c) $4PH_{3(g)} \rightleftarrows P_{4(s)} + 6H_{2(g)} + 37\ kJ$ (exo)

(4 mol gas → 6 mol gas)

The products has/have minimum enthalpy.

The products has/have maximum entropy.

If $PH_{3(g)}$ was put in a flask, what should happen? (go to completion/ reach a state of equilibrium/not occur at all)

go to completion

(3)

20. Do systems always reach ***minimum enthalpy*** at equilibrium? no

Explain. the tendency for max entropy may be opposing it

(-1)

21. Do systems always reach ***maximum entropy*** at equilibrium? no

Explain. the tendency for min. enthalpy may be opposing it

(-1)

22. A "heat term" in a chemical equation shows what is happening to the enthalpy and really has nothing to do with the entropy. (Answers are either entropy or enthalpy)

(-1)

23. As a reaction approaches equilibrium, the rate of the forward reaction decreases, while the rate of the reverse reaction increases. Once equilibrium is reached, the rates become equal

(3)

24. Consider the reaction: $BaCO_{3(s)} + \text{heat} \rightleftarrows BaO_{(s)} + CO_{2(g)}$

Which one of the following observations will indicate that the reaction has most likely achieved ***equilibrium***?

a) The mass of the system becomes constant (always true "cons. of mass")
b) The concentration of $BaO_{(s)}$ becomes constant (conc. of solids are always constant)
c) All the $BaCO_3$ is consumed. (doesn't go to completion)
d) The gas pressure of the system becomes constant

Your answer is (d). Explain why. pressure is a macroscopic property - becomes constant at equilibrium.

(2)

25. Consider the following reaction: $Fe^{3+}_{(aq)} + SCN^{-}_{(aq)} \rightleftarrows FeSCN^{2+}_{(aq)}$

A solution of $Fe(NO_3)_3$ is added to a solution of KSCN. As equilibrium is being established, the $[Fe^{3+}]$ is decreasing and the $[FeSCN^{2+}]$ increasing

(2)

13