Investigation Report Outline:
How Does Changing Temperature Affect the Equilibrium of a Reaction

Instructions: Write the report directly on this document. The bullet points below each section will guide you as you write. These bullet points should not appear in your final draft (but please keep the **Section headings**).

Section 1: Evidence

Table 1: This chart displays the temperature conditions of each trial in Celsius as well as the recorder absorbances and calculated concentrations.

Trial	Temperature (℃)	Absorbance	Concentration (M)
1	5	0.720	1.37×10^{-4}
2	15	0.669	1.28×10^{-4}
3	25 (Room)	1.037	1.93×10^{-4}
4	35	0.412	8.26×10^{-5}
5	45	0.720	1.37×10^{-4}

K = 174

Section 2: Claim and Reasoning

When the temperature conditions of a system are increased or decreased, there is no significant effect on the equilibrium value.

It was found that by increasing or decreasing the temperature of the conditions of a reaction between Fe^{3+} and SCN^{-} to be in equilibrium with $FeSCN^{2+}$, that the overall equilibrium constant would ultimately undergo insignificant change. In this experiment, two trials were performed respectively at temperatures greater than as well as less than room temperature (25 ℃). In order to determine the concentrations for each trial and the treatment received, the absorbance of each solution was measured and used in the equation derived from the rate law for the reaction (M=(abs+0.055)/5655). The initial two trials, performed at 5℃ and 15℃, had calculated concentrations of $FeSCN^{2+}$ at 1.37×10^{-4} and 1.28×10^{-4} respectively. Between these two treatments, a slight decrease in concentration was observed, suggesting that by increasing the temperature of the reaction conditions, the $FeSCN^{2+}$ product was favored causing the reaction to produce more reactants, a property consistent with an exothermic reaction. This trend continued when the temperature was increased to 35℃ where an absorbance of 0.412 was measured and an $FeSCN^{2+}$ concentration of 8.26×10^{-5} was calculated. However, at room temperature, the calculated concentration of $FeSCN^{2+}$ increased from trial two at 1.93×10^{-4}. This was inconsistent with the previously observed trend of increasing temperature causing the reverse reaction of this system to become favored. Likewise, the calculated concentration of the trial performed at 45℃ was 1.37×10^{-4}, the same concentration as the trial performed at 5℃.

The data produced from this investigation was inconclusive as to determining the effect changing temperature has on a system at equilibrium. In this experiment, changing the temperature surrounding the system elicited significantly different results with each trial, suggesting that there is no quantifiable dynamic between changing temperature and the equilibrium of a reaction, as was described in the claim. Typically, a system will respond to an external stress such as temperature change, and adjust the internal conditions of the reaction in order to reestablish equilibrium. For example, in an endothermic reaction, increasing the surrounding temperature would shift the reaction to produce more products, while decreasing the temperature would cause the system to shift left and produce more products. Conversely, increasing the temperature surrounding an exothermic reaction would cause the system to shift to the left producing more reactants, and decreasing the temperature would force the reaction to shift right and produce more products.