

Examrace

Competitive Exams: Chemistry MCQs (Practice_Test 1 of 31)

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1. For a process at 451 K and constant pressure, S_{urr} is -326 J K^{-1} . Calculate the quantity of heat (in kJ) absorbed by the system.
 - a. N/A
 - b. N/A
 - c. N/A
 - d. N/A

2. Which of the following produces an INCREASE in entropy of the system?
 - a. $\text{H}_2\text{O}(\text{l}) \rightarrow \text{H}_2\text{O}(\text{s})$
 - b. $2\text{O}_2(\text{g}) + 2\text{SO}(\text{g}) \rightarrow 2\text{SO}_3(\text{g})$
 - c. $2\text{CH}_3\text{OH}(\text{g}) + 3\text{O}_2(\text{g}) \rightarrow 2\text{CO}_2(\text{g}) + 4\text{H}_2\text{O}(\text{l})$
 - d. $\text{I}_2(\text{s}) \rightarrow \text{I}_2(\text{l})$
 - e. None of the above:

3. The gas-phase reaction between H_2 and Cl_2 can be initiated by ultraviolet light at 25°C , $\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightarrow 2\text{HCl}(\text{g})$. Using the thermodynamic data provided below, calculate the standard free energy change (in kJ) at 25°C for this reaction. Compound $\Delta_f H^\circ$, kJ mol^{-1} ; $\Delta_f S^\circ$, $\text{J mol}^{-1} \text{K}^{-1}$

H_2	0	130.57
Cl_2	0	222.96
HCl	-92.30	71.86

 - a. N/A
 - b. N/A
 - c. N/A
 - d. N/A

4. In lecture, you observed the following reaction, For this reaction, $\Delta_r H^\circ = -241.8 \text{ kJ}$ and $\Delta_r S^\circ = -88.8 \text{ J K}^{-1}$. Assuming that $\Delta_r H^\circ = \Delta_r H$ and $\Delta_r S^\circ = \Delta_r S$ at all temperatures, calculate the temperature (in K) at which this reaction would become non-spontaneous.
 - a. N/A
 - b. N/A
 - c. N/A

- d. N/A
5. For a particular chemical reaction at 4000C, $G = -67$ kJ. Calculate the time (in seconds) it will take for the reaction to reach completion.
- a. N/A
- b. N/A
- c. N/A
- d. N/A
6. For a particular chemical reaction, H_o is positive and S_o is negative. Which of the following statements about the spontaneity of the reaction under standard conditions is TRUE?
- a. The reaction will be spontaneous only if the magnitude of H_o is large enough to overcome the unfavorable entropy change.
- b. The reaction will be spontaneous only if the magnitude of S_o is large enough to overcome the unfavorable enthalpy change.
- c. The reaction will be spontaneous regardless of the magnitudes of H_o and S_o .
- d. The reaction cannot be spontaneous.
- e. The reaction will be spontaneous only if G_o is positive.
7. Which of the following is TRUE for an operating voltaic cell?
- a. $G > 0$; $E = 0$
- b. $G < 0$; $E < 0$
- c. $G = 0$; $E > 0$
- d. $G = 0$; $E = 0$
- e. $G < 0$; $E > 0$
8. Which of the following produces a DECREASE in entropy of the system? Hint: The system is shown in bold.
- a. Dissolving sugar in a cup of coffee.
- b. Condensation of water on the surface of a glass of iced tea on a hot summer day.
- c. Boiling water in a pot on the stove to make spaghetti.
- d. Allowing the liquid propane in a gas grill to escape from the tank.
- e. Producing CO_2 gas from baking soda ($NaHCO_3$) when baking a cake.
9. Consider the following reaction and thermodynamic data, $2H_2O_2(aq) \rightleftharpoons 2H_2O(l) + O_2(g)$ substance H_{fo} , kJ mol⁻¹ S_o , J mol⁻¹ K⁻¹, $H_2O_2(aq)$ -191.17143, $H_2O(l)$

-285.8369. 91, O₂ (g) 0205.14 Calculate the value (in kJ) of G_o at 250C.

10. For a particular chemical reaction, both H_o and S_o are negative. Which of the following statements about the spontaneity of the reaction under standard conditions is TRUE?
- The reaction will be spontaneous only if the magnitude of H_o is large enough to overcome the unfavorable entropy change.
 - The reaction will be spontaneous only if the magnitude of S_o is large enough to overcome the unfavorable enthalpy change.
 - The reaction will be spontaneous regardless of the magnitudes of H_o and S_o.
 - The reaction cannot be spontaneous.
 - The reaction will be spontaneous only if G_o is positive.
11. The boiling point of a substance is the temperature at which equilibrium is established between the liquid and the vapor. CH₃CH₂OH (l) ⇌ CH₃CH₂OH (g) Calculate the boiling point (in K) of ethanol, CH₃CH₂OH, if H = 42.6 kJ and S = 122 J/K for this process.
- N/A
 - N/A
 - N/A
 - N/A
12. What is the significance of the Third Law of Thermodynamics? Choose the best answer.
- The absolute entropy of a substance decreases with increasing temperature.
 - The change in entropy of the universe must be positive for a spontaneous process.
 - The absolute value of entropy can be measured for some very pure substances.
 - The change in entropy of the universe equals the sum of the change in entropy of the system plus the change in entropy of the surroundings.
 - The entropy of the universe is constant.
13. The K_{sp} for the sparingly soluble salt barium chromate (BaCrO₄) at 250C is equal to 2.0 × 10⁻¹⁰. Calculate G_o (in kJ) for the following reaction. BaCrO₄ (s) ⇌ Ba²⁺ (aq) + CrO₄²⁻ (aq)
- N/A
 - N/A
 - N/A

d. N/A

14. A Chemistry 116 student determined the value of K_{sp} for a saturated solution of borax at several different temperatures. The value for K_{sp} for the dissolution of borax in water can be determined from:
- the slope of the line resulting from a plot of $\ln K_{sp}$ versus $(1/T)$
 - the y-intercept of the line resulting from a plot of $\ln K_{sp}$ versus T
 - the slope of the line resulting from a plot of K_{sp} versus $(1/T)$
 - the y-intercept of the line resulting from a plot of $\ln K_{sp}$ versus $(1/T)$
 - the slope of the curve at 25°C from a plot of $\ln K_{sp}$ versus T
15. Consider the following gas-phase reaction, $2\text{NO}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g}) + \text{O}_2(\text{g})$, $\Delta G^\circ = +70.5$ kJ, If 1.00 mole of $\text{NO}_2(\text{g})$ is placed in a 1.00 – L flask (no $\text{NO}(\text{g})$ or $\text{O}_2(\text{g})$ initially) at 25°C , which of the following statements is TRUE?
- The reaction will occur spontaneously from left to right.
 - The reaction will occur spontaneously from right to left.
 - The reaction is not spontaneous in either direction.
 - The reaction is spontaneous in both directions.

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