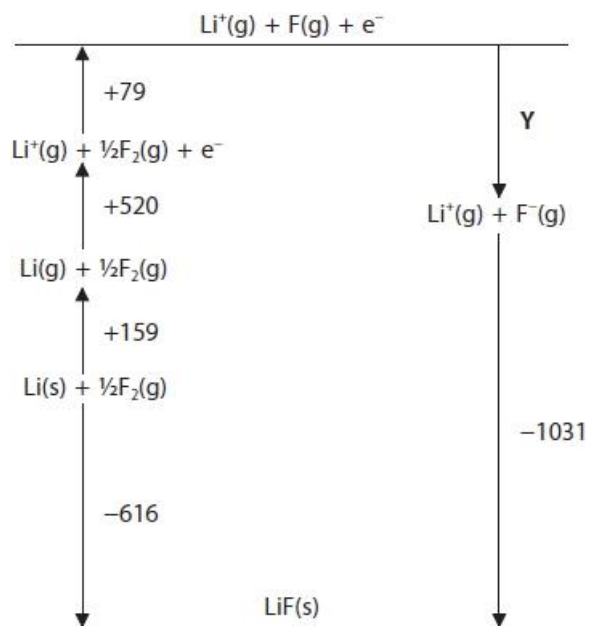


**Questions**

Q1.

This question is about ions and ionic compounds.

The diagram, which is not drawn to scale, shows the Born-Haber cycle for lithium fluoride. The energy changes are given in  $\text{kJ mol}^{-1}$ .



What is the value for  $Y$ , in  $\text{kJ mol}^{-1}$ ?

- A  $-273$   
 B  $-343$   
 C  $-432$   
 D  $-889$

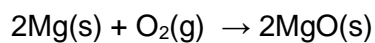
(1)

(Total for question = 1 mark)

**Q2.**

This question is about entropy.

What is the standard molar entropy change,  $\Delta S_{\text{system}}^{\ominus}$ , in  $\text{J K}^{-1} \text{mol}^{-1}$ , for the reaction shown?



Substance	Standard molar entropy, $S^{\ominus} / \text{J K}^{-1} \text{mol}^{-1}$
Mg(s)	32.7
O <sub>2</sub> (g)	205.0
MgO(s)	26.9

(1)

- A +210.8
- B -210.8
- C +216.6
- D -216.6

**(Total for question = 1 mark)****Q3.**

This question is about enthalpy changes and entropy changes.

What is the expression for  $\Delta S_{\text{total}}$ ?

(1)

- A  $\Delta S_{\text{surroundings}} + \frac{\Delta H}{T}$
- B  $\Delta S_{\text{surroundings}} - \frac{\Delta H}{T}$
- C  $\Delta S_{\text{system}} + \frac{\Delta H}{T}$
- D  $\Delta S_{\text{system}} - \frac{\Delta H}{T}$

**(Total for question = 1 mark)**

Q4.

Answer the question with a cross in the box you think is correct . If you change your mind about an answer, put a line through the box  and then mark your new answer with a cross .

Sodium hydride, NaH, can be used to generate hydrogen for fuel cells.

Lattice energies provide an indication of ionic bond strength.

Which are the lattice energies of the hydrides NaH, KH and MgH<sub>2</sub>?

(1)

Lattice energy / kJ mol <sup>-1</sup>			
	Sodium hydride, NaH	Potassium hydride, KH	Magnesium hydride, MgH <sub>2</sub>
<input type="checkbox"/> A	-804	-711	-1018
<input type="checkbox"/> B	-804	-711	-2718
<input type="checkbox"/> C	-804	-911	-1018
<input type="checkbox"/> D	-804	-911	-2718

(Total for question = 1 mark)

Q5.

This question is about enthalpy changes and entropy changes.

Which reaction has a negative value for  $\Delta S_{\text{system}}$ ?

