1) Does reaction with a decrease in enthalpy ($\Delta H < 0$) always proceed spontaneously?

2) When a substance converts from gas → liquid, what is the change in entropy?

3) If a reaction is third-order with respect to reactant A, what effect will doubling the concentration of A do to the reaction rate?

4) Is the molar entropy of water vapor (g) greater or less than that of hydrogen gas?

5) Which combinations of ΔH and ΔS lead to ΔG values which are NOT dependent on temperature?

6) List several examples of changes which INCREASE entropy, we went over 4 cases at the start of Ch 18.

7) What is MOLAR ENTROPY and how do we know if one molecule has a greater molar entropy than another?

8) What is the SECOND law of thermodynamics and what does it tell us about spontaneity?

9) Predict the signs of ΔH, ΔS, and ΔG for the condensation of water vapor on your bathroom mirror at 32 °C.

10) For a reaction, $\Delta H° = 80.9$ kJ and $\Delta S° = -80.7$ J/K, calculate $\Delta G°$. Is this reaction spontaneous at 25 °C?

11) If a reaction is non-spontaneous at a given temperature, how would you determine when the reaction becomes spontaneous?

12) Write the rate expressions for all reactants and products:

$$2\ C_2H_6\ (g) + 7\ O_2\ (g) \rightarrow 4\ CO_2\ (g) + 6\ H_2O\ (g)$$

13) A reaction has the following rate law: Rate = $k[A]^2[B]^3$. If the concentration of **A is doubled** and the concentration of **B is tripled**, by what factor will the rate increase?

14) For a second-order reaction, how can you graphically determine the rate constant (k)?

15) For the following reaction, the rate of O_2 loss was measured to be 0.352 M/s.

$$2\ C_2H_6\ (g) + 7\ O_2\ (g) \rightarrow 4\ CO_2\ (g) + 6\ H_2O\ (g)$$

Determine the rate of CO_2 production over the same period of time.

16) A given reaction is determined to be first-order with a rate constant of 0.025 min^{-1}. If the reaction is started with an initial concentration of reactant A of 0.500 M, what will be the concentration of A after 7.5 minutes?

17) A certain first-order reaction starts with an initial concentration of 0.50 M. 75% of this reactant is used up in 10 minutes. What is the half-life ($t_{1/2}$) of the reaction?

18) Explain why all collisions between reactant molecules do not lead to product formation.

19) The following reaction has the mechanism shown below. $ABY + C \rightarrow ABC + Y$

Mechanism

Step 1: $ABY \rightarrow AB + Y$ (fast) rate = k[ABY]

Step 2: $AB + C \rightarrow ABC$ (slow) rate = k[AB][C]

Write the rate law for this reaction.

20) Determine the order of each reactant and write the RATE LAW for this reaction.

$$H_2SeO_3\,(aq) + 6\,I^-\,(aq) + 4\,H^+\,(aq) \rightarrow Se\,(s) + 2\,I_3^-\,(aq) + 3\,H_2O\,(l)$$

$[H_2SeO_3]$	$[H^+]$	$[I^-]$	Initial Rate (M/s)
$1.0 \times 10^{-4}\ M$	$1.0 \times 10^{-2}\ M$	$1.0 \times 10^{-2}\ M$	1.66×10^{-7}
$3.0 \times 10^{-4}\ M$	$1.0 \times 10^{-2}\ M$	$1.0 \times 10^{-2}\ M$	4.98×10^{-7}
$1.0 \times 10^{-4}\ M$	$3.0 \times 10^{-2}\ M$	$1.0 \times 10^{-2}\ M$	14.94×10^{-7}
$1.0 \times 10^{-4}\ M$	$1.0 \times 10^{-2}\ M$	$2.0 \times 10^{-2}\ M$	6.64×10^{-7}