

15.2 Entropy & Spontaneity

Question Paper

Course	DPIB Chemistry
Section	15. Energetics/Thermochemistry (HL only)
Topic	15.2 Entropy & Spontaneity
Difficulty	Hard

Time allowed: 10
Score: /5
Percentage: /100

Question 1

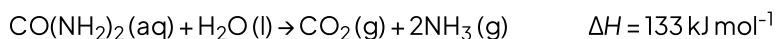
Which row correctly describes a reaction that only occurs spontaneously at a low temperature?

	Reaction	$\Delta H_{\text{reaction}}$
A.	$X(g) + Y(g) \rightarrow Z(g)$	exothermic
B.	$R(s) \rightarrow T(g) + U(g)$	endothermic
C.	$E(g) \rightarrow 3F(g)$	endothermic
D.	$M(g) + 2N(g) \rightarrow P(g) + Q(g)$	endothermic

[1 mark]

Question 2

Urea reacts with water to produce carbon dioxide and ammonia via the following reaction



Thermodynamic data for the components of this reaction are

Substance	$\text{CO}(\text{NH}_2)_2(\text{aq})$	$\text{H}_2\text{O}(\text{l})$	$\text{CO}_2(\text{g})$	$\text{NH}_3(\text{g})$
$S^\ominus (\text{JK}^{-1} \text{mol}^{-1})$	105	70	214	192

At which of the following temperatures will this reaction become feasible?

- A. $\frac{133}{[214 + (2 \times 192)] - (105 + 70)}$
- B. $\frac{[214 + (2 \times 192)] - (105 + 70)}{133}$
- C. $133 - \frac{[214 + (2 \times 192)] - (105 + 70)}{1000}$
- D. $\frac{133 \times 1000}{[214 + (2 \times 192)] - (105 + 70)}$

[1 mark]

Question 3

Which reaction occurs with the largest increase in entropy?

- A. $\text{Pb}(\text{NO}_3)_2(\text{s}) + 2\text{KI}(\text{s}) \rightarrow \text{PbI}_2(\text{s}) + 2\text{KNO}_3(\text{s})$
- B. $\text{CaCO}_3(\text{s}) \rightarrow \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$
- C. $3\text{H}_2(\text{g}) + \text{N}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$
- D. $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightarrow 2\text{HI}(\text{g})$

[1 mark]

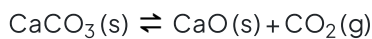
Question 4Which is correct for the reaction $\text{H}_2\text{O}(\text{g}) \rightarrow \text{H}_2\text{O}(\text{l})$?

- A. Enthalpy increases and entropy increases.
- B. Enthalpy decreases and entropy increases.
- C. Enthalpy increases and entropy decreases.
- D. Enthalpy decreases and entropy decreases.

[1 mark]

Question 5

Which factors will increase the entropy of this system?



- I. Increasing the temperature without changing the volume of the container.
 - II. Decreasing the concentration of the gas without changing the volume of the container.
 - III. Increasing the pressure without changing the volume of the container.
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

[1 mark]