(1)

- A  $2\text{Cu(s)} + \text{O}_2\text{(g)} \rightarrow 2\text{CuO(s)}$
- B  $2\text{H}_2\text{O}_2\text{(l)} \rightarrow 2\text{H}_2\text{O(l)} + \text{O}_2\text{(g)}$
- C  $\text{MgCO}_3\text{(s)} + \text{H}_2\text{SO}_4\text{(aq)} \rightarrow \text{MgSO}_4\text{(aq)} + \text{H}_2\text{O(l)} + \text{CO}_2\text{(g)}$
- D  $\text{Zn(s)} + 2\text{HCl(aq)} \rightarrow \text{ZnCl}_2\text{(aq)} + \text{H}_2\text{(g)}$

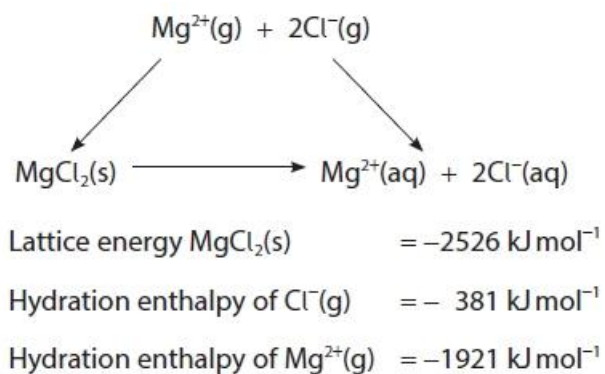
(Total for question = 1 mark)

Q6.

Answer the question with a cross in the box you think is correct . If you change your mind about an answer, put a line through the box  and then mark your new answer with a cross .

This question is about dissolving different compounds.

What is the value, in  $\text{kJ mol}^{-1}$ , for the standard enthalpy change of solution of magnesium chloride?



(1)

- A +157  
 B -157  
 C +224  
 D -224

(Total for question = 1 mark)

**Mark Scheme**

Q1.

Question Number	Answer	Mark
	<p>The only correct answer is B</p> <p><b>A</b> is incorrect because <math>(-1031) + (79 + 520 + 159)</math> is incorrect</p> <p><b>C</b> is incorrect because <math>(-1031) + (79 + 520)</math> is incorrect</p> <p><b>D</b> is incorrect because <math>(-1031) + 79 + 520 + 159 - 616</math> is incorrect</p>	(1)

Q2.

Question Number	Answer	Mark
	<p>The only correct answer is D (-216.6)</p> <p><b>A</b> is not correct because the values for magnesium and magnesium oxide have not been doubled and the entropy for the products has been incorrectly subtracted from the reactants entropy</p> <p><b>B</b> is not correct because the values for magnesium and magnesium oxide have not been doubled</p> <p><b>C</b> is not correct because the entropy for the products has been incorrectly subtracted from the entropy of the reactants</p>	(1)

Q3.

Question Number	Answer	Mark
	<p>The only correct answer is D</p> <p><b>A</b> is not correct because <math>\Delta S_{\text{surroundings}}</math> is incorrect</p> <p><b>B</b> is not correct because <math>\Delta S_{\text{surroundings}}</math> is incorrect</p> <p><b>C</b> is not correct because sign of <math>\Delta H/T</math> is incorrect</p>	(1)

Q4.

Question Number	Answer	Mark
	<p>The only correct answer is B (-804, -711, -2718)</p> <p>A is not correct because the lattice energy of magnesium hydride is not exothermic enough</p> <p>C is not correct because the lattice energy of potassium hydride should be less exothermic than sodium hydride and also that the lattice energy of magnesium hydride is not exothermic enough</p> <p>D is not correct because the lattice energy of potassium hydride should be less exothermic than sodium hydride</p>	(1)

Q5.

Question Number	Answer	Mark
	<p>The only correct answer is A</p> <p>B is not correct because all increase in entropy as disorder increases when gases are formed</p> <p>C is not correct because all increase in entropy as disorder increases when gases are formed</p> <p>D is not correct because all increase in entropy as disorder increases when gases are formed</p>	(1)

Q6.

Question Number	Answer	Mark
	<p>The only correct answer is B (-157)</p> <p>A is incorrect because this is the value if the cycle is used in the opposite direction</p> <p>C is incorrect because this is the value if the hydration enthalpy for the chloride ion is not multiplied by 2</p> <p>D is incorrect because this is the value if the cycle is used in the opposite direction and the hydration enthalpy for the chloride ion is not multiplied by 2</p>	(1)