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Chemistry_Questions_0066

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1.

Which of the following compounds has the lowest entropy at 25 °C?

Student
Response

a. CH₃OH(l)

b. CO(g)

c. MgCO₃(s)

d. H₂O(l)

e. H₂O(g)

2.

Which of the following substances has the greatest entropy per mole?

Student
Response

a. O₂(g)

b. N₂(g)

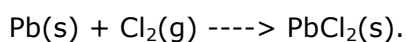
c. CO(g)

d. CO₂(g)

e. C₄H₁₀(g)

3.

Without consulting entropy tables, predict the sign of ΔS for the following process:

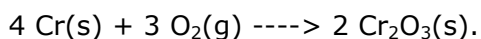


Student Response

- a. $\Delta S < 0$
- b. $\Delta S > 0$
- c. $\Delta S = 0$
- d. More information is needed to make a reasonable prediction.

4.

Using the data below, calculate $\Delta S^{\circ}_{\text{rxn}}$ for the following reaction:



Substance ΔS , J/K?mol

Cr(s)	23.77
O ₂ (g)	205.138
Cr ₂ O ₃ (s)	81.2

Student Response

- a. 548.1 J/K
- b. 147.7 J/K
- c. -147.7 J/K
- d. -548.1 J/K
- e. None of the above.

5.

In 1774 Joseph Priestly prepared oxygen by heating mercury(II) oxide according to the reaction $\text{HgO(l)} \rightarrow \text{Hg(l)} + \frac{1}{2}\text{O}_2\text{(g)}$, for which $\Delta H^{\circ} = 90.84 \text{ kJ/mol}$ and $\Delta S^{\circ} = 108 \text{ J/K}\cdot\text{mol}$. Which of the following statements is true for this reaction?

Student Response

- a. The reaction is spontaneous only at low temperatures.
- b. The reaction is spontaneous at all temperatures.
- c. ΔG° becomes less favorable as temperature increases.
- d. The reaction is spontaneous only at high temperatures.
- e. The reaction is at equilibrium at 25 °C and 1 atm pressure.

6.

Is $\text{H}_2\text{O}_2(\text{g})$ stable? For the reaction $\text{H}_2\text{O}_2(\text{g}) \rightarrow \text{H}_2\text{O}(\text{l}) + 1/2 \text{O}_2(\text{g})$, $\Delta H^\circ = -106$ kJ/mol; $\Delta S^\circ = 58$ J/K.

Student Response

- a. No.
- b. Yes, if the temperature is low enough.
- c. Yes, if the rate of decomposition is low.
- d. Yes, if the O-O bond energy is greater than the O-H bond energy.
- e. Yes, under all conditions.

7.

The signs of ΔH° , ΔS° , ΔG° for the vaporization of water at 50°C are

Student Response

- a. positive, positive, and positive.
- b. negative, negative, and negative.
- c. positive, negative, and positive.
- d. positive, positive, and negative.
- e. More information would have to be given to answer the question.

8.

Use the following data to calculate ΔG° at 298 K for the combustion of propane: $\text{C}_3\text{H}_8(\text{g}) + 5 \text{O}_2(\text{g}) \rightarrow 3 \text{CO}_2(\text{g}) + 4 \text{H}_2\text{O}(\text{l})$

Substance ΔG°_f , kJ/mol

$\text{C}_3\text{H}_8(\text{g})$	-23.0
$\text{O}_2(\text{g})$	0
$\text{CO}_2(\text{g})$	-394.6
$\text{H}_2\text{O}(\text{l})$	-237.2

Student Response

- a. 2109.6 kJ/mol
- b. 608.8 kJ/mol
- c. -608.8 kJ/mol
- d. -2109.6 kJ/mol
- e. None of the above.

9.

The heat of vaporization of 1-pentanol is 55.5 kJ/mol, and its entropy of vaporization is 148 J/Kmol. What is the approximate boiling point of 1-pentanol?

Student
Response

- a. 100 °C
- b. 375 °C
- c. 0 °C
- d. 25 °C

10.

Calculate ΔG° for the dissociation of HF in H₂O at 25 °C. [K_a of HF = 6.9×10^{-4} at 25 °C].

Student
Response

- a. -18 kJ
- b. 7.83 kJ
- c. -7.83
- d. 1.51 kJ
- e. 18 kJ

11.

Spontaneous reactions occur in one direction only and are not spontaneously reversible in the opposite direction.

Student
Response

- a. True
- b. False

12.

What is the best way to predict whether a reaction will be spontaneous?

Student Response

- a. Energy changes in a system
- b. Entropy
- c. Both entropy and change in enthalpy
- d. none of the above

13.

The greater the number of microstates the less likely the possibility of a spontaneous reaction.

Student
Response

- a. True
- b. False

14.

Which statement is true concerning entropy?

Student Response

- a. An exothermic process results in a decrease in the entropy of the surroundings.
- b. An exothermic process transfers heat from system to surroundings.
- c. An endothermic process absorbs heat from within the system.
- d. An endothermic process increases the entropy of the surroundings.

15.

If the change in free energy is less than zero then

Student Response

- a. the reaction is spontaneous in the forward direction.
- b. the reaction is non-spontaneous or spontaneous in the opposite direction.
- c. the system is in equilibrium.
- d. none of the above.