predict the effect of a change in temperature on the spontaneity of a reaction using standard entropy and enthalpy changes and the equation $\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$.	3